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WE NEED TO KNOW MORE ABOUT CTE TEACHERS

High school career and technical education teachers play a pivotal role in the success of many students, but more research about them is needed to create effective policy for CTE programs.

By J. Cameron Anglum, Andrew R. Diemer, Walter G. Ecton, & Tuan D. Nguyen

We currently are near the end of the fourth school year disrupted and changed by the COVID-19 pandemic. Nationally, school leaders, educators, and researchers have focused on two critical issues: disruptions to student learning and the teacher shortage. Turmoil in the teacher labor market continues to grow, accompanied by numerous commentaries ranging in tone from doomsday predictions

J. CAMERON ANGLUM (cameron.anglum@slu.edu; @CameronAnglum) is an assistant professor of education policy and equity in the School of Education, Saint Louis University, St. Louis, MO. **ANDREW R. DIEMER** (andrew.diemer@slu.edu; @AndrewDiemer) is a doctoral candidate in education policy and equity in the School of Education, Saint Louis University, St. Louis, MO. **WALTER G. ECTON** (wecton@fsu.edu; @WaltEcton) is an assistant professor of education policy at the College of Education, Florida State University, Tallahassee. **TUAN D. NGUYEN** (nguyetd1@ksu.edu; @edu_tuan) is an assistant professor at the College of Education, Kansas State University, Manhattan.

(e.g., Nathanson, 2022) to calls for nuanced attention to regional and context-specific issues (e.g., Edwards et al., 2022; McMurdock, 2022).

We know that achievement gaps widened between students from low- and higher-income households during the pandemic (e.g., Willen, 2022). We also know that teacher turnover and shortages have not occurred uniformly across subject matters and school types (McMurdock, 2022). Before the pandemic, for example, shortages typically were more acute in hard-to-staff subject areas and fields, including STEM and special education (Goldhaber et al., 2015).

Teacher shortages in career and technical education (CTE) represent an underexplored area. Interest, enrollment, and program offerings in CTE have exploded in recent decades, spurring a spate of research on the academic and economic benefits of CTE in high school and the effectiveness of various state and federal initiatives. (See Dougherty, 2023, in this issue for a summary of the recent research.) Yet we know comparatively little about high school CTE teachers and their demographic characteristics, career trajectories, and qualifications.

Growing CTE enrollment

The need for research on CTE teachers is especially important given the large numbers of students who take CTE courses in high school. Estimates from nationally representative datasets indicate that between 85% and 92% of all U.S. students take at least one CTE course while in high school (Hudson, 2014; Levesque et al., 2008). More than 98% of public high school districts offer at least one CTE course (Gray & Lewis, 2018).

CTE courses provide students a connection between their classwork and real-world skill development (Plasman, Gottfried, & Klasik, 2021). Students entering high school with lower academic achievement scores and lower levels of advanced middle school math coursework are overrepresented in CTE programs, which means that CTE should be of particular interest to researchers and policy makers looking to improve student achievement outcomes. Students who take CTE classes are more likely to reside in rural areas, come from lower-income households, and have disabilities (Ecton, in press; Levesque et al., 2008; Theobald et al., 2022). The importance of CTE for students who may be more vulnerable during and after high school makes a stronger understanding of CTE teachers especially meaningful.

Shifting focus in CTE programs

In past decades, CTE students were tracked into distinct pathways in ways that prevented many students, especially racially minoritized students, girls, and students with disabilities, from accessing college-preparatory classes needed for many high-status, high-earning careers (Bowles & Gintis, 1976; Grubb & Lazerson, 1982; Tyack, 1974). This is far less true today (Stone & Aliaga, 2005; Yettick, Cline, & Young, 2012). In the 1990s and 2000s, high schools increasingly embraced a "college for all" model in which college preparation became a primary goal (Rosenbaum, 2001). Most states aligned their high school graduation requirements to college entry requirements (Mishkind, 2014). During this time, student participation in CTE became more fluid. Some students participate in deliberate, intensive CTE programs; others take a few classes as electives. This diversity of participation means that CTE teachers have a wider influence on more students.

