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Research Priorities for Advancing Equitable Dual Enrollment Policy and Practice

AUTHORS

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A Call to Action

At a time of declining postsecondary enrollments due to the COVID-19 pandemic, it is essential that education practitioners, policymakers, and researchers deploy every effective tool and strategy to get high school students back on the pathway toward a postsecondary degree or credential and a good-paying career. One key tool in that toolkit is the opportunity for students to take college courses while in high school through programs like dual enrollment, concurrent enrollment, and early college high school.

The research is clear: dual enrollment is an evidence-based practice that has broad positive impacts on student outcomes, including college enrollment and completion. It is prevalent nationwide, and widely supported by students, parents, and education policymakers and practitioners. If implemented thoughtfully, intentionally, and equitably, the benefits to students' college and career pathways can be significant.

But there is still a lot of work to be done to deploy this important strategy to boost college access and success correctly. While the research tells us loud and clear that dual enrollment has significant benefits for students, it also tells us that access is not equitable, and that those positive outcomes are not shared equitably by all student populations participating in these experiences.

This is unacceptable; if dual enrollment is really to be the college access and success strategy we think that it can be - whether that's in service of a credential, associates degree, or bachelor's degree - it has to be accessible to historically marginalized learners. And given the impact of COVID, this need is more acute than ever.

As a result, there are significant, important questions to answer about the best ways to shape practice and implement policies to maximize the effectiveness of dual enrollment as a college access and success strategy. Dual enrollment policy and practice leaders need more high-quality research exploring how program design impacts equity of access and outcomes, and how innovative policies like multiple measures of student eligibility or automatic acceleration contribute towards reaching historically marginalized learners.

In collaboration, we as dual enrollment researchers and policy and practice leaders have spent the last year outlining what we know - and what we still need to know - about dual enrollment, to help shape the field's research in ways that will positively impact equitable student outcomes. As dual enrollment continues to expand and become further embedded within the K-12 and higher education systems, it is essential that research forge into new and exciting areas of study, unpacking the nuance behind these programs and uncovering the evidence-based policy and practice interventions that will address equity gaps.

Current research tells us that dual enrollment has positive student outcomes, but it does not tell us the full story about *why*. States, colleges, and school districts are working hard to close equity gaps through implementing a number of policy and practice reforms, but research has not yet been able to tell us which of those reforms has yielded the most progress. And with such a high degree of variability among dual enrollment programs nationwide, inclusive of more intensive programs like early college high school, it is essential to study and scale the program design characteristics that are fundamental to successful dual enrollment programs.

The field urgently needs continued support from the research community to answer these vital questions. We encourage you to review and interrogate the following research agenda thoroughly, and if you leave it as inspired as we are by the promise and potential behind these college in high school programs, we invite you to join us in evolving the field of dual enrollment research to the next stage and supporting policy and practice leaders in making the most informed and evidence-based choices to support student success.

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Project Background

This research agenda was developed by a collaboration of dual enrollment researchers and educational policy and practice leaders (see Appendix C). Dual enrollment researchers developed topic-based literature syntheses (found in Appendix A) and research priorities based on gaps in the literature. The collaborative of researchers and leaders convened in summer 2021 to discuss the literature review and prioritize research topics and areas for the research agenda. We also conducted several listening sessions with dual enrollment leaders and stakeholders affiliated with the College in High School Alliance (CHSA) and the National Alliance of Concurrent Enrollment Partnerships (NACEP), and these listening sessions informed the content of this research agenda. The final research agenda was reviewed by the participating dual enrollment researchers and educational policy and practice leaders.

Suggested Citation

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Executive Summary

Even amid what some economists call the nation's best job market ever, the benefits of a postsecondary credential are undeniable. Ultimately, those with a postsecondary credential will have the most options for good-paying jobs and the greatest likelihood of long-term economic mobility. Yet, college enrollments have declined significantly over the past few years under the collective weight of the historically low unemployment rate, the high cost of college, and the COVID-19 pandemic. This trend does not bode well for efforts to ensure equity and access to higher education for a diverse population of students. Yet we know that introducing students to postsecondary coursework in high school can help them better assess and pursue a path to the array of educational opportunities beyond a high school diploma.

Over the past few decades, the boundaries that separate secondary and postsecondary education have increasingly blurred as more high school students enroll in college before they graduate high school. This is an encouraging trend. As high schools and colleges have partnered to provide opportunities for students to take college coursework early – in programs typically called dual enrollment, dual credit, or concurrent enrollment – one in three high school graduates have received early exposure to, and credit toward, a college or credential pathway.

While national estimates suggest about 1.4 million high school students—or 9% of all high school students—are enrolled in college courses, this number has grown tremendously in recent years. The growth of dual enrollment programs is difficult to assess at the national level due to limited data, but state-level data often show astounding growth. For example, in Indiana, 39% of high school students graduated with dual enrollment credits in 2012 but that percentage grew to 60% by 2018. Not only is the percentage of high school students taking dual enrollment growing, but the number of dual enrollment credits students are taking is also increasing. For example, in Oregon, the average number of college credits earned via dual enrollment increased from 6.8 in 2010-2011 to 10.4 in 2017-2018. In many states, the majority of high school students are already college students before they graduate high school, and this trend shows no signs of slowing down.

Even while national estimates are hard to pinpoint, the research shows that dual enrollment expands learning opportunities and college access; is evidence-based and has broad positive impacts on student outcomes and success; is seen as a strong option among students, parents, educators and policymakers; and, is an effective mechanism for aligning secondary and postsecondary systems.

The growth in dual enrollment, however, has not translated into equitable opportunities for all students. Research consistently shows that Students of Color, low-income students, male students, lower achieving students, English language learners, students with disabilities, foster youth, and students experiencing homelessness participate in dual enrollment at lower rates than their counterparts. Similarly, dual enrollment is less accessible at schools that serve larger proportions of lower-income communities or communities of color. Research on equity in dual enrollment outcomes is mixed whereby some studies show dual enrollment helps reduce inequities and other studies show dual enrollment perpetuates inequities. The various models also have the potential of reducing the costs and amount of time it takes to pursue a postsecondary credential, but they don't always.

We undertook this project because interest in and the impact of dual enrollment is expanding, yet the research on dual enrollment has not kept up with its growth. Dual enrollment leaders and policymakers need actionable research and evidence to inform their decisions and to support more equitable outcomes of dual enrollment programs.

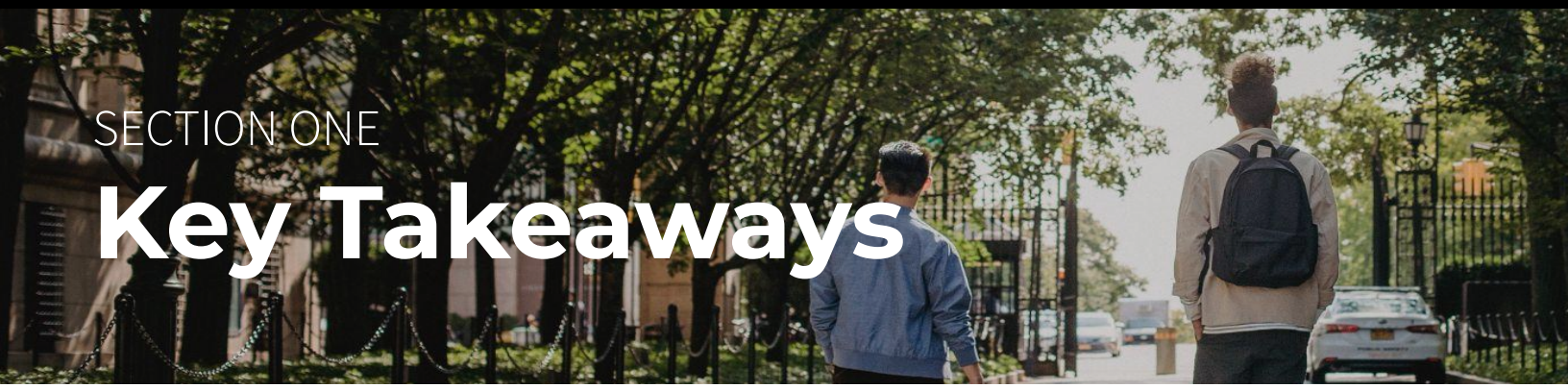
This paper reflects a larger collaborative project intended to (1) to summarize and synthesize the existing literature on dual enrollment; and (2) develop a dual enrollment research agenda that is policy- and practice-relevant. The project was a collaboration with a team of dual enrollment researchers who reviewed and summarized the literature and a team of educational policy and practice leaders who provided substantive input on the research agenda. While the available research is considerable, this review identified a number of questions and research priorities that need further exploration in order to better understand the types of programs and investments that will allow students the best options. The five priority areas that demand further research are:

Priority #1 Center Equity and Justice in Dual Enrollment Research
Priority #2 Examine Dual Enrollment Design and its Influence on Access and Outcomes
Priority #3 Refine Dual Enrollment Outcome Measures
Priority #4 Deepen Research on the Dual Enrollment Student Experience
Priority #5 Pursue New and Emerging Research Topics

This paper outlines a robust set of specific research questions in each priority area and a full review and synthesis of the existing literature. The paper includes three primary sections:

Section One Key takeaways that synthesize the five priority areas for future research and that articulate what the evidence tells us about dual enrollment.
Section Two The detailed research agenda that articulates specific research gaps and research questions for each of the five research priority areas.
Section Three Appendices that include the literature reviews, references, and participating researchers and educational policy and practice leaders.

A primary objective of this paper is to inspire researchers and funding organizations to undertake further research that answers questions that will advance more equitable dual enrollment policies and practices. We hope this research agenda serves as a blueprint for the next generation of dual enrollment research.



SECTION ONE

Key Takeaways

Over the past few decades, the boundaries that separate secondary and postsecondary education have increasingly blurred as more high school students enroll in college before they graduate high school. Often called dual enrollment, dual credit, or concurrent enrollment,[1] high schools and colleges across the United States have partnered to develop opportunities for high school students to take college courses and earn college credit while in high school.

The terms dual enrollment, dual credit, and concurrent enrollment are commonly used to refer to high school students taking college courses. States and localities use different terms and these terms may have different meanings by location. This paper uses the term dual enrollment to include all types of programs and courses that enable high school students to enroll in and earn college credit.

National estimates suggest about 1.4 million high school students—or 9% of all high school students—are enrolled in college courses each year,[2] but this number has grown tremendously in recent years. The growth of dual enrollment programs is difficult to assess at the national level due to limited data, but state-level data often show astounding growth. For example, in Indiana, 39% of high school students graduated with dual enrollment credits in 2012 but that percentage grew to 60% by 2018.[3] Not only is the percentage of high school students taking dual enrollment growing, the number of dual enrollment credits students are taking is also increasing.For example, in Oregon, the average number of college credits earned via dual enrollment increased from 6.8 in 2010-2011 to 10.4 in 2017-2018.[4]

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[1] Terminology varies by state. We use the term dual enrollment for consistency and refer broadly to the phenomenon of high school students taking college courses, excluding exam-based models such as Advanced Placement and International Baccalaureate.

[2] https://public.tableau.com/app/profile/john.fink/viz/UndergraduateEnrollmentTrendsbySector/Summary

[3] https://www.in.gov/che/files/DualCredit_final_041817.pdf; https://www.in.gov/che/files/2021_Early_College_Credit_Report_02_01_2021a.pdf

[4] https://www.oregon.gov/highered/research/Documents/Reports/HB4053-Accelerated-Learning-Report-2019.pdf

WHY IS DUAL ENROLLMENT GROWING AND WHY DOES IT MATTER?

Educational leaders, educational researchers, and policymakers should care about dual enrollment for at least a few reasons that we highlight below:

Dual Enrollment is an Evidence-Based Practice that Has Broad Positive Impacts on Student Outcomes

As described in more detail in this paper, the evidence clearly demonstrates that dual enrollment helps increase high school graduation, college enrollment, and college completion. Although the effects of dual enrollment are not always equitable, the evidence is clear that on average, dual enrollment positively impacts student outcomes, and some recent advancements in policy and practice have the potential to equalize opportunities for dual enrollment access and success.

Dual Enrollment Expands Learning Opportunities & College Access, & has the Potential to Improve Local Communities

Arguably the most important impact of dual enrollment growth is that it has expanded opportunities for high-quality learning and development, and it has expanded opportunities for students to access college-level education. Expanding college access has cumulative effects that have the potential to translate into more Americans who are college educated who can contribute to their local communities and economies.

Dual Enrollment Addresses Increasing Demand for College-Level Education & Increasing College Costs

Although the pandemic has led to a dip in college enrollment, long-term college enrollment trends show that demand for college has increased over the past couple decades. At the same time, the price of college for students and families has increased exponentially. Dual enrollment is an approach that brings college courses to more students and often does so at a much lower price than the average college course (depending on the state or local finance model).

Dual Enrollment has Broad Support from Students, Families, High Schools, Colleges, & Policymakers

Put simply, dual enrollment is popular among a broad range of stakeholder groups. Because of its practicality, accessibility, and affordability, dual enrollment enjoys wide support among various groups, including policymakers from both sides of the aisle. Students and families are attracted to dual enrollment because they understand that dual enrollment can save them money. High schools and colleges are interested in strengthening the high school to college transition and dual enrollment supports that goal.

Dual Enrollment Requires Intentional Alignment and Integration of Secondary and Postsecondary Education Systems, Structures, & Policies

Perhaps more than any other policy or program, dual enrollment bridges two educational systems—secondary and postsecondary—at the local, state, and national levels. It requires two sets of policies and structures to align and integrate to design and deliver dual enrollment. Successfully bridging these two sectors to design high-quality programs requires deliberate and intentional policy and action across sectors and levels.

SUMMARY OF RESEARCH PRIORITIES

The next generation of dual enrollment research needed to advance dual enrollment policy and practice is outlined below and in detail in this document. The research agenda is organized into five broad areas of inquiry and offers a call to action for educational researchers and leaders who are interested in promoting equitable dual enrollment policies and strategies.

Priority #1: Center Equity and Justice in Dual Enrollment Research

A unifying theme of the research agenda is that equity and justice must be the anchor of future dual enrollment research. This stems from well-documented evidence that illustrates inequities in dual enrollment opportunities at the national, state, and local levels, and some evidence that in many localities and states, dual enrollment does not lead to equitable outcomes. Future research should:

- Address inequities across all research designs
- Examine inequities by student populations and intersecting identities
- Assess how innovative policies and practices can close dual enrollment equity gaps

Priority #2: Examine Dual Enrollment Design and its Influence on Access and Outcomes

Across the country, thousands of high schools and colleges partner to deliver dual enrollment programs, and these programs are often designed, structured, and/or delivered in different ways based on local, state, and federal policy and context. Future research should:

- Assess salient dual enrollment program policies and design elements such as state and federal policies, leadership and collaboration practices, program scope and purpose, recruitment and marketing, course location and modality, faculty and instruction, support structures and services, and finance and affordability models.
- Examine how variation in the design and delivery of dual enrollment programs influences equitable dual enrollment access and outcomes.

Priority #3: Refine Dual Enrollment Outcome Measures

Existing impact studies have typically assessed the impact of dual enrollment on a similar set of outcomes such as high school graduation, college access, and college degree attainment. The diversity of outcomes and the type of outcomes examined in relation to dual enrollment could be expanded to address more nuanced and relevant outcomes in both the short-term and long-term. Future research should:

- Assess dual enrollment's differential impacts on short-term and long-term outcomes.
- Examine dual enrollment's impact on understudied outcomes such as college aspirations, credit transfer, career and employment outcomes, and community outcomes.

Priority #4: Deepen Research on the Dual Enrollment Student Experience

Although qualitative research on student experiences may not be generalizable or lead to policy changes that affect the majority of dual enrollment students, these results can have profound implications for students on the margins or for students whose lived experiences do not easily conform to dominant narratives of the dual enrollment student experience. Future research should:

- Assess how dual enrollment influences students' social-emotional development and mental health.
- Understand the nuances and diverse nature of dual enrollment student experiences.

Priority #5: Pursue New and Emerging Research Topics

Some areas of scholarship were not reviewed in this paper or they are not developed adequately to review a full body of literature. Future research needs to address these new and emerging topics, including: (1) Intersection of dual enrollment, Advanced Placement, and International Baccalaureate; (2) Educational tracking and dual enrollment; (3) COVID-19 and dual enrollment; (4) Regional accreditation and NACEP accreditation; (5) New theoretical and conceptual approaches; and (6) The role of parents, families, and communities in relation to dual enrollment.

WHAT THE EVIDENCE TELLS US

Appendix A includes detailed literature reviews developed by the collaborative of researchers that authored this paper. This section synthesizes the literature with some primary take-aways based on existing evidence. The review is organized into three broad categories of conclusions: (1) Dual Enrollment Access, Outcomes, and Student Experiences; (2) Dual Enrollment Policy, Models, and Approaches; and (3) Dual Enrollment Implementation and Practice.

Dual Enrollment Access, Outcomes, and Student Experience

Dual Enrollment is Widespread and Growing, and Programs Vary by State and Locality

Dual enrollment is now a common practice in most U.S. high schools, and the number of high school students participating in dual enrollment continues to grow. Nearly 1.4 million high school students participate in dual enrollment each year, and in some states, as many as 60% of high school graduates participated in dual enrollment. Although dual enrollment is widespread and growing, dual enrollment program purpose, design, offerings, and participation can vary dramatically by state and locality.[5]

Equity: Dual Enrollment Access is Inequitable, and Research on Equity in Dual Enrollment Outcomes is Mixed

The opportunity to participate and access dual enrollment is unequal. Research consistently shows that Students of Color, low-income students, male students, lower achieving students, English language learners, students with disabilities, foster youth, and students experiencing homelessness participate in dual enrollment at lower rates than their counterparts. Similarly, dual enrollment is less accessible at schools that serve larger proportions of lower-income communities or communities of color. Research on equity in dual enrollment outcomes is mixed whereby some studies show dual enrollment helps reduce inequities and other studies show dual enrollment perpetuates inequities.[6]

On Average, Dual Enrollment Positively Impacts High School and College Outcomes

Research consistently shows that on average, dual enrollment programs have positive impacts on high school and college outcomes such as high school graduation, college enrollment, college success, and college completion, although the magnitude of the effects vary by study and context. For some outcomes, such as college enrollment and college completion, the effects of dual enrollment are stronger and more consistent than the effects of dual enrollment on high school graduation and college success.[7]

Students Participate in Dual Enrollment to Save Money, Save Time, Prepare for College, and to Seek More Positive Educational Environments

Students report that they enroll in dual enrollment because it is often affordable and can help students and families save money, depending on state and local context. Students also report they take dual enrollment because it helps them get a head start on college and can save them time in college. Further, many students take dual enrollment because they are looking for a more rigorous educational experience or an educational environment that is more conducive to their learning and development.[8]

[5] Indiana Commission for Higher Education, 2021; Jenkins & Fink, 2020; Marken et al., 2013; Taie & Lewis, 2020

[6] An, 2013a; 2013bBirkeland; 2019; Fink, 2021; Harlow, 2018; Kanny, 2014; Karp et al., 2007; Miller et al., 2018; Shivji & Wilson, 2019; Speroni, 2011a; Struhl & Vargas, 2012; Taylor, 2015; Xu et al., 2021

[7] Allen & Dadgar, 2012; An, 2013a; Berger et al., 2014; Blankenberger et al., 2017; Edmunds et al., 2015; Giani et al., 2014; Grubb et al., 2014; Henneberger et al., 2018; Inghram, 2018; Karp et al., 2007; Loftin, 2012; Miller et al., 2018; Speroni, 2011a; Struhl & Vargas, 2012; Taylor, 2015.

[8] Adams et al., 2000; Allen et al., 2019; Battle, 2020; Bennet, 2020; Browning, 2011; Hart, 2019; Huntley & Schuh, 2002-2003; Kanny, 2015; McDonald & Farrell, 2012; Tobolowsky & Allen, 2016

Students Report Vastly Different Experiences in Dual Enrollment

Qualitative research on dual enrollment student experiences shows that dual enrollment students can have both positive and negative experiences, depending on the nature and design of the course(s) and students' background and expectations of the course(s). Positive experiences include providing authentic and rigorous experiences, boosting self-confidence, developing a college student identity, and helping students feel prepared for college. Negative experiences included feeling unsupported and isolated, decreasing self-confidence by failing a dual enrollment course, limiting educational experiences and choices, and experiencing low-quality dual enrollment pedagogy and inadequate administration of programs.

