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Fiddlers Green College: Looking for Equitable Workforce Pathways in Silicon Valley

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ABSTRACT

Often, research on the efficacy of postsecondary workforce programs does not convey their impact on true social mobility. The purpose of this study is to investigate project-based Career and Technical Education (CTE) workforce pathways in Silicon Valley.[1] This study takes a step towards better understanding what constitutes the metrics that explain functioning pathways. In contributing to Project-Based Learning (PBL) theory, Amaral et al. (2015) found that seven PBL essentials form good learning outcomes; Creghan and Adair-Creghan (2015) then showed a measurable outcome of PBL is higher attendance, to which Plasman and Gottfried (2020), using a case of Applied STEM CTE (AS-CTE), framed attendance as a predictor of the efficacy of a workforce pathway. Recommendation: Through ethnography, the investigators observed that when social mobility was added as a metric of high quality PBL with AS-CTE in a predictive ontology framework of education success, an improved level of attendance was observed. The authors conclude that using the seven essentials and social mobility as a metric of PBL helps explain the observation of PBL's improved efficacy. Hence, social mobility should be a metric of PBL AS-CTE program outcomes.

Keywords: Social mobility, Career technical education, Workforce pathways, Equity, Virtual design and construction

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Although Silicon Valley, California is one of the most technologically advanced regions in the world, entire groups of people are pushed to the margins and prevented from partaking in the fruits of this prosperity. Just as tech draws the best and brightest from all over the world, so too do technical trades taught in the workforce postsecondary Career Technical Education (CTE).[2] There is a call for highly skilled workers in the San José region to construct the many massive mixed-use development projects.

Through ethnographies as postsecondary Applied STEM CTE (AS-CTE) instructors teaching those highly skilled workers – using Project-Based Learning (PBL) – the investigators observed that many students fall short of their goal of social mobility to high-skill, high-wage jobs. These findings necessitate further inquiry and a social mobility metric to address a lack of student matriculation into the highly skilled workforce and further problematize the use of innovative PBL pedagogies as the sole means of fostering social mobility. Our ethnographies have found that efficient PBL pedagogy alone will not provide equitable social mobility and that in order to move our PBL pedagogies to the future, theorists must first acknowledge the larger systems that need to be interrogated and redefine success through more precise metrics such as our proposed social-mobility metric. This paper is a distress call reminding our colleagues that in order to move forward and into the future, PBL practitioners and theorists must acknowledge large systemic barriers in order to ensure efficacy and to include historically marginalized groups who have largely been left out of the fruits of these pedagogical practices to join us in a future created in part through a PBL driven equitable education.

Traditionally, technical trades were taught through apprentice programs, which often have trade-union-mentored, on-the-job project-based learning formats. Workforce education has taken many forms, and this research is attuned to the past exploitation and pain caused by non-union vocational education programs that targeted Black, Indigenous, and People of Color (BIPOC). These programs perpetuated social inequities through the economic surplus created from the exploited labor of marginalized people. These are examples of programs that do not provide social mobility. The investigators are not advocating for this form of vocational education, nor are the investigators advocating for a discounted ‘cheap’ labor force.

Problem statement: Current research on PBL and the efficacy of postsecondary workforce programs does not convey their impact on true social mobility. Although highly skilled workers are required to build Silicon Valley, that highly skilled workforce is now scarce. The investigators posit that a lack of observed social mobility is not due to low attendance or inferior pedagogy, but could be due to leaks in the education system. Research goal: The purpose of this study is to investigate the postsecondary PBL AS-CTE workforce pathways in Silicon Valley to understand what additional metrics help to explain the functioning pathways. This study is guided by two research questions: (a) What current

metrics in literature explain functioning CTE education pathways; (b) What additional observable metric improves on explaining functioning CTE education pathways. In our ethnography, we uncover two very different postsecondary PBL pathways and propose a new metric of social mobility to be added to the framework of efficient PBL programs.

REVIEW OF POSTSECONDARY CTE SUCCESS METRICS

Applied STEM Career and Technical Education (AS-CTE) research often frames predictors of vocational education success through metrics like motivation (Lee & Stankov, 2018) and measures success in administrative qualities like leadership (Bartlett et al., 2018). Amaral et al. (2015) found that seven PBL essentials form good learning outcomes. Creghan and Adair-Creghan (2015) found that PBL resulted in higher attendance – a predictor of program completion as shown by Plasman and Gottfried (2020). To contribute to PBL theory, the investigators pull from underpinning concepts in AS-CTE as guides in the formalization of a framework that demonstrates an improvement in predictive performance for academic success – keeping the attendance contribution metric by Plasman and Gottfried in mind – over that last contributed by Creghan and Adair-Creghan.

