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Envisioning Career Technical Education as a Platform for Student Empowerment

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Introduction

Career Technical Education (CTE) has emerged as a promising platform to improve educational preparation for students underrepresented in the sciences. Despite its potential, funding inequalities, lack of teacher preparation, and inadequate industry connections affect the quality of CTE programs. This paper describes Teachers and Students for Community Oriented Research and Education (TSCORE), a community-university partnership that focuses on CTE health science teachers and provides pedagogical tools, knowledge, and connections needed to bring local, cutting-edge health disparities research into classrooms. Framed in critical pedagogy, TSCORE delivers 1) teacher empowerment, 2) implementation support, and 3) student conscientization. Teachers receive 85 hours of professional development on health disparities, project based learning, and curriculum development. Pedagogical support is provided during the year as teachers use newly created curricular units to guide students in inquiry that problematizes the state of health in their communities and engages them in developing community-based interventions to improve health outcomes for their people. TSCORE challenges the academic-vocational divide by moving past views of CTE as a job training platform for entry level positions and invites students to experience first-hand how a career in science and research can have a positive impact on the health of their communities.

Literature Review

Career Technical Education (CTE) has emerged in the last decade as an evidence-based approach to boost graduation rates and to provide students with opportunities to gain exposure to a vast array of careers (Levesque et al., 2008). Studies of CTE participation have

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found that students who take at least three CTE courses participate in more rigorous coursework (Aliaga, Kotamraju, & Stone, 2012), take more math and science courses at higher levels (Stone & Aliaga, 2003), are more likely to aspire to and earn bachelor's degrees (Levesque et al., 2008), and are less likely to drop out of high school (Gray, 2004). Despite variability, most CTE programs are characterized by a sequence of courses that blends standards-based academics with hands-on, challenging career-preparation skills. Those funded with federal Perkins IV grants are required to demonstrate academic rigor, seamless postsecondary connections, and college preparation in career-focused education.

Despite CTE's potential as an empowerment platform, questions remain regarding its effects on urban districts given the historical, and potentially outdated, connections between CTE and ability tracking. In fact, a growing body of literature is raising concerns that although CTE students might experience higher employment rates directly after graduation, participants seem to suffer when looking at long term outcomes as more jobs require postsecondary credentials and broader competencies beyond technical skills (RWIN, 2017). CTE curricula can no longer solely focus on skills demanded by labor markets that are likely to evolve and change over time. Rather, the 21st century demands that students be equipped with critical thinking skills, the ability to look for and synthetize information, and the capacity to develop solutions to novel problems. These transferable skills allow students to be competitive in contemporary labor markets and continue career advancement in the real world.

CTE programs now serve the vast majority of public high school students, as approximately 92 percent of high school students have taken at least one CTE course (Levesque et al., 2008). In the state we work in, Kansas, enrollment in CTE classes has increased dramatically over the last three years. In the 2015-2016 school year, 71,109 Kansas students were enrolled in secondary CTE courses, an increase of 131 percent in the past year (PCRN, 2016). Approximately 1,400 students earned industry-recognized credentials, including 1,022 in a health-related field. Although the CTE course enrollment has been increasing, CTE pathway concentration and completion rates have been lagging. For instance, in one of the major urban school districts in Kansas, only 10% of health science students who took entry-level courses were pathway "completers" which is half the national average of a 20.8% pathway completion rate (Levesque et al., 2008).

State and district CTE leaders recognize that student failure to complete CTE pathways might stem from a multiplicity of factors affecting urban districts including 1) fear of challenging higher level technical and application course content, 2) a lack of understanding of how the higher level courses will prepare students for health careers, and 3) a lack of preparation of health science teachers to teach higher level courses (Aliaga et al., 2014; Castellano et al., 2012, 2017). Moreover, there seems to be consensus that while affluent suburban districts have thrived in establishing industry connections and aligning their efforts with curricular standards, well-intentioned urban schools continue to struggle to deliver quality CTE programming to their students. Finding industry mentors in urban neighborhoods struggling with poverty and staffing high level CTE courses with qualified teachers are some of the barriers faced by urban schools, including the very schools involved in the program presented here (Brand, 2008; Bridwell-Mitchell, 2017).

