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# Work-Based Learning for All: Changes in Internship and Cooperative Education Participation Over Time

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## Abstract

Over the past two decades, there has been an increasing focus on encouraging high schools to promote both college and career readiness in the United States. Through federal legislation, one particular area of emphasis has been a renewed interest in promoting work-based learning (WBL) and improving access and opportunity for traditionally underrepresented student populations. Using two nationally representative datasets, we explore how changes to the federal policy governing WBL and associated educational programming (the Perkins IV legislation) may relate to changes in WBL participation over time for key subpopulations of students. Our main results suggest there was a significant increase in WBL participation over time with female students showing a particular increase relative to male students, and students with disabilities becoming less likely over time to participate relative to non-disabled students. Given the benefits associated with WBL in general, we suggest this growth is a positive trend, and call on states and districts to continue to grow partnerships with local industry to continue to open access to such opportunities.
*Keywords: Work-based learning; Career readiness; Education policy; Special populations*

## Introduction

Across the country, there is increasing discussion in education relating to promoting college and career readiness amongst secondary school students (Plasman & Thompson, 2023). Major federal legislation, including the Carl D. Perkins series, the Every Student Succeeds Act of 2015 (ESSA), and the Workforce Innovation and Opportunity Act of 2014, all emphasize the importance of college and career readiness programs because they understand how pivotal it is for students to gain the knowledge, skills, and dispositions needed to be successful in education or employment post-high school (Cushing et al., 2019). One particular pathway that may provide a unique opportunity to promote both college and career readiness is through educational programs focused on career development and career readiness. In recent years, career-focused educational programming has seen a change in perception from a path for immediate entry into low-skill occupations to a practical pathway to gain relevant and sought-after skills to prepare for both postsecondary education and the workforce (Gordon & Schultz, 2020). Students with varied post-secondary goals have experienced positive workforce and educational outcomes through participation in career preparatory programs (Cahill, 2016).

Historically, not all students have had the same opportunities to participate in career development experiences. For example, students from traditionally underserved populations—including low-income students and students with disabilities, among others—have historically had lower levels of participation and access to high quality career-focused coursework (Kim et al., 2021). There are multiple potential explanations for these disparities in participation, including a lack of options at some schools or disproportionate encouragement (or discouragement) or guidance for certain students to pursue career development experiences in general (Hodge et al., 2020).

One particular career development opportunity in high school that has high relevance to the world of work while also remaining academically rigorous to help students prepare for postsecondary education is work-based learning (WBL)—experiences in which students apply what they learned in the classroom in the workplace. Though there exists a body of literature exploring the uneven participation of students from diverse backgrounds in career-focused coursework and programs of study (Cox et al., 2015; Palmer & Gaunt, 2007; Plasman et al., 2020a, 2020b; Sublett & Gottfried, 2017), there is less understanding about who participates in WBL activities. The two most recent reauthorizations of the federal policy governing career and technical education (CTE)—Perkins IV in 2006 and more recently Perkins V in 2018—emphasize the need for secondary schools to include WBL experiences as a key career readiness strategy. Students participating in WBL have the opportunity to apply the foundational and theoretical knowledge acquired in the classroom in real workplace settings with industry or community professionals. WBL participants often continue their learning through ongoing trainings and evaluations offered by their onsite supervisors. These programs provide a valuable service to students who gain experience and expand their networks, which has been shown to increase student's post-secondary employability (Taylor et al., 2013).

Given the increasing national emphasis on preparing students to be both college and career ready upon leaving high school (Brand et al., 2013), it is important students from all backgrounds have access to and participate in WBL opportunities. Recent authorizations of the Perkins legislation—Perkins IV in particular—have emphasized the need to involve traditionally underserved populations in all aspects of CTE programming, with a growing focus on including WBL as a central feature of career readiness. However, we do not know a great deal about who exactly participates in certain WBL experiences and how participation in WBL has changed over time in response to policy changes. Understanding and identifying any potential changes will help shine light on this issue.

## Work-Based Learning in Perkins Legislation

Since its initial authorization by the federal government in 1984, federal Perkins legislation has served as a major funding and guiding force in college and career readiness. The initial Perkins Act primarily focused on increasing access to high-quality programs of study but did not include a specific focus on WBL, nor did it emphasize participation for the full suite of what Perkins legislation now defines as "special populations." Specifically, Perkins V defines "special populations" as individuals with disabilities; individuals from economically disadvantaged families, including low-income youth and adults; individuals preparing for non-traditional fields; single parent' including pregnant women; out-of-workforce individuals; English learners;

homeless individuals; youth who are in, or have aged out of, foster care; and youth with a parent who is a member of the armed forces (Strengthening CTE for the 21st Century Act, 2018). Over time, the various iterations and reauthorizations of the Perkins Act have focused on expanding opportunities for students to explore career readiness opportunities, including WBL.

The first reauthorization of the Perkins Act in 1990 did include an emphasis on career readiness programming for special populations, though it only identify four groups: "handicaps, disadvantaged individuals, individuals of limited English proficiency, and foster children" (Carl D. Perkins Vocational and Applied Technology Education Act, 1990). Perkins III, reauthorized in 1998, expanded the definition of special populations and requested performance reports that included student enrollment and outcomes for these groups (Carl D. Perkins Vocational and Applied Technology Education Amendments, 1998). The Perkins IV reauthorization in 2006 again expanded the definition of special populations and emphasized the need for increasing participation for students preparing for careers in non-traditional fields, where a non-traditional field is defined as one in which a specific gender makes up less than 25% of the labor force, such as women in engineering (Carl D. Perkins Career and Technical Education Improvement Act, 2006).