Dual Enrollment Affordability for Students and Families Varies by State and Locality, but Emerging Policies and Practices to Address Affordability are Promising

In some states and localities, dual enrollment is an affordable and/or free opportunity for students, but not all. Innovative policies and practices such as tuition waivers/reductions and technology-mediated dual enrollment programs can expand dual enrollment participation and address student and family affordability concerns.[9]

Dual Enrollment Policy, Models, and Approaches

State Dual Enrollment Policy Drives Local Practice and Policy

State-level dual enrollment policies vary extensively and often drive local policy and practice in areas such as access and equity, finance, quality, and transferability. Research shows that critical state policy issues such as inadequate funding, restricted eligibility, and inflexible quality control mechanisms can restrict dual enrollment access and equity.[10]

Career and Technical Education (CTE) Dual Enrollment is a Prevalent Model in Many State, and Some CTE Dual Enrollment Models are Helping Prepare Students for College and Careers

CTE dual enrollment is a prevalent model in many states but the scope of CTE participation varies across states. CTE dual enrollment models have evolved from career academies, to Tech Prep, to Pathways and Programs of Study, to Linked Learning and Pathways in Technology Early College High Schools (P-TECH). Evidence of their impact is promising and shows that many CTE dual enrollment programs are helping high school students complete high school and transition to college and careers; and research suggests they support secondary and postsecondary alignment.[11]

Early College High Schools (ECHS) Primarily Recruit and Enroll Historically Underrepresented Students and have Positive Impacts on Student Outcomes

ECHS are a comprehensive school reform model that includes dual enrollment as one element. Many ECHS are designed to enroll students who are underrepresented in college, and much of the research shows that ECHS have achieved that purpose. The research also shows that ECHS have positive impacts on overall outcomes, the outcomes for students who are historically underserved in college, and particularly large outcomes on postsecondary degree attainment.[12]

[9] Bartlett, 2008; Duncheon, 2020; ECS, 2019; Ferguson, 2014; Griffith, 2009; Lauen et al., 2017; Roberts, 201; Rodriguez et al., 2012; Taylor et al., 2014; Thomas et al., 2013; Vargas et al., 2014; Wallace, 2015

[10] Barnett, 2018; College in the High School Alliance & Level UP, 2020; ECS, 2009; Taylor et al., 2015; Williams & Perry, 2020; Zinth, 2014; Zinth & Barnett, 2018

[11] Alfeld & Bhattacharaya, 2013; Bragg et al., 2006; Caspary & Warner, 2017; Cellini, 2006; Orr et al., 2002; Rodriguez, Hughes, & Belfield, 2012; Rosen et al., 2020; Warner et al., 2016

[12] AIR & SRI International., 2008; Berger et al., 2013; Berger et al., 2014; Chapa et al., 2014; Edmunds et al., 2012; Edmunds et al., 2020; Edmunds, Unlu, et al.; 2017Edmunds et al., 2020; Haxton et al., 2016; Lauen et al., 2017; Munoz et al, 2014; Rosen et al., 2020; Song & Zeiser, 2019; Swiderowski et al., 2021

Dual Enrollment Funding Models and Structures are Complex and Varied

Dual enrollment funding is largely guided by state policies, so the funding structures and mechanisms reflect 50 different state policies. Some states have streamlined dual enrollment finance policies such as school and college reimbursement policies, tuition policies, and administrative funding policies, for example. But overall, funding structures vary considerably and revenue sources for dual enrollment can be a combination of federal, state, local, private, and students/families (via tuition/fees).[13]

Cost-Benefit Research on Dual Enrollment is Promising

The limited evidence that examines the cost-benefits of dual enrollment programs suggests that the benefits of dual enrollment outweigh its costs. In other words, some studies indicate that dual enrollment is a cost-effective strategy for students, schools, colleges and universities, and states.[14]

Dual Enrollment Implementation and Practice

Dual Enrollment Programs have Common Design Elements, but the Implementation of Elements Varies Widely by Context

Case study research on dual enrollment shows that dual enrollment programs have common design features or program components but the implementation varies widely. Common dual enrollment program design features include: partnerships, funding, courses offered, eligibility requirements, student supports, populations served, program outcomes, course location, course timing, instructor types and qualifications, credit policies, outreach and recruitment, and quality assurance.[15]

Dual Enrollment Instructional Conditions, Instructor Roles, and Pedagogical Approaches Show Dual Enrollment is a Unique Instructional Environment that Does Not Precisely Mirror the College or High School Context

Research on teaching and learning in the dual enrollment classroom is limited, but the existing research suggests that dual enrollment classes and instruction do not precisely reflect the high school or college experience and environment. Rather, they are in a liminal space that requires dual enrollment instructors to navigate multiple educational systems, cultures, and norms.[16]

Dual Enrollment is Perceived as Beneficial and Valuable among K-12 and Higher Education Leaders and Teachers

Research shows broad support for dual enrollment among many K-12 and higher education educators. These educators perceive that dual enrollment is valuable and beneficial to students and it can have a positive impact on schools.[17]

[13] ECS, 2019; Hoffman, 2005; Hoffman &Vargas, 2010; Goldberger & Santos, 2009; Griffith, 2009; Leonard, 2013; Perry, 2019; Piontek et al., 2016; Taylor et al., 2014; Williams, 2016

[14] Atchison et al., 2019; Perry, 2013; Reichardt & Christeson, 2020; WSIPP, 2019

[15] Barnett & Kim, 2019; Barnett, Gardner, & Bragg, 2004; Edwards, Hughes, & Weisberg, 2011; Greenberg, 1991; Harnish & Lynch, 2005; Hoffman & Robins, 2005; Miller, 2017; Nodine, Jaeger, & Bracco, 2019a; Nodine, Jaeger, & Bracco, 2019b; Piontek et al., 2016; Rochford & Gelb, 2007; Sherretz & O'Malley, 2013; Stephenson, 2014; Sunderman, 2017; Watt-Malcolm, 2011

[16] Burdick & Greer, 2017; Charlier & Duggan, 2009; Chumbley, 2016; Denecker, 2013; Duncheon & Relles, 2020; Duncheon & Munoz, 2019; Hughes & Edwards, 2012; Gilson & Matthews, 2019; Kaniuka & Vickers, 2010; McCrimmon, 2010; McWain, 2018; Mollet, et al., 2020; Omer & Killacky, 2017; Russo, 2020; Schneider, 2010; Staats & Laster, 2018; Stein & Klosterman, 2020; Thompson & Ongaga 2011; Wilkinson, 2019

[17] Hanson et al., 2015; Horbeck & Malin, 2019; Howley et al., 2013; Mertes, 1988; Piontek et al., 2016

SECTION TWO

Full Research Agenda

PRIORITY #1: CENTER EQUITY AND JUSTICE IN DUAL ENROLLMENT RESEARCH

A unifying theme that emerged among the researchers and leaders that participated in the development of the research agenda is that equity and justice must be the anchor of future dual enrollment (DE) research. This stems from long-standing evidence that illustrates inequities in DE participation at the national, state, and local levels, and strong evidence that in many localities and states, students do not benefit equally from participating in DE. These inequities exist along multiple student identities and backgrounds including, but not limited to race/ethnicity, income/class, sex, geography, academic performance, ability, English Language Learners (ELL), first-generation status, and undocumented status. The set of research priorities embedded in this category is intended to reflect an overall need to address DE inequities and is intended to transcend all subsequent research agenda areas and questions.

Ensure All Research Designs Address Inequities

DE research needs to center or address equity in all research designs and studies. This ranges from studies examining the development and evolution of DE programs to studies examining the impacts and outcomes of DE programs and policies. When equity and inequities are overlooked or not accounted for in research designs and studies, researchers risk contributing to the perpetuation of existing inequities.

Examine Inequities by Student Populations and Intersecting Identities

The need to assess DE inequities for every marginalized student group is critical, particularly inequities in DE access and outcomes, but also DE student experiences. The DE research has clearly established that DE is a promising strategy to expand college access, engage students early in college, and support college retention and completion, but inequities in DE access and outcomes are clear based on existing evidence. This set of research priorities should clearly identify marginalized student groups and assess their DE access, experiences, and outcomes. Future research should focus on the following priorities:

1. How does access to DE courses and programs vary based on student identities and backgrounds including, but not limited to race/ethnicity, income/class, sex, geography, academic performance, ability, ELL, first-generation status, refugee status, foster care status, and undocumented status?

2. How do students' DE course and program experiences vary based on student identities and backgrounds including, but not limited to race/ethnicity, income/class, sex, geography, academic performance, ability, ELL, first-generation status refugee status, foster care status, and undocumented status?

3. How do the outcomes of DE courses and programs vary based on student identities and backgrounds including, but not limited to race/ethnicity, income/class, sex, geography, academic performance, ability, ELL, first-generation status, refugee status, foster care status, and undocumented status?

Existing DE research also does not account for the ways in which student identities intersect to shape their opportunities, experiences, and outcomes. Future research should focus on the following priorities:

1. How do students' intersecting identities influence their DE access, experiences, and outcomes?

Assess How Innovative Policies and Practices Close DE Equity Gaps

One pressing question for leaders and policymakers is how to close DE equity gaps, yet there is little empirical evidence on specific policies or practices that help close longstanding equity gaps in DE access, experiences, and outcomes. Embedded throughout this research agenda are examples of new or innovative practices that are more intentionally designed to close equity gaps (e.g., using multiple measures for DE placement, auto-enrollment policies), and future research needs to explicitly study how innovative policies and practices help reduce inequities in DE participation, experiences, and outcomes. Future research should focus on the following priorities:

1. In what ways do multiple measures for DE placement influence students' participation in DE and their success in DE?
2. How do auto-enrollment policies for DE influence which students participate in DE and their success in DE?
3. How do less restrictive DE eligibility requirements influence students' participation in DE and their success in DE?
4. How do community-level and family-level engagement and outreach programs influence which students participate in DE?
5. How do free DE courses influence which students participate in DE?
6. How do programs designed to expand the capacity of qualified DE teachers help close DE equity gaps?
7. How do strategies to diversify DE faculty and curriculum help create a more positive, safe, and engaging learning environment for DE students?
8. How can middle school engagement and recruitment programs influence which students participate in DE?
9. How can the use of co-requisite course opportunities in DE impact students' participation and outcomes?
10. How do mandatory college student success courses delivered via DE influence college readiness and success?

PRIORITY #2: EXAMINE DUAL ENROLLMENT DESIGN AND ITS INFLUENCE ON ACCESS AND OUTCOMES

The design and delivery of DE programs is an important priority for DE because of the significant variation in DE program models and implementation approaches. This section addresses research priorities that document and examine existing DE designs, and how the design and delivery of DE programs influences DE participation and outcomes. This priority includes four main categories: (2A) DE Purpose and (Un)Intended Outcomes; (2B) DE State and Federal Policies; (2C) DE Development and Leadership; and (2D) DE Program/Course Design, Structure, and Delivery.

2A: DE PURPOSE AND (UN)INTENDED OUTCOMES

DE evolved from a niche program for academically advanced students to a program that serves a much broader range of students from more diverse academic and demographic profiles. As DE evolved and grew, the purposes of DE courses and programs became more diverse and sometimes unclear. Multiple and/or changing purposes can lead to confusing, conflicting, or even misleading studies and research results, particularly about the impact of DE. A clear example of this is that some research finds that DE programs lead to inequitable outcomes for low-income students or Students of Color, yet the literature indicates that the purpose of many DE programs was not to close equity gaps. Alternatively, when program purpose and outcomes align, research has shown that DE programs intended to reduce inequities are achieving this goal. Thus, the following areas of inquiry are critical research needs for DE.

Document Multiple Purposes of State and Local DE Policies and Programs

Research should document and help clarify the multiple purposes of DE, particularly at the state level and local levels. Most local programs are guided by state policies and these policies drive local implementation practice. The field lacks explicit theories of change and models that can help researchers understand which outcomes to measure and study. Future research should focus on the following priorities:

1. What are the explicit intended goals and aims of state and local DE policies and programs?
2. What are the implicit or assumed goals and aims of state and local DE policies and programs?
3. What are student, family, and community goals of DE programs?

Align Research Outcomes with Intended and Multiple Purposes

Researchers should also focus on studying the outcomes that align with intended and stated DE purposes and goals, as well as the multiple purposes that DE can serve. The diversity of state and local policies and contexts suggests that this line of inquiry may lead to different conclusions and inferences about the impact of DE programs based on the type of DE program and its intended goals. Future research should focus on the following priorities:

1. To what extent are DE programs achieving their intended outcomes and goals?
2. How can we better characterize the different types of DE programs based on their intended purposes, goals, and designs?

Study Unintended Impacts of DE

DE researchers have identified ways in which DE programs lead to impacts that are less explicit or unintended. For example, some research shows how DE programs may negatively impact students' college GPAs if they are not successful in DE. Similarly, other research shows that accelerating students through college too quickly may mean that they miss out on desirable college experiences once they transition to college. This body of literature is thin and future research needs to interrogate and understand how DE leads to unintended negative impacts, how widespread these unintended negative impacts are, and the extent to which they are unique or attributable to DE or symptomatic of larger educational systems. Future research should focus on the following priorities:

1. What are the unintended negative impacts of DE programs, how widespread are they, and how unique or attributable are they to DE?
2. What policies and practices can DE programs use to mitigate unintended negative impacts of DE programs?

2B: DE STATE AND FEDERAL POLICIES

Multiple state and federal policies interact to influence the type, nature, and impacts of DE programs. For example, many local DE programs are guided by state-level policies that influence fundamental aspects of DE programs such as eligibility criteria, funding, instructor qualifications, and course offerings. Similarly, many federal policies, such as the Every Student Succeeds Act (ESSA) and the Carl D. Perkins Career and Technical Education Act, for example, have direct implications for how some DE programs are designed, offered, implemented, and funded. Future research should focus on the following priorities:

1. What areas of statewide policy are most influential in impacting students' DE participation and outcomes?
2. In what ways can state funding models be designed or adapted to create more equitable DE outcomes?
3. What political and policy strategies or state financial investments are the most effective to encourage statewide policy change and development related to DE?
4. In what ways do federal K-12, higher education, and CTE policies facilitate or hinder DE programs' access, growth, and success?
5. What statewide governance and leadership structures for DE are most effective to the development and sustainability of high-quality, equitable, and successful DE programs?
6. In what ways can state and/or federal policy be used to incentivize or promote the development and sustainability of strong K-12 and higher education partnerships that facilitate DE?
7. How do state K-12 accountability policies that include DE influence DE program growth, quality, and outcomes?
8. In what ways can states partner and engage to address issues of DE quality, equity, and outcomes?

2C: DE DEVELOPMENT AND LEADERSHIP

There are thousands of DE programs across the country, all with their unique stories of development and leadership, and these stories and processes that are critical to development, implementation, and sustainability are also likely linked to critical program outcomes like equitable access and outcomes. Yet, the DE literature leaves much to be desired about how DE programs are developed and led. Future research should focus on the following priorities:

1. What factors are most important to developing and designing a high-quality and equitable DE program by a high school and college partnership?
2. What theories of change are employed during the design and development of DE programs, and to what extent do the programmatic elements of DE programs reflect the theories of change?
3. What leadership approaches are critical to the successful implementation and growth of DE programs?
4. What are the most promising and effective collaborative approaches between K-12 and postsecondary education to ensure a successful, equitable, and sustainable DE program?
5. How does the development and leadership of DE programs influence their equitable student access and outcomes?

2D: DE PROGRAM/COURSE DESIGN, STRUCTURE, AND DELIVERY

One of the most promising areas for future research on DE is to understand the design, structure, and/or delivery of DE, and how these influence course and program-level outcomes. In the sections that follow, we describe key priorities for several dimensions of DE designs. These sections are not listed in any particular order of priority.

Early College Models & CTE Programs

With all its variation and heterogeneity, Early College High Schools (ECHS) and CTE DE programs are a unique subset of DE that are important to study and understand independently and in connection with broader or more general DE programs. ECHS and CTE DE programs both have intentional and specific goals, structures, and designs that warrant unique study.

ECHS: Research priorities for ECHS can be organized in two large buckets about the purpose and design of ECHS, and what we can learn from ECHS and apply to a broader set of DE courses and programs.

ECHS Purpose and Design: The implementation and evolution of ECHS has raised important questions about their purpose and design. Future research should focus on the following priorities:

1. What characteristics make a student most likely to succeed in ECHS?
2. In what ways do students need to be academically and socially supported to successfully participate in ECHS?
3. What are the models or forms of ECHS, and how do these different models impact student access and success, both overall and for marginalized groups of students?
4. What design elements of ECHS have the highest impacts on marginalized students?
5. In what ways can high school and college faculty best collaborate to design and deliver ECHS?
6. How do the college experiences (e.g., participation in high-impact practices such as study abroad, etc.) of ECHS students with significant numbers of college credits differ from other students?
7. In what ways does associate's degree completion at the time of high school graduation influence students' college and career trajectories?

Learning from ECHS: As evidenced by the literature, the ECHS model has generated a compelling evidence base that may have value and potential impact beyond ECHS models. DE is one of many components or ingredients to the ECHS model, but ECHS models include other components for which traditional DE programs could learn. Thus, the overarching recommendation for future research is to assess how ECHS models can inform traditional DE models. Future research should focus on the following priorities:

1. How can components of ECHS be applied to and scaled to traditional DE, such as affective and academic supports, college readiness strategies, school culture, professional working environment, and faculty experiences?

CTE: Because CTE DE programs are another unique subset of DE, many of the research priorities and questions that apply broadly to DE in other sections of this agenda can also apply to CTE DE programs. That said, below are specific questions that warrant future inquiry specific to CTE DE programs. Future research should focus on the following priorities:

1. How is CTE DE defined and conceptualized based on different courses, programs, and school models?
2. How do business and industry partners engage in the development and maintenance of CTE DE programs? What are the most effective mechanisms to align CTE DE programs to local and regional workforce needs?
3. CTE DE Access and Participation: What are CTE DE participation rates? How do participation rates vary across districts, schools, and student populations? What types of eligibility requirements influence CTE DE participation? How do formal and informal school structures and mechanisms influence when and if students participate in CTE DE?
4. CTE DE Outcomes: How do CTE DE programs influence the attainment of industry recognized credentials? How do CTE DE programs influence workforce outcomes?
5. How does CTE DE operate in comprehensive high schools?
6. In what ways do CTE DE students engage in non-CTE DE coursework and what shapes their participation in different types of DE programs?
7. How do high schools and community colleges collaborate to develop CTE DE Programs of Study in ways that lead to coherent course sequences, align with guided pathways, and lead to stackable credentials?
8. What are the characteristics, qualifications, and experiences of CTE DE faculty? How do state policies, federal policies, and accreditation requirements influence the supply and quality of CTE DE faculty?

DE Recruitment and Marketing Practices

How DE programs recruit and market to prospective students is arguably one of the most impactful yet understudied DE practices. These practices are impactful because the literature demonstrates the scale of inequity in DE participation, which is undoubtedly linked to the ways in which DE programs market their programs, recruit students, and enroll students. However, we have almost no evidence that examines how existing recruitment and marketing practices influence DE participation. Thus, future research must interrogate both existing policies and practices and study innovative ways in which programs are reaching marginalized student groups who historically have not participated in DE. Future research should focus on the following priorities:

1. How do specific DE recruitment, marketing, and outreach practices influence which students participate in DE?
2. Are existing strategies for recruiting marginalized students into postsecondary education employed by DE programs and if so, are they effective?
3. How does engagement with parents and local community groups influence (in)equitable student participation in DE?
4. How do state policies that mandate DE outreach/notification impact DE participation and outcomes, particularly for underserved and marginalized student groups?
5. What factors contribute to school districts or colleges de-emphasizing equitable student recruitment and marketing practices, and how can they be resolved?

6. How do institutional agents (e.g., counselors, DE liaisons, teachers, administrators) promote or gate-keep student participation in DE and for whom?
7. What K-12 and postsecondary advising and counseling models for DE are most effective and why?
8. How do peer social networks influence DE recruitment and participation?

DE Location and Modality

Most educational research suggests that the contexts in which educational programs operate matter for student experiences and outcomes, and DE is no exception. DE courses are delivered in diverse locations and modalities and despite the importance and relevance of these delivery contexts, the evidence base on the impact of these delivery contexts is thin. Thus, future research needs to better understand the extent of participation in these delivery contexts and the extent to which these contexts matter for students. Future research should focus on the following priorities:

1. How and why are DE courses delivered in different locations (high school, college, career center) and modalities (face-to-face, online, hybrid)?
2. What factors enable or constrain the delivery of DE courses in different locations or modalities?
3. How does participation in DE courses vary by location and modality and what factors account for participation in variation?
4. How does the DE course location or modality influence how students experience DE programs?
5. How does the DE course location or modality impact student learning and success?