Project-based Learning Strategies That Increase Program Completion and Attendance:

Creghan and Adair-Creghan (2015) found that school attendance rates of economically disadvantaged students increased when PBL strategies were used in the classroom. The demographics of the students in these findings were similar to those of the feeder schools and postsecondary schools in Silicon Valley. Both Creghan and Adair-Creghan (2015) and Plasman and Gottfried (2020) found that project-based education resulted in higher attendance (PBL and AS-CTE, respectively). They found that correlation with improved attendance was, therefore, a better predictor of academic success than previous frameworks using metrics such as motivation (Lee & Stankov, 2018). The investigators take the Plasman and Gottfried (2020) attendance framework as their point of departure.

Underpinning Concepts in AS-CTE Formalizations

In formalization development, the investigators pull from the following concepts: project-based learning, critique of workforce education, and historical views of certification in CTE.

Project-based Learning in Workforce Education: Silicon Valley CTE courses have undergone a paradigm shift, adopting progressive pedagogies which include PBL strategies. The feeder secondary school referenced later in this paper (under the ‘Participants’ header) is classified as an engineering education pathway, however, its

classes differ from traditional secondary engineering courses in which students are often "singularly focused on a solution and not an iterative design process" (Hughes & Denson, 2021 p. 6). This pathway's engineering curricula leverage core concepts of Project Based Learning (Amaral et al., 2015; Guerra et al., 2017; Larmer & Mergendoller, 2010). Students chose an 'ill-structured problem'(Savery, 2015) and followed the seven PBL essentials originally laid out by Larmer and Mergendoller (2010) and were utilized by Amaral et al. (2015). These seven essentials state that the problem should have: (1) a need to know, (2) a driving question, (3) student voice and choice, (4) 21st-century skills, (5) inquiry and innovation, (6) undergo critique and revision, and (7) a public presentation. The authors come from a tradition of a workforce virtual design and construction courses where PBL projects are presented publicly to an expert panel (Frank & Fruchter, 2014; Fruchter & Courtier, 2011; Tarantino et al., 2016).

Critique of Workforce Education: Highly skilled labor and its pathways, commonly referred to as CTE or vocational education, are being rebranded to attract more students, especially women and students of color. The truth is that these pathways need rebranding because of their toxic history. Vocational institutions have exploited people in the United States (U.S.) for many years. The exploitation of indigenous youth is just one of many examples of this victimization (Lomawaima, 1996; Williams & Tracz, 2016). If, as a community, our goal is truly to fix the issues within workforce pathways, then there must be an acknowledgment of the historical tracking and exploitation of marginalized groups at the hands of these institutions. Many of these schools were created as a means for proletarization. In vocational education, proletarization and external labor are personified in high-tech manufacturing industries where exploited workers labor on or with commodities that are beyond their financial reach. With the rebranding of high-tech CTE in fields such as cybersecurity, software, and coding, a new vocational education era begins: one that is looking to exploit high-tech workers. Furthermore, there is a new inclusion of exploited affective labor careers (Hardt, 1999) where there is a discontinuity in the wage and the labor produced, such as teaching and nursing, in CTE (Vora, 2015). With the 2020 global COVID-19 pandemic, the affective toll that nurses and other caregivers face is a result of a mismatch in the fungibility of wage and labor prices. These mismatches exist by design and are felt more severely by marginalized workers.

Historical Views of CTE Certifications: The mission of the workforce education system is to develop human capital. In the U.S., this mission falls to the community college system: 40 percent of U.S. undergraduates are educated at a community college (Budd, 2018). Those colleges focus on certifications that categorize workers into different classifications of value. Groeger (2017) saw that craft employers view education as a metric of human capital value. The investigators are acutely aware of the origins of vocational education and the role of certifications rooted in human capital. While the

authors are aware of this framing, we do not aim to view this study through the lens of human capital theory. Groeger (2021) further problematized human capital theory with her critique of credentialism, where she questions the actualization of human capital benefits. Informed by the underpinning concepts of human capital and credentialism, we look for a path forward which we posit will more accurately measure success through social mobility and reentry to the academy of higher education and the workforce.

Using a critical lens to view our CTE history, the investigators entered ethnographies of the Silicon Valley postsecondary AS-CTE education centers to develop and teach a PBL AS-CTE course. Through these ethnographies, the authors propose adding social mobility as a success metric of postsecondary AS-CTE pathways.

RESEARCH METHODOLOGY

Experiment Setting

The investigators studied social mobility through ethnography (Hartmann et al., 2009) and case study examples gained through a community-based participatory research approach (CBPR) (Amaral et al., 2018; Minkler & Wallerstein, 2011). In our methodological approach, we do not try to fit an objective ideal of an imagined perfect reality into our observations (Kliewer et al., 2004; Montoya et al., 2020). Rather, we seek to understand a pragmatic reality, and then to explain that reality and apply the explanation in a useful way (Bernstein, 2013). The ethnography was taken via the investigators' roles as classroom instructors in several postsecondary educational settings using project-based learning (PBL) in college, apprenticeship, and adult education settings: a situation in which PBL is suited for data collection (Fruchter & Townsend, 2003).