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The goal of this paper is to describe the Teachers and Students for Community Oriented Research and Education (TSCORE) program. TSCORE joins a growing number of programs highlighting the potential of CTE as a platform for innovation, student engagement, and curriculum integration. We agree with Jocson that "CTE can be a place where what it means to be human and educated is not simply tied to shifting labor markets" (Jocson, 2018, p.642). TSCORE engages students in a process of critical awareness that leads them to analyze the current state of health in their communities and to develop action plans for change. We offer teachers learning experiences tailored for those teaching in the urban core and organized around the themes of health disparities, public health, and social determinants of health. By posing problems within the context of students' realities, TSCORE teachers help students envision how science (biomedical, clinical, behavioral, and social) and research can serve as powerful tools to ameliorate the diseases and illnesses impacting their communities. Students witness firsthand the workforce contributions they can make by choosing careers in public health research along with other more traditional medical and health science opportunities. This paper describes the TSCORE model.

Theoretical Framework

TSCORE is grounded in critical pedagogy, an educational approach based on the works of Paolo Freire (1970, 1972, 1987). Following Freire, we reject traditional "banking" methods focused on transmission of knowledge and skills dictated by shifting labor markets (Freire, 1970). In such a system, teachers deposit knowledge on students who in turn regurgitate it without deeper understanding. In contrast, Freire proposes that the main aims of education should be to develop critical awareness of students' own social and personal circumstances and to create new knowledge rooted in students' realities and aimed at addressing the injustices and inequalities of an oppressive world. More than simply providing contextualized lessons, for learning to be "authentic" it should lead to conscientization. Freire defines conscientization as "to learn to perceive social, political, and economic contradictions and to take action against the oppressive elements of reality" (Freire, 1970, p. 17). Conscientization is therefore a call for action that clearly surpasses the boundaries of the traditional classroom. It also challenges traditional classroom-as-a-container discourses that prescribe where learning "takes place." It calls for the creation of learning networks that confer teachers the opportunity to expand their own knowledge and to cross the "in-school"/"out-of-school" border. Finally, applying a Freirean framework to CTE courses requires challenging traditional approaches to CTE that are centered on workforce readiness and market demands. The reductionist approach found in many current CTE classrooms ignores the ever-changing nature of our global markets and the skills that they demand. Equating CTE to mere production "misrepresents the capacity of individuals to be active participants with the social knowledge, symbolic power, and other forms of capital that can enhance their valued participation within particular social spaces" (Bourdieu, 1986, 1989, cited in Jocson, 2018, p.659).

Using a public health lens, TSCORE pushes CTE teachers and students to problematize the state of health in their communities and to start conceptualizing community-based interventions that could improve health outcomes. In this sense, empowering students with the tools to become inquisitive about their surroundings and to enact change, we strive to

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"transform the outlook of marginalized youth from one of desperate resignation to one of critical awareness and pragmatic optimism" (Noguera, 2007, p.18). It is this sense of hope that can have a positive impact on students' self-efficacy, knowledge, and interest in STEM careers.

We approach curriculum development and teaching from a dialogical perspective with the goal of co-producing knowledge in collaboration with teachers and students; the type of knowledge that is reflective of the perspectives and experiences of local populations. The TSCORE curriculum is rooted in students' own community whose inhabitants experience high levels of poverty and unemployment, low access to health care services, and linguistic and cultural barriers that limit their ability to thrive. Hence, we challenge teachers to abandon the traditional hierarchy that confers teachers' authority over students and the boundaries delineating teacher-student interactions. A teacher working within a critical pedagogy framework acknowledges that "nobody knows everything" and that education is transformative. As a facilitator, the teacher poses real, present, and local problems to students and challenges them to think critically about their own realities and to develop solutions to the problems their own communities face. This pedagogy of questioning invites students to discover reality in the root causes of health inequities, to think critically about the conditions in which they live, and to feel empowered to change them.