Another shift in the past two decades is in *which* CTE fields students concentrate. While traditional "vocational" programs in areas like construction and cosmetology still exist, there has been a growing emphasis on applied STEM fields and on increasing the academic rigor of CTE programs (Dougherty & Lombardi, 2016). Increasing academic rigor has been the focus of the past two reauthorizations of the Carl D. Perkins Vocational and Technical Education Act, the primary driver of federal policy and funding for CTE. The 2006 Perkins Act formalized this shift by renaming vocational education as career and technical education. The 2018 reauthorization (now called the Strengthening Career and Technical Education for the 21st Century Act) took the additional step of encouraging CTE programs to prepare students for both career *and* college. With these changes, the types of education and skills needed by CTE teachers has evolved, raising new challenges as schools seek to recruit and retain qualified teachers with marketable industry qualifications beyond traditional education credentials.

While CTE teachers historically have been thought of as preparing students for direct entry into the workforce, today's CTE teachers also play a crucial role in preparing students for postsecondary education — especially at community and technical colleges. As postsecondary training becomes increasingly important in a growing number of industries (Holzer & Baum, 2017), CTE teachers must help students transition from high school CTE into related postsecondary

AT A GLANCE

- High school CTE teachers play an important role in the success of many students, including those who are most vulnerable.
- Teacher shortages in STEM subjects are well-documented, but CTE teachers have different qualifications and cannot be lumped in with STEM teachers.
- More research is necessary to create recruitment and retention strategies and policies for teachers in high school CTE programs.

Research is limited in describing who CTE teachers are and where they come from, but the research that exists suggests striking differences in motivations, backgrounds, preparation, and academic and employment histories for CTE teachers when compared to all public school teachers or even just STEM teachers.

programs. The degree to which CTE students enter college directly after high school differs substantially by career cluster, however. This means that CTE teachers in areas like health care and education may have substantially different postsecondary goals for students than teachers in construction or manufacturing (Ecton & Dougherty, 2022). For students who do not enter postsecondary education directly after high school, CTE teachers may help them apply for jobs in their industry or connect them to local employers through apprenticeships, internships, and formal and informal networking.

Gaining an improved understanding of CTE teacher characteristics, qualifications, and career trajectories will help inform CTE-focused policy making, particularly with respect to sustaining and growing a teacher workforce that can prepare students for both college and careers.

CTE teacher shortages

A comprehensive contemporary examination of national teacher shortages in 2022 (Nguyen, Lam, & Bruno, 2022) suggests that at least 36,500 vacant teaching positions exist, and at least 163,000 positions are held by underqualified teachers (i.e., teachers lacking a standard certification or teaching in an out-of-subject area). Vacancies and underqualification exist in every state where data are available, though with wide variation in magnitude. For instance, in the 2021-22 school year, some states reported fewer than 50 vacant positions in the entire state (e.g., Missouri, Nebraska, and Utah). Others reported more than 1,000 vacant positions (e.g., Alabama, Florida, and Mississippi). Reported counts of underqualified teachers range from under 100 teachers in some states to more than 10,000 in California, Florida, and North Carolina, respectively (Nguyen, Lam, & Bruno, 2022). What remains unclear, however, is the extent to which teacher vacancy and underqualification may vary by content areas.

Some prior research has provided guideposts to the CTE teacher shortage, albeit with limitations. For instance, James Cowan and his colleagues (2016) observed that, since the 1999-2000 school year, at least 20% of U.S. schools indicated they had dificulty filling STEM vacancies, an umbrella classification that includes some CTE teachers. Similarly, Thomas S. Dee and Dan Goldhaber (2017) found that the prevalence of STEM emergency teaching permits and waivers more than doubled between 2011-12 and 2015-16, a possible indication of hiccups in the CTE teacher labor supply. While these are not direct measures of CTE teacher vacancies, they provide some indication of the dificulty of filling highly specialized teaching positions.

Further, specific concentrations within CTE may suffer disproportionate uncertainty in teacher supply. For example, in recent years, at least 35 states reported teacher shortages in manufacturing, information technology, and health sciences, shortages underscored by predictions of substantial CTE enrollment growth in the near future (Advance CTE, 2016). Other reports indicate teacher shortages in agriculture and family and consumer sciences (Graves & Hasselquist, 2021). While these studies have documented shortages in specific CTE programs, one key challenge remains: Existing research does not quantify the extent of the overall CTE teacher shortage.