Notably, the fourth iteration of Perkins also set aside funds to directly address barriers that could prevent the participation of individuals belonging to special populations, including eliminating costs associated with participation (e.g., transportation or childcare). It also includes specific language and funding to enhance and expand WBL offerings. Clearly, Perkins IV prioritizes meeting the needs of special populations and making WBL opportunities accessible to these students, and as such represents an interesting policy initiative on which to understand and differentiate participation in WBL opportunities over time.

There are a number of key student groups identified in other prominent federal education-focused policies that are not directly mentioned in Perkins as special populations. Specifically, ESSA highlights the need to improve college and career readiness indicators and access to related programming for students from racial and ethnic minority groups (e.g., Black, Hispanic, and Native American) to ensure equitable access to high-skill, high-demand careers (Landgraf, 2003; U.S. Department of Education, 2010). Again, while women are not directly mentioned in Perkins IV, there is a strong implication women in STEM should be a particular focus through the emphasis on students preparing for non-traditional fields. Finally, rural students represent another group of interest in Perkins as a set of students on whom to focus support in periods of transition, though they are not identified as a unique special population. As such, racial and ethnic minority students, women, and rural students are all of interest in this study despite not being considered special populations.

In addition to identifying key populations for whom to emphasize increased participation and access to career education, Perkins legislation also defines a range of WBL experiences. These experiences include the following activities: (i) Cooperative Education, a structured method of combining classroom-based education with practical work experience; (ii) Job Shadowing, a school-arranged visit to a workplace for observational purposes; (iii) Community Service, volunteer work arranged by the school to support the local community; (iv) Internships, work experience that is not necessarily part of a required class; (v) Mentoring, a school-arranged

match with an adult in an identified career area aimed at improving student understanding of workplace culture through a supportive workplace relationship; and (vi) School-Based Enterprise, work with a business run by students or teachers within the school (Strengthening CTE for the 21st Century Act, 2018). These experiences are designed to provide students an opportunity to connect classroom material to hands-on workplace activities, thereby improving college and career readiness.

**Benefits of WBL**

The existing research on WBL is generally positive, with participation in WBL activities linking to positive education and labor market outcomes. For example, WBL participation is associated with decreased dropout rates (Abowitz, 2000; Hemelt et al., 2019; Stone & Aliaga, 2005), increased likelihood of tertiary enrollment (Buzzeo & Cifci, 2017; Davalos & Haensly, 1997), and improved student engagement (Fletcher et al., 2020). In addition, these programs have been shown to improve attendance and grades (Hughes et al., 2001). Students who enroll in these programs tend to learn the importance of high school graduation in most fields of study, and this information encourages high school completion (Griffith, 2006). WBL experiences emphasize active learning, which is linked to increased engagement and comprehension through connections between knowledge and skills learned in school with real-life work settings (Fergusson, 2022). Further, WBL participants may benefit by identifying future career interests through onsite experiences and discussions with coworkers (Kenny et al., 2016). Trigwell and Reid (1998) provide a useful description summing up how WBL programs link to student benefits:

> they get the chance to be involved in complex problem solving. On a personal level they learn interpersonal skills, written communication skills, time management, develop increased confidence, and have a better knowledge of career opportunities. (p.151).

This proposed link to knowledge of career opportunities is also supported through empirical evidence as WBL participants tend to benefit in the labor market. For example, students are able to make connections with employers and coworkers in the workplace and leverage these relationships to improve employability (Morley, 2018). Additionally, Misko (2001) found unemployment rates for WBL participants to be significantly lower than the national unemployment average. Griffith (2006) found students who participated in WBL had better employment outcomes after graduation, including "higher state-reported total and quarterly earnings, and self-reported higher hourly wages, and greater relevance of high school curriculum to their post-secondary education, training and employment than non-participants" (p.37). Recent work by Plasman and Thompson (2023) further supported this association between WBL participation and later income, though benefits depended on the type of WBL in which a student participated. These labor market outcomes can likely be attributed to the acquired knowledge, skills, and networks formed during these programs that ultimately aid students in preparing for school-to-work transitions (Sweet, 2013).

**WBL and Accumulation of Various Forms of Capital**

Drawing from economic and sociological perspectives, WBL experiences such as internships and cooperative education likely offer students the opportunity to accumulate various forms of capital, including human, social, and cultural (Gordon & Schultz, 2020). From the economic perspective, WBL programs can help students accumulate human capital through individual investment in educational attainment and advancement, where human capital is identified as the skills, knowledge, and experience an individual possesses (Becker, 1964; Plasman et al., 2024). Many career development programs and WBL experiences support the accumulation of human capital through providing students opportunities to reinforce academic skills, develop new skills, and increase perceptions relating to the relevance of schooling (Gottfried et al., 2014; Plasman & Gottfried, 2018).

First, WBL participation likely contributes to academic skill reinforcement by allowing students to directly apply the theoretical knowledge they learn in the classroom (Galbraith & Mondal, 2020). Students who are able to engage in active learning, such as implementing their knowledge in the workplace, are able to retain information and perform better in exams when compared to passive learners (Minhas et al., 2012). Further, through these WBL opportunities, students have the opportunity to collaborate with coworkers at their assigned work sites, allowing them ask their colleagues questions, shadow them as they complete tasks, and ask for feedback on their completed work, which would help cement what they have learned (Hughes et al., 1999; Raelin, 2008).

Second, WBL experiences likely encourage students to develop new skills employers value. There are certain skills and knowledge that can only be acquired on the job, and WBL places students in an environment that supports the acquisition of these key occupation-specific knowledge and skills (Bailey et al., 2003). For example, students in a classroom-based welding program would learn how to approach common situations of the trade, but students in a WBL welding program may also learn how to approach unusual or extremely difficult cases on the job as they arise. In addition, students may be introduced to alternative ways of completing tasks not taught in school. Participants are not only introduced to a range of experiences during their WBL assignments, but they are also taking these experiences back to the classroom, which ultimately improves discussions and student learning (Griffith, 2006).