Although the literature on Freire's work is extensive, his work does not escape criticism. The applicability of his theories to contexts outside Brazil as well as the complexity of his epistemological foundation and lack of clear and practical pedagogical models for the classroom are some of the most salient (Au, 2007; Beckett, 2013; Jackson, 2007). To address these shortcomings and given the focus of TSCORE on praxis, our project adopts project based learning (PBL) as its method of delivery due to its focus on engaging students by empowering them to investigate authentic, complex questions or problems, build collaboration and project management skills, and respond to meaningful, relevant challenges (Mergendoller, 2018). Pragmatically, PBL relies on "rigorous projects [that] are carefully planned, managed, and assessed to help students learn key academic content, practice 21st Century Skills (such as collaboration, communication and critical thinking), and create high-quality, authentic products and presentations" (BIE, 2012). PBL places a great deal of emphasis on student-centered, inquiry-driven practices, principles that are highly aligned with Freire's pedagogical philosophy.

The TSCORE Model: Praxis and Implementation

To ensure successful development and implementation of the TSCORE program, we convened a diverse team. The team includes individuals with experience in public health, health disparities research, and community-university partnerships as well as experience teaching, developing curriculum, and designing and evaluating professional development opportunities for teachers in the urban core. From 2016-2018 and over the course of three school years, we have worked with a total of 21 teachers in two major urban districts in Kansas. As shown in Figure 1, the TSCORE model is organized around three intertwined priorities: 1) teacher empowerment, 2) implementation support, and 3) student

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conscientization. Each of these areas are described below in Figure 1 and subsequently in the text that follows.

Teacher Empowerment

Each summer we host high school teachers on campus for an 85-hour professional development opportunity, the TSCORE Summer Institute. Although we originally planned on limiting recruitment to CTE health science teachers, given districts' movement towards career-focused academies, we expanded our guidelines to include core content teachers within the health science academies. Cross-curricular opportunities have proven extremely effective in raising the bar and maximizing our impact within the schools.

The TSCORE Summer Institute is organized around three main themes: health disparities, PBL, and curriculum development. We know that teachers' content knowledge highly influences their professional practices and student achievement. Teachers with advanced science knowledge pose questions, pursue unanticipated inquiries, and engage students in co-construction of knowledge, while teachers with limited knowledge most often revert to direct instruction and focus on factual knowledge (Davis & Petish, 2005; Hauslein et al., 1992). Moreover, following a national trend, our teachers often reside in counties other than the one where they teach; even when they do, they tend to be unaware of the disparities their community members face (Downs, 2016). Using a public health lens, our Summer Institute provides teachers with the knowledge and research connections they need to develop a curricular unit that is contextualized in students' realities and empowers students as agents of change within their communities.

To mirror the inquiry process, the TSCORE Summer Institute begins with a tour of the community that highlights both health disparities and local resources. The experience is designed to spark teachers' interest in the communities surrounding the school and to start problematizing the realities in which their students live. Teacher fellows meet with community partners, expand their social network, and start to define their project ideas and driving questions for their units based on the reports provided by community sites that work with the same students and families our teachers serve. Examples of sites include the local health department, the Community Health Council, and non-profit organizations that work with vulnerable populations.

The four-part TSCORE Summer Institute is organized as follows:

Part One focuses on providing a working definition of health disparities. Using a pedagogy of questioning, TSCORE staff leads teachers to think critically about factors affecting health and how much control people have over their health. Focusing on real data and the Robert Wood Johnson Foundation County Health Rankings Model for health outcomes (UWPHI, 2018), the group problematizes how social determinants of health (i.e. health behaviors, clinical care, social and economic factors, and the built environment) affect health outcomes. Context specific examples such as health insurance access, infant mortality, unemployment rates, imprisonment, and life expectancy are discussed and compared to adjacent affluent counties.

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Part Two dives deeply into what community researchers actually do. Using real, local case studies, university health disparities researchers share with teaching fellows the process they follow to come up with research ideas. From reading journal articles, community magazines, local health reports, to conversations with researchers, fellows are introduced to ideas for potential unit topics. Emphasis is placed on researchers' approach to establishing milestones for their projects. Parallels are constantly drawn between the process of research, evaluation, and assessment and the unit planning process. The approach is dialogical, and both researchers and fellows contribute with questions and comments to find connections. Reflecting on the community tour in part one, teachers start to narrow down their topics and draft assessments for the unit they are developing by mirroring the evaluation process described by researchers.