DE Faculty and Instruction

Central to the DE experience is what happens in the teaching and learning environment: the classroom. The classroom environment is largely shaped by two groups of people: teachers and students. This section addresses critical research needs related to DE teachers/faculty and the next section addresses DE students/peers. One of the most understudied areas within the DE research is DE faculty and their instruction. This glaring gap in research is unfortunate because DE faculty and their instruction are central to DE student experiences and outcomes, although we have little evidence within a DE context that specifically links the two. Future research should focus on the following priorities:

1. What factors influence whether faculty teach DE or not? Among faculty who teach DE, what motivates them to teach DE courses?
2. How is success defined for and understood by DE faculty? What factors, experiences, and personal characteristics predict and influence whether DE faculty are successful?
3. How do DE faculty understand their professional identities as secondary and/or postsecondary faculty and in what ways do they negotiate their identities?

4. What are the characteristics of the "border crossing" DE faculty who navigate secondary and postsecondary education contexts? What strategies do these faculty use to successfully navigate both contexts?
5. What are the unique professional development and peer networking needs of DE faculty, beyond credentialing?
6. What professional development and peer networking strategies are most effective in supporting DE faculty?
7. In what ways are DE faculty prepared to teach DE? How do teacher preparation programs prepare high school faculty to teach DE and in what ways should teacher preparation programs prepare high school faculty to teach DE?
8. In what ways can college faculty who teach DE learn from their DE teaching experience, learn from high school teachers, and how does this learning influence (or not) college faculty who do not teach DE?
9. How can policies related to accreditation and credentialing requirements be addressed to enable DE instructors to deliver innovative instructional practices?
10. How can DE faculty be enabled and supported to deliver culturally relevant instructional practices?
11. What specific instructor credentials and/or professional development requirements are most critical to student success in DE?
12. In what ways, if any, do DE faculty modify or change instructional practices to accommodate DE students?
13. What DE instructional practices are most and least effective in their impact on student learning and development?
14. In what ways are DE course curricula comparable to courses taught to matriculated college students?
15. In what ways are rigor and quality defined in DE programs and to what ends?
16. What are the experiences of the college faculty who mentor and train high school teachers to deliver dual enrollment courses?

DE Student Peer Interactions and Peer Culture

The classroom environment is shaped not only by faculty but by the composition of the students in the class. The heterogeneity of DE programs and experiences suggests the need to understand how the diversity of peer experiences and interactions shape the DE experience for students. Future research should focus on the following priorities:

1. What is the peer classroom culture in DE classrooms and what is the nature of peer-to-peer interactions?
2. How is the DE peer classroom culture different by key contextual factors such as course location, course subject, modality, faculty background, composition of peers?
3. In what ways do the DE peer classroom culture or peer interactions influence student learning, development, and success?
4. How do marginalized students experience the peer culture in DE classrooms and what is the effect of the peer culture on their learning?

DE Support Structures and Services

An under-researched DE topic is the support structures and services that are provided to DE students and how those structures and services influence their success. The best evidence on support services emerges from the ECHS literature, but as previously noted, it is unclear the extent to which this evidence can be extrapolated to the broader DE population and traditional DE models. Future research should focus on the following priorities:

1. How and to what extent do college and high school partnerships provide access to high-quality academic, co-curricular, and wrap-around support services to DE students, and to what extent are these services utilized by DE students? What, if any, specialized DE support services are provided to and used by DE students?
2. What institutional and organizational factors or structures facilitate or impede colleges from providing DE students access to these services and support structures?
3. How does access to these services and support structures help DE students' learning and development, self-efficacy, academic success and progress, overall readiness for college, and transition into college?

DE Finance and Cost

The financial and economic dimensions of DE programs are arguably one of the most complex aspects of DE practice and scholarship, in part due to the complex funding and finance mechanisms at the K-12 and higher education levels. The terrain of DE financing and cost can be considered from both a DE program financing/cost perspective and a DE student financing/cost perspective.

DE Program Financing/Cost Future research should focus on the following priorities:

1. What are DE revenue sources and what are expenditures by revenue sources? How do revenue and expenditures vary and how are they influenced by state policy context?
2. How do local and state DE funding models operate and how are they implemented? What are the DE funding models complexities and nuances, and to what extent are they perceived to be effective by local and state DE leaders?
3. How do DE funding models intersect with (a) accountability funding models in K-12 policies; and (b) performance-based funding models in higher education policies? In what ways do state accountability and funding policies influence DE program growth, retraction, or implementation.
4. In what ways do free college policies at the state and institutional levels intersect with DE?
5. What are the relative individual and social costs and benefits of DE, and how do these costs and benefits vary for different populations?
6. What is the Return on Investment (ROI) in both the short-term and long-term and for whom? How does ROI vary by DE program, model, and course types?
7. What costs are associated with expanding access to DE and how do schools/colleges manage these costs?
8. How has COVID relief funding been used to support DE and how has the funding influenced the delivery and impact of DE programs? How can changes from COVID relief funding be sustained if effective?

DE Student Financing/Cost Future research should focus on the following priorities:

1. To what extent does DE help students save money in the short-term and long-term, for students who matriculate to college and for students who do not matriculate to college?
2. How do federal, state, and local subsidies influence DE participation rates and how do those participation rates vary by subsidy recipient (school, college, student/parent) and amount of subsidy?
3. What are the unintended financial impacts of DE for students, such as scholarship loss if admitted to college as a transfer student, or paying for "excess" credits after matriculating to college, for example?

PRIORITY #3: REFINE DUAL ENROLLMENT OUTCOME MEASURES

Existing impact studies have typically assessed the impact of DE on a similar set of outcomes such as high school graduation, college access, and college degree attainment. The diversity of outcomes and the type of outcome measures examined in relation to DE could be expanded to address more nuanced and relevant outcomes in both the short-term and long-term. Future research should focus on the following priorities:

1. To what extent are the strongest impacts of DE programs realized in the short-term or long-term? For example, to what extent are the impacts of DE programs greater for shorter-term outcomes such as learning, college aspirations and readiness, and college matriculation compared to longer-term outcomes such as college graduation or employment outcomes?
2. What are the primary factors that explain *mixed* evidence on the impacts of DE programs? To what extent are these factors at the policy-level (federal and/or state), organizational level (school and/or college), and/or the student/family level?
3. To what extent are DE courses accepted for transfer after college matriculation? What factors influence whether or not DE courses are accepted for transfer? How do DE transfer acceptance outcomes differ from transfer acceptance for non-DE courses?
4. What impact does DE have on students' career and employment outcomes? How can DE support local and state workforce development in high-demand jobs and fields?
5. What are the potential outcomes for local communities that do not provide DE access or equitable DE access?
6. To what extent does DE influence students' aspirations to go to college and how does that vary by DE programs and course types?
7. How does DE participation influence the sector/type of postsecondary institution in which students enroll in college?
8. What number(s) and type(s) of DE courses are most effective for students' college and career transition and success?
9. How prevalent are the negative outcomes of DE, such as failing a DE course or negative implications for financial aid eligibility?

PRIORITY #4: DEEPEN RESEARCH ON THE DUAL ENROLLMENT STUDENT EXPERIENCE

Existing DE research has only scratched the surface of the DE student experience, and future research needs to address how DE students experience DE programs in ways that can inform policy and best practices. Although qualitative research on student experiences may not be generalizable to all students or lead to widespread policy recommendations that affect the majority of DE students, the results of qualitative studies of DE student experiences can have profound impacts for DE students on the margins or students whose experiences do not easily conform to dominant narratives. Similarly, aspects of the DE student experiences can be captured using large-scale surveys to capture more student experiences and in ways that can be more easily generalized. Future research should focus on the following priorities:

1. In what ways do students feel like they are prepared for DE in terms of their social-emotional development, academic readiness, and college readiness?
2. In what ways does DE support or impede high school students' mental health?
3. How do DE students respond to intensive and rigorous experiences and expectations in their DE courses? What resources and supports do DE students use to overcome challenging academic experiences and expectations in their DE courses? To what extent are DE students' experiences similar to or different than other rigorous academic experiences (e.g., Advanced Placement)?
4. In what ways do mixed DE classrooms (classes with DE and non-DE students) operate and how does the nature of the mixed classroom enhance and/or diminish the educational experience for DE and non-DE students?
5. In what ways are students who take DE as seniors similar to or different than first-year college students, and what implications do these similarities or differences have for the ways in which DE educational environments are designed?
6. What are students' experiences with and perceptions of DE courses that are embedded in the regular school day compared to courses that are outside the regular school day?
7. How does the first-year college experience of DE students differ from students who start college without DE credits?
8. What is the optimal number of DE courses for students to take that prove beneficial to their college journeys?
9. What are the unintended consequences of taking too many DE courses?

PRIORITY #5: PURSUE NEW AND EMERGING RESEARCH TOPICS

Despite our lofty intentions to review the full terrain of DE literature and scholarship, some obvious areas of scholarship were underexplored or do not exist. In this section, we recommend future research address new and emerging topics that are understudied in the extant literature, although we recognize that some scholarship in these areas may already exist.

Intersection of DE, Advanced Placement, and International Baccalaureate

Many high school students have opportunities to participate in multiple accelerated program opportunities within their high school, including DE, Advanced Placement (AP), and International Baccalaureate (IB). Access to these accelerated programs varies across the country, and students may have access to only one or more than one accelerated program in their high school. For those students who have access to multiple accelerated programs, future research needs to investigate critical questions about the intersection of these accelerated programs. Future research should focus on the following priorities:

1. Why do students enroll in or choose to enroll in more than one accelerated program or not, and what factors are most important to their decision-making?
2. Why do high schools and/or school districts decide to provide only one or more than one accelerated program option to their students? How do high school leaders, counselors, and teachers understand and describe the purpose and goals of different accelerated programs? How do schools communicate and advise accelerated program opportunities in different ways to different student populations?
3. What are the state, local, and national politics that influence the prioritization of delivering one accelerated program over another?
4. To what extent are there differences in the perceived legitimacy and value of DE, AP, and IB programs, and how do value perceptions influence access to DE programs and the effectiveness of DE programs (e.g., transfer of DE courses)?
5. How do students experience different accelerated programs and to what extent do different programs make students feel welcome and feel like they belong?
6. What are the individual and cumulative effects of participating in one or more accelerated program on student outcomes?
7. To what extent do the curricula and pedagogies of AP, DE, and IB courses align or misalign?

Educational Tracking and DE

The United States educational system has long been critiqued for creating tracking systems, whereby students are sorted into different academic pathways, often based on standardized testing or measures. Researchers have documented how tracking has led to inequitable outcomes by race/ethnicity, income, and social identities. As previously noted, future research is needed to understand how inequities in DE participation can be reduced, but it is also important examine DE policies within the broader context of tracking in the US education system to understand how DE contributes to tracking. Future research should focus on the following priorities:

1. To what extent does DE perpetuate or reduce existing stratification in education that tracks students into educational and career pathways?
2. In what ways can DE be used to reverse longstanding tracking effects in education?

COVID-19 and Dual Enrollment

The COVID-19 global pandemic has had profound impacts on education, and DE programs and policies are no exception. We did not explore any research related to COVID-19 and DE, although some research is beginning to emerge. However, we know that the pandemic has impacted the delivery of education, the mental health and well-being of students and educators, and the academic momentum and progress of students, among other things. Because DE sits at the intersection of high school and college, DE programs have had to navigate the terrain of both secondary and postsecondary education policies and procedures during COVID. Future research should focus on the following priorities:

1. In what ways has COVID-19 influenced the purpose and goals of DE programs?
2. How can DE programs serve as a buffer to help moderate any negative effects of lost learning or development as a result of COVID-19?
3. In what ways has online learning opportunities for DE expanded or evolved as a result of changes in learning modalities as a result of COVID-19?
4. In what ways have student preferences for the delivery of DE programs changed as a result of changes in learning modalities as a result of COVID-19?
5. How has COVID-19 influenced DE instruction and what new demands have surfaced for DE instructors?

Regional Accreditation and NACEP Accreditation

Accreditation intersects with DE in critical ways that are largely underexplored in the DE literature. Recent interests in DE and changes to accreditation procedures by regional accreditors have prompted the need to better understand the ways in which DE intersects with and is impacted by regional accreditation. Similarly, the National Alliance for Concurrent Enrollment Partnerships (NACEP) is the only organization that accredits DE programs, and many programs pursue NACEP accreditation to improve their programs. Future research should focus on the following priorities:

1. In what ways do regional accreditation policies and standards influence DE program design and delivery?
2. How does NACEP accreditation influence the quality and implementation of DE programs, and as well as program longevity and sustainability?
3. In what ways does regional accreditation and NACEP accreditation influence student learning and outcomes?

New Theoretical and Conceptual Approaches

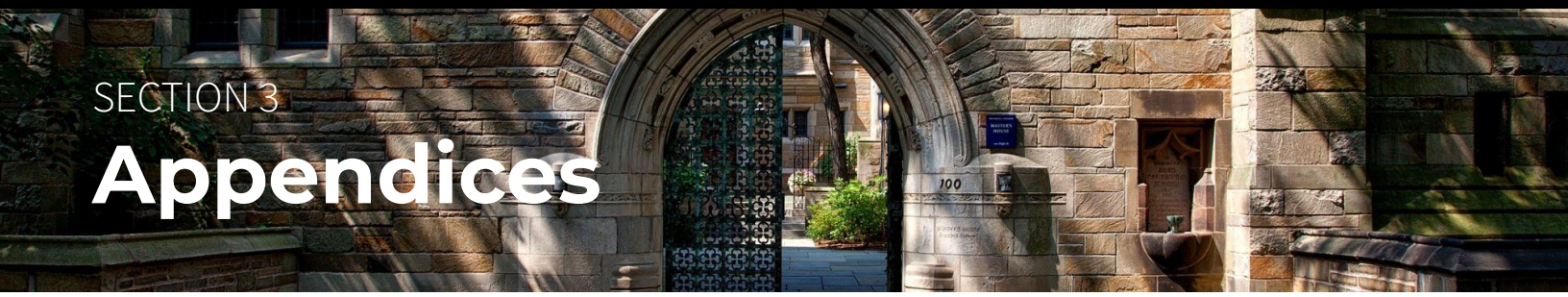
DE scholarship has relied on several theoretical and conceptual frameworks to understand and examine DE. However, DE research often continues to use some of the same theoretical frameworks, and there are opportunities to advance DE research using new theoretical and conceptual frameworks. Future research should focus on the following priorities:

1. To what extent are dominant theoretical approaches to studying DE adequate in fully explaining DE participation and DE outcomes?
2. How can Critical Race Theory, Feminist Epistemologies, Postcolonial theories, and other critical theories shed light on perceptions and understandings of DE rigor, merit, quality, and equity?
3. In what ways does can DE serve as an emancipatory mechanism for students and support the democratization of education?

The Role of Parents/Guardians, Families, and Communities in Relation to DE

Too much educational research ignores the multiple community and familial contexts in which students live. These community and family contexts shape and inform students' expectations of and experiences with education in profound ways. Unfortunately, the DE literature has not adequately addressed how community and family contexts intersect with DE. Thus, future research should focus on the following priorities:

1. In what ways do parents/guardians and families have access to DE information and understand DE, and how does parental and family information and understanding vary by first-generation status, race/ethnicity, income, and language?
2. What is the specific influence of parents, families, and older siblings on students' decision-making to participate in DE?
3. In what ways do community and family intersect with students' learning in the DE classroom?
4. How do families and communities mediate DE's influence on college-going behaviors and outcomes?
5. How does student participation and success in DE influence family members' college aspirations and college plans?



SECTION 3

Appendices

APPENDIX A

Individual Literature Reviews

This appendix includes the literature reviews developed by each of the individual researchers that participated in this project. Each researcher was invited to review the literature based on the domain of literature described by the appendix section header.

A1 Dual Enrollment Equity and Justice (Taryn Ozuna Allen)
A2 Dual Enrollment Participation and Access (John Fink)
A3 Dual Enrollment Outcomes and Impacts (Brian P. An)
A4 Dual Enrollment Student Experiences (Barbara F. Tobolowsky)
A5 Dual Enrollment Finance and Affordability (Xiaodan Hu)
A6 Dual Enrollment & Career and Technical Education (Matt S. Giani)
A7 Early College High Schools (Julie A. Edmunds)
A8 Dual Enrollment Faculty, Professional Development, and Faculty Background & Training (Christine Denecker)
A9 Dual Enrollment Implementation, Program Design, and Leadership (Michelle Hodara)

APPENDIX A1

Dual Enrollment Equity and Justice

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METHODOLOGY

In order to identify literature relevant to equity and justice, dual credit, and historically minoritized student populations, I began my review using *Academic Search Complete, JSTOR, Google Scholar*, and *ProQuest*. I used a variety of key terms, including "dual credit" and "in/equity," "dual credit" and "students of color/low-income students/first-generation college students," "dual credit" and "access," and "dual credit" and "affordability." Since dual credit and dual enrollment are often used interchangeably, I also conducted similar searches with the stated terms, but leading with "dual enrollment" instead of "dual credit."

These searches produced a variety of refereed and non-refereed articles, book chapters, reports, policy briefs, and dissertations. The number of publications varies from 2,830 ("dual credit" and "students of color") to 134 ("dual credit" and "equity"). Items were excluded if they were not relevant to the equity and justice with a focus on students of color, low-income students, and first-generation college students. Publications that were not research or policy reports or peer-reviewed publications were also excluded from review. Ultimately, 53 publications were included in this review. The reviewed materials included state and federal reports, reports by professional organizations and policy organizations, national publications on demographic trends, literature reviews, and peer-reviewed publications. Relevant unpublished dissertations were also included in this review. The publications included a mixture of quantitative and qualitative research published between 2002-2021.

THEMATIC FINDINGS

Prior research shows dual credit students are more likely to be White, Asian, female, high-income, and high-achieving students (Fink et al., 2017; Museus et al., 2007; Pretlow & Wathington, 2014). As a result, recent policy efforts have focused on broadening access to historically minoritized populations and middle- and lower-achieving students (Bragg, Kim, & Barnett, 2006). Research has started to explore the representation of these student groups in dual credit programs and the experiences of students in the programs. Scholars have also examined the outcomes of dual credit participation in college achievement (i.e., college GPA and degree completion). The focus of this section is to provide an overview of scholarly literature related to students of color, low-income students, and first-generation college students and equity and justice in dual credit courses and programs.

STUDENTS OF COLOR

Students of color are increasingly diversifying K-12 schools and postsecondary institutions. As they matriculate, prior research indicates students of color may encounter educational challenges. These obstacles may include academic preparedness, lack of mentors, financial responsibilities, among others (American Council on Education (ACE), 2020). Earning college credits and learning about the college environment may counter these challenges and prepare students of color to enroll and succeed in college (Museus et al., 2007; Pretlow & Wathington, 2004).

Demographic characteristics reveal the majority of dual credit earners are primarily White and Asian students (Allen, 2010; Museus et al., 2007; Taylor, 2013; Taylor & Lichtenberger, 2013). Nationally, White and Asian students represent 38 percent of ninth-grade dual credit earners (NCES, 2019). Fewer Hispanic (30 percent) and African American (27 percent) enrolled in dual credit in ninth-grade (NCES, 2019). Nationally, White students gain a larger benefit from dual credit participation in that they are more likely (13.9 percent) to enroll in college, than their African American (9.8 percent) and Hispanic (8.6 percent) peers (Liu et al., 2020; Struhl & Vargas, 2012; Taylor, 2015).

There is some variation in demographic representation by state, however. For instance, Texas dual credit enrollment shows that of the 133,342 enrolled students, 45 percent identified as Hispanic and 38 percent identified as White (Troutman et al., 2018). This demographic trend may be attributed to the state-wide growth of the Hispanic population and the expansion of Early College High Schools across the state, but particularly in South Texas and the Rio Grande Valley. A recent report on dual credit in Texas (Miller et al., 2018) highlighted recent legislative initiatives to broaden access for diverse students. Miller et al. (2018) also reported there is great benefit in offering dual credit courses (i.e., postsecondary degree attainment, increased earning potential, and increased tax revenue for the state). Despite these benefits, students of color and low-income students benefited less from dual credit programs than White and affluent students (Miller et al., 2018).

Few studies have focused specifically on one racial or ethnic group (Kanny, 2015; Rarig, 2019). Kanny (2015) conducted a qualitative study and specially examined Hispanic students enrolled in dual credit courses and reported that students benefited from learning the unspoken rules of being a college student. These students also experienced challenges in their dual credit courses, including low grades, consequences for poor behavior (i.e., skipping class), and course transfers (Kanny, 2015). Rarig (2019) focused on African American dual credit earners and found that students were unaware of dual credit or initially believed dual credit was for White students. After earning dual credits, the students found they were able to improve their GPA and save money (Rarig, 2019). They were also more likely to enroll in college after high school (Rarig, 2019).

LOW-INCOME STUDENTS

Prior research reveals educational disparities confronting low-income college students (Cahalan et al., 2016; Southern Education Foundation, 2010). Low-income students contend with barriers and inequity to college access, persistence, and costs (Cahalan et al., 2016; Goldrick-Rab, 2006; Price, 2004). Also, home instability and food insecurities negatively affect low-income students' college enrollment and persistence (Goldrick-Rab, 2016).