The investigators are further informed by their in-situ ethnography prior to attaining a university education, holding roles in the proletariat class of unskilled laborers. During years-long experience in those roles, each has been recognized by their fellow workers with a rank of 'lead' laborer in which they became responsible for mentoring new laborers. This lead role is required to help new laborers quickly learn to work safely and skillfully, as well as to pass on a tradition of knowledge in the class struggle for human rights.

The theory development is based on an ontology. In ontological theory development, the project follows a formalization of the framework, an application of that framework in a beneficial process, and finally an example of a practical implication of that process. This paper is focused on the formalization of the metric and framework.

Research-Practice Partnership

This study is part of a larger project (Montoya et al., 2020, 2018; Tarantino et al., 2016) which relies on the same Northern California Silicon Valley–based Research-Practice Partnership (RPP). Our RPP included educators and other community participants (i.e., union leadership, policymakers, business partners). Figure 1 depicts the numerous organizations which make up our RPP and together are known as the Santa Clara County Construction Careers Association (S4CA).[3] Our larger partnership includes four high schools, three community colleges (i.e., 2-year colleges), eight apprenticeship programs, an adult education program, and two universities (i.e., graduate and bachelor's degree–granting institutions). This paper focuses on postsecondary education institutions.

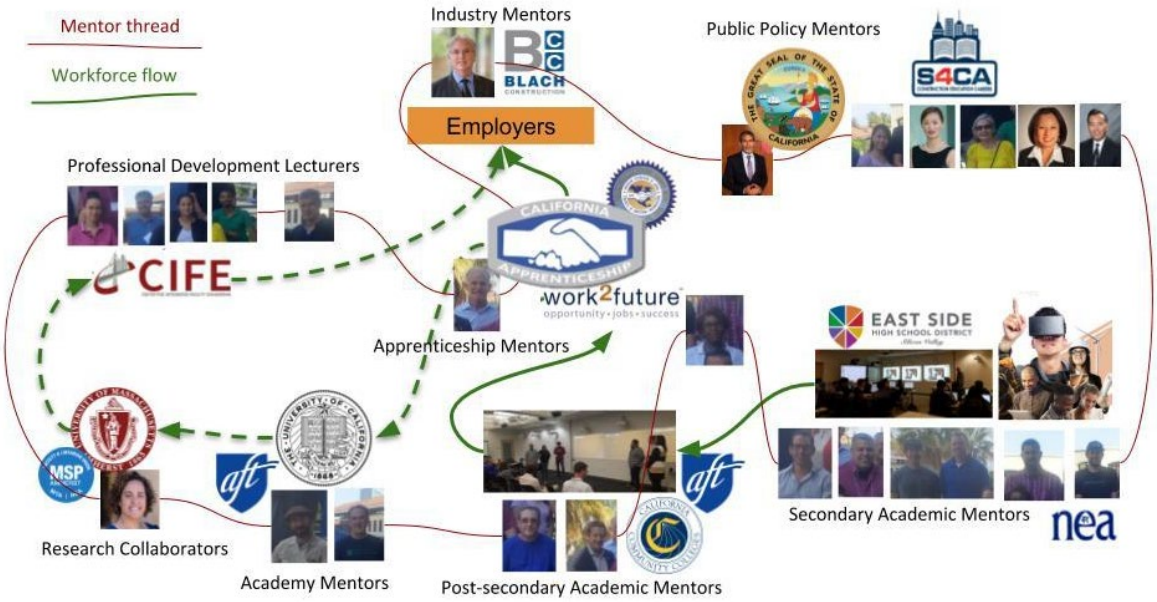

Figure 1. Research-Practice Partnership Network.

Note: An evolving network of community participants, researchers, and practitioners (adapted from Montoya et al., 2020; Tarantino et al., 2016). The participants represent each stop in the workforce pathway from education, to employment, to public policy, to labor standards oversight.

Participants

The study draws on data from students, instructors, and mentors. These participants come from two community colleges that we have collectively given the pseudonym Fiddlers Green College and an adult education center we call the Pipe Trades Education Center. The participants are from the tenth-largest city in the United States. This region's demographics are evenly divided between Latinx, Asian, and white: half of the homes in this city speak English as a second language.

The students reside in a lower-income working-class community whose feeder secondary schools are composed of 50 percent students who qualify for free and reduced-price meals. The region is industrial and its working communities suffer from a legacy of contaminants from industrial sites (Montoya et al., 2018; Pimentel, 2004; Schlanger, 2017; Stewart et al., 2014). Despite the racialized socially and environmentally unjust reality, the students are a high-performing and distinctly working-class demographic.