Part Three provides teachers with the opportunity to explore "alternative" methods of data collection, particularly ethnography, photovoice, and interviews. These methods are not only great tools for differentiation in the classroom, but they also provide teachers with the opportunity to offer students a different perspective on what research can look like. A multifaceted team of researchers offer examples of how these alternative methods are used in research to capture the voice of the underserved and to provide the other side of the picture that community statistics rarely deliver. Community activists, faculty, and health professionals continue facilitating professional development sessions by providing local cases of how data have been utilized to improve the surrounding communities such as bringing grocery stores to local food deserts, building exercise trails, or opening Affordable Care Act enrollment centers. Teachers also learn about several advocacy models including the World Health Organization practical guide to successful advocacy, a simple seven-step plan for effective advocacy which includes identifying target audiences, developing key messages, and selecting implementation strategies (WHO, 2008).

Part Four enables educators to expand their social network and to apply newly acquired work-based knowledge to their curriculum development. As teachers plan their units, they are scheduled to meet with members of their newly acquired professional network, at which point they begin generating commitments for guest speakers, field trips, or potential research mentorships for themselves and students. Individual sessions for each teaching fellow are scheduled with both content and pedagogical experts to provide feedback, share ideas, and ensure "authenticity" of the curriculum.

Unit examples developed by TSCORE teaching fellows and staff are shown in Figure 2, below.

Implementation Support

Roughly 50 percent of all urban public school teachers nationwide leave their positions in less than three years because they do not feel prepared (Ingersoll, Merrill, & Stuckey, 2014). CTE teachers struggle with access to meaningful professional opportunities due to budget cuts and a hyper-focus on "core" subjects (Deeds, 2017). Research around the effects of coaching on teacher practices is well documented with solid evidence indicating that those receiving post-intervention coaching consistently outperform those who only receive

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coursework (Neuman & Wright, 2010; Walpole, McKenna, Uribe-Zarain, & Lamitina, 2010; Sailors et al., 2014).

By the end of the Summer Institute, participating teachers have a well-developed unit as well as the professional network needed to bring outside partners to their classrooms. Our support, however, does not end there. The TSCORE model includes a year-long implementation support program that includes on-site coaching, externships, and industry connections. Each teacher receives at least three one-hour observations and three additional fifteen minute "pop-ins."

During the classroom visits, program staff, in partnership with instructional coaches at the local schools, rely on different tools to support fellows, including cycles of reflection activities where teachers identify challenges, discuss causes of learning gaps, and develop an intervention plan. Through email and online tools, teachers interact with health disparities researchers and the TSCORE staff to share resources, ideas, and solve challenges. TSCORE teaching fellows receive feedback from their peers, research team, and community advisory board.

Additional professional development sessions are based on participants' needs and interests. For instance, one-day externships bridge classroom learning with real world challenges by providing teachers with opportunities to present their unit to experts in the field, obtain feedback to increase rigor, deepen their understanding of a specific topic, and develop relevant soft skills associated with their unit's content. Figure 3 includes two examples of externships.

Student Conscientization

Urban CTE programs frequently use one-time campus or workplace tours to expose students to industry-related programs and careers. These trips are often disconnected from the course content and students' realities. TSCORE aims to empower students with both its method and the promotion of "localized" knowledge. Using a public health lens, the TSCORE curriculum pushes students to gain awareness about their own community's position within the larger society. Our program focuses on student conscientization, that is, "the process in which men [and women], not as recipients, but as knowing subjects, achieve a deepening awareness both of the socio-cultural reality which shapes their lives and their capacity to transform that reality" (Freire, 1972, p.51). To facilitate this process, the TSCORE model embraces Freire's premise in teaching literacy to oppressed communities: "to read the word is to read the world" (Freire & Macedo, 1987). All authentic education should investigate learners' realities and provide opportunities for students to establish connections between their world and the content being studied.

For instance, as exemplified in Figure 2, students in one TSCORE classroom investigated the question, *"How does asthma affect the teenage body?"* Rather than exploring the respiratory system from a purely anatomical perspective, learners investigated the system within the context of air quality and asthma, a condition that continues to disproportionality affect children in the urban core. In the Kansas City Metropolitan area, 12.6 percent of children 0-17 years old have asthma (CMHKC, 2016). In this unit, students explore potential

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reasons behind these alarming asthma rates in their community, including potential causes within the school environment. They conducted an observational air quality assessment and developed solutions that were presented to the school leadership. Learning about the effects of social determinants of health on the respiratory system allows students to question traditional discourse that blames personal choices on health outcomes like asthma; it also provides them with an opportunity to affect real change within the school and in their community at large.