The third human capital mechanism focuses on relevance such that WBL participation helps students develop an understanding of the relevance of the curriculum and how they can leverage it in education and workplace settings (Darche et al., 2009). Applying what classroom learning to real-world experiences allows students to understand the relevance of school. WBL participants are also introduced to a wide array of careers, thereby helping them recognize how their classroom-based knowledge is both relevant and transferable. Furthermore, students themselves have indicated on-site WBL assignments allow them to attach higher value to their schoolwork (Alfeld et al., 2013).

While the human capital perspective provides an important lens to understand the benefits of WBL, this approach has been critiqued as inadequately accounting for additional factors, such as social and cultural capital, that impact a person's employability and social position (Caballero et al., 2020). Social capital can be interpreted as the networks an individual has access to that could result in information and resources (Bourdieu, 1986). WBL programs assign projects and plan

activities to facilitate interactions between students and WBL stakeholders, including co-workers, supervisors, and clients, which help participants develop their networks. The development of social networks can be linked to improved employment opportunities, particularly for traditionally underserved youth (Rosenbaum et al., 1990). Further, the accumulation of social capital is also associated with job referrals, knowledge sharing, collaboration, and innovation (Rossin & Hyland, 2003; Raelin, 2008).

In addition to expanding social capital, students participating in WBL programs may develop cultural capital (Boone, 2018). Cultural capital refers to the knowledge, expectations, behaviors, and attitudes unique to specific situations (Bourdieu, 1986; Lareau & Weininger, 2003). These aspects of cultural capital are valuable in the labor market and could lead to additional opportunities. For example, while employers often view credentials as signaling technical skills, which they can assess from applications and resumes, interviews help to evaluate a candidate's non-technical skills (e.g., interpersonal communication) and to gauge organizational fit (Stiglitz, 1975). The more cultural capital an applicant has accumulated, the more easily they can convey they are the right fit for a position. Learning to embody the behaviors and cultural norms of a workplace primarily happens through experience, which onsite WBL opportunities often provide (Brown & Scase, 2005). Historically, marginalized students often have less opportunity to accumulate social and cultural capital, and participating in WBL may be a unique opportunity for these students to develop valuable networks, knowledge, and skills (Nunley et al., 2016; Rigsby et al., 2013; Watson & Brand, 2014).

## This study

As noted above, there is a growing focus on promoting college and career readiness for all students, and there is a general consensus in the research body that work experience related to coursework can have numerous benefits. While prior work has explored patterns of participation in CTE coursework over time (Plasman et al., 2020; Theobald et al., 2022), less work has sought to understand who participates in WBL in high school and how participation has changed over time. This is a key oversight given the emphasis placed on improving workforce readiness and development at local, state, and federal levels as evidenced by key federal policies (e.g., ESSA and Perkins) as well as more local initiatives (Every Students Succeeds Act, 2015; Harsnich et al., 2024; Strengthening CTE for the 21st Century Act, 2018). Additionally, these various policies tend to highlight specific student populations on which to focus. For the purposes of this project, we highlight six key student groups: female students, Black students, Hispanic students, economically-disadvantaged students, students with disabilities, and rural students. With this backdrop in mind, we seek to fill this gap in the literature by responding to the following research questions:

1. What student and school characteristics are associated with WBL participation prior to the reauthorization of Perkins IV in 2006?
2. What student and school characteristics are associated with WBL participation post-Perkins IV reauthorization in 2006?
3. How did participation in WBL change over time from pre-Perkins IV to post-Perkins IV for identified student subpopulations?

In this study, we focus specifically on the WBL experiences of internship and cooperative learning. These opportunities provide students access to influential organizations and networks, easing workforce transitions (Alfeld et al., 2013; Esters & Retallick, 2013). Further, internships and cooperative learning experiences tend to assign students to specific projects, thereby allowing students to better familiarize themselves with the actual work and develop employability skills (Jones, 2007). Often, internship host organizations organize professional development and networking activities for their WBL participants to continue career exploration and self-growth (Chatterjee et al., 2019). Given the advantages associated with these types of WBL opportunities, there is a need to understand who is participating and therefore who stands to benefit from participation.

## Methodology

### Data Description

To explore national trends over time, we relied on two nationally representative datasets collected by the National Center for Education Statistics (NCES). Each of these datasets followed students as they progressed through high school and into postsecondary education and the workforce. The first—the Educational Longitudinal Study of 2002 (ELS)—tracked a cohort of students who were in their sophomore year of high school in the spring of 2002 (Ingels et al., 2014). The full dataset includes observations from more than 16,000 students representing more than 750 public and private high schools across all 50 states. In addition to the base year student survey in 2002, ELS included base year surveys of parents and school administrators as well as a follow-up student survey in the spring of 2004. Notably, students in the ELS dataset were expected to graduate in 2004, prior to the reauthorization of Perkins IV in 2006.

The second dataset—the High School Longitudinal Study of 2009 (HSLS)—tracked a cohort of students who entered high school as freshman in the spring of 2009 (Ingels et al., 2015). The full HSLS dataset includes a nationally representative of more than 23,000 students from more than 900 high schools across the country. As with the ELS dataset, HSLS also included base year student, parent, and administrator surveys as well as a first follow-up survey during the 2011-12 school year and an update in the fall of 2013 – the fall after the anticipated graduation date. The students in the HSLS sample began high school in 2009, a full three years after the Perkins IV reauthorization, which would have given schools and districts time to adapt to new funding requirements and recommendations.