Sources of Data

This paper focuses on the researchers' roles as instructors in postsecondary classes, but is also informed by their dual-enrollment[4] course observations, informal interviews with interlocutors, and various meetings with the greater RPP to collect and analyze data for this study. Each of these individual categories is described in detail below, but see Table 1 for an overview of the data collected in this study.

Data Source	Overall
Observation/fieldnotes	182 days of practitioner fieldnotes
Postsecondary classroom observations	100 hours
Dual-enrollment course hours	50 hours
Informal interviews	20 interviews
Researcher meetings	40
S4CA meeting notes	4
Apprenticeship coordinators meeting notes	4

Table 1. Sources of Data.

Using an ethnographic action research method (Hartmann, et al., 2009), the authors leveraged their roles as instructors and researchers to gather various sources of data. The course takes a project-based learning format to teach virtual design and construction as an implementation of the PBL lab's Architecture Engineering and Construction (AEC) Global Teamwork course (Fruchter & Courtier, 2011; Fruchter & Townsend, 2003). The authors collected data using fieldnotes, student artifacts, and narrative ethnographic notes. Data were collected in the following settings: the postsecondary classroom, informal interviews, and formal meetings.

Postsecondary classroom observations were recorded through daily fieldnotes and ethnographic narratives by the two lead authors, who worked as instructors of two individual postsecondary courses. Fieldnotes were taken directly after courses were taught. The authors utilized an ethnographic narrative style often weaving in personal

experience and observations of other courses. All of the quotes for this paper are from the first author's fieldnotes.

The investigators conducted informal interviews (Figure 2) with dozens of students, colleague researchers, and practitioners who are all part of the broader RPP and ethnography. The researchers also used these informal meetings to discuss the curriculum and do member checks and logic checks for interpretation of data analyses.

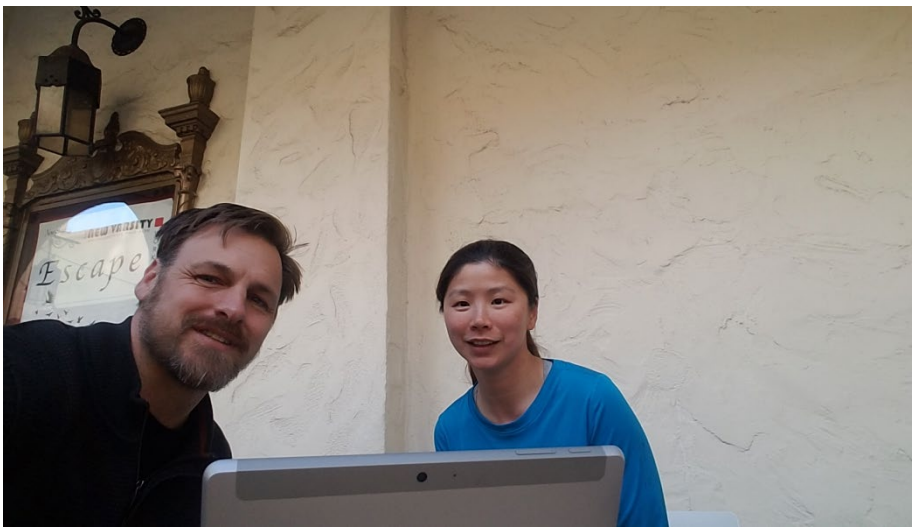

Figure 2. Researcher Meets with Journeywoman Pipefitter Aster for Interview.

Data Analysis

Through ethnographic participatory roles (i.e., as instructors), the authors analyzed and used inductive coding to identify key themes of social mobility and perceptions of social mobility. The lead authors met weekly throughout the course to discuss emerging themes.

Ethnographic Access

To gain access to ethnographic situations, the investigators relied on community-based participants. These participants come from an existing long-term and close collaboration with the Santa Clara County Construction Careers Association (S4CA). S4CA includes educators from community colleges and trade education centers as well as leaders from the academy, labor, industry, and public policy. Many of the S4CA participants overlap with two California Workforce Development Boards which are active in the study region: the North Valley Job Training Consortium (NOVA) and the San José–Silicon Valley Work2Future. The S4CA participants and the investigators of this study have collaborated on workforce education since 2012 and began publishing their findings in 2016.