In some ways, this lack of data reflects an overarching problem: the lack of a systemic teacher labor market data infrastructure (Nguyen, Lam, & Bruno, 2022). The current lack of data limits policy makers' ability to understand and address the problem. Understanding where and in what subjects CTE teachers are in short supply is not just a matter of practical importance to prepare a robust workforce, but also a question of equity. It's possible that some historically disenfranchised students lack access to promising career pathways because their local district or community college system is not able to locate and hire someone to teach them. Future research must determine how many CTE teacher vacancies exist, how they are distributed geographically, and whether traditionally disadvantaged schools (high-poverty or minoritized schools, for example) are more likely to experience CTE vacancies.

What CTE teachers need

Improved understanding of trends in hiring for hard-to-fill teaching positions, including those in STEM fields, undoubtedly would help answer some of our questions about the CTE teacher supply and demand. However, simply applying our knowledge of STEM teachers to secondary CTE as a whole may have unforeseen consequences. The reason teachers enter and leave the profession cannot be treated as uniform and consistent across contexts (Carver-Thomas

& Darling-Hammond, 2017; Nguyen et al., 2020). Research is limited in describing who CTE teachers are and where they come from, but the research that exists suggests striking differences in motivations, backgrounds, preparation, and academic and employment histories for CTE teachers when compared to all public school teachers or even just STEM teachers (Cramer, 2004; Jacques & Potemski, 2014). More up-to-date research is needed to further dissect the demographic characteristics, preparatory qualifications, and career trajectories of CTE teachers. Improved understanding of these traits likely will increase our understanding of which teacher characteristics are linked to positive student outcomes.

Mounting evidence indicates CTE's positive academic and employment impacts for students (Dougherty, 2018, 2023; Kreisman & Stange, 2020; Stevens, Kurlaender, & Grosz, 2015). Research also supports the idea that teachers of traditional subjects are more effective, on average, when they have better preparation, test scores, and more teaching experience (Clotfelter, Ladd, & Vigdor, 2007; Kini & Podolsky, 2016). However, those findings may not hold for CTE teachers, given that they are charged with developing student skills for postsecondary education *and* career endeavors (Kemple & Willner, 2008). Thus, the research focus on teacher contributions to student outcomes should be widened to include the goals of secondary CTE.

To a greater degree than their counterparts in traditional academic subjects, CTE teachers are responsible for bridging the cognitive gap between academic theory and practical application. Unlike STEM teachers, most of whom likely entered the field through traditional academic learning pathways, CTE teachers may have received most of their workforce training in settings as diverse as an automotive garage or a working farm. Qualitative research on CTE teachers highlights that they may need further professional development, assistance integrating into the school, or help building relationships with administrators (Boone & Boone, 2007; Deever et al., 2020). While there is some limited evidence that CTE teachers have less extensive pedagogical training than their counterparts in traditional academic classrooms, it is unclear whether a traditional certification process offers enough preparation for CTE teachers to translate their workforce experience into effective classroom teaching (Clark, Kelsey, & Brown, 2014; Kerna, 2012).

At the same time, prospective CTE teachers' lack of classroom experience does not necessarily make them ill-equipped to prepare the nation's future workforce. Indeed, CTE proponents often note that the best preparation for future plumbers, mechanics, and farmers occurs through training with current plumbers, mechanics, and farmers (Walter & Gray, 2002). Recent, rigorous evidence indicates CTE students benefit from exposure to teachers with real-world job experience (Chen et al., 2022). Though it remains to be seen whether this holds true on a broader scale, it nonetheless suggests that professional backgrounds within a high-quality CTE workforce may not be the same as that of non-CTE teachers. The priorities for managing and retaining these teachers might differ as well. While it is often feared that STEM teachers may be coaxed away from teaching to earn higher wages in industry positions (e.g., Hansen, Breazeale, & Blankenship, 2019), there is reason to believe that CTE teachers are more focused on better work conditions, not higher pay (Graves & Hasselquist, 2021).

Understanding the need and how to address it

While CTE includes a broad collection of subjects ranging from health sciences to construction, each program shares a similar objective: to provide an alternative student pathway to college and career success. The lack of systematic data on CTE teacher turnover and shortages limits comprehensive understanding of where and when CTE teacher demand is met by its highly specialized supply (Advance CTE, 2016; Cardichon, 2017; Cowan et al., 2016). In addition, we do not know to what degree CTE teachers' training should mirror that of teachers in academic subjects.