Most recent data from the Pew Research Center and National Postsecondary Aid Study (NPSAS) indicates a larger proportion of undergraduates are in poverty or near poverty (Fry & Cilluffo, 2019). More specifically, 39 percent of dependent undergraduates (i.e., students who are 24 years old or younger and financially supported by their parents) were in or near poverty in 2016, an increase from 29 percent in 1996 (Fry & Cilluffo, 2019). Among independent students, the number increased from 55 percent in or near poverty in 1996 to 67 percent in 2016 (Fry & Cilluffo, 2019). Although the college enrollment rate of low-income students demonstrates broadening access, the influx is mostly in public two-year institutions and the least selective four-year institutions (Fry & Cilluffo, 2019).

Dual credit is an opportunity to address equity gaps and promote college readiness and success among low-income students (Bailey et al., 2002). Indeed, more policymakers have supported increasing dual credit offerings to make access more equitable for low-income students (Hoffman et al., 2008; Miller et al., 2018), but participation remains inconsistent. While some studies have found high schools with low-income households are more likely to provide dual credit classes (IES, 2021), other research reveals just the opposite (IES, 2020). The variability in dual credit participation may be associated with access to dual credit information, transportation, and the cost of the courses (Garcia et al., 2020; Miller et al., 2018; Museus et al., 2007; The Education Trust, n.d.; Thomas et al., 2013).

Low-income students' experiences and outcomes highlight benefit and challenges associated with dual credit participation (Museus et al., 2007; Kanny, 2015). For example, some scholars (An, 2013; Berger et al., 2013; Karp et al., 2007) reported that students from lower SES backgrounds benefit or benefit more from dual credit than their higher SES peers. Karp et al. (2007) found dual credit had a greater effect on low-income students' cumulative GPA, compared to high-income dual credit earners. An (2013) reported dual credit decreases the likelihood of remediation for low-income students.

In terms of college completion, research on low-income students varies. Taylor's (2015) study in Illinois and found that low-income students who earned dual credit were more likely to complete a postsecondary degree or certificate than other low-income students who did not earn dual credit. On the other hand, a recent American Institutes for Research study on Texas dual credit programs found that earning dual credits had a negative effect on low-income students' four-year degree completion (Miller et al., 2018).

FIRST-GENERATION COLLEGE STUDENTS

First-generation college students are defined as currently enrolled college students whose parents did not enroll in a college or university (Nunez, Cuccaro-Alamin, & Caroll, 1998). They face substantial obstacles in accessing and persisting in higher education. Research demonstrates first-generation college students often lack information on applying and selecting a college or university, are less likely to take college admissions test, and are more likely to need remedial education (Choy, 2001; Thayer, 2000; Vargas, 2004). First-generation college students tend to be older students, and they are more likely to attend school part-time, have dependent children, and be a person of color (Center for First-Generation Student Success, 2019). The proportion of first-generation college students enrolled in post-secondary education has been declining, but they still represent approximately one-third of all students enrolled in colleges and universities (Skomsvold, 2015).

Dual credit offers an opportunity to support first-generation college students' postsecondary achievement by enrolling in more rigorous coursework and earning college credit while in high school. Most studies examining first-generation college students' dual credit experiences is from a quantitative approach. These studies (An, 2012, 2013; Kanny, 2014) have examined the role of dual credit in GPA and college degree attainment. For instance, An (2013) found deal credit acts in a compensatory way, benefitting first-generation college students more than their peers with college-educated parents.

Other research has also examined first-generation college students in Early College High Schools (ECHS). ECHS are schools specifically designed to support first-generation, low-income, and students of color (ECHS Initiative, 2011). These schools offer students the opportunity to begin earning dual credits as early as ninth grade. Then, at the time of graduation, students have the opportunity to have earned an Associate's degree in addition to their high school diploma. Research shows students gain benefits from participating in ECHS. Benefits include improving their academic abilities, learning the college environment, and in some cases, earning an Associate's degree (Berger et al., 2010; Nodine, 2009). There are some attendant challenges, however. For example, Tobolowsky & Ozuna (2016) found that ECHS have academic programs that are demanding and intense, thereby limiting a "traditional" high school experiences with social events or sports. Also, Berger and colleagues (2010) found that first-generation college students in ECHS had lowered educational aspiration and lower high school and college grades.

APPENDIX A2

Dual Enrollment Participation and Access

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I conducted a systematic literature review on the topic of dual enrollment (DE) access and participation. For the review, I defined DE broadly to include any arrangement where secondary school students take college courses for credit prior to graduating from high school through a partnership with a postsecondary institution. As such this includes a range of DE programs, including dual credit, concurrent enrollment, early or middle colleges, early college high schools, among others. This review only included empirical research (including peer-reviewed reports and journal articles, dissertations, and other non-peer reviewed empirical reports, briefs, articles, or working papers, but excluding opinion essays and articles). The review was also inclusive to any methodological or epistemological tradition but was focused on studies about DE in the United States. I used ProQuest to search across 10 major databases (e.g., ERIC, ProQuest Dissertations & Theses Global, Ebook Central), with key term searches in publication titles and abstracts including dual enrollment, concurrent enrollment, dual credit, access, participation, equity, and gaps. As a result, I reviewed a total of 319 sources, of which 91 were directly relevant to the topic and met criteria for inclusion. Some additional sources were included for contextualization of findings and recommendations.

FINDINGS

Findings from the literature review are presented in four themes speaking to the topic of dual enrollment (DE) participation and access: 1) DE is widespread but not uniform, 2) Access and participation is uneven, replicating existing inequities, 3) Policies, practices, and mindsets systematically exclude students, and 4) Broadening the benefits of DE is possible.

DUAL ENROLLMENT IS WIDESPREAD BUT NOT UNIFORM

Widespread A longstanding educational practice, the number of high school students taking dual enrollment (DE) courses has grown steadily for at least two decades in the United States. The first official count of students taking DE coursework by the US Department of Education estimated that 812,700 high school students participated in the 2002-03 school year (Kleiner & Lewis, 2005). When the US Department of Education updated this official count for the 2010-11 school year, the number of high school students taking DE courses rose to an estimated 1,363,500 (Marken et al., 2013). More recent data from the Civil Rights Data Collection during the 2015-16 and 2017-18 school years indicate that the number of students taking dual enrollment courses has continued to increase (Fink, 2021). Among high schools, DE opportunities are widespread nationally with 82 percent of public high schools offering DE coursework (Taie & Lewis, 2020). As DE has grown over the past two decades, community colleges have maintained a consistently strong market share among postsecondary providers, enrolling approximately 70 percent of DE students nationally (Kleiner & Lewis, 2005; Marken et al., 2013). Though DE coursework is offered through varying modalities, the concurrent enrollment model, whereby students take college courses located at their high school, accounts for more than three quarters of DE offerings (Thomas et al., 2013; Shivji & Wilson, 2019).

Another measure that has been used to estimate the growth of students taking DE courses is colleges' undergraduate fall enrollments among students age 17 and younger, collected biannually by the Integrated Postsecondary Education Data System (IPEDS). By this measure, more than 1.4 million students age 17 or younger were enrolled at postsecondary institutions in fall 2019 alone (Fink, n.d.). More than 1 million students age 17 or younger were enrolled at community colleges in fall 2019, accounting for approximately 1 in 6 community college fall enrollments overall. Enrollment of DE students in community colleges has increased markedly in nearly every state over the past decade, even as overall community college enrollment has declined (Jenkins & Fink, 2020).

Not uniform Dual enrollment coursework includes a diverse array of college offerings for high school students. The design of DE programs is wide-ranging, from immersive Early College High Schools (ECHS) to much more common models wherein students take one or more college courses taught either by a faculty member or qualified high school teacher and located at the college, online, or in the high school. With such wide-ranging types of DE offerings, it is unsurprising that researchers have found varied levels of access and participation among types of DE offerings (e.g., Birkeland, 2019; Hodara & Pierson, 2018), and varied effects on student outcomes by program design (e.g., What Works Clearinghouse, 2017) and course subjects (e.g., Giani et al., 2014; Villarreal, 2017). Similarly, student enumerate many different reasons for taking DE courses, from cost-savings and getting a jump-start on college or a career path, to seeking challenging coursework or a different social environment from high school (Dare et al., 2017; Johnson & Brophy, 2006).

ACCESS AND PARTICIPATION IS UNEVEN, REPLICATING EXISTING EDUCATIONAL INEQUITIES

There is a vast literature base documenting how growth in DE has been unevenly distributed among student groups, types of schools, and geographic regions. Taken together, this literature base illustrates how DE opportunities have typically fallen short of their potential for expanding access to college opportunity for underserved communities. Instead, they have been implemented in ways that have replicated existing educational inequities, disproportionately impacting marginalized groups such as Black, Indigenous, and Latinx students, and students from lower-income households. DE programs have also had varying take-up among schools and districts that serve primarily rural or urban areas, primarily lower-income communities, and primarily communities of color. In the following sections, I summarize research findings on uneven access to DE first by student characteristics then by school type.

Student characteristics National estimates indicate that racially minoritized students and first-generation college students are underrepresented among those participating in DE. Drawing on the High School Longitudinal Study of 2009 high school freshman, Shivji and Wilson (2019) estimated that while about a third of high school students ever took a DE course, Black, Hispanic, and students with parents without college degrees had participation rates between 5-16 percentage points lower than White students and students with college educated parents (Shivji & Wilson, 2019). Xu et al. (2021) and Fink (2021) similarly examined differences by student race/ethnicity in DE course participation rates during the 2015-16 and 2017-18 school years, respectively, utilizing national, school-level data from the Civil Rights Data Collection (CRDC). For both CRDC 2015-16 and 2017-18, Xu et al. (2021) and Fink (2021) found that White students participated in DE coursework at about twice the rate of Black and Hispanic students. Fink (2021) further documented that male, multiracial, American Indian, and Pacific Islander students were underrepresented among DE participants during the 2017-18 school year. A number of other state- and institution-level studies highlight differences in access to and participation in DE by student characteristics. These are summarized as follows.

Student race/ethnicity Researchers have consistently found that White students participate in DE coursework at higher rates than students of color, particularly compared to Black/African American and Hispanic/Latino/Latinx high school students (Friedmann, 2021; Harlow, 2018; Harper, 2015; Henneberger et al., 2015; Hooker et al., 2021; Light, 2016; Lochmiller et al., 2016; Lynch & Hill, 2008; Moreno et al., 2021; Museus et al., 2007; Pierson et al., 2017; Shields et al., 2021; Smith, 2014; Taylor & Lichtenberger, 2013; Trost, 2016; Ulate, 2011; Young et al., 2013; Welsh et al., 2005). Notably, researchers tracking changes over time in access to DE have found that differences in participation rates between White high school students and their Black or Hispanic/Latinx peers have typically remained (Light, 2016; Pretlow & Wathington, 2013, 2014) or widened (Harlow, 2018; Young et al., 2013).

Student gender Researchers have found higher rates of DE participation among female relative to male students (Harper, 2015; Lochmiller et al., 2016; Shields et al., 2021; Young et al., 2013). However, a study of participation in career technical education (CTE) dual credit in Georgia found gender parity in participation rates (Lynch & Hill, 2008).

Student household income Differences in access to DE by student family income and parental education was a common feature among the studies reviewed. Researchers have found lower-income students, typically measured by eligibility for free- or reduced-price lunch (FRPL), to be underrepresented among DE participants (Friedmann, 2021; Harlow, 2018; Hodara & Pierson, 2018; Holten & Pierson, 2016; Hooker et al., 2021; Light, 2016; Moreno et al., 2021; Pierson et al., 2017; Shields et al., 2021; Smith, 2014; Taylor & Lichtenberger, 2013; Welsh et al., 2005). However, in their 2008 study of DE in Georgia, Lynch and Hill found that FRPL-eligible students were overrepresented in CTE dual credit offerings.

Other student characteristics Though differences in DE participation by race/ethnicity, gender, and income were most common among the studies reviewed, researchers have also documented differences in access to DE by other student characteristics such as academic achievement, native language, and disability status. Specifically, researchers have documented higher rates of DE participation among students with higher middle- and high-school academic achievement (Hodara & Pierson, 2018; Lochmiller et al., 2016; Shields et al., 2021). Lochmiller et al., (2016) also found that students in Kentucky who were English language learners were less likely to participate in DE. In 2021, Hooker et al. described uneven access to DE among California high school students from various special populations, providing new insight into the underrepresentation of English language learners, students with disabilities, foster youth, and students experiencing homelessness among high school students participating in DE.

The studies detailed in the previous sections include those primarily focused on issues of access to and participation in DE. As a part of this literature review, I noted additional empirical research on the effects of participating in DE on student outcomes which also included data on DE participants and non-participants indicating underrepresentation of specific student subgroups among DE participants (e.g., results from pre-matched samples in effects studies using propensity score matching). These additional studies corroborate previously reviewed research on lower rates of participation in DE among student of color (Allen & Dadgar, 2012; Blankenberger et al., 2017; Giani et al., 2014; Liu et al., 2020; Miller et al., 2017; Minaya, 2021; Taylor, 2015; Taylor & Yan, 2018; Wang et al., 2015), men (Blankenberger et al., 2017; Grubb et al., 2017; Liu et al., 2020, Taylor, 2015; Taylor & Yan, 2018, Wang et al., 2015), lower-income or first generation college students (Grubb et al., 2017; Kremer, 2020; Liu et al., 2020; Minaya, 2021; Taylor, 2015; Taylor & Yan, 2018) and English language learners among DE participants (Giani et al., 2014; Liu et al., 2020; Minaya, 2021).

School type Researchers have also examined how DE offerings and student participation varies by the type or setting of the participating school. These studies mirror findings from the previously reviewed research on student-level differences in DE participation, finding that schools serving primarily lower-income communities or primarily communities of color tend also to less frequently offer DE coursework (Excel*in*Ed, 2018; U.S. Government Accountability Office, 2018). Another common finding from studies examining access to DE by school type is the prevalence of DE offerings in rural, small town, and suburban settings, striking a contrast to the predominance of Advanced Placement course opportunities in more urban settings (Fink, 2021; Waits et al., 2005; Xu et al., 2021). Though even in the most remote rural areas, access to DE coursework can be a particular challenge (Gertge, 2008). In a study of rural access to DE using CRDC data from the 2017-18 school year, Gagnon et al., (2021) differentiate between access to DE (whether schools offer DE) and participation (whether students enrolled in DE courses at schools that offer DE). Findings reveal that although rural schools were less likely to offer DE coursework, those rural schools that did offer DE had high rates of student participation. The study also found that primarily lower-income serving schools had higher rates of access and participation in DE, conflicting with prior analyses on the 2015-16 CRDC (finding more access to DE in higher-income serving schools, see Excel*in*Ed, 2018; U.S. Government Accountability Office, 2018), and raising important further questions access to DE in lower-income rural, suburban, and urban communities.

POLICIES, PRACTICES, AND MINDSETS SYSTEMATICALLY EXCLUDE STUDENTS

Another common topic of research on DE access and participation is what explains uneven access to and participation in DE. Literature review findings on this topic can be organized into state policies, institutional practices, and individual mindsets that researchers have identified as exclusionary.

State Policies The prior sections have reviewed how DE opportunities are widespread but not uniform, and this is also the case among state policies governing DE programs, including their eligibility, financing, and operations. Researchers examining what policies may drive unequal access to DE have identified underfunding of schools and colleges and resulting higher costs for students and families as a primary barrier to access and participation (Haag, 2015; Wozniak & Bierlein Palmer, 2013) with disproportionate impact on low-income students, students of color, students with disabilities, English language learners, foster youth, and students experiencing homelessness (Garcia et al., 2020; Hooker et al., 2021). Underfunding can create barriers to access by disincentivizing schools and colleges from offering DE coursework, or it can create barriers to participation by not offering sufficient financial assistance for books, tuition/fees, and transportation for lower-income students (Mehl et al., 2020). In addition to funding, state policies governing eligibility to participate in DE have excluded groups of students who could benefit from DE courses (Barnett, 2018; Tobolosky & Allen, 2016). For example, Laurin (2013) detailed how a change to Arizona state policy systematically excluded undocumented students from participating in DE. More commonly, state policies perpetuate educational inequities through overreliance on standardized placement tests for DE eligibility (Moreland, 2018; Scott-Clayton et

al., 2014), despite there being students who would potentially benefiting from DE who do not take or pass placement tests (Barnett, 2018; Mehl et al., 2020). Finally, state, accreditation, and institutional policies governing which instructors can qualify to teach DE courses have been identified as influential in determining access to DE coursework, particularly in rural communities (Green, 2007; Piontek et al., 2016).

Institutional Practices Even in similar state policy contexts, institutional practices can lead to varying results with regard to DE access and participation (Anderson, 2014; Hodara & Pierson, 2018; Xu et al., 2021). Xu et al.'s (2021) findings signaled the significance of institutional practices in driving greater participating in DE; authors examined how district- and state-level factors explained variation in school district rates of participation and racial equity gaps in access to DE and AP coursework, drawing on national CRDC 2015-16 data. While Xu et al. found that local (e.g., average district results for student academic preparation, family socioeconomic backgrounds, district racial composition) and state (strength of policies to expand access to DE and AP) factors explained substantial variation in student participation in AP coursework, results were unable to explain much of the variation in access to DE coursework. One of the major implications of this national study was that institutional practices matter in advancing (or inhibiting) access to and participation in DE courses. In other, closer-to-practice qualitative studies, researchers have commonly found that students and families, particularly low-income and communities of color, do not have access to information about DE opportunities (Anderson, 2014; Davis, 2019; Green, 2007; Hooker et al., 2021). Osumi (2010) found that institutional practices which place the burden on students and families to seek out and register DE opportunities disproportionately limits access to DE for ethnic minorities in Hawaii. Advising for DE students is typically limited, with colleges traditionally relying on high school counselors—overburdened and less familiar with college program options and requirements—to do the bulk of advising (Kanny, 2015).

Individual Mindsets Operating within school-college partnerships that offer DE courses, individual educators are often trusted institutional agents with sizable influence on student participation in DE. Strong leadership and dedication to student success from educators is a cornerstone of an effective DE program, particularly for students who have been historically underserved in the high school to college transition (Mehl et al., 2020). Yet individuals also bring learned and often unconscious biases to their work, which can result in problematic and exclusionary practices if unaddressed. Researchers documenting barriers to DE access and participation have identified problematic mindsets that disproportionately impact students from marginalized and minoritized groups. For example, two qualitative studies of Black students taking DE courses—one in Virginia (Rarig, 2019) and one in Ohio (Davis, 2019)—found that Black participants perceived DE to be more intended for White students and reported experiencing incidences of counselor bias regarding their DE participation. Other researchers connected lower DE participation rates to educators' low expectations of students of color and other minoritized groups (Hooker et al., 2021; Trost, 2016; Witowsky & Clayton, 2020). As Witoksky and Clayton (2020) describe in a study of high school counselor perceptions of DE in Colorado, exclusionary mindsets can be well-intentioned as counselors might be wary of recommending DE coursework for students if they judge that students might fail. Or, counselors may be less willing to encourage and support students to participate in DE generally (Hanson et al., 2015; Howley et al., 2013). Educator mindsets about DE–attitudes about what DE can offer students and who DE is (and is not) for–have been shown to influence student referral to and participation in DE, with disproportionate impacts on Black students as well as those from other minoritized or marginalized groups.

BROADENING THE BENEFITS OF DUAL ENROLLMENT IS POSSIBLE

For more than a decade, reformers have called for educators to work toward broadening the benefits of DE participation to students who have been traditionally underserved in the transition from high school to college (Karp & Hughes, 2008). As educators have innovated to serve more students through DE, researchers have documented promising approaches for expanding DE access and participation. Similar to the previous section, findings from the literature review summarizing how access to DE can be broadened are organized into categories for state policies, institutional practices, and individual mindsets.

State Policies Researchers have studied how state policies governing funding and incentives for DE and student eligibility have influenced DE access and participation. In a historical review of Florida state policy, Hunt (2007) argued that incentives and funding for K-12 and colleges—notably from the state's policy of dual funding for K-12 and postsecondary in the 1990s-2000s—was associated with a substantial increase in student DE participation. Yet, efforts to increase participation in DE without focused efforts to expand access for underserved students may further exacerbate inequities of access (Patrick et al., 2020; Xu et al., 2021). Zinth (2014) reviewed state policies that might support increased DE access and participation among underserved students, identifying 13 model policies including ensuring parents do not have to pay for DE tuition, broadly communicating opportunities to students and parents, providing advising to support DE students, and requiring districts and colleges to report on student participation and outcomes. Other reports have advocated for state policies to focus more directly on equity for underserved populations (College in the High School Alliance & Level Up, 2019; Williams & Perry, 2020), providing examples of how states and institutions can broaden eligibility requirements to serve not only the highest-achieving students (Barnett, 2018; Zinth & Barnett, 2018). Indeed, increasing access to DE remains a key focus in state legislatures with more than 100 bills addressing access to DE courses introduced in 37 states in 2019 alone (Pompelia, 2020). In a quasi-experimental evaluation of a policy in Washington state to expand participation in DE through expanding eligibility to 10th graders and providing tuition subsidies for rural and low-income students, Hanson (2019) found no effects of the subsidies on DE participation but a positive impact resulting from expanding eligibly to 10th graders. Mixed and insufficient research in this area motivates the need for further state policy evaluations with attention to equity and institutional implementation.