Each dataset includes rich information with respect to student demographic, attitude, and academic history variables as well as school characteristics. The measures selected were identical in each dataset. To address potential missing data concerns, we employed a chained regression technique to impute across 20 additional datasets as recommended in literature (Graham et al., 2007). Note we used this multiple imputation strategy separately across the ELS and HSLS datasets and then merged them together after the process in an effort to maintain the representativeness in each dataset. Inclusion in our final analytic sample was contingent on two factors: a non-missing response on the item regarding whether a student participated in WBL and a non-zero weight (for the weight related to base year and first follow-up). Based on these requirements, our analytic sample included 13,010 observations from the ELS dataset and 20,390

observations from the HSLS dataset, for a total of 33,390 observations. As per NCES guidelines, we round all sample sizes to the nearest 10. We ran each of the analyses on the merged dataset both with and without NCES identified survey weights in order to account for representativeness of each sample. The differences in estimates were negligible. As such, the reported estimates are those with weights included.

**Outcome: Participation in WBL Experiences**

While WBL includes many different types of experiences, we focus our analyses on participation in internships/cooperative education. We direct our attention to these experiences for two reasons. First, as mentioned above, internships and cooperative education are closely linked to the development of human, social, and cultural capital. Second, while ELS asks students to respond to participation in six different types of WBL experiences during high school (two of which are internships and cooperative education), HSLS does not. In the HSLS sample, students are only asked a single question as to whether they participated in an internship or cooperative education experience during high school. As such, our outcome of interest is whether a student ever participated in WBL as evidenced by completing an internship or cooperative education experience during high school in either the ELS or HSLS. Given this, our references to WBL in in the analytic approach and results sections below should be interpreted as participation in an internship or cooperative education experience.

**Independent Variables**

Our research questions focus on identifying characteristics associated with participation in WBL. We identified our independent variables from prior literature exploring participation in career development programs including WBL (Bozick & Dalton, 2013; Kim et al, 2021; Plasman & Thompson, 2023). Table 1 presents the descriptive statistics for each of our selected variables across the full sample as well as the ELS and HSLS samples separately. As shown, our variables fall across three categories: sociodemographic variables; academic history and attitude variables; and school variables. Sociodemographic variables include measures such as gender (male as the reference), race/ethnicity (white as the reference), family arrangement (single parent household, both biological parents as the reference, or some other arrangement), and low-income status. For the purposes of this study, low-income is defined as less than twice the federal poverty level—a definition used in prior research as well as by the National Center for Children in Poverty (Plasman et al., 2020a; Jiang et al., 2015; Roberts et al., 2013). Academic history and attitude variables include 9$^{th}$ grade GPA, standardized math score, academic credits, CTE credits, ever participated in extracurricular activities, postsecondary expectations (no postsecondary expectations as reference, a two-year credential or less, and a four-year degree or more), math self-efficacy, and disability status (no disability as the reference) as identified by the presence of an IEP. Finally, our school level variables include percent of students identified as English learners, percent receiving free or reduced-price lunch, percent identified as underrepresented minorities; urbanicity (urban, suburban as reference, or rural); and region (South, Northeast as reference, Midwest, or West).

While our overall interest focuses on factors related to WBL participation, we were particularly interested in changes in WBL participation over time for our six highlighted student populations

pulled from Perkins-defined special populations as well as those from racial and ethnic minority backgrounds or rural regions. Note for female students, we use this as a proxy for the Perkins-defined special population of students in non-traditional fields given the general

Table 1

Descriptive Statistics

| | Full Sample | | ELS Sample | | HSLS Sample | |
|---|---|---|---|---|---|---|
| | Mean | Std Dev | Mean | Std Dev | Mean | Std Dev |
| Intern./Coop. ed. participation | 0.16 | (0.37) | 0.17 | (0.37) | 0.16 | (0.36) |
| *Student Variables* | | | | | | |
| Female | 0.49 | (0.50) | 0.50 | (0.50) | 0.49 | (0.50) |
| White | 0.54 | (0.50) | 0.57 | (0.50) | 0.53 | (0.50) |
| Black | 0.12 | (0.33) | 0.13 | (0.34) | 0.11 | (0.32) |
| Asian | 0.09 | (0.29) | 0.10 | (0.29) | 0.09 | (0.29) |
| Hispanic | 0.16 | (0.37) | 0.15 | (0.35) | 0.17 | (0.38) |
| Other race | 0.06 | (0.24) | 0.01 | (0.09) | 0.10 | (0.29) |
| Low-income | 0.25 | (0.43) | 0.25 | (0.43) | 0.25 | (0.43) |
| Single parent | 0.26 | (0.44) | 0.22 | (0.42) | 0.29 | (0.45) |
| Both biological parents | 0.57 | (0.49) | 0.59 | (0.49) | 0.56 | (0.50) |
| Other family arrangement | 0.15 | (0.35) | 0.16 | (0.37) | 0.14 | (0.34) |
| *Academic History and Attitudes Variables* | | | | | | |
| 9th Grade GPA | 2.67 | (0.91) | 2.60 | (0.90) | 2.71 | (0.91) |
| Standardized math score | 0.02 | (0.99) | 0.00 | (1.00) | 0.03 | (0.98) |
| No PSE expectations | 0.27 | (0.44) | 0.15 | (0.35) | 0.35 | (0.39) |
| PSE expect 2 yrs or less | 0.09 | (0.29) | 0.14 | (0.34) | 0.06 | (0.26) |
| PSE expect 4 yrs or more | 0.64 | (0.47) | 0.72 | (0.45) | 0.59 | (0.43) |
| IEP | 0.17 | (0.38) | 0.12 | (0.33) | 0.21 | (0.41) |
| Academic credits | 19.55 | (5.88) | 22.38 | (4.30) | 17.90 | (6.04) |
| CTE credits | 2.94 | (2.51) | 3.21 | (2.60) | 2.78 | (2.44) |
| Extracurriculars | 0.69 | (0.46) | 0.71 | (0.45) | 0.67 | (0.47) |
| *School Variables* | | | | | | |
| % ELL | 4.59 | (8.55) | 4.19 | (8.43) | 4.86 | (8.62) |
| % FRL | 29.42 | (25.60) | 23.67 | (25.03) | 33.12 | (25.28) |
| % URM | 33.71 | (29.53) | 34.45 | (31.23) | 33.20 | (28.30) |
| Urban | 0.31 | (0.46) | 0.34 | (0.47) | 0.29 | (0.45) |
| Suburban | 0.48 | (0.50) | 0.48 | (0.50) | 0.48 | (0.50) |
| Rural | 0.21 | (0.41) | 0.18 | (0.39) | 0.23 | (0.42) |
| West | 0.19 | (0.39) | 0.20 | (0.40) | 0.17 | (0.38) |
| South | 0.39 | (0.49) | 0.36 | (0.48) | 0.40 | (0.49) |
| Midwest | 0.26 | (0.44) | 0.25 | (0.43) | 0.26 | (0.44) |
| Northeast | 0.17 | (0.37) | 0.18 | (0.39) | 0.16 | (0.36) |
| N | | 33,390 | | 13,010 | | 20,390 |