In this moment, our understanding of the current workforce and training needs of CTE teachers is insufficient to inform necessary action. Failing to build our collective knowledge

"It's not stealing, Sara. You can use my lesson plan."

could undermine the overarching objectives of the CTE movement —to ensure students are suficiently prepared to meet their own future workforce needs. ■

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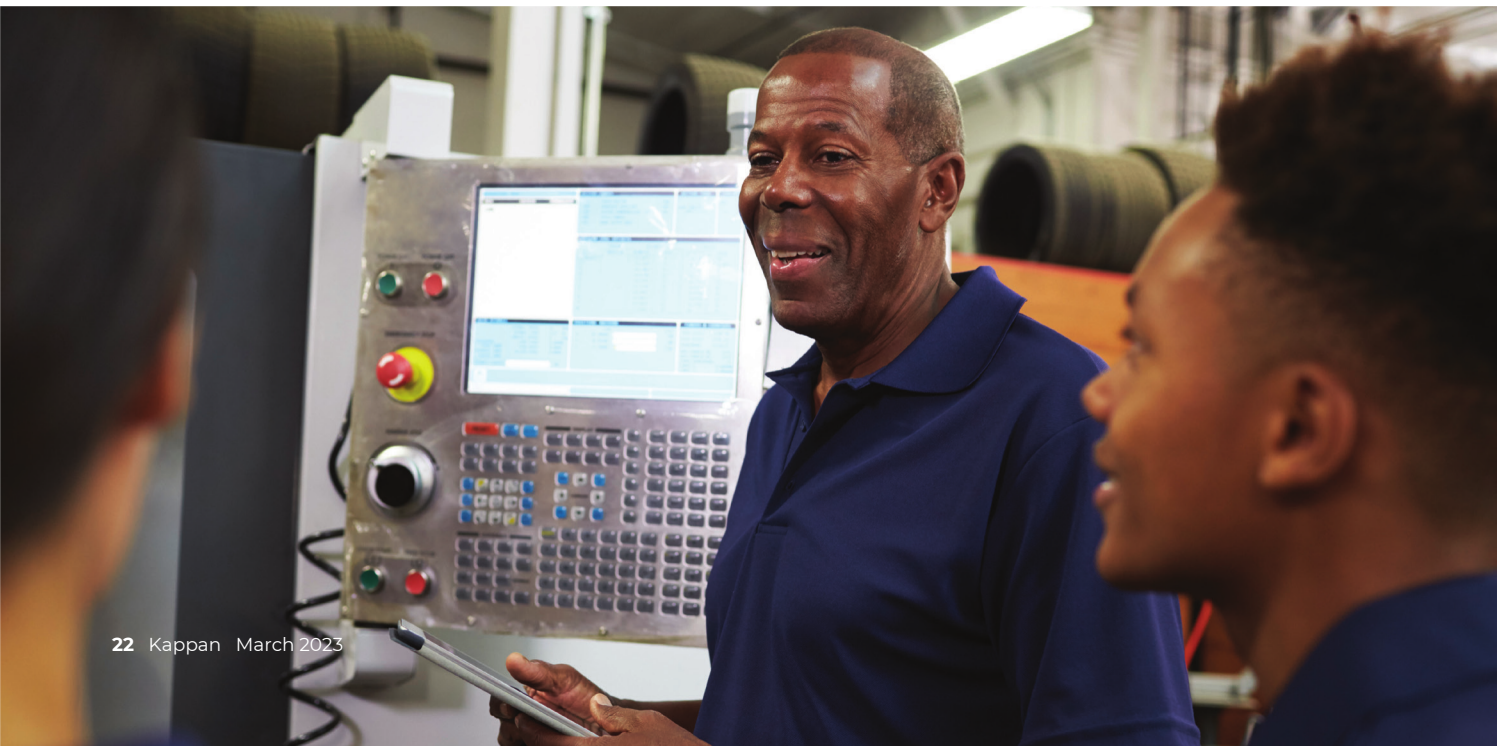

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