Institutional Practices Researchers studying how schools and colleges can broaden the benefits of DE have illustrated numerous promising practices for expanding access to DE with additional supports to ensure students are successful. Focused outreach to underserved communities, a key component of the Early College High School (ECHS) model (e.g., Edmunds et al., 2020), is likely essential for advancing equity in DE more broadly (Barnett, 2018). DE provides an opportunity for students to take actual college courses and thereby acclimate to college-level expectations. However, as is evident in the ECHS model, the additional challenge of meeting college-level expectations must be supported so that students can thrive in a more demanding learning environment (Edmunds et al., 2020; Vargas, 2019). Mehl et al. (2020)'s *Dual Enrollment Playbook* lends insights to how institutions can both expand access and provide additional supports with a focus on ensuring students of color are benefiting from DE. Mehl et al. used administrative student data from Florida, Ohio, and Washington to identify community-college–high-school partnerships that had achieved equal access and early college outcomes for Black and Latinx students through their DE programs. From site visits to nine of these partnerships, authors described how partnerships actively reached out to underserved students and communities to share about DE opportunities and recruit and support their participation. These school-college partnerships took steps to both broaden access through the use testing-for-all strategies, testing bootcamps, alternatives to testing (e.g., GPA), as well as through additional supports and high-quality instruction to ensure their success. Mehl et al. (2020) described how the school-college partnerships worked to motivate and build student aspirations for college post-high school by helping them explore academic and career interests, connecting their DE courses to paths that lead from high school to bachelor's degrees and careers in different fields, and assisting DE students in developing a personalized academic plan in a field of interest.

In a study focused on efforts to expand access to DE in Tulsa, Roach et al. (2015) described how educators leveraged an exemption to state policy to broaden eligibility to DE and provided additional supports (e.g., study skills courses) alongside other efforts to reduce cost and transportation barriers. Roach et al. found that as a result of these efforts, there was an increase in DE participation overall and particularly among Black and Latino students. Other researchers have identified the following as important for expanding DE access and participation: general institutional capacity (Dickhoner, 2017; Gertge, 2008), strong school-college partnerships, welcoming college environments, family and community involvement (Mbaergbu, 2019), intentional outreach to underserved communities, counselor buy-in, and offering DE during the school day (Hooker et al., 2021).

Individual Mindsets Just as educator beliefs and attitudes about what DE can offer and who DE is for can negatively influence DE access and participation, educator mindsets can also drive work to equalize DE access and participation. Researchers have described how educators have worked to expand DE access and participation by aligning efforts to schoolwide initiatives to foster college-going cultures within high schools (Anderson, 2014; Trost, 2016). Individual DE program directors and other student-facing staff are crucial advocates for expanding DE access and participation within the context of their state and local policies (Hugo, 2001; Mehl et al., 2020). For these DE advocates, foundational to any action taken to change local policies and practices to expand DE access and participation is a belief that all students can succeed in and benefit from DE coursework provided the right supports (Hart et al., 2006; Mehl et al., 2020). In a study of African American men in DE, Price (2019) further described that educators can have a transformational effect on expanding DE access and participation by correcting the myth that some students are not college material and framing DE as a pathway to college and career opportunity post-high school. Although policies and practices vary depending on local contexts, educators' praxis and advocacy around the belief that all students can benefit from DE is a key mechanism for expanding DE access and participation, particularly for students who have historically been underserved in the high school to college transition.

APPENDIX A3

DE Outcomes and Impacts

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In this paper, I reviewed empirical studies on the influence of dual enrollment on students' educational outcomes (otherwise known as dual enrollment impacts and outcomes). I used *Google Scholar* as the primary search engine to find works on dual enrollment, using keywords based on a combination of two search stems. The first stem was either dual* or concurrent* and the second stem was either enrol* or credit*. This initial search led to 1,251 results. I then excluded documents that did not contain empirical work, such as literature reviews, opinion essays, and news articles. I further excluded empirical studies that were unrelated to dual enrollment, such as studies about Medicare and Medicaid. I also removed studies that combined different accelerated programs—such as combining Advanced Placement and dual enrollment into a single indicator—which made it impossible to distinguish the unique contribution of dual enrollment. Moreover, I excluded empirical studies that focused solely on Advanced Placement, Early College High Schools, and Career and Technical Education. To avoid monotony in writing, I use "dual-enrolled students," "dual-enrolled participants," and "dual enrollees" interchangeably to reflect students who participated in dual enrollment. Due to the awkwardness of referring to students who did not participate in dual enrollment as "non-dual-enrolled students" or "non-dual enrollees," I instead use "nonparticipants."

I also removed working papers and master's thesis, as well as studies outside of my topic area of dual enrollment impacts and outcomes. Finally, I excluded empirical studies that did not account for baseline differences between dual-enrolled students and nonparticipants through regression-based adjustment, quasi-experimental design, or randomized experimental design. This left me with 87 empirical works that I used to evaluate dual enrollment impacts and outcomes. Of these 87 works, 24 are journal articles or book chapters, 19 are reports, 41 are dissertations, and three are conference papers.

I organize the literature around four central themes: explanations for dual enrollment impacts and outcomes; general effectiveness of dual enrollment; differential effectiveness based on race, social class, sex, and achievement; and decomposition of dual enrollment impacts. These four central themes are not mutually exclusive, but they do encapsulate important policy-relevant questions researchers have asked when examining dual enrollment impacts and outcomes.

HOW AND WHY DUAL ENROLLMENT AFFECTS EDUCATIONAL OUTCOMES

There are several explanations for how and why dual enrollment affects students' educational outcomes. Social scientists and policy analysts have centered these explanations around three arguments: dual enrollment increases students' college readiness (both cognitive and non-cognitive); dual enrollment provides students with academic momentum once they enter college; and dual enrollment affects students' experiences while in college, which in turn, affects their educational outcomes.

COLLEGE READINESS

Although not a new issue, the number of students who are academically underprepared renewed the federal government's commitment to promote a college and career readiness for all students (U.S. Department of Education, 2010), as well as set an agenda for several states (Malin et al., 2017). Despite interest in college readiness from a multitude of keyholders, there has been some disagreement in its meaning. Some have defined college readiness as the minimum criteria necessary for a student to apply to a four-year institution (Greene & Forster, 2003). Others take a more stringent approach and consider students as college ready only if their preparation influences their likelihood of attaining a college degree (Nagaoka et al., 2013). The definition of college readiness can take a middle position where students are college ready when they meet the necessary level of preparation to enroll and succeed—meaning the ability to complete entry-level courses with a proficiency level that allows them to take the next course in the subject area—and without remediation (Conley, 2007). College readiness may include both cognitive and noncognitive skills, behaviors, attitudes, and knowledge (Nagaoka et al., 2013). Jackson and Kurlaender (2014) organize the definitions and conceptualizations of college readiness around three broad areas: academic preparedness prior to college matriculation, knowledge and information about what to expect and succeed in college, and whether students require a remedial or developmental course.

A way to define college readiness is the academic rigor of the coursework that students participated in while in high school (Adelman, 1999). This conception is in line with how social scientists, policy analysts, and policy makers view dual enrollment as a form of college readiness. Benefits of dual enrollment are more than the knowledge gained from taking those courses; it is also about the experiences students have while dual enrolled. There is an increased emphasis of using high school coursework as a predictor of academic readiness (Porter & Polikoff, 2012). For instance, Maruyama (2012) recommends including high school course taking when measuring college readiness. Greene and Forster (2003) include coursework in English (four years), math (three years), natural science (two years), social science (two years), and foreign language (two years) as one of the minimum thresholds necessary for a student to be considered college ready. Wyatt et al. (2012) use similar academic subjects to create an academic rigor index (ARI) that measures the intensity associated with students' high school coursework.

ALTERNATIVE FORMS OF COLLEGE READINESS

Much of the research on college readiness has focused primarily on cognitive dimensions of readiness (Maruyama, 2012). For example, dual-enrollment advocates are interested in using these programs to reduce remediation. Some researchers, however,

have argued this focus limits the concept of college readiness (Conley, 2007; Maruyama, 2012). Instead, they have considered self-efficacy, socialization, engagement and academic skills, motivation and other "noncognitive" or nonacademic factors as expansions to the meaning of college readiness.

Once such framework is Conley's (2007, 2012) model of college and career readiness. This approach stresses both the cognitive and noncognitive domains of college readiness into four primary dimensions. First, key cognitive strategies represent a range of intentional and practiced intellectual behaviors that foster development of strategies and capabilities important for college-level work, such as problem formulation and problem solving, research, interpretation, organization and construction of work products, and verification of the work. Second, key content knowledge refers to foundational content from core subject areas students need to know. Technical knowledge and skills related to career aspirations, the effort students expend to learn necessary content, and students' explanations of why they either succeed or fail in mastering this knowledge is also part of this dimension. Third, key learning skills and techniques mean students take ownership of their learning (e.g., goal setting, motivation and persistence, monitoring progress, and help seeking) and their development of learning techniques (e.g., time management, study skills, strategic reading, and collaborative learning). Finally, key transition knowledge and skills represent the necessary, and oftentimes privileged, information for the successful transition beyond high school. This includes understanding the body of work in high school that raises one's chance for admission to college, financial aid options and procedures, and college-level norms and expectations. This dimension also includes knowledge and skills required for successful interactions with diverse others (e.g., administrators, professors, and peers) in college.

Some social scientists have considered college readiness as the extent to which an individual is prepared to take on the roles and responsibilities of being a college student (An, 2015; Kanny, 2015; Karp, 2012; Lile et al., 2018). Individuals need to learn how to behave that is considered socially appropriate within the social structure in which they occupy. As individuals interact with others, they gather information about different roles within the social structure. Individuals use this information to form expectations of others who occupy a certain role as well as anticipate what others expect from them (Karp, 2012).

However, these roles change over time as individuals encounter different social structures (Turner, 1990). As social structures change for individuals—such as a transition out of high school—individuals too need to adjust their cultural repertoires, and the ways they behave and understand the world. This process usually requires a trial period for individuals to learn about the new role, behaviors, and normative expectations (Karp, 2007). Dual enrollment provides high school students with the opportunity to learn the norms, rules, and behaviors of being a college student (Karp, 2012). Students therefore are more comfortable with their new roles once they enter college. These experiences potentially give students concrete and realistic expectations for their upcoming role, which in turn leads to decreases in role shock and strain (Allen & Van de Vliert, 1984).

ACADEMIC MOMENTUM

The pace through which students accumulate college credit (academic momentum) is an important indicator to attaining a college degree (Adelman, 1999, 2006). There are three reasons how academic momentum may affect college completion (Attewell et al., 2012). First, students have greater opportunities to interact with other students and their professors when they take many college courses, which helps them integrate into the life of a college student. Second, accomplishments early in students' college careers are important to increase their levels of academic self-efficacy and self-concept. Finally, banking college credits help mitigate life issues that may arise for students, which may hinder them from fully engaging in their academics.

Research shows a positive relation between college accumulation during the first semester and college graduation. Students who take 12 credits in their first semester are 5.5 percentage points lower in their probability of attaining a baccalaureate than students who took 15 credits in their first semester (Attewell & Monaghan, 2016). This makes sense given that most undergraduate programs require 120 credits completed for a baccalaureate. Similarly, Calcagno et al. (2007) find earning 20 credits or completing 50% of a program are significant milestones for attaining a credential in community college. Dual enrollment can play an important role in college credit accumulation because an attractive feature of these programs is that students oftentimes receive college credit upon their successful completion of the dual enrollment course.

EXPERIENCES OF DUAL-ENROLLED STUDENTS AFTER COLLEGE MATRICULATION

Recently, social scientists have used established conceptual frameworks in higher education to explain for the effects of dual enrollment on educational outcomes. These frameworks emphasize the experiences of dual-enrolled students as matriculated students. A prominent framework in higher education is Astin's input–environment–outcomes (I–E–O). This framework allows researchers to evaluate both individual and institution characteristics that affect student development. It considers the characteristics students bring to college (inputs), their experiences while in college (environment), and the developmental endpoint that occurs based on the experiences with the environment (outcome) (Astin & antonio, 2012). Researchers have considered dual enrollment both as an input (Geise & Knight, 2011) and as a college environment (Kim & Bragg, 2008).

Perhaps the most used conceptual framework taken from higher education to explain for dual enrollment impacts and outcomes centers around student engagement. Researchers define engagement as the amount of effort students put into their studies, as well as their participation in activities that are related to schooling (Kuh et al., 2007). Students engage in activities and behaviors either through reactive (responding to other people's requests) or proactive (taking the initiative to interact in non-mandatory activities) stimulus (Grabowski & Sessa, 2014). In terms of academics, these include behaviors such as task-management skills, study habits, class attendance and assignment completion, participation in class discussions, and interactions with peers and faculty (Hu & Wolniak, 2013; Kuh et al., 2007; Nagaoka et al., 2013).

How dual enrollment relates to student engagement is that dual-enrolled students receive prior exposure to experiences, norms, and expectations that readies them for college. For example, dual enrollees learn that instructors and professors in college treat them differently from high school teachers. These students learn to initiate the conversation with their college professors when they need help, whereas high school teachers are more likely to initiate this type of conversation (Kanny, 2015). Generally, high school teachers tend to show greater concern for students' overall well-being, while college professors are concerned more on specific learning areas (Huntley & Schuh, 2002–2003). Dual-enrolled students therefore become acclimated to student–instructor interactions at the college level quicker than nonparticipants (Kanny, 2015).

DUAL ENROLLMENT IMPACTS AND OUTCOMES

In this section, I review literature on the influence of dual enrollment on several educational outcomes. I consider how social scientists and policy analysts conceptualize dual enrollment, as well as the different outcomes they examine. Because I focus on the impacts of dual enrollment on educational outcomes, my review mainly used quantitative research. As a reminder to readers, I removed studies that solely examined Advanced Placement, Early College High Schools, and Career and Technical Education. I also removed studies that did not or minimally attempted to account for baseline differences in dual enrollees and nonparticipants.

I organize this section in the following five ways. First, I examine studies that conceptualize dual enrollment as a binary indicator (i.e., did or did not participate in dual enrollment). Second, I discuss studies that conceive of dual enrollment in a different manner, namely as the number of dual credits earned. Third, I evaluate studies that focus on characteristics of dual enrollment courses, which includes course location (e.g., on campus, online, or at a high school) and course subject area. Fourth, I review the literature that examines factors that mediate the relation between dual enrollment and educational outcomes. Finally, I highlight research where researchers were motivated in potential inequities in the relation between dual enrollment and educational outcomes. This includes both the heterogeneous effects of dual enrollment across various social groups as well as the potential for dual enrollment to mitigate outcome gaps in education.

DUAL ENROLLMENT AS A BINARY INDICATOR

Do students who participate in dual enrollment benefit from such programs over those who do not? Although simple, this question addresses a foundational inquiry for researchers interested in the impacts of dual enrollment. Perhaps not surprisingly, researchers have given this question the most attention. Almost half of all analyses that I observed treated dual enrollment as a binary indicator.

HIGH SCHOOL GRADUATION

Advocates of dual enrollment argue that participation in these programs helps prepare students for college. However, it is unclear whether they consider high school graduation as a purpose of dual enrollment. I found only a handful of studies investigating whether dual enrollment increases high school graduation. Moreover, there were no works published in journals that paid attention to this outcome—at least when treating dual enrollment as an unspecified binary indicator. Studies from reports show a positive relation between dual enrollment and high school graduation. In Florida, Karp et al. (2007) find the probability of students graduating from high school is 4.3 percentage-points higher if they participated in dual enrollment than if they had not participated. Miller et al. (2018) estimate a similar, albeit higher effect (8.9 percentage-points) for high school juniors in Texas who participated in dual enrollment. However, studies that attempted to remove additional unobserved confounders show weak or no evidence of this relation (Speroni, 2011b). To assess the robustness of their findings, Miller et al. (2018) use a measure of dual enrollment implementation within a school as an instrument that is associated with participation in dual enrollment but unrelated to educational outcomes. They find little evidence that dual enrollment increases the likelihood of high school graduation.

COLLEGE ENHANCEMENT

Compared to high school completion, there is more research on the relation between dual enrollment and college matriculation, although this type of inquiry remains underdeveloped. Most studies show that dual enrollment increases student's likelihood to enroll in college. For example, Giani et al. (2014) estimate the odds of students enrolling in a college is 30% higher for dual-enrolled participants than for nonparticipants. Likewise, Dash (2017) finds similar results for Nebraska where dual enrollees are 38% more likely in their odds to enroll in college compared to those who do not dual enroll. However, these studies mask differences in where students attend college. The evidence shows a positive relation between participation in dual enrollment and attendance at a two-year college (Henneberger et al., 2018; Miller et al., 2018). Studies are more mixed in

whether dual enrollment increases enrollment at a four-year college where some studies show positive associations (Britton et al., 2019; Giani et al., 2014; Speroni, 2011a) while other studies show no association (Henneberger et al., 2018; Miller et al., 2018).

Nevertheless, there is little evidence that dual enrollment hinders students' likelihood to enroll at a four-year college. Part of the explanation may be most dual-enrollment programs reside in high schools and two-year colleges, and dual-enrolled students are likely to continue their education at the same college from which they earned their college credits.

ACADEMIC PERFORMANCE

Although researchers are interested in whether dual enrollment increases college enrollment, they are more interested in whether participation in dual enrollment leads to college success. For example, researchers examine the influence of dual enrollment on academic performance in college, typically measured either as first-year grade point average (GPA) or developmental/remedial courses. Most of the evidence point to a positive relation between dual enrollment and first-year GPA. Although the estimates vary, studies typically find the effect of dual enrollment on GPA to range from 0.08 to 0.16. Moreover, Allen and Dadgar (2012) show that this relation holds even after they account for students' demographic and academic characteristics, as well as for further unobserved characteristics through their exploitation of idiosyncratic variation in program participation.

One way in which researchers and policy makers view whether students are academically prepared for college is if they require remedial or developmental courses. Colleges and universities provide students with developmental courses if they fail to meet the college's standards for reading, writing, or math (Attewell et al., 2006). Students usually pay tuition and fees for taking these developmental courses, but they often do not receive credits that count toward their college degree (Melguizo et al., 2016).

Surprisingly, researchers rarely examine the relation between dual enrollment and developmental education. The nascent literature does show dual enrollment tends to reduce the likelihood that students take a remedial/developmental course. For example, Grubb, Scott, and Good (2017) estimate the probability for a dual-enrolled student to take a developmental course is 9 percentage points lower than for nonparticipants. An (2013b) finds somewhat lower estimates where participation in dual enrollment reduces the likelihood of participating in a developmental course by 6 percentage points. Moreover, this estimate requires a potential unobserved confounder as influential as calculus course-taking to undermine the result.

ACCUMULATION OF COLLEGE CREDITS

Advocates of dual enrollment argue these programs provide students with academic momentum to start of their college careers, which helps them to persist in college and ultimately attain a college degree. Indeed, research shows that participation in dual enrollment increases the total number of college credits earned. Karp et al. (2007) estimate that students who participated in dual enrollment earned 15.1 more college credits within three years after high school graduation than nonparticipants. Moreover, both Allen and Dadgar (2012), and Grubb (2015) report that dual-enrolled students earn almost one more credit—which excludes dual-enrollment credits—during the first semester in college than students who did not dual enroll.

COLLEGE PERSISTENCE AND DEGREE COMPLETION

Although researchers have paid attention to the academic performance of dual-enrolled students once they have matriculated, this type of inquiry pales in comparison to researchers' interest in college persistence and degree completion of dual-enrolled

students. I found a similar number of studies that analyzed college persistence as those that analyzed college GPA. However, even studies on college persistence are fewer than those that focus on college degree completion.

The evidence is mixed regarding whether dual enrollment increases students' college persistence. Studies show that persisting to the second year at either two-year or four-year institutions tends to be higher for dual-enrolled students than for nonparticipants (Dickhoner, 2017; Giani et al., 2014). However, these effects appear to be stronger at two-year colleges than at four-year colleges (Giani et al., 2014; Henneberger et al., 2018; Karp et al., 2007). Nevertheless, the weight of evidence shows that dual enrollees are more likely to persist at four-year colleges than nonparticipants (Giani et al., 2014; Inghram, 2018; Kentucky Council on Postsecondary Education, 2020; Loftin, 2012; Rowett, 2012), but a notable number of studies find little evidence of this advantage for dual-enrolled students (Allen & Dadgar, 2012; Duffy, 2009; Gruman, 2013). These studies collectively suggest dual enrollment increases the likelihood that students persist in college, but its influence appears to reside more at two-year colleges than at four-year colleges.