At another TSCORE site, a cross-curricular collaboration between a math and a health science teacher focused on: *"How can students help the community overcome the probability of poor health outcomes?"* Students analyzed data on their county's health outcomes and developed interventions based on results. Forty-seven students presented their interventions at a Graduate Student Research Forum, which provided an opportunity for feedback and to gauge experts' reactions to their ideas. Although county databases were often used as "evidence," a plethora of projects employed both qualitative and mixed-method data collection techniques that teachers learned about during our Summer Institute and externships. The skills teachers learned and integrated into their TSCORE unit ultimately contributed to students' ability to connect with the health disparities being explored at a personal level.

Moving Forward with the TSCORE Model

As reflected by the growing number of CTE programs, well-resourced school districts have seen the potential of high-quality CTE programs as a delivery system of 21st century skills and STEM competencies. For urban schools struggling with high drop-outs rates, promising evidence points to CTE's potential to increase graduation and postsecondary education engagement. The TSCORE model relies on CTE's natural focus on contextualized learning that emphasizes connections between the classroom and the real world to foster innovative instructional strategies like project based leaning that embrace the Freirean view of conscientization. Nevertheless, our model is also designed to address some of the challenges that continue to affect CTE programs, particularly in urban districts, such as its view as a path for low-performing students, its quality and the preparedness of its teachers, its alignment with national standards and core-curricular subjects, and the high drop-out rates in some pathways. By empowering teachers with individualized learning experiences, opportunities to bring local, cutting-edge health disparities research into classrooms, and expand their professional network, TSCORE hopes to propel CTE health science courses in urban districts as an "educational pathway of choice" and a potential platform to increase the number of minority students interested in a career in health care.

Envisioning CTE as an empowering platform to prepare students for college and beyond, particularly in under-resourced, underserved districts, will require a community effort and reliable partners committed to urban education and to diversifying the health professions. For those working in academia, it entails paying attention to the reality of schools and molding our efforts to serve teachers' and students' needs, including identifying partnerships that can get students to establish real and tangible connections between research and its potential impact on the quality of life in their communities. For under-resourced urban

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schools that continue to struggle to forge and maintain the industry networks needed to build rigorous programs, partnerships with academic institutions and community sites like the one proposed in TSCORE assist in equalizing the field for all students. Trained teachers integrating these partnerships into curriculum further provides a sustainable channel to increase the number of underrepresented students in science and research.

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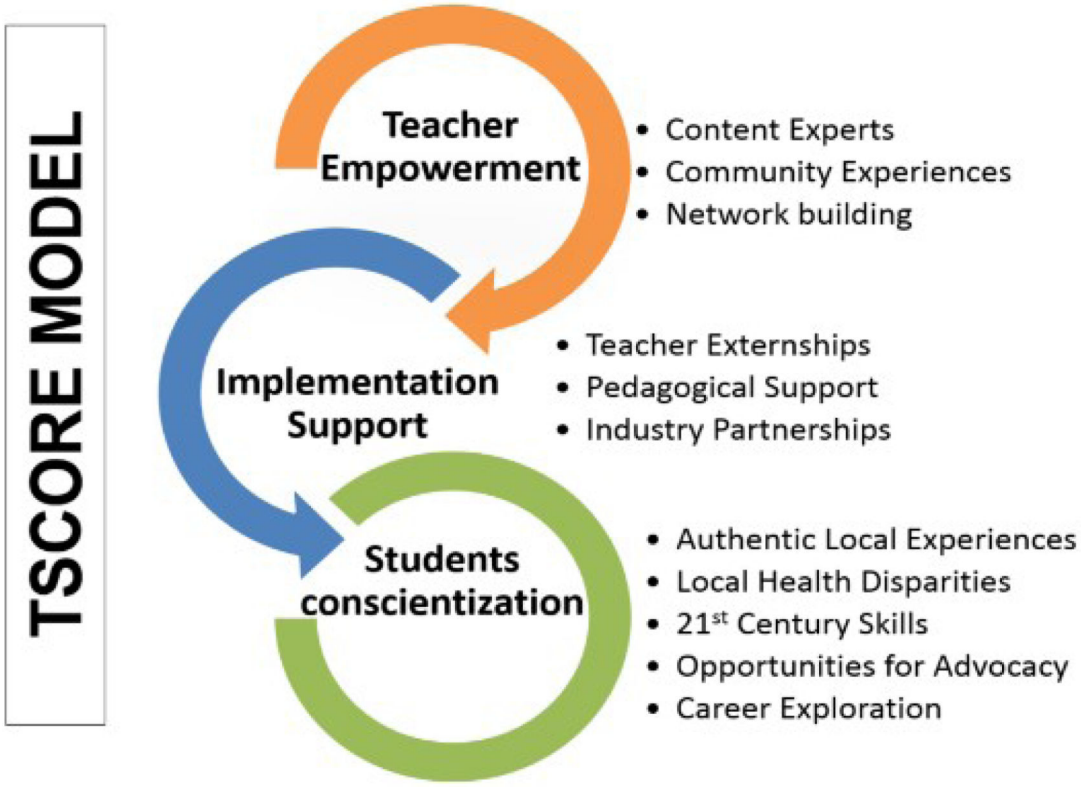