*Note:* All variables binary unless otherwise noted here (GPA: 0 to 4; math score: -3.05 to 3.13; self-efficacy: -2.5 to 4; academic credits: 0 to 53; CTE credits: 0 to 21.5; Extracurriculars: 0 to 4; % ELL/FRL/URM: 0 to 100)
*Abbreviations:* WBL – work-based learning; GPA – grade point average; IEP - Individualized Education Plan; PSE - postsecondary expectations; ELL - English language learner; FRL - Free or reduced-price lunch; URM - Underrepresented minority

underrepresentation of female students in CTE programs of study in high school (Plasman et al., 2020b; Stone & Aliaga, 2003).

## Analytic Approach

To address our first two research questions regarding participation in WBL separately for our ELS and HSLS cohorts, we estimated the following logistic regression model:

$$WBL_{is} = \frac{e^{(\beta_0+\beta_1 X_i+\beta_2 Acad_i+\beta_3 School_s)}}{1+e^{(\beta_0+\beta_1 X_i+\beta_2 Acad_i+\beta_3 School_s)}}$$

This estimation strategy is appropriate in instances when the outcome is a binary variable, such as is the case with WBL participation in this study. In the equation, $WBL_{is}$ indicates whether student *i* in school *s* participated in an internship or cooperative education WBL experience in high school. $X_i$ is a vector containing our set of sociodemographic variables; $Acad_i$ is a vector containing the set of academic history and attitude variables; and $School_s$ is a vector containing the set of school variables. We run this model separately on the ELS sample and the HSLS sample to identify factors related to WBL participation at these two separate timepoints.

Our third research question asked whether there was a change in the probability of a WBL participation between the ELS and HSLS cohorts. In other words, we were interested in determining whether students after the Perkins reauthorization in 2006 were more likely to participate in an internship/cooperative education experience than students prior to the reauthorization. The following logistic regression model illustrates our estimation approach:

$$WBL_{ist} = \frac{e^{(\beta_0+\beta_1 HSLS_t+\beta_2 X_i+\beta_3 Acad_i+\beta_4 School_s)}}{1+e^{(\beta_0+\beta_1 HSLS_t+\beta_2 X_i+\beta_3 Acad_i+\beta_4 School_s)}}$$

To estimate this equation, we merged our ELS and HSLS samples and included an indicator for the time of the observation, $HSLS_t$. Here, we were interested in the probability student *i* in school *s* at time *t* participated in WBL. The estimate associated with the HSLS variable, $\beta_1$, represents our coefficient of interest.

In addition to understanding whether there was an overall change in WBL participation, we also explore changes for our identified student populations using the full merged sample. Specifically, we run a unique logistic regression for each of the six different student populations in which we interact our chosen population identification variable with our cohort indicator as indicated in the equation below:

$$WBL_{ist} = \frac{e^{(\beta_0+\beta_1 HSLS_t+\beta_2 X_i+\beta_3 HSLS_t*SPop_i+\beta_4 IndVars_{is})}}{1+e^{(\beta_0+\beta_1 HSLS_t+\beta_2 X_i+\beta_3 HSLS_t*SPop_i+\beta_4 IndVars_{is})}}$$

We include indicators for cohort membership ($HSLS_t$), special population or group of interest ($SPop_i$), and the interaction between these two indicators ($HSLS_t*SPop_i$). All of our independent variables for students and schools, less the selected special population of interest, are represented by vector $IndVars_{is}$. The coefficient $\beta_3$ represents our estimate of interest as it identifies the unique change over time for the identified student population. As a reminder, the six subpopulations on which we focus include female students, Black students, Hispanic students, students with disabilities, economically disadvantaged students, and rural students.

For each of our models, we present our estimates as odds ratios to ease interpretation. As such, estimates greater than 1 indicate higher odds of participation and estimates less than 1 indicate lower odds of participation. As an illustration, an estimate of 1.3 suggests 30% greater odds of observing an outcome. An estimate of 0.7, meanwhile, would suggest 30% lower odds of observing a given outcome. Additionally, we ran a variance components model to identify the proportion of variance at the school level and determine whether a multilevel model would be appropriate. The intraclass correlation coefficient in this instance was estimated at less than 0.07, suggesting a multilevel model is not necessary.

## Results

### Research Question 1 – Pre-Perkins WBL Participation (ELS Cohort)

In responding to our first research question, we were interested in exploring what student and school characteristics related to participation in WBL (as measured by participation in internship or cooperative education) for the high school graduating class of 2004—our ELS sample. Table 2 presents the results of this analysis. Across this model, there are a number of variables related to higher odds of WBL participation and a handful related to lower odds of WBL participation. With respect to higher odds, Black and Asian students were each more likely to participate in WBL than White students (1.24, $p < 0.05$ and 1.38, $p < .001$, respectively). With respect to academic history and attitudes, for CTE credit earned, students saw higher odds of WBL participation (8% increase in odds per additional credit). Finally, students who participated in extracurricular activities had approximately 34% higher odds of WBL participation.