More important than college persistence for policy makers is whether dual enrollment increases a student's likelihood to earn a college degree. As stated previously, I found dual-enrollment researchers have focused on degree completion more than any other college outcome. Studies generally show a positive relation between dual enrollment and attaining a college degree. This finding tends to hold regardless of whether researchers measure degree completion as any type of degree (An, 2013a; Blankenberger, Lichtenberger, & Witt, 2017; Henneberger et al., 2018; Struhl & Vargas, 2012; Taylor, 2015), or whether researchers break postsecondary degrees down into baccalaureate (An, 2013a; Blankenberger, Lichtenberger, & Witt, 2017; Henneberger et al., 2018; Struhl & Vargas, 2012) and sub-baccalaureate (Miller et al., 2018; Morrison, 2008; Oakley, 2015; Struhl & Vargas, 2012). Collectively, the findings support the contention that dual enrollment positively influences students' degree completion. Coupled with research findings of college persistence at four-year colleges, the evidence suggests that dual enrollment may not return gains early on in a student's college career, but the gains become realized over time.

The final way researchers consider college degree completion is based on the time it takes to earn a degree. Approximately, one-third of college graduates at flagship public universities did so within four years, while only one-fifth of college graduates at non-flagship institutions did so during this time frame. Compare these numbers to the 1970s, where approximately half of college students graduated within four years (Complete College America, 2014). The consequences of extending the time to degree is costly where students on average pay an additional $22,826 per year of schooling as well as forgoing $45,327 in potential earnings (Complete College America, 2014).

Reducing the time to degree is in line with the momentum argument by dual-enrollment advocates because accumulating college credits prior to entering college lowers the total number of college credits needed to graduate. Students with college credits prior to matriculation therefore should reduce their time to graduation (ACT, 2015; Bailey & Karp, 2003; Hoffman et al., 2008). Studies indeed show that dual enrollment reduces a student's time to degree. For four-year graduation, the estimates tend to vary where dual-enrolled students graduate with a baccalaureate 1 month (Miller et al., 2018) to 4.1 months (An, 2009) sooner than nonparticipants. For a sub-baccalaureate, Morrison (2007) estimates dual enrollees graduate 77 days sooner than nonparticipants. Grubb et al. (2017) also show that the likelihood of graduating within two years is 26 percentage-points higher for students who participated in dual enrollment than for those who did not participate.

UNDERSTUDIED OUTCOMES ON THE EFFECTS OF DUAL ENHANCEMENT

The studies I reviewed thus far have garnered most of researchers' attention when it comes to educational outcomes. However, there is a small pocket of studies that have looked beyond high school graduation, college enrollment, academic performance, credit accumulation, and college persistence/completion. In particular, research is mixed regarding dual enrollment impacts beyond a student's undergraduate experiences. On the one hand, Geise and Knight (2011) find little evidence that participation in the Post Secondary Enrollment Options Program in Ohio increased students' likelihood to continue into graduate education one year after attaining a baccalaureate. On the other hand, Henneberger et al. (2018) estimate students who dual enrolled earn $2,100 more in wages six years after the 12th grade than students who did not dual enroll. Future research is needed to consider whether dual enrollment has lingering effects beyond an undergraduate education.

DUAL ENROLLMENT INTENSITY OR DOSAGE

So far, I have discussed studies where researchers have addressed the following research question: do students who participate in dual enrollment benefit from such programs over those who do not? As previously mentioned, this line of inquiry is by far the most frequently studied on dual enrollment. However, researchers have asked an important alternative question, which is do the benefits of dual enrollment increase as students take more courses and earn more credits (intensity) from these programs? From my analysis of the literature, this question motivates the second most frequent branch of research regarding dual enrollment impacts and outcomes. Researchers that consider the "dosage" effects of dual enrollment implicitly (or explicitly) worry that a binary treatment of dual enrollment masks valuable information about its gradated effects.

Most studies show that the number of dual-enrollment credits students accumulate influences educational outcomes above and beyond whether people take dual enrollment. Research demonstrates that increasing the number of dual-enrollment credits raises the odds of students enrolling in college (Ferrari, 2017), persisting in college (Delicath, 1999; Giani et al., 2014), and ultimately graduating with a college degree (Garbee, 2015; Giani et al., 2014). Studies also demonstrate that the number of dual-enrollment credits students take reduces the total number of credits needed to graduate (Kim & Bragg, 2008), as well as the time to complete a sub-baccalaureate (Dingess, 2018).

One limitation of this research is it assumes that the returns of dual enrollment continue linearly as students take more courses. At what point do these returns begin to taper off or disappear, or do these benefits continue ad infinitum? A pocket of studies within this research line has tested for nonlinearities in the dosage effects. The research is unclear of definitive cut points in which dual enrollment is most effective. Some studies suggest a moderate dose of dual enrollment—one or two courses—yields the strongest results (An, 2013a; Karp et al., 2007). Other research finds the benefits are better for dual-enrolled students who took 12 or more credits than for those who took less than 12 credits (Radunzel et al., 2014). The dosage effect of dual enrollment might differ depending on the outcome under investigation. In a study of students in Texas, Villarreal (2017) estimates the expected educational outcomes for students who accumulated varying levels of dual-enrollment credits (ranging from 0 to 10 credits). Villarreal finds the benefits of dual enrollment on high school graduation plateaus around 3 credits. However, the benefits of dual enrollment on other educational outcomes (e.g., college enrollment, attaining a sub-baccalaureate and baccalaureate) peak at 10 credits. These findings suggest that, at least up to 10 credits, students continue to reap the rewards of dual enrollment the more courses they take.

WHERE STUDENTS TAKE THE DUAL-ENROLLMENT COURSE

Does the effect of dual enrollment differ based on whether students take the course on a college campus, at their high school, or online (course location)? These days, students are most likely to take dual-enrollment courses at their high school. In 2010–11, approximately 77% of the total enrollment in dual-credit courses were taught at high schools, 18% were taught at college campuses—particularly at two-year colleges—and 6% were taught through distance education (Thomas et al., 2013). Policy analysts and social scientists have debated whether the effects of dual enrollment matter based on where students take the course. The debate tends to center around dual-enrollment courses taught at high school, perhaps due to students traditionally taking dual-enrollment courses on college campuses, as well as high schools being the modal location for these programs.

Critics of dual-enrollment courses taught at high school assert that they do not maintain the same level of academic rigor as courses taught on college campuses (Allen, 2010). Norms and rules in high school are distinct from the norms and rules in college (Zimmermann, 2012). It is important for students to have an authentic college experience, and strong academic and support services available to them when taking dual enrollment courses—which is more easily available on college campuses (Hughes et al., 2012). Therefore, students may receive fewer benefits from taking dual-enrollment courses on their high school campus than on a college campus.

Advocates for dual-enrollment courses on high school campuses point toward the ease and convenience of taking these courses. It may be difficult for some to find reliable transportation to attend class on a college campus. Moreover, some parents do not want their adolescent child to travel alone to an unfamiliar college campus (Hughes et al., 2012). Dual-enrollment courses taught online especially benefit schools in rural areas, because they tend to offer fewer courses than schools in suburban or urban areas (Holian et al., 2014). In other words, most arguments for dual enrollment taught at high school centers on issues of equity and opportunity.

Despite the claimed advantages of dual-enrollment courses on college campuses, the evidence for this advantage is mixed at best. On the one hand, some evidence shows dual enrollment on college campuses yields better results than on high school campuses. D'Amico et al. (2013) find students who dual enrolled on technical college campuses are more likely to persist in college than students who dual enrolled on high school campuses. DeHay (2019) finds similar results for first-year college GPA for students who dual enrolled on a high school campus as compared to students who dual enrolled on a college campus. Speroni (2011a) shows positive effects for dual enrollment on college campuses—but not for high school campuses—on any college enrollment, four-year college enrollment, and attaining a baccalaureate.

On the other hand, some studies show students who take dual enrollment on high school campuses benefit equally or even greater than students who take these courses on college campuses. Birkeland (2019) estimates high school graduation and college attendance for two dual enrollment programs in Washington state: Running Start and College in High School. Running Start are programs where students take their dual-enrollment courses on a college campus whereas College in High School are programs where students take these courses at high school. Birkeland (2019) finds a positive association for Running Start on one outcome (attending any college) whereas College in High Schools is positively associated across multiple outcomes (high school graduation, attending any college, and attending a four-year college). Liu et al. (2020) find the effects of dual enrollment are similar regardless of whether students took it on a college campus, at a high school, or online.

In summary, it is difficult to know from the evidence whether the location of where students take the dual enrollment course matters. Despite some people's assertions that the instructional quality and experiences of dual enrollment are lower at a high school than at a college, the evidence is far from definitive to justify these assertions. More work is needed on this topic as dual-enrollment courses on high school campuses and through online delivery become increasingly popular.

SUBJECT OF THE DUAL-ENROLLMENT COURSE

A small but growing body of research explores the differential impact of dual enrollment by course subject. The research question for this line of inquiry is: does the effect of dual enrollment depend on what course subject students take? Compared to nonparticipants, dual-enrollment participation in English, language, and arts increases a student's likelihood to enroll in college (Struhl & Vargas, 2012; Villarreal, 2017) and attain a baccalaureate (Villarreal, 2017). One issue with this line of inquiry is researchers provide little justification for conducting their analyses. As a result, these studies give the impression of an exploratory analysis rather than analysis based on theoretical or conceptual foundations. Moreover, it is unclear why we would expect the subject of the dual-enrolled course to affect students' educational outcomes, especially given that the outcomes tend to be general (e.g., college persistence and degree completion) and not specifically linked to the course subject under investigation (e.g., majoring in that field).

An exception is in math where Heavin (2020) contends the importance of math competence for students due to the increasing demand of qualified workers in STEM fields (science, technology, engineering, and math) and other industry positions of the new middle-class economy. Indeed, Giani et al. (2014) report that dual enrollment in math exerts an influence on grades and baccalaureate attainment. Each additional dual-enrollment course in math raises the odds of attaining a baccalaureate by 1.60–1.89. Dual enrollment in math also moves students away from enrolling at two-year colleges toward enrolling at four-year colleges (Hemelt et al., 2020). Evidence also shows that dual enrollment in math may benefit students at the margins of the distribution (Speroni, 2011b). Interestingly, Heavin (2020) finds little evidence that dual-enrollment participation in college algebra increases the likelihood of graduating with a degree in STEM. Heavin (2020) suggests students who intended to major in STEM are already likely to have enrolled in advanced math course and dual enrollment in math may not provide the value-added benefits for students at this part of the math distribution.

WHAT ARE THE MECHANISMS OR PROCESSES THROUGH WHICH DUAL ENROLLMENT AFFECTS EDUCATIONAL OUTCOMES?

Earlier in this paper, I have presented several explanations for how dual enrollment affects educational outcomes. These explanations focus on three themes: college readiness, academic momentum, and student engagement. Indeed, dual enrollees tend to be more acclimated to student–instructor interactions in college than nonparticipants (Kanny, 2015). Dual-enrolled students learn that active engaging with the course and its materials are important parts of what it means to be a college student (Lile et al., 2018). Moreover, students who dual enrolled experience changes in their academic behaviors. For example, dual-enrolled students tend to develop better study habits and are more academically motivated than nonparticipants (An, 2015; Bishop-Clark et al., 2010; Lile et al., 2018; Smith, 2007). Developing these skills pushed dual-enrolled students to reflect upon their own skills, abilities, and responsibilities as college students (Lile et al., 2018). Dual enrollees report greater levels of college and academic self-efficacy in situations and tasks, such as interactions with professors and social integration in college than nonparticipants (Soto, 2012). Using Conley's (2012) framework of college readiness, An and Taylor (2015) find students who participated in dual enrollment exerted higher levels of college readiness on three of the four dimensions during their first year of college than those who did not earn college credit in high school. They find little evidence participation in dual enrollment raises students' key transition knowledge and skills. However, Lile et al. (2018) report that dual-enrollment participation did enhance key transition knowledge and skills for lower-income students.

These studies I mentioned shed light on how dual enrollment affects educational outcomes. However, a more rigorous analysis to test these conceptual frameworks and theories is to perform mediation models. Researchers typically use mediation models to explain for the mechanisms through which dual enrollment affects educational outcomes. Surprisingly, few studies perform these types of analyses. For instance, An (2015) finds academic motivation and engagement mediate a modest portion, at most 22%, of the relation between dual enrollment and first-year GPA. Moreover, Wang et al. (2015) report that academic momentum

completely mediates the effect of dual enrollment on student college retention or completion in two-year technical colleges at Wisconsin. Overall, social scientists and policy analysts implement several theories or conceptual frameworks to explain for dual enrollment impacts; but the reality is that our understanding of the processes for these effects remain a black box.

EQUITY AGENDA OF DUAL ENROLLMENT

Although far from equitable, participation in dual enrollment has expanded beyond an exclusive segment of the school population (high-achieving, white, and high-SES students). Advocates of dual enrollment have argued to make these programs more inclusive to increase the share of underrepresented minorities and low-income students graduating with a baccalaureate, as well as a potential way to reduce inequalities in social class (Dual enrollment in Texas, 2010; Hoffman et al., 2008).

How do researchers that study dual enrollment impacts and outcomes go about evaluating whether these programs reduce (or exacerbate) inequities and inequalities? Researchers typically explore heterogenous effects of dual enrollment across various social groups (e.g., race, social class, sex, and academic achievement). Using Rawls's (1999) theory of justice, Taylor (2015) argues that if opportunities to participate in dual enrollment are unequal, which they are, then the returns for participating in these programs need to at least benefit those marginalized and disadvantaged in society. Moderation effects are aligned with a theory of "justice as fairness" because researchers can test if the effects of dual enrollment are at least the same for all who participate.

Most studies show students tend to benefit from dual-enrollment participation regardless of their race. However, the evidence is mixed regarding whether certain racial groups benefit from dual enrollment more than others. Some studies show the effects of dual enrollment are the same for racialized minority students as they are for white students (Speroni, 2011a). For instance, Birkeland (2019) shows the effects of College in High School on both high school graduation and college enrollment are similar for underrepresented minority students as they are for white and Asian students. Harlow (2018) also finds that dual enrollment affects college enrollment and persistence for black students similarly to the overall sample.

Studies also show heterogeneous effects of dual enrollment by race, although the evidence is unclear on the direction of the effects. The lack of consistency in findings is not due to specific outcomes under investigation. On the one hand, research shows that the effects of dual enrollment are weaker for racialized minority students than for white students (Kentucky Council on Postsecondary Education, 2020; Struhl & Vargas, 2012; Taylor, 2015). Struhl and Vargas (2012) estimate that white students who dual enrolled are 2.21 times in their odds to enroll in college as similar white students who did not dual enroll. By contrast, black students who dual enrolled are only 1.6 times in their odds to enroll in college as similar black students who did not dual enroll. Taylor (2015) finds that although dual enrollment benefits racialized minorities in their college enrollment and degree completion, these benefits are weaker than the benefits for the overall population. Dickhoner (2017) reports that dual enrollment benefits Asian students less than white students in regards to remediation and first-year GPA. On the other hand, evidence points to dual enrollment exerting a compensatory effect for racialized minority students. Dickhoner (2017) shows the returns of dual enrollment on college enrollment is greater for Latinx students than for white students. Similarly, Liu et al. (2020) find dual enrollment gives racialized minority students a greater return on enrollment to a state university than for white students.

Research on heterogeneous effects of social class—typically measured as socioeconomic status, family income, or parental education—also provides scattershot evidence. Again, most studies show that all students, regardless of their social class, tend to benefit from dual enrollment. Some evidence shows that the effects of dual enrollment are the same between working- and upper-class students (An, 2013a, 2013b; Harlow, 2018). Other studies find the returns of dual enrollment tend to be lower for low-income students than for students at other parts of the economic distribution (Miller et al., 2018; Taylor, 2015). Despite these

findings, the weight of evidence leans toward compensatory effects of dual enrollment for low-income students. In other words, low-income students tend to benefit more from their participation in dual enrollment than students from other parts of the income distribution (Blankenberger, Lichtenberger, Witt, et al., 2017; Dickhoner, 2017; Henneberger et al., 2018; Kentucky Council on Postsecondary Education, 2020).

Researchers have examined the effects of dual enrollment across students' sex and prior academic achievement, but these research lines are far shorter than for race and social class. By now, readers may wager that the evidence for these groups remain unclear—and they would be correct. Regarding a student's sex, studies either show that dual enrollment exerted a greater effect for male students than for female students (Kentucky Council on Postsecondary Education, 2020) or these programs exert equal effects for male and female students (Kanny, 2014). Regarding prior academic achievement, Heavin (2020) finds little evidence that educational outcomes for dual enrollees changed whether their math ACT score is either below 22 or above 22. Miller et al. (2018) report similar homogenous effects of academic achievement across a host of educational outcomes. Yet other studies demonstrate that high-achieving students who participated in dual enrollment earn higher GPAs (Kanny, 2014) or a baccalaureate (Speroni, 2011a) than low-achieving students. At the same time, Cowan and Goldhaber (2015), and Karp et al. (2007) report the opposite finding: lower-performing students tend to gain the most from dual-enrollment participation than high-performing students.

As shown, most studies that emphasize the equity agenda of dual enrollment explicitly or implicitly follow Rawls's (1999) "justice as fairness" thesis where, at the least, the effects of dual enrollment needs to be equal for all participants. Other research considers inequities as the relative positioning of individuals based on their social group. For instance, An (2013a, 2013b) uses research from educational stratification to examine whether participation in dual enrollment contributes to the status maintenance of those from the upper rungs of the socioeconomic ladder (Breen & Goldthorpe, 1997; Lucas, 2001). In other words, this research focuses on the extent to which dual enrollment contributes to the differences in college outcomes observed among social classes. An (2013a, 2013b) finds that participation in dual enrollment does little—less than 4%—to explain for the unequal outcomes between high- and low-SES students. Instead, almost half of the gap in attaining a baccalaureate between students whose parents did not attend college and students with a college-educated parent is due to differences in academic achievement and other coursework taken (An, 2013a).

APPENDIX A4

Dual Enrollment Student Experiences

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To begin, I cast a wide net searching Academic Search Complete and EBSCO Host for any empirical work published from 2000 to the present that focused on the student voice. I used the key words *dual credit*, *dual enrollment*, *concurrent enrollment,* and *students* (as a secondary term) to identify articles and reports that may be relevant. Then, I skimmed the titles and abstracts to find any qualitative research that explored the student perspective and saved those works in Dropbox. Initially, I was reticent to include dissertations because they have not been peer-reviewed like academic articles. However, the number of published empirical studies was limited, so I felt it was necessary to expand my search and add dissertations to the list. So, I went back and used the same keywords to investigate the original databases and ProQuest to identify any relevant dissertations.

In all, I found 29 articles or dissertations focused on the students' perceptions of dual enrollment. Eleven of the 29 were dissertations. Nineteen articles or dissertations investigated dual enrollment, generally, but may have included students who also participated in other accelerated learning options like Early College High Schools (ECHSs), Advanced Placement (AP),

Honors, and/or International Baccalaureate (IB). Ten studies specifically investigated the student experiences at an ECHS. Five dissertations and four articles studied the experiences of underrepresented populations. The number of student participants ranged from 1 (West, 2020, dissertation) to 111 (Duncheon, 2020). Some researchers interviewed students who were still in high school, while others had students recall their dual enrollment involvement as college students. One dissertation interviewed former students who were 15 years or more removed from their dual credit experience (Bennett, 2020).

All articles and dissertations were read and annotated, capturing the argument, research questions, findings, and other points of note. I coded the annotations so I could create a code index capturing the content in a single document to aid in my synthesis of the material. I focused the codes on student perceptions of the experience, such as: *reasons they participated in dual enrollment*, *type of dual enrollment*, *experience in dual enrollment*, *courses taken*, *perceptions of dual enrollment faculty*, *perceptions of the other students,* etc. In addition, I wrote analytic memos to assist me in making connections across the various sources. Based on these efforts, I organized the research around the following themes: (a) reasons for participation, (b) course experiences, and (c) (mis)assumptions of dual enrollment.

REASONS FOR PARTICIPATION

The students from the selected studies offered many reasons why they decided to participate in dual enrollment. The most common goal was to save money (e.g., Adams et al., 2020; Allen et al.; Felder, 2017; Hart, 2019; Huntley & Schuh, 2002-2003; Lewis, 2009). In general, the classes were free or had a nominal cost (Battle, 2020; Gronlund, 2017; Tobolowsky & Allen, 2016). In some cases, the school district also paid for the students' books (Hart, 2019). Therefore, this low to no cost initiative was appealing to students and parents alike (e.g., Adams et al., 2020, Bennett, 2020; Ongaga, 2010).