ETHNOGRAPHY-INFORMED ADDITION OF A NEW METRIC

To address the forks and blocks in workforce pathways, the investigators explored the social mobility of these pathways through roles they took as associate faculty instructors at two local community colleges (Willis, 1977). The investigators define social mobility as students' perceptions that their workforce pathway can give them a career with a living wage and act as a pathway to a career or to higher education (Montoya et al., 2018). The AS-CTE course was an implementation of virtual design and construction curriculum with a social and environmental justice focus (Barg et al., 2020; Bick et al., 2021; Brosque et al., 2021; Fischer, 2006; Garcia-Lopez & Fischer, 2014; Montoya et al., 2018; Peng et al., 2021; Peterson et al., 2011; Song & Fischer, 2020; Tarantino et al., 2016; Tayag et al., 2021) taught through Project-based Learning (PBL), following the PBL Lab AEC course format (Fruchter & Courtier, 2011). The investigators experienced the AS-CTE programs from the inside. The fact that the investigators themselves had, years before, been students in these very same programs added a layer of depth. Further, the investigators worked as instructors and mentors in the secondary schools which act as feeders to these AS-CTE programs. This personal familiarity provides a layer of depth and perspective that allows investigators to connect with interlocutors in a unique way that allows for comfortable and authentic sharing. Thus, this study may not be replicable nor generalizable to other sites and populations. The investigators themselves are products of the investigated community. This experience allowed the investigators to interact with students at several stages of their school and career trajectories. To begin to explore the issues of social mobility, the following narrative will explore a case example of one student who is representative of many.

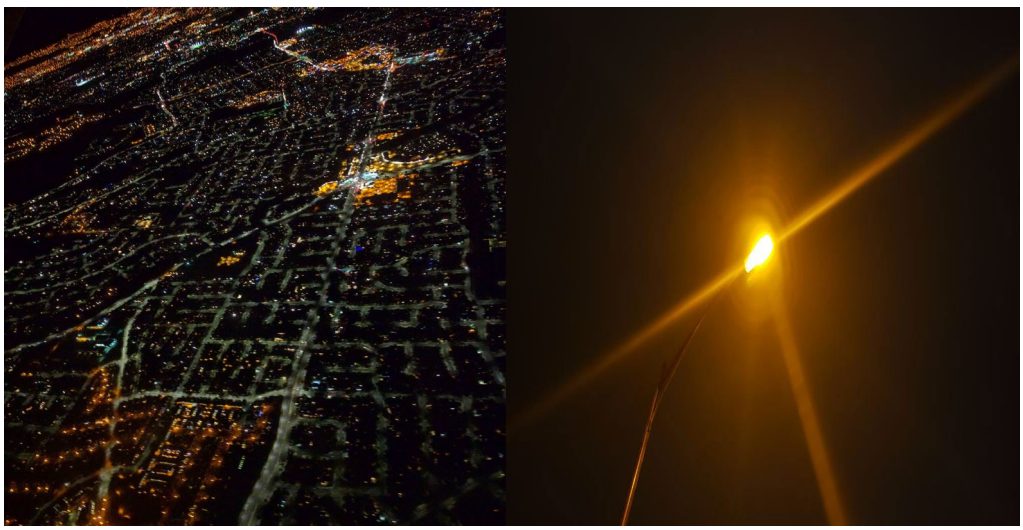

Figure 3. The Setting. Photos courtesy of Jason Brown. May he rest in peace.

Note: The setting of the ethnography often carried through the before- and after-class discussions in the early winter mornings under sodium lights pictured on the right. The

aerial view on the left shows the city's slow change to LEDs with pockets of sodium lights still in use. These lights will soon be phased out, reminding us of the fleeting temporality of this ethnography.

> **The following is a first-person narrative account of the investigator's first encounter with a student at the postsecondary institution:**
>
> *"The subtle orange glow of sodium lights greeted me as I walked onto campus for my first postsecondary faculty position. I arrived nearly an hour early, which, according to my grandfather, would be right on time. The only time he stood on a college campus was to work as a laborer. All of his technical skills were learned on the job.*
>
> *Standing under those antiquated lights, I considered the differences between how my grandfather learned his trade and how my students are learning theirs. A dark figure approached, with every step revealing more of their face illuminated orange. In the youth's eyes, I saw myself, my grandfather, and my community. As we stood face-to-face, I recognized the figure as a former student from my secondary classroom years earlier. Having myself both worked as a laborer and studied at this institution, looking at the student was like looking into a mirror and a time capsule simultaneously. They smiled awkwardly and hesitated, wondering if I recognized them. I did then and have always been able to truly see my students."*

This student was well into their twenties and would be categorized as high-performing, with near-flawless attendance in their secondary and postsecondary classrooms. Furthermore, they were a product of that secondary school's feeder CTE program, which in theory should be a functioning pathway for social mobility to both college and career.