There were also a number of variables associated with decreased odds of participation. Notably, female students had odds about 15% lower than males of participating in WBL. Additionally, for each additional point of GPA, a student had about 10% lower odds of WBL participation. In other words, higher GPA was associated with a decreased likelihood of WBL participation. Similarly, for each unit increase in standardized math score, students were expected to see a decrease in odds of WBL participation by about 19%. This implies students with higher math scores were less likely to participate in WBL. Finally, only one school variable was associated with WBL participation, either negatively or positively. Specifically, students attending school in the Midwest had about 20% lower odds of participating in WBL than did students in the Northeast.

Table 2
Predictors of Internship/Cooperative Education participation: ELS

| | OR | SE |
|---|---|---|

| | | |
|---|---|---|
| *Student Variables* | | |
| Female | 0.85** | (0.05) |
| Black | 1.24* | (0.12) |
| Asian | 1.38*** | (0.13) |
| Hispanic | 1.01 | (0.09) |
| Other race | 0.89 | (0.23) |
| Low-income | 1.07 | (0.06) |
| Single parent | 0.96 | (0.06) |
| Other family arrangement | 1.06 | (0.07) |
| *Academic History and Attitudes Variables* | | |
| 9th Grade GPA | 0.90** | (0.04) |
| Standardized Math score | 0.81*** | (0.03) |
| PSE Expect 2 yrs or less | 0.95 | (0.09) |
| PSE Expect 4 yrs or more | 1.05 | (0.08) |
| IEP | 1.13 | (0.11) |
| Academic credits | 0.99 | (0.01) |
| CTE credits | 1.08*** | (0.01) |
| Extracurriculars | 1.34*** | (0.01) |
| *School Variables* | | |
| % ELL | 1.00 | (0.00) |
| % FRL | 1.00 | (0.00) |
| % URM | 1.00 | (0.00) |
| Urban | 1.06 | (0.07) |
| Rural | 0.97 | (0.08) |
| West | 1.00 | (0.09) |
| South | 0.86 | (0.07) |
| Midwest | 0.80* | (0.08) |
| N | | 13,010 |

*Note*: Coefficients presented at Odds Ratios. Robust standard errors in parentheses. **p < 0.01; ***p < 0.001.

**Research Question 2 – Post- Perkins WBL Participation (HSLS Cohort)**

Our second question asked what specific factors were related to WBL (internship or cooperative education) participation for students in the HSLS sample—the high school graduating class of 2013. Table 3 presents the results of this analysis. As with the ELS sample, Black (1.41, $p < .001$) and Asian (1.69, $p < .001$) students in the HSLS sample were more likely to participate in WBL activities than their White peers. There were also similarities with respect to academic history and attitudes. Specifically, both GPA (0.93, $p < .05$) and standardized math score (0.84, $p < .001$) remained negatively associated with participation in WBL. CTE credit accumulation, meanwhile was positively associated with WBL participation, such that each additional credit linked to 8% higher odds. A final similarity related to extracurricular participation, such that students who participated in extracurricular activities (1.31, $p < .001$) were more likely to participate in WBL.

Unique to the HSLS cohort, female students no longer had lower odds of participation than male students and region of school attendance had no relationship with participation in WBL. Additionally, Hispanic students (1.18, $p < .05$) were more likely than White students to participate in WBL. Finally, students who expected four or more years of postsecondary education had about 21% higher odds of participation in WBL than students with no postsecondary expectations.

Table 3
Predictors of internship/cooperative education participation: HSLS

| | OR | SE |
|---|---|---|
| *Student Variables* | | |
| Female | 0.98 | (0.04) |
| Black | 1.41*** | (0.10) |
| Asian | 1.69*** | (0.14) |
| Hispanic | 1.18* | (0.08) |
| Other race | 1.14 | (0.08) |
| Low-income | 1.08 | (0.05) |
| Single parent | 1.03 | (0.05) |
| Other family arrangement | 0.96 | (0.06) |
| *Academic History and Attitudes Variables* | | |
| 9th Grade GPA | 0.93* | (0.03) |
| Standardized Math score | 0.84*** | (0.03) |
| PSE Expect 2 yrs or less | 0.96 | (0.10) |
| PSE Expect 4 yrs or more | 1.21*** | (0.06) |
| IEP | 1.08 | (0.07) |
| Academic credits | 1.00 | (0.00) |
| CTE credits | 1.08*** | (0.01) |
| Extracurriculars | 1.31*** | (0.07) |
| *School Variables* | | |
| % ELL | 1.00 | (0.00) |
| % FRL | 1.00 | (0.00) |
| % URM | 1.00 | (0.00) |
| Urban | 1.04 | (0.06) |
| Rural | 1.14 | (0.08) |
| West | 1.08 | (0.10) |
| South | 1.02 | (0.08) |
| Midwest | 1.02 | (0.08) |
| N | | 20,390 |

*Note*: Coefficients presented at Odds Ratios. Robust standard errors in parentheses. **p < 0.01; ***p < 0.001.

**Research Question 3 – Changes Over Time and for Special Populations**

Table 4 presents the estimates of our analyses related to changes in participation in WBL (either internship or cooperative education) between the graduating classes of 2004 (ELS) and 2013 (HSLS). The first model shows the overall change in participation for the entire population of students. Models 2-7 present the changes specifically for our identified student populations. The coefficients associated with the interaction terms are of particular interest here as they represent significant changes in representation of the identified group in WBL between ELS and HSLS. For parsimony, we present only the results associated with our coefficients of interest though all covariates of interest were included in each model.