Figure 1.
Teachers and Students for Community Oriented Research and Education Model

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Unit Title; Driving Question	Learning Objectives
Clean Air Project: *How does asthma affect the teenage body?*	• Research the impact of air quality on students and the learning environment. • Develop and conduct and air quality assessment of school. • Write a letter to school leadership with recommendations for action.
We Are the Change: *How can we improve socio-economic and health outcomes in our community?*	• Conduct a community needs assessment based on the social determinants of health. • Lead focus groups to elicit expert and community feedback. • Implement an intervention (i.e. health fair, job fair) to address needs.
Chance the Researcher: *How can we help the community overcome the probability of poor health outcomes?*	• Collect, analyze, and display relevant data to support interventions. • Develop an intervention that educates the community and/or seeks to prevent chronic diseases.
Leading the Way to Better Water: *Is our water safe to drink?*	• Research the impact of drinking water quality on communities. • Analyze data of lead levels and other contaminants in drinking water.

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	• Create public service announcements in languages of the community to address issues in water quality and health disparities.
Nurturance & Resilience: *What do students need to thrive?*	• Conduct ethnographic research to understand resilience in different cultures. • Collect and analyze survey data to study the school climate's effect on student resilience. • Provide recommendations to school leadership to promote a climate in which students can thrive.
Infant Mortality: *How does one's lifestyle and community affect the health of an unborn child?*	• Recognize geographic health disparities in infant mortality. • Create an informative campaign targeted to decrease disparities in infant mortality in the local community.
Mental Health Disparities: *How do social determinants of health and physical health affect mental health?*	• Research the upstream causes of local mental health disparities. • Conduct a school-based mental health assessment. • Plan, organize, and implement a community health event addressing identified mental health needs.
***Health Disparities:** *What factors contribute to the health outcomes in my community?*	• Analyze health disparities related to socio-economic status, gender, geography, culture, and access to health care. • Describe the social and environmental factors that contribute to different health outcomes in different communities.
***Health Advocacy:** *How can I advocate for the health of my community?*	• Examine the root causes of health outcomes by exploring three public health issues: food deserts, violence, and tobacco. • Practice authentic data gathering and analysis skills applicable to community health advocacy. • Choose a public health issue; apply advocacy principles to create an advocacy project that impacts their community.
**Staff developed units. Download at:* www.tscoreks.org	

Figure 2.
Teacher and Staff Developed Units

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Example 1. "We Are the Change" = Sociology/Economics Teacher
• Community organizations with job fair expertise highlighted event logistics, provided marketing tools, and gave insight into anticipating stakeholder and participant needs. • Public health outreach experts demonstrated how to develop quantifiable goals, evaluate interventions, and conduct focus groups.
Example 2. "Chance the Researcher" = Health Science and Math Teachers
• Biostatisticians explored methods of data collection, shared classroom-ready examples of current biostatistics research, and invited them to a local StatKC conference to build students' professional networks and knowledge of careers that use math in health. • Public health researchers shared questions that guide the research process, explored the role of bias in survey formation, and provided tools to evaluate community-based research.

Figure 3.
Externship Examples