> **Below, the instructor listened to the same student sharing their motivation and background to attend their postsecondary CTE class:**
>
> *"We got to talking, and although they did well in high school (secondary) and had completed a CTE education program, they could not find a job. In their opinion, the college's residential construction framing course would give them an opportunity to secure a 'good job.' I asked if they ever considered an apprenticeship. They said no. The student preferred community college because they could work during the day."*

Although this student had checked all the boxes to transition to a postsecondary education and career pathway, they were still in community college well into their twenties. They

were also working an unrelated low-wage job to supplement their career education. This is a result of many factors, including a lack of articulation and lack of dual-enrollment, that hinder social mobility into the high-skill, high-wage workforce.

> **Arriving early allowed the instructor to speak with many students and hear their individual and collective stories, which were very similar to this student. The instructor discusses waiting outside the classroom:**
>
> *"As an expendable associate faculty instructor, I was not given a key to the classroom. Waiting for the senior instructor to open the door 15 minutes late, I was able to meet nearly all of the forty men and women who were hoping to take my class. Many of these students had similar stories, and already put in a 10+ hour day of work in low-wage non-technical jobs like retail and foodservice."*

This student's situation was not unique, and the more the investigators interacted with students in these pathways, the more stories they heard that were similar to this case study student. Furthermore, the investigators are seeing one of our first clear barriers to these students' social mobility. With 40 people showing up to an 18-student-capacity classroom, over half of these eager students will be turned away.

> **The instructor discusses the issue with limited enrollment capacity:**
>
> *"With enthusiasm, students asked if they would be able to add the class. The senior instructor replied that they were not sure how many could add and to show up next week. They then released the group and proceeded to explain to me that we needed to cap the class at 18 students."*

Impacted CTE programs are common in public institutions. Through this interaction, another potential block to the students' actualization of their social mobility is clear: the lead instructor was not transparent with the students. Many would show up for the next class only to be turned away. Clearly, these students' time was seen as less valuable than the instructor's time.

> **The new associate faculty instructor and ethnographer describes their concern for these students' opportunity costs below:**
>
> *"There were some legitimate safety and logistical concerns for capping at 18, but I was mostly confused that they would not share this with the students. Because the senior instructor was the key master, I kept my questions to a minimum. However, I did comment that we should at least email the students, many of whom commute, rush from work, have*

> *babysitters, etc... At the end of the day, these are people with real opportunity costs. I thought it was important to let them know there would be no additions and not to waste their time. The senior instructor's response: just tell them next week."*[5]

This dismissive attitude toward students' time permeated much of the postsecondary CTE program. Often, instructors were not invested in the program and scheduled classes in service to senior faculty members instead of considering students' needs first. Furthermore, they were not transparent about program expectations and policies. This was a recipe for inequitable programs where students found themselves in limbo, often remaining consistently a few classes away from certificates and the completion of programs that would theoretically get them into the high-skill high-wage job market. These experiences reveal that the pathway to work and career has many forks and blocks, and often the results are not fair. Every step forward in research that explains the workforce education pathway is a step towards creating equitable workforce pathways and social mobility for our most marginalized populations.

> **Intervention Ethnography: A New Awakening Through a Case Study**
>
> *"Again, I walk to the classroom in the yellow glow of those San José parking lot lights, only now it is the Pipe Trades Education Center that I am approaching. I imagine the same student in the same scenario, with the same excellent attendance, only now, I no longer have the same apprehension for my student's social mobility."*

As an apprenticed pipe trades journeyperson, this student will soon make over 130 percent of the regional mean income.[6] In addition to this income, they will have pension-protected benefits, hiring hall, union-negotiated labor standards and job protections, and an opportunity for continued skills development. This program stands out from the previous ones beyond the measurement afforded by metrics of AS-CTE and attendance.

At the Pipe Trades Education Center, my role is that of a guest to observe an often-unseen reality in CTE education. The Center is administered by a trade union and without a specific reason to be on that site, you would not know it exists. A complex of clean, low-rise education buildings is tucked away adjacent to a commercial zone, with a solidly constructed iron fence protecting the site.

> **The investigators participated in the apprenticeship education system as guests – one describes the social mobility the students enjoy:**
>
> *"It started as a simple call and a request to grab a coffee and talk about apprenticeship education. From collaboration with and numerous visits to*

the Pipe Trades Education Center, I was familiar with this apprentice. They had already given guest lectures in courses I taught as an associate faculty. "Just meet me at my worksite, there is a coffee shop across the street!" The contrast between the student in their 'street clothes' and the student in their 'work clothes' was one that as a concrete laborer I understood – that feeling that says, "see, I am a person." As we sat in an upscale coffee shop in the heart of the Silicon Valley venture capital financial district, surrounded by startup teams, we were as socially mobile as everyone around us. We could have pitched a startup just as easily as talked through the human rights this student learned about in their labor course. That this student was employed full-time in a high-skill high-wage occupation seemed secondary, given all the other opportunities we discussed."