Table 4

Predicted changes in internship/cooperative education participation over time for identified populations

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | OR | OR | OR | OR | OR | OR | OR |
| HSLS | 1.00 | 0.91 | 0.99 | 0.99 | 0.99 | 1.02 | 0.97 |
| | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) | (0.05) |
| Female | | 0.83*** | | | | | |
| | | (0.04) | | | | | |
| Female*HSLS | | 1.19** | | | | | |
| | | (0.08) | | | | | |
| Black | | | 1.30* | | | | |
| | | | (0.12) | | | | |
| Black*HSLS | | | 1.06 | | | | |
| | | | (0.11) | | | | |
| Hispanic | | | | 1.07 | | | |
| | | | | (0.09) | | | |
| Hispanic*HSLS | | | | 1.07 | | | |
| | | | | (0.11) | | | |
| Low income | | | | | 1.06 | | |
| | | | | | (0.06) | | |
| Low income*HSLS | | | | | 1.04 | | |
| | | | | | (0.08) | | |
| IEP | | | | | | 1.21* | |
| | | | | | | (0.11) | |
| IEP*HSLS | | | | | | 0.86 | |
| | | | | | | (0.08) | |
| Rural | | | | | | | 0.99 |
| | | | | | | | (0.08) |
| Rural*HSLS | | | | | | | 1.16 |
| | | | | | | | (0.11) |
| N | | 33,390 | 33,390 | 33,390 | 33,390 | 33,390 | 33,390 |

*Note*: Coefficients presented as Odds Ratios. Robust standard errors in parentheses below the estimated coefficients. **p < 0.01; ***p < 0.001.

Our initial finding examining the change in WBL participation over time shows there was practically no change in overall WBL participation rates between the pre-Perkins IV cohort (i.e., ELS) and the post-Perkins IV cohort (i.e., HSLS). There is, however, one noteworthy finding relative to changes over time. As shown in model 2, female students were the only group to show a significant increase in odds of participation (1.19, $p < .01$) that exceeded the odds of the general population. In other words, we observed a closing of the gap in participation in WBL for female students compared to male students. This finding reflects the results in our HSLS cohort estimation showing female students had statistically comparable rates of participation in WBL compared to male students, while there was a significant underrepresentation in the ELS sample. While we see in model 3 that Hispanic students are overall overrepresented with respect to WBL participation in the combined sample, there was no statistically significant difference in the make up of WBL participants with respect to Hispanic status between ELS and HSLS. Similarly, students with disabilities were overrepresented across the combined sample (model 6) but exhibited no significant change over time.

## Discussion

Our main goal in pursuing this study was to examine predictors of participation in WBL (specifically internships and cooperative education). In particular, we wanted to explore how participation may have differed before and after the reauthorization of federal Perkins legislation in 2006 and how participation may have changed over this time period for key student populations. Relying on two nationally representative datasets—one in which students were expected to graduate prior to Perkins IV, and one that began well after Perkins IV would have had a chance to be fully implemented—we are able to present some overarching conclusions regarding WBL participation. Below, we highlight the key findings and suggest potential directions for future research.

### Pre-Perkins IV

In the early 2000s, prior to the reauthorization of Perkins IV, we observed associations between a number of relevant factors and WBL participation. With respect to demographic factors, we found race/ethnicity and gender to be significantly related to WBL participation. Contrary to what we may have expected given the overrepresentation of white students in career-focused programming in general (Hamilton et al., 2015), we found Black and Asian students were more likely to participate in WBL opportunities. While this finding was unexpected, it is not a negative finding considering prior work showing the benefits of WBL related to academic reinforcement and later labor market success through development of social and cultural capital (Galbraith & Mondal, 2020; Raelin, 2008; Rossin & Hyland, 2003). With respect to gender, female students were significantly less likely to participate in WBL than their male counterparts. This finding may potentially be explained by attitudes expressed by women with respect to career-focused coursework in that they feel they lack emotional and institutional support as well as experience gender biases (Lester, 2010). It is also an unfortunate finding given the various forms of capital (i.e., human, social, and cultural) WBL supports, thereby setting these young women at a potential disadvantage when entering the job market (Nunley, 2016; Rigsby, 2013).

There were also a handful of academic variables significantly associated with WBL participation. Notably, the Perkins IV reauthorization made a point to emphasize how CTE and WBL should be seen as an option to prepare students for both college and career (Brand et al., 2013). Our findings here show why this emphasis may have been warranted given students with higher GPAs and standardized math scores were significantly less likely to participate in WBL. Finally, participation in extracurricular activities was also linked to higher odds of WBL participation. This finding aligns with prior work showing students who participated in extra-curricular activities were significantly more likely to participate in vocational exploration opportunities in subsequent years and these two types of experiences may serve to complement one another in supporting career development (Denault et al., 2019).

**Post-Perkins IV**

Turning to the factors related to post-Perkins IV WBL participation, we again found a handful of demographic and academic factors to be significant. As with pre-Perkins, we found Black and Asian students were more likely to participate, though here we also found Hispanic students were more likely to participate than their White peers. Unlike the pre-Perkins cohort, female students were no longer less likely to participate in WBL.

With respect to academic factors, there is some evidence to support the idea policy changes were able to overcome some of the stigma related to career preparatory programming in high school. Specifically, in the HSLS cohort, we observed students with higher postsecondary expectations to have higher odds of participation in WBL. This aligns with the overall push to encourage participation in WBL and other career-focused activities for students bound for both college and career. It is also an important finding given higher education institutions are becoming more and more likely to recognize the value of career-related education experiences, such as WBL, in helping students prepare for postsecondary education (Gordon & Schultz, 2020). Further, students with higher college expectations may be recognizing how WBL can be useful in growing social networks and accumulating human capital that could be beneficial in either college or career (Hughes et al., 1999; Trigwell & Reid, 1998). Contrary to this push to support both college and career readiness, however, achievement was still negatively related to WBL participation. Specifically, both GPA and standardized math scores remained negatively associated with WBL. In other words, students with higher GPA and higher math scores are less likely to participate in WBL. This suggests there may still be some lingering stigma associated with these career-focused opportunities. Finally, we again see students who participated in extra-curricular activities (i.e., activities outside a school's regular curriculum such as clubs, band, or sports) were more likely to also participate in WBL.