Another common reason students participated in dual enrollment was because they had negative views of their high schools. High-achieving students claimed they were "bored" (Huntley & Schuh, 2002-2003, p. 88; Woodcock & Olson Beal, 2013, p. 64) and desired "a greater challenge" (Lewis, 2009, p. 15) by taking what were advertised as "college-level" courses (An, 2015). Other students felt stigmatized by "high school drama and stupid stuff" (Hart, 2019, p. 235). Some specifically talked about being bullied by cliques, which made their lives challenging (Lile et al., 2017; McDonald & Farrell, 2012). For example, a student, who felt unaccepted in his high school, declared he had to "dumb down to fit in" (McDonald & Farrell, 2012, p. 230). Another participant in McDonald and Farrell's (2012) study summed it up succinctly stating "high school sucks" (p. 231). For these students, dual enrollment offered them a means to escape their high school challenges. By taking courses on the college campus, the students welcomed "anonymity" (McDonald & Farrell, 2012, p. 233), because "social stigmas…disappear[ed]" (Lile et al., 2018, p. 105).

Another primary reason the participants from many of the studies took dual enrollment course work was to save time. It was common for the programs to be described as a way to "get ahead" (Huntley & Schuh, 2002-2003, p. 87; Tobolowsky & Allen, 2016, p. 37) or "get a jump start" on college (Browning., 2011, p. 77). Some students hoped to get enough credits to shorten their time in college. Others saw it as a way to get to graduate school earlier (Battle, 2020, p. 99) or lighten their load while in college so they might take advantage of various electives like study abroad (Battle, 2020) or have a double major or participate in research without falling behind (Bucci & Simpson, 2021). Other students did not know if it would shorten their time in school, but they hoped it would give them a "sneak peek" at college life (Tobolowsky & Allen, 2016). They believed gaining this information would help them feel more prepared when they matriculated as official college students (Bucci & Simpson, 2012; Kanny, 2015; Lile et al., 2017) and develop a college student identity (Lile et al., 2017). The students also anticipated this "taste of college" would help them make decisions about future majors and careers (Bucci & Simpson, 2012, p. 10).

Although these were the main reasons for participation, the researchers noted a few additional ones as well. Some participants in the various studies noted the courses were convenient. These students admitted that they only took the classes because they were available in their high school (Hart, 2019). They would not have taken advantage of them if they had to leave campus. For others, there was transportation offered that took the students to and from the community college for their dual-enrolled classes, which made them a viable option. Finally, one student encapsulated the benefits by stating the classes were an opportunity for a "better life," plain and simple (Allen et al., 2019, p. 47). Thus, the students enumerated many personal, organizational, and administrative reasons they chose to participate in these programs.

COURSE EXPERIENCE

Although their reasons for participation were common across the studies, the students described very different experiences in their dually enrolled courses. In this section, I discuss their perceptions of the class and their lives as college students.

THE DUAL-ENROLLED CLASS

The participants differentiated between those courses that were "authentic" (Gronlund, 2017), which meant they met their expectations for college rigor, and those that were not. The varying opinions often were linked to whether the courses were offered in the high school, the community college, a four-year institution, online or in-person, and who taught them. In general, classes taught in the high school were not considered to be at the college level to the students (Felder, 2017; Karp, 2012). These classes were less demanding and "less stressful" than those offered on the college campus, and the high school faculty were considered "more lenient" (Nash, 2005, p. 93). A few students claimed the easiest classes of all were online (Battle, 2020).

Yet, for the most part, the students preferred the more challenging courses offered at the college, because they wanted the "true college experience" (Nash, 2005, p. 97). This is not to say the students did not stress about their grades. On a practical level, they understood that the dual-enrolled classes affected their high school and college GPAs, because the course credits applied to both. If the students did well, this was a boon to their high school GPA (Battle, 2020) and may serve as calling card to college admissions officers. However, if they did poorly, it could negatively affect both as well (Kanny, 2015). Lower GPAs could limit their college choice and major options in the future.

In addition, some of the participants shared they had anxiety about going to the larger campus filled with older students. A few admitted to feeling "a little scared" and "a little anxious" at first (Gronlund, 2017). They described being "lost in a sea of people" (Lile et al., 2017, p. 105) and lonely (Locke et al., 2017) in these unfamiliar locations. Nevertheless, in time, some of the students who were initially reticent grew comfortable on the larger campus finding it "exciting" (Burns & Lewis, 2000, p. 7) and enjoying their older, more diverse classmates (Battle, 2020), while others continued to feel "isolated" and "unsupported" (Kanny, 2015, p. 67).

In spite of these stressors, the students spoke about the long-term advantages they gained by taking these courses. Most important, the students talked about gaining a college identity (Hart, 2019). Students who had not previously considered attending college at all, now saw themselves as college material whether they took the course at their high school or at a college (Hart, 2019, p. 101). Further, they felt more confident they would succeed because of this exposure to college coursework (Bucci & Simpson, 2021). The benefits were even more pronounced if the students did well in the class, stating they felt "college-ready" and "prepared for what professors expect with regards to quality and effort" (Hart, 2019, p. 101) regardless of where they took the course.

Those who failed the course, however, rarely held this belief. In fact, failing the course, whether at the high school or college, often "negatively impacted their self-confidence heading into college and their college aspirations" (p. 103). In fact, one student in the Nash study (2005) decided to attend community college rather than a four-year institution as a result of his dual credit experience. In other instances, students decided to forgo college altogether (e.g., Hart, 2019; Taczak & Thelin, 2009; Thelin & Taczak, 2013).

However, it should be noted that some students did learn from poor results. In Bennett's (2020) dissertation, a former student said her failure was "a wake-up call." She realized she had to "put forth more effort and learn studying strategies that I had not learned thus far" (p. 95). Similarly, another student admitted that this is "the time to learn from your mistakes…you can mess up now and fix it later" (Adams et al., 2020, p. 25). The range of student attitudes about their positive and negative experiences reflects the wide range of students who participated in dual enrollment and their varying levels of maturity tackling challenging material in often unfamiliar circumstances.

THE STUDENT'S LIFE

These studies captured the students' experience within specific dual enrollment programs reflecting the uniqueness of each of the offerings. The setting, the teachers, and policies and practices associated with them varied greatly. Like all qualitative work, the researchers did not intend to draw wide-ranging conclusions about dual enrollment, rather their goal was to provide an in-depth understanding of dual credit within a specific context and, perhaps, pose questions about dual credit for researchers, policymakers, and practitioners to consider moving forward. As a result, some of the researchers turned their focus to the students themselves asking: Who participated in dual enrollment and how did their characteristics affect their experiences?

Consequently, some researchers concluded that a reason for negative experiences was linked to the students own behaviors. In Taczak and Thelin's (2009) study, students in their sophomore year of high school were recruited to take a dual credit composition course through the STEP program (i.e., Strive Toward Excellence Program), which was a dual enrollment program to assist middle school students "prepare for and understand college" (p. 8). The intention was to see if these young students could "succeed alongside other college students" (p. 8). However, the authors concluded that the students "immaturity showed in their approach to the class" (p. 17). They behaved in a "high schoolish" way with "a lot of whispers" and required the teacher to explain things over and over "because the younger kids just don't have the knowledge and experience to understand" (p. 17). In addition to changing his syllabus to "accommodate" the young students, the teacher also "ended up inflating their grades" (p. 19). He regretted these decisions later because he felt they "held" the rest of "the class back from fully realizing their potential" (p. 17). The other students agreed and "felt frustrated" how their young classmates negatively impacted the class (Thelin & Taczak, 2013, p. 17). The authors concluded that the teens did not have the critical thinking capability yet to do the work required in a college composition course. Other researchers who also looked at composition courses came to similar conclusions (Deneker, 2013; Hart, 2019). Taczak and Thelin (2013) argued that students at that age are not "intellectually, experientially, and emotionally, ready to do college-level work" (p. 8), leading them to wonder if these students had been unintentionally set up to fail.

Other studies noted there were significant pedagogical differences between high school and college that may have exacerbated academic challenges the students faced in these courses (Bucci & Simpson, 2021). For example, some dual credit students said they struggled with "time management," "studying," (Parsons, 2020, p. 91) and "lecture style teaching," (Bucci & Simpson, 2021, p. 12) which was more common in college (Parsons, 2020, p. 93). In high school, the students felt "coddled" (Bennett, 2020, p. 95) and "spoon fed" (Deneker, 2013) with teachers teaching to a test, requiring them to focus on rote memorization (Battle, 2020; Felder, 2017). These skills were insufficient for college-level work (Battle, 2020). Thus, the pedagogical shift in the dual credit

courses was abrupt and problematic for some of the participants. Others admitted to not being conscientious students, inclined to procrastinate and not do the work, as required (e.g., revise based on feedback, meet deadlines) (e.g., Taczak & Thelin, 2009). In Felder's (2017) dissertation, a student confessed, "I still passed, but I definitely could have tried way harder" (p.91). Therefore, the students did not always put the necessary effort in to succeed in the classes either.

The demands were particularly great for students attending an Early College High School (Adams et al., 2020; Beall, 2016; Brenner, 2012; McDonald & Farrell, 2012; Ongaga, 2010; Woodcock & Olson Beal, 2013). Many of the students talked about the "sacrifices" they were forced to make such as not being able to participate in typical high school activities or something as simple as watching "television or hanging out with friends" (McDonald & Farrell, p. 228). By way of an explanation, one participant attending an ECHS said it was common to have to get by "on three to four hours of sleep a night" (McDonald & Farrell, 2012, p. 229) to handle all the homework. Therefore, there was no time for social activities. As a result, some students did not put in the effort that was needed.

A few of the researchers linked their lack of effort to the cost of the program. In Hart's (2019) dissertation, a student said he was fine doing minimal work, because he did not pay for the class. He thought college students cared more because they paid for their education (Hart, 2019, p. 235). A student in Leonard's (2013) study offered a similar view stating that because he shared the responsibility of paying for his early college high school, he had a greater "incentive to succeed" (Leonard, 2013, p. 12). He added, "I think if my mother paid for it, it'd be different….I think I'd be less dedicated and I wouldn't be committing myself to everything, staying up late, studying or writing papers or something" (p. 12). Therefore, he had more of a vested interest because he was contributing financially. To him, if he quit, "it'd be a waste of money," so he did what was needed (p.12).

The college culture, itself, also required some adjustment from the students. They were used to being "micromanaged" in the high school, but no one monitored their behavior at the postsecondary institution (Duncheon, 2020, p. 183). One student summed up the differences in this way, the "professors didn't care and the high school people didn't know" (Woodcock & Olson-Beal, 2013 p. 90), which led some students to act out in risky ways. Several studies mentioned the teens either knew of classmates or they themselves skipped class, drank, and partied as a consequence of the more relaxed college environment (Hart, 2019; Kanny, 2015; Thelin & Taczak, 2013; Woodcock & Olson Beal, 2013). Therefore, though the teens relished the freedom of the college campus, not all of them were mature enough to handle it.

(MIS)ASSUMPTIONS OF DUAL ENROLLMENT

It was apparent from the research that is the base of this paper that the students held some assumptions of dual enrollment that turned out, in some cases, not to be true or were incomplete. For instance, there was the belief that if taking courses that earned college credit was a good thing, then it would be better to take as many of them as possible. However, the downside of this decision was that some students felt their paths were now pre-ordained (Tobolowsky & Allen, 2016). In the Tobolowsky and Allen (2016) study, one student felt her major was "set in stone," because she had entered college as a junior (p. 40). She added, "I have like a year until I graduate college then I have to be an adult," which she admitted "freaks me out sometimes" (p. 41). She envied those students who took fewer dual credit courses because she felt they had "all the time in the world to decide" on their futures (p. 41). Another student who entered college with 78 dual credits "felt she was at a competitive disadvantage with other students in her major," because "she did not have time to pursue" summer internships, "which would have given her valuable experience and position her for employment after graduation" (Tobolowsky & Allen, 2016, p. 40). These comments suggest there is a potential sweet spot regarding the number of credits that help with the financial burdens of college but still allow students time to explore areas of interest before deciding on their major or career path.

The number of credits earned created other issues as well. Battle (2020) reported that a student found it was better to enter college "as a first-time student," so they would be "eligible for more scholarships" and campus housing (p. 94). They lost these options if they came in with credits, so this student decided not to transfer in the dual credits. On the other hand, some students ended up limiting their college choice to schools that would take more of their dual enrollment courses (Tobolowsky & Allen, 2016). This decision led one student to "cry" when she first "laid eyes on the [selected] campus," because she had long dreamed of attending another more traditional college that had a bucolic campus rather than the concrete, urban one she ended up attending (p. 400). Therefore, there were ramifications linked to taking the courses and how many credits were earned that were only considered when the students hit an obstacle.

Another assumption was tied to course quality and equivalencies. One of the primary reasons policymakers embraced dual enrollment options was to help students become college ready, so they did well when they matriculated (Bailey et al., 2002). If courses are not rigorous, then students are not being exposed to an "authentic" college experience. However, in the Taczak and Thelin (2009) study, the teacher specifically altered the syllabus to accommodate the teens. Other participants talked about the classes not being rigorous as well. If courses do not rise to a certain level of rigor, then students are not prepared for college-level work. Further, they may be getting more credit for a course than was warranted. Hart (2019) went so far to say that granting two semesters of credit for the composition course was "antithetical to good education and good teaching" (p. 257). If the credit allocation is not accurate, then students may have fewer opportunities to gain needed skills. As a result, students may begin their first year of college after dual enrollment and lack both an understanding of the demands of college coursework and sufficient academic skills to handle it. Simply stated, the system may then be shortchanging students and setting them up for failure. These are thorny issues for policymakers and dual credit administrators to consider if and when they set limits on how many and which dual-enrolled courses are appropriate to offer and the credit equivalencies for them, so that the students are not negatively affected by those decisions.

Another assumption was made by the schools rather than the students. They assumed the students knew what dual enrollment was without specifically informing them about the option. This was particularly an issue for underrepresented student populations. The research reported that these students wished they knew about the program earlier (Felder, 2017) and that there were more courses available to them (Bennett, 2020). Some students were unsure about the scope of the program even as they took courses in it (Battle, 2020, p. 133). In addition, only one of the high schools in the study offered a mandatory orientation for students in the program, (Deneker, 2007) which may explain why even after participation the students were a bit unclear on the details of dual enrollment.

The lack of an orientation may also explain why many of the participants were unaware that they could access the resources at the community college or four-year institution where they may be taking their courses. In other cases, students knew there was tutoring available, but they were not able to take advantage of it because they could not stay on campus or return to attend tutoring sessions, if they relied on transportation supplied by their high schools. It also kept them from asking professors questions after class. In Lile et al. (2018), the students credited a high school counselor for keeping them from "feeling adrift" (p. 107). Battle (2020) reported there was a college advisor who helped the student participants in her study. Yet, in most of the research, there was no one person tasked to assist the students through the program. The authors recommended such supports would be beneficial.

Finally, because these studies focused on the particulars of a specific dual enrollment option families, students, educators, and policymakers may assume that all dual enrollment is the same. Although students may choose to participate in these programs for the same reasons, the vastly different experiences are the result of the programs varying in delivery, instruction, teacher qualifications, etc. Therefore, what seems to work well in one context and one location may not be as successful elsewhere.

APPENDIX A5

DE Finance and Affordability

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SEARCH STRATEGY AND INCLUSION CRITERIA

Criteria for selecting relevant articles for inclusion are the following: (a) The studies must focus on DE programs, which is defined as postsecondary courses offered to high school students, excluding exam-based models such as Advanced Placement (AP) and International Baccalaureate (IB); (b) the phenomena of interest are the finance and affordability of DE programs, such as how DE programs are funded, who pays for DE courses, and the financial benefits of participating in DE programs; (c) the studies must be empirical based regardless of study design, including peer- reviewed journal articles, non-peer reviewed reports from non-profit organizations, and published dissertations. Articles that are conference papers, unpublished, opinion-based, and prior to 1990 are excluded. To conduct an exhaustive search of the literature, the search was undertaken in four steps: (a) databases searches, (b) Google Scholar search, (c) organizational websites (e.g., National Alliance of Concurrent Enrollment Partnerships), and (d) hand searching references found in the previous three steps. Specifically, databases searches included education and discipline-specific sources: Academic Search Complete, Education Resource Information Center (ERIC), JSTOR, and ProQuest Digital Dissertations.

The search terms used a combination of topics of DE, funding structure, costs of participation, and other relevant financial implications, including: (a) dual enrollment, dual credit, concurrent enrollment, early college high school (ECHS); (b) finance, financial, financing, fund, revenue; (c) afford, affordability, cost, pay, tuition; and (d) earning, income, wage. Database searches identified 715 unduplicated results that were then exported to Zotero, including 311 book chapters and reports, 146 journal articles, and 258 doctoral dissertations. These 715 citations were then evaluated against the inclusion criteria first with abstract evaluation and then with full-text evaluation. After excluding articles that are not relevant to DE programs, articles that use the terms “cost” “fund” that are not related to DE programs, and non-empirical based articles, 155 entries comprised the initial list to be reviewed for the topic of DE finance and affordability.

I synthesize and organize the literature review in five sections. The first section provides an overview of different funding models for DE programs, which introduces the primary funding sources and their varying emphases. The next section focuses on the cost and benefit considerations for state governments, high schools, and postsecondary institutions, as well as the current financial incentives to encourage these educational entities’ DE participation. In the third section, I discuss the affordability of taking DE courses, highlighting the financial barriers (i.e., tuition and other associated costs) facing potential DE students and common practices to ensure DE affordability. The fourth section reviews studies on DE programs’ (indirect) influences on the affordability of postsecondary education and students’ long-term labor market outcomes. In the last section, I identify research gaps and discuss directions for future research on this topic.

THE FUNDING MODELS OF DUAL ENROLLMENT PROGRAMS

Despite the value of DE programs on students' academic outcomes (e.g., An, 2013a, 2013b, 2015; An & Taylor, 2019; Cowan & Goldhaber, 2015; Miller et al., 2017; Taylor & Yan, 2018), the adoption and expansion of DE programs remains challenging for educational entities due to funding shortages (Wozniak & Palmer, 2012). To encourage school districts and postsecondary institutions to participate in DE programs, the funding mechanism tends to adopt a "hold-harmless" principle that DE programs should bring no cost to students and no financial harm to either the secondary or the postsecondary partners (Hockley, 2013; K. L. Hughes et al., 2012; Ward & Vargas, 2012). In practice, DE programs have adopted varying funding models as creative and collaborative solutions at the local level, providing funds directly to education providers to cover program operation costs and/or defray tuition, as well as directly to DE students in the form of financial aid (Griffith, 2009; Piontek et al., 2016).

Primary funding sources for the adoption and operation of DE programs include the federal government, state government, school districts, postsecondary institutions, and private non-profit organizations. While these funds all aim to support high school student success and access to postsecondary education, different funding sources can emphasize varying outcomes. At the federal level, the Every Student Succeeds Act (2015) authorized local educational agency grants to support K12 student success, allowing secondary schools to use funds received to cover costs associated with DE programs including tuition and fees, textbooks, transportations, and teacher professional development. Recent plans also proposed to use Governor's Emergency Education Relief (GEER) funding in the CARES (Coronavirus Aid, Relief and Economic Security) Act to support DE students (A. Williams & Perry, 2020). It is also common for federally funded DE programs to have a Career and Technical Education (CTE) focus. For example, the *College Career Pathways program* in Connecticut is funded through the Carl D. Perkins Career and Technical Education Improvement Act, leading to employment in high-skill, high-wage, high demand careers (Connecticut Board of Regents for Higher Education, 2018; C. Williams, 2016). The passage of Perkins V in 2018 further allowed use of its funding for college in high school programs, as long as they align with the school district's needs assessment (A. Perry, 2019). The recently passed U.S. Innovation and Competition Act of 2021 authorized funding for states to support access to postsecondary Science, Technology, Engineering, and Mathematics (STEM) pathways for high school students, covering costs for participating students and overall program development and implementation (e.g., teaching recruitment and credentialing).

The state government plays a critical role in funding DE programs with various designs to serve multiple purposes (Hoffman & Vargas, 2010; Horn et al., 2018). State appropriations are often provided to cover DE program's start-up costs and facilities (Jobs for the Future, 2006b). For instance, Georgia uses state appropriations to support its *ACCEL* program, covering DE program tuition and other costs with a capped allowance. ACCEL was later consolidated into the *Move on When Ready* (MOWR) program in 2015, and it continues to pay tuition and mandatory fees to postsecondary institutions at the high school per-student full-time equivalent (FTE) rate (Kinnick, 2012). Massachusetts adopted an application process that colleges and universities need to apply for a state-funded grant through the Commonwealth Dual Enrollment Partnership (CDEP). To compete for this funding, colleges and universities need to offer DE programs with a variety of course offerings, provide academic and career supports, and demonstrate recruitment efforts targeting students that are first-generation, low-income, and racial/ethnical minority (C. Williams, 2016). In Pennsylvania, state appropriations were designated for DE programs and a fourth of this fund went to partnerships that serve low-income students and other historically marginalized populations (Hoffman & Vargas, 2010).