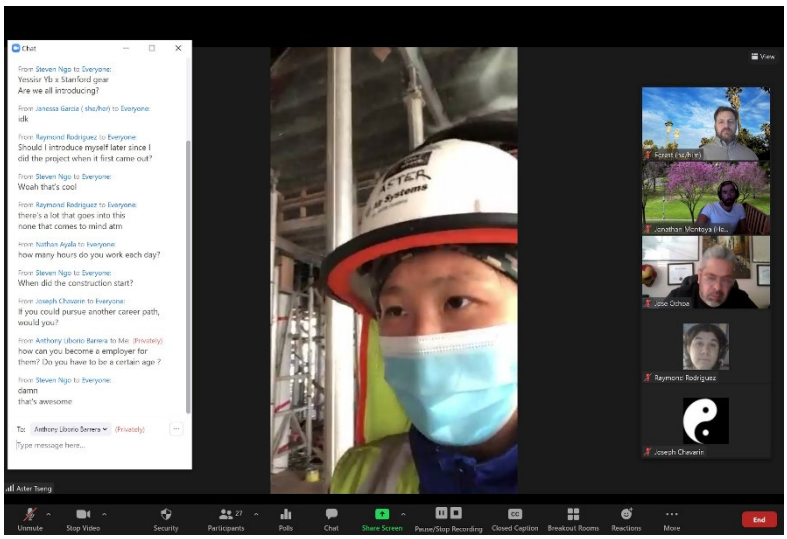

Figure 4. The 'Classroom.'

Note: An investigator visiting the 'classroom' of an apprentice pipe trades student: the student leads their PBL AS-CTE class through a jobsite walkthrough.

CONTRIBUTION TO THE FIELD

Building on Plasman and Gottfried's (2020) success metrics of attendance as a measure of program efficacy as a point of departure, and the authors claim that social mobility is a necessary metric of measuring CTE pathway success. The results of ethnographies reveal differing degrees of social mobility in traditional postsecondary AS-CTE pathways (community college) and union-led apprenticeship pathways (pipefitters). This study centered the stories of traditionally marginalized students who would have been considered successful using the seven PBL essentials to predict pathway success (Amaral

et al., 2015) and success metrics using attendance as a measure of program efficacy (Creghan & Adair-Creghan, 2015; Plasman & Gottfried, 2020). However, their personal stories and struggles described in this ethnography reveal a different narrative. Through their roles as postsecondary PBL AS-CTE instructors, the investigators observed a lack of both social mobility and perceived social mobility for students who would be considered successful. Given this discrepancy, social mobility should be added to the postsecondary PBL AS-CTE ontology as a metric of success (used for example in program evaluations).

IMPLICATIONS

This ethnography left a bleak vision of how the workforce has been sold versus the reality of historically marginalized students. However, there is a glimmer of hope in the counter-narrative of the pipe trades. The authors identified that social mobility is a metric of success for the pipetrades, and suggest that trade programs strive for this metric which improves on attendance alone as a predictor of success. While the authors observed many other interesting metrics, as researchers the authors identified a concise contribution in social mobility which itself encompasses many program-specific metrics which may detract from the greater PBL AS-CTE contribution. To move toward an equitable future for those in the workforce and education system we need work to problematize the historical roots of workforce pathways. While looking to the future of Silicon Valley PBL AS-CTE education, we must be cautious to avoid superficial amelioration of past harms caused by these pathways. Let us first take the palimpsest of the workforce education recipe and scrape away the prescribed instructions, analyzing each layer to avoid rewriting historical injustices. This recipe must be critically examined in order to be more justly rewritten. By observing the pipetrades' potential for social mobility, we propose the implementation of an improved predictive measure: that social mobility be added as a metric to a predictive ontology framework of education success. Through the counter-narrative, this study envisages a socially mobile workforce – one where classes are articulated to postsecondary institutions, students earn a living wage, and their health and safety are protected. This is not a pipe dream: it already exists in our region in trade education such as the Pipe Trades Education Center.

This study forces us to acknowledge past harms caused by CTE programs in marginalized communities such as San José. Al Garza and Herman Gallegos have shared details of these toxic pathways and their impacts on marginalized communities in Silicon Valley (Martinez, 2014). Project-based learning curricula such as workforce VDC have shown promise in helping to mitigate such harms. However, the implementation of Workforce VDC may simply postpone the inevitable reality that these programs must either be radically reimagined or dissolved entirely.