**Changes Over Time**

In exploring how patterns of WBL participation may have changed over time, we focused on key demographic subpopulations related to traditional disadvantage in education broadly as well as in career preparatory programming more specifically. Prior to discussing specific subpopulations, it is worth mentioning participation in WBL over time remained practically equivalent. This is an intriguing finding given the language in Perkins IV supporting the expansion of WBL offerings. With respect to changes in participation by specific subgroups, female students post-Perkins

experienced a significant increase in participation rates relative to their male counterparts. In other words, females closed the gap in WBL participation over this time. This aligns with our findings that they were no longer underrepresented in the post-Perkins IV dataset. Given the push to increase access to WBL opportunities and participation by preparing students for non-traditional fields in Perkins IV, this finding provides additional evidence as to positive developments in this regard, which aligns with prior work showing increased participation in STEM-focused CTE by female students across this same time period (Plasman et al., 2020a).

## Implications

There are a number of implications worth noting. With respect to policy, our work highlights there was no observed increase in overall WBL participation, which we would have expected given this was of particular emphasis in Perkins IV. Given the industry perspective of a shortage in middle skilled occupations (Craig, 2019; Kochan et al., 2012) in conjunction with the benefits of WBL participation for students themselves (Buzzeo & Cifci, 2017; Hemelt et al., 2019; Plasman & Thompson, 2023), this finding suggests further work needs to be done to ensure students are provided with appropriate opportunities to prepare for postsecondary options. Further policy updates at the federal level may be needed to entice more localized education entities to offer WBL and ensure students are aware of these opportunities and the benefits associated with participation. In addition to federal legislation, states and districts should look to continue to develop partnerships with local and regional employers to ensure students are gaining valuable work-place experience with the most relevance to their geographical context.

A second overall implication relates to the specific populations for whom these changes may differ from the general population. Female students saw an increase in participation rates above and beyond the increase of their male counterparts. Note, however, this implies female students are now equally likely to participate in WBL as males; the observed increase simply moved the participation rates to parity, which is likely a good final outcome. Specifically, this likely allows for additional accumulation of each human, social, and cultural capital, thereby providing these young women with more equitable opportunities in the labor market (Nunley, 2016; Raelin, 2008).

A final implication relates to the overall lingering stigma of career development and preparatory options in high school. Perkins IV made targeted attempts to rebrand these experiences as both college and career preparation as opposed to solely for vocational preparation. That students with higher postsecondary education expectations saw increased odds of participation in the later cohort suggests this push may have had some influence. However, this finding can be viewed through multiple lenses. First, this can be seen as a positive development as it implies career preparatory activities such as WBL are becoming more appealing as preparation for both college and career. On the other hand, it may be the case students who are more likely to head directly to the labor market immediately after high school—a group for whom these WBL opportunities may be most beneficial (Nunley, 2016; Plasman et al., 2024)—are being crowded out. It is important these students are not being forced into career-focused programming, but it is equally important all students have access to educational programs in which they have the greatest chance to excel.

**Limitations and Future Research**

While our work makes an important contribution toward understanding the context of WBL in the United States, there are a few limitations worth considering. First, we do not intend our work to be interpreted as causal. In other words, we are not claiming Perkins IV was the only change that caused an increase in WBL participation. We are simply identifying a pattern in change over time around which a relevant policy was implemented. Future research may look to use a single state's administrative dataset that includes multiple cohorts of students tracked over time to attempt to approach a more causal identification as to the effects of Perkins. This would provide more ability to account for other state-specific policies as well as other changes that may have occurred during this time and approach a more causal estimate of the policy effects.

A second limitation is we do not know in which fields these WBL experiences took place. While the ELS and HSLS datasets provide a good deal of in-depth information, they do not identify which career programs of study or career pathways with which an internship or cooperative education experience may be associated, nor do they identify the specific industry in which these experiences took place. Future work may look to explore similar questions using statewide longitudinal data systems, which are much more likely to include this information. Identifying the field of study would add further context to our current study. Specifically, in addition to growing WBL experiences, Perkins IV emphasized a focus on instruction of STEM academic and technical skills through career education. It would be useful to know if these WBL experiences were taking place in STEM-related industries, and if so, for which groups.

Finally, neither of these datasets include information regarding why students choose to participate (or not) in WBL experiences. While it is not possible to go back to a pre-Perkins IV era and ask students about these decisions, gaining a deeper understanding of these motivations in the current context would also be informative. Approaching this question through a more qualitative approach would provide additional details regarding what students themselves may view as the benefits of participating in WBL. One area of particular focus in this regard will be to understand the changes in participation based on college expectations. Additionally, such an approach would help shed light on how non-college bound students view opportunities to participate in WBL and the benefits of doing so to better identify whether they feel they are being crowded out of WBL programming as it gains broader college and career readiness appeal.

Despite these potential limitations, our work provides a good descriptive overview of changes in WBL participation over time, with a focus on the potential influence of federal Perkins legislation on any observed changes. Our work aligns with the ongoing college and career readiness movement across the country, which has only gained traction since the Perkins IV reauthorization. With this in mind, it is important that both practitioners and policymakers continue to embrace balanced educational experiences for all students. Given how rapidly the demands of the labor market change in our current global economy, it will become more and more necessary to ensure students continue to gain a broad knowledge base that includes general academic, technical, and employability (e.g., logical reasoning, creativity, problem solving, etc.) skills through an integrated educational experience.

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