SIGNIFICANCE OF IMPACT

This study lends insight into the ways that postsecondary Career Technical Education institutions struggle to fulfill their mission to increase employment and social mobility for students from marginalized communities. Historically, access to education is not enough. Groeger (2017) reminds us that, "increased access to education, so often hailed as a road to opportunity, gave rise to a new form of social inequality in the modern United States." Groger's critique highlights 'credentialism,' where unequal access to education credentials perpetuates an elite ruling class (Groeger, 2021). This inequality is mirrored in neighborhoods in Silicon Valley. Recent research from Montoya et al. (2018) found poor environmental factors as students completed a safety survey of the routes to their school. The students were then transported to an affluent community where they did another survey and for the first time had a comparative lens to see inequities in both their schools and their environments. This study examines whether inequities reach further than the built environment and extend to their postsecondary CTE facilities.

Not all communities are created equal, and knowing to what degree each postsecondary institution generates social mobility allows for recommendations towards best practice. The investigators are motivated by service to their community and aim to inform community stakeholders which institutions are functioning to facilitate their workforce mobility. Too often, underrepresented minorities and/or low-income individuals carry the burden of social and environmental injustices that impacts their livelihood and lack of mobility. In the high-tech region, neighbors are exposed to environmental stresses and contaminants that measurably impact community health (Montoya et al., 2018). Furthermore, many live with neurotoxins like lead paint, carcinogens like asbestos, or in close proximity to brownfields and manufacturing facilities of unknown and mixed pollutants (Montoya et al., 2018).

As one of the wealthiest regions in the country, the Silicon Valley has impacted communities – composed mainly of minority individuals – that are nine times more likely to reside near toxic facilities and sites (Massey, 2004). Efficient postsecondary PBL AS-CTE pathways help to ameliorate these environmental and structural inequities by providing true pathways to job skills that will result in higher wages.

Uncovering and creating these functioning pathways through PBL AS-CTE helps to increase a homegrown skilled workforce. Job skills and prosperity allow community members to improve the environmental impacts of buildings around them and to join a growing and prosperous workforce (Fischer, 2006; Peterson et al., 2011). These studies have the potential to help bridge these gaps to postsecondary AS-CTE for a community with a historically underrepresented population that has struggled to enter the college–career pipeline and construction management field.

RECOMMENDATION

In conclusion, the authors recommend that researchers, administrators, and policy makers add social mobility as a metric to a predictive ontology framework of education success.

LIMITATIONS AND SUGGESTED RESEARCH

Union apprenticeship programs, like the Pipe Trades Education Center featured, are currently the most apparent pathway to the university. Important concepts, such as social justice, are derived through academic equivalency which creates social mobility. The apprentice described in this paper would never be allowed to teach even a CTE community college course whereas the investigators, due to their advanced degrees, would be able to even if they knew nothing specifically of the topic they were teaching.

Researchers should further explore pathways from the apprenticeship to regional university undergraduate programs, bargained agreements of recognized academic equivalency by industry companies, and potentially across industry sectors if that option becomes available in the United States. As best as we can tell, the pipe trades program had a lower overall cost per student, however, we did not look at the budgets which undoubtedly are public information. Following the example of The European Credit Transfer and Accumulation System (ECTS), the investigators recommend exploring academic credit for knowledge gained through experience, including experience in elected executive-type roles within labor organizations. Last, workforce education centers should be administered by those who have participated in the relevant workforce. Looking ahead, a legislated direction may be necessary to move these recommendations forward to implement social mobility as a metric of predicting PBL AS-CTE program success.

The investigators are aware that, given the nature of their positionality and particular lens, these ethnographies cannot and should not be generalized beyond our unique setting. These analyses are specific to the investigators, and although the investigators have made every effort to avoid blind spots and misinterpretations to accurately describe these students, their experiences, and their pathways, these analyses could not be replicated because they are unique individuals during a unique time.

This study did not explore the pathway of academic equivalency as thoroughly as intended. As ethnographers, much of the pace of research is dependent on real developments by a community of participants that the ethnographers do not and should not have an influence on. This study was conducted during a pandemic and accompanying economic collapse and political upheaval. That said, the investigators present a PBL path

forward for AS-CTE students through academic equivalency and reentry to the academy of higher education.

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[1] The authors use the now discontinued term 'vocational' as a term that is recognizable to a wider audience across languages where the term Vocational Education and Training (VET) is commonly used in translations.
[2] CTE courses in Silicon Valley are taught through project-based learning.
[3] For additional information on the organization of the community partnership structure see (Montoya et al., 2018).
[4] Dual-enrollment is an enrollment designation wherein a student is enrolled in both a secondary and postsecondary institution simultaneously, and receives credit from both institutions.
[5] The investigators, as CTE students years prior, had experienced returning week after week requesting to add a course needed to complete their certification or degree. Several times, after weeks had passed, a 'lottery' was held to select a few extra students that would be allowed into the course and the rest were turned away to try again the next academic term.
[6] Occupational Employment and Wages: San Jose, U.S. BLS, www.bls.gov/regions/west/news-release/occupationalemploymentandwages_sanjose.htm