Funding from school districts and/or colleges is common that these education providers use available funding to support DE initiatives (C. Williams, 2016). For example, Kennesaw State University waived several mandatory fees for their DE students to leave most students with only textbook and lab fees (Kinnick, 2012). Taylor et al. (2014) outlined how funds are exchanged between postsecondary institutions and high schools noting that a variety of approaches are used depending on the type of the cost (e.g., application fee, tuition) and the affiliation of instructors (e.g., college instructor, high school instructor). For instance, the *College in the High School* program in Washington requires participating colleges to provide high school teachers a stipend

for the relevant administrative work (e.g., grading papers, attending training) (Dutta, 2017). In many states, however, funding was taken away from high schools to pay for postsecondary credits (Hoffman, 2005).

Finally, some DE programs are funded by private foundations. One of the major DE programs is the *Early College High School Initiative* (ECHSI) supported by the Bill & Melinda Gates Foundation. Launched in 2002, ECHSI funded the development of DE programs to serve historically marginalized students in postsecondary education. Within five years of implementation, 157 DE programs were made available in collaboration with education providers across the nation (Berger et al., 2009). The James Irvine Foundation also funded California's $4.4 million *Concurrent Courses Initiative: Pathways to College and Careers* between 2007 and 2010. Targeting youth populations that are low-income and historically underrepresented in higher education, this initiative aimed to demonstrate the feasibility of using career-focused DE programs to enhance students' college and career pathways (Golann & Hughes, 2008). Similarly, the American Electric Power Foundation funded the five-year *Credits Count Initiative* in central Ohio in 2014, focusing on creating STEM dual enrollment pathways for historically marginalized students in five Columbus City School District high schools (Hooker, 2018).

With varying funding sources available, some DE programs are intentional about sustaining and expanding their programs by diversifying funding streams and establishing public-private partnerships (Goldberger & Santos, 2009). For instance, Ohio's nine ECHS programs are supported through a locally developed funding model with state aid, private support, district tuition via per pupil funding, and postsecondary education funding (Rochford, 2011). Leonard (2013) indicated that, instead of the "hold-harmless" model, educational entities together with government, philanthropies, and students and families should approach DE funding from a shared responsibility perspective to provide affordable, sustainable, and localized DE programs.

FINANCIAL DETERMINANTS OF DUAL ENROLLMENT PROGRAM ADOPTION AND IMPLEMENTATION

Given the complexity of local contexts and state-level policies/regulations, DE program funding arrangements are often up to the participating educational entities. From a cost-benefit analysis perspective, there are at least five possible funding mechanisms for DE-participating high schools and colleges, including double funding (i.e., both high schools and colleges are funded for DE students at their full rate), high schools losing funds (i.e., high school loses average daily attendance [ADA] funding for DE students), colleges losing funds (i.e., colleges loses FTE funding for DE students), both losing funds (i.e., both colleges and high schools lose some, but not all, of their ADA/FTE funding for DE students), and partial policies when precise funding is not specified, but at least some ADA/FTE funding for DE students is affected (Karp et al., 2004, 2005). State governments, high schools, and colleges often consider the costs and benefits of DE participation from their own perspectives.

COSTS AND BENEFITS FOR STATES, HIGH SCHOOLS, AND COLLEGES

Previous studies have also conducted cost-benefit analysis, but the results greatly vary depending on the definitions of *costs* and *benefits*. For instance, the Washington State Institute for Public Policy (WSIPP) (2019) estimated that the benefit of DE participation exceeds its cost by $68,296 per student, with a benefit-to-cost ratio of 17.4. This calculation considers the net program costs and benefits to program participants, taxpayers, and other indirect benefits which may include reductions in crime victimization, the economic benefits from a more educated workforce, and the benefits from employer-paid health insurance. Using a combination of different measures from multiple studies, the WSIPP study's calculation can be flawed (Atchison et al., 2019). Therefore, Atchison et al. (2019) selected 2,458 students that participated in DE program admission

lotteries and followed them six years after expected high school graduation, discovering that DE enrollment results in an average lifetime benefit of about $58,000 per student with a benefit-to-cost ratio of 15.1. The authors also noted substantial variation in the cost of DE programs across sites that students, educational entities, and local communities may not reap equal economic returns by participating in DE programs.

DE programs can financially benefit participating students, school districts, postsecondary institutions, and the state in terms of state appropriations (Indiana Commission for Higher Education [ICHE], 2021). Focusing on Colorado's statewide DE programs, a recent report explained why DE programs can be a good investment at the state level (Reichardt & Christeson, 2020). Specifically, the report indicated that the economic cost of the statewide DE programs in 2016-17 was about $32 million for school districts and $8 million for postsecondary institutions. The benefits, which are estimated as the increases from DE participation with respect to individual income, state and federal taxes, and savings to some state and federal programs, far exceeded the costs (Reichardt & Christeson, 2020). Some states emphasized DE programs as a means for students to shorten their time to earning a postsecondary degree, which allows available public funding to aid more students toward postsecondary access and success (L. M. Perry, 2013). Some states, however, consider funding two systems (i.e., secondary and postsecondary) for one service to be "double dipping" that DE programs are not cost-saving for taxpayers (Hoffman, 2005; Hunt, 2007, p. 864).

Because both high schools and postsecondary institutions consider diverse and stable funding sources as key components for DE program success, the cost and benefit considerations for high schools and colleges can determine DE programs' quality, affordability, and sustainability in the long term (EdSource, 2005; Horn et al., 2018; Jobs for the Future, 2019). When Washington's *Running Start* was first piloted in the 1990s, high school staff reported increased counseling time for dually enrolled students and advocated for increased funding to compensate for increased counseling workload (Seppanen, 1991). The lack of financial support also exists for teacher training. While a considerable proportion of DE courses are taught by high school teachers, many schools are not sufficiently funded to support teachers' professional development and provide qualified DE instructors (Hooker, 2019; Horn et al., 2018). If school districts are primarily responsible for DE participation costs, one major concern is around the loss of control over budget and revenue that their K12 funds must now be spent to support students' postsecondary-level education (McCarthy, 1999). In the high school losing funds model, each DE student means lost enrollment and lost funding for the high school, and this tension erodes participation and trust in the DE partnership (Howley et al., 2013).

Similarly, some colleges are concerned about the reduced tuition rate of DE credits, lost revenues from students who transfer in a large number of DE credits, and additional costs on facilities and support services (Coates & Webb, 2013; Jobs for the Future, 2006a; Martinez, 2018). Some colleges face financial dilemmas that Tulsa Community College in Oklahoma spent $270,000 per semester to subsidize their DE program, and this heavy financial burden threatened the sustainability and growth of the DE partnership (Roach et al., 2015). However, Kingston and Anderson (2013) mentioned that compared with commercially available placement tests, the low- cost, state standards-based assessment used for DE program placement has the potential to be used for other placement purposes, reducing colleges' reliance and expense on commercial tests for which they currently must pay. In sum, while current research agree upon the cost-effectiveness of DE programs, education providers tend to disproportionately bear the cost of delivering DE programs.

FINANCIAL INCENTIVES TO ENCOURAGE DE PROGRAM DEVELOPMENT

Responding to the concerns of high schools and colleges, a variety of financial incentives have been used to encourage DE program adoption and implementation. The "hold-harmless" model is a first step for education entities to receive fair funding by participating in DE programs. For example, in 1997, the switch to "hold-harmless" model (i.e., allowing community colleges receiving funding for DE courses regardless of whether high schools receive ADA funding) among community colleges in Illinois led to a 240% increase in DE enrollment (Andrews, 2001). Similarly, Texas made this funding change for both DE-participating

high schools and postsecondary institutions in 2003 (Texas Education Code, 2003). Coupled with a series of available funds for both educational entities and students, DE enrollment has greatly increased in Texas (American Institutes for Research, 2011). Hunt (2007) described how different financial incentives were offered in Florida to encourage greater DE participation among districts and community colleges, revealing that the dual funding structure is "a necessary ingredient for the successful implementation of dual enrollment courses" (p. 879). Some states aim to tackle the financial burden related to professional development for DE instructors that dedicated resources were used to cover the cost of growing a qualifying teaching force (J. Vargas, 2019). When the Higher Learning Commission changed its accreditation guidelines in 2015 requiring high school DE instructors to have a master's degree or at least 18 graduate-level credit hours within the subject, a partnership in Indiana was established to financially support high school DE instructors to acquire those graduate- level credit hours (Higher Learning Commission, 2015; Indiana University, 2017).

Additionally, depending on a given state's performance-based funding (PBF) metrics, DE programs can potentially increase state appropriations received by institutions by contributing to their performance indicators (Struhl, 2013). For instance, Indiana's previous PBF provision in early 2010s allocated 5.5% of performance-related appropriations based on the number of students who earned DE credits and 0.8% for earning early college credits. As a result of this policy, Ivy Tech Community College received nearly $1 million from PBF in 2012 for DE completion (Struhl, 2013). The same idea applies to the secondary sector that high schools in Florida are graded based on the percentage of students who succeeded in DE courses (Mehl et al., 2020). However, White et al. (2014) emphasized the complexity and uncertainty in PBF formulas that course completion and degree completion resulting from DE programs may not necessarily translate to success points in PBF metrics and institutional revenues.

THE STUDENT PERSPECTIVE: AFFORDABILITY OF DUAL ENROLLMENT PARTICIPATION

Because DE eligibility is based on students' GPA, standardized test scores, and written recommendations from high school (Education Commission of the States [ECS], 2019), access to the potential benefits associated with DE participation appears to be stratified across student groups defined by race, family income, and academic performance (Freismuth, 2017; Lochmiller et al., 2016; Zinth & Barnett, 2018). The structural inequity allows higher income students to be more likely to enroll in DE programs, benefiting students who are already more privileged with sufficient educational resources. Additionally, while DE programs can have higher per-credit cost than AP credits (i.e., $110 per credit for DE and $83 for AP), DE participants are also more concerned about the cost of the class when compared with participants that took AP/IB exams (Dutkowsky et al., 2009; M. A. Smith et al., 2007). Thus, eliminating financial barriers facing potential DE students is of particular significance to ensure affordability of DE programs.

FINANCIAL BARRIERS FACING POTENTIAL DE STUDENTS

Given the varying funding models mentioned above, no consensus has been achieved with respect to how DE program tuition and other associated costs, such as fees, textbooks, and transportations, should be covered. As of 2019, 16 states clearly require either the state or the school district to take primary responsibility for paying tuition for DE students. In nine states, students and their families are primarily responsible for DE tuition; the remaining states either have a cost-sharing mechanism or leave the decision to local education providers to determine (ECS, 2019).

Tuition levels for DE programs are often set at a reduced rate when compared with regular college-level courses (Mehl et al., 2020; Pierson et al., 2017). For example, in Washington, colleges and universities are permitted to charge *Running Start* students (i.e., students enrolled in a DE program on a college campus) up to 10% of college-level tuition (K. Smith, 2014), while its *College in the High School* students (i.e., students enrolled in a DE program in high school) only pay between $420 and $700 per year for each college-level course (Dutta, 2017). Similarly, the *Metro Early College High School* in Ohio pays its postsecondary partner at a discounted tuition rate at $100 per credit hour per student, which is less than half the amount for in-state resident full-time college students in the same institution (North, 2011). Using the Fast Response Survey System, Thomas et al. (2013) surveyed 11th or 12th grade students in 1,500 public high schools across the nation and found that nearly half DE students paid full or partial tuition, regardless of their academic or vocational focus.

For some states (e.g., Hawaii, West Virginia), it is stipulated that students should bear the cost of DE participation (Karp et al., 2005). In many other states (e.g., California, Oklahoma), DE programs clearly outline no financial cost to the students (Bishop et al., 2021; Pompelia, 2020; Roach et al., 2015), largely because students' knowledge of tuition-waiver can considerably influence their DE participation decisions, especially for low-income students (Bartlett, 2008; Duncheon, 2020; Lauen et al., 2017; Rodriguez et al., 2012). However, even within the same state, there are great variations among school districts and DE partnerships regarding how tuition level is determined and how it is paid (Pierson et al., 2017; Stephenson, 2013; Taylor et al., 2014). From the students' standpoint, DE programs may be "tuition-free" but students and their families are typically not aware of how this cost is subsidized by certain funding sources (e.g., school district, state government, postsecondary institutions) or how education providers are required to forfeit tuition revenues (Starkey, 2020).

It is also common to offer DE programs to students at no cost only if certain criteria are met, such as the number of DE credits, field of study, and students' low-income status (McCarthy, 1999; C. Williams, 2016). The state of Washington covers DE students' tuition cost up to a combined 1.20 FTE, but offers tuition waivers for students who are eligible for free or reduced lunch beyond this threshold (K. Smith, 2014). Since 2015, the College Credit Plus Act has mandated Ohio high schools to create pathways for participating DE students to earn 15 to 30 college credits with no costs (Jackson et al., 2019). Similarly, though Maine's state Department of Education assumes the burden of paying for DE courses, they only pay half of the in-state tuition for student's first three credit hours each semester and up to six credit hours per academic year (Michelau, 2006). The state of Indiana chooses to subsidize DE credits in the prioritized field of liberal arts and CTE with a tiered system: no cost for qualifying low-income students and $25 maximum per credit for all other students (ICHE, 2021). Karp et al. (2007) recommended that, for states that cannot afford tuition coverage for all participating DE students, they should prioritize tuition coverage for historically marginalized students. However, according to a 2019 study by Hanson (2019), tuition subsidies do not influence students' participation in DE programs.

In addition to tuition, DE programs also have other associated costs, including mandatory fees, books, and transportation, that can impede students from taking DE courses (Osumi, 2010; Starkey, 2020; Thomas et al., 2013). For instance, Zinth (2014b) pointed out that fees for CTE- oriented DE courses can be substantially higher than fees for academically-oriented DE courses (e.g., $1,911 for a Welding Production certificate). While 57% DE students reported that transportation was needed for at least some of their DE courses, students and their families are left with primary responsibilities of commuting (Thomas et al., 2013). Especially for students in rural areas, while a higher percentage of rural DE programs are funded by students and families relative to DE programs in non-rural areas, the lack of transportation and high-speed internet limited students from accessing DE programs (Institute of Education Sciences, 2020; J. K. Roberts, 2019). For DE students in Iowa, their tuition is covered by the state, and the costs of textbooks and transportation are shared between the state and local school district (Crouse & Allen, 2014). In Florida, DE students are exempt from all registration costs, tuition, and fees, and these financial subsidies are pivotal for DE students to "save time and money toward their college degree" (Florida Department of Education, n.d., p. 7).

CURRENT POLICIES AND PROGRAMS TO ENSURE DE PROGRAM AFFORDABILITY

Beyond tuition waiver or reduction, one intervention to ensure DE program affordability is to directly provide financial aid to DE students, eliminating financial barriers for low-income students. Previous studies have found that financial assistance for DE programs has a positive impact on students' DE participation and postsecondary outcomes (Ferguson, 2014; K. D. Roberts & Hitchcock, 2018; J. G. Vargas et al., 2014). Typically, DE students experience challenges to be eligible for financial aid at various levels (Michelau, 2006). At the federal level, Pell grants were only provided for DE students in a federal experiment in 2016 to learn about the impact of early access to financial aid on low-income students' postsecondary outcomes (U.S. Department of Education, 2016). Several states have adopted policies making financial aid available to DE students. In Kentucky, dual credit scholarship was established in 2016 supported by Kentucky Lottery proceeds, and it expanded to cover CTE-oriented DE programs in 2018 (Kentucky Council on Postsecondary Education, 2020). Nebraska approved the need-based Access College Early (ACE) scholarship program to specifically fund low-income high school students taking DE courses, but the amount of available funds has been insufficient to meet student demands (Nebraska's Coordinating Commission for Postsecondary Education [CCPE], 2018).

Another intervention to ensure affordability is based on the idea that technology-mediated DE programs can be more cost-effective for high school students to participate, especially for rural students that do not have convenient physical access to DE programs (J. K. Roberts, 2019; Wallace, 2015). Among states with DE programs, at least 36 states offer online DE courses (ECS, 2019). In a study examining academic outcomes of DE students in math courses, online students earned similar ACT scores when compared to their on-campus peers (Pyzdrowski et al., 2011). According to Zinth (2014c), the online or hybrid modality made it possible for small groups of rural students in individual school districts to take DE courses, accounting for the startup costs to establish DE programs in the rural area and the logistic costs for students to travel out of districts to take DE courses. As long as educational quality is guaranteed, online or hybrid DE courses have the potential to reduce cost of DE participation for students. However, because of the different designs in online DE courses (e.g., class size, the amount of time needed from instructors), the cost per credit hour for online DE courses ($125) can actually be higher than in-person DE courses ($103) (American Institutes for Research, 2011).

A COST-SAVING ROUTE TO POSTSECONDARY EDUCATION AND BEYOND

The financial benefits for DE students are often promoted by DE policy advocates as a route toward reduced college costs and time-to-degree (e.g., the Dual Credit Quality Act in Illinois). Intuitively, DE programs can put college-ready students on a fast track to start accumulating college credits while in high school at a lower cost, so DE students can reap financial benefits with fewer remaining credits during college years and shorter time-to-degree (Dannenberg & Hyslop, 2019; Freismuth, 2017). Stephenson (2013) noted that students can save as much as $3,000 in college tuition by completing DE courses in the Kentucky Community and Technical College System.

Running Start in Washington has also saved an average of $2,500 per participating DE students, offsetting about 20% of the estimated annual tuition at a four-year university (Conklin, 2005). This financial benefit is particularly true if DE courses are offered at no cost to students (Nebraska's CCPE, 2018). Using propensity score methods, Hughes (2016) compared statistically equivalent DE students and non-DE students, revealing that DE students were more likely to experience a shorter time to degree and incurred a lower amount of student loans. However, Hu and Ortagus (2022) found no difference between DE students' probability of borrowing to pay for college when compared with non-DE students, or their cumulative amount of student loans among borrowers, except for certain subgroups of racially minoritized students. Lin et al. (2020) further noted that DE students borrowed more relative to AP participants, adding important information for high school students' decision-making in college-level programs.

The (perceived) cost-effectiveness has been widely accepted as an advantage of DE programs by students and their families (Artman, 2017; Buchanan, 2006; Duran, 2019; Reichheld, 2000). A survey among DE participating students suggested their awareness of the cost-saving benefits: DE programs play a critical role in providing students with college education that they "might not have been able to afford otherwise" (Berger et al., 2013, p. 46). The expectation to save money by enrolling in DE programs is particularly true for rural students and low-income students (Johnson & Brophy, 2006; Pfeil, 2009). The perceived cost-effectiveness was a main reason for rural students in Washington to participate in DE programs (Johnson & Brophy, 2006). A group of low- income *Access College Early* participants in Nebraska recognized the value of DE credit "both in saving money and freeing them from the pressure of taking a full load of classes their freshman year in college" (Pfeil, 2009, p. 117). In at least eight states, students may also take developmental courses through DE programs (ECS, 2019). For example, a local DE program in Kentucky enabled 88% of their students to bypass at least one developmental education course, saving them time and over $400,000 in tuition costs in 2006 (Strawn & Duke, 2007).

Assuming DE participation reduces students' time-to-degree, DE students can enter the workforce early so that the accumulated benefits can be translated into labor market success (Edmunds et al., 2020; Wallace, 2015). Prior studies have indicated that DE programs can bring long-term financial benefits: DE students earned higher wages six years after the 12th grade when compared to their non-DE peers, and this effect is especially true for degree completers (Henneberger et al., 2018; Phelps & Chan, 2016). Their labor market success can be attributed to DE programs' effective teaching, advising, and curriculum alignment with employment opportunities (Mark, 2011; Zinth, 2016). For example, CTE-oriented DE programs in Michigan must be aligned to regional workforce needs with integrated career planning services to ensure labor market benefits for students (Zinth, 2016).

Whereas DE policies can be well-intended to shorten the number of credits and time needed for a college student to complete their postsecondary credential, the influence of DE participation on postsecondary affordability is built upon the assumption that the DE credits earned are transferable toward their postsecondary degree plan. In fact, colleges may not be motivated to accept DE credits, and whether DE programs are cost-saving for students depends on the number of DE credits earned and if the earned credits are transferable (Freismuth, 2017; ICHE, 2021; Venezia & Jaeger, 2013). Though many states have statewide transfer articulation initiatives, these policies may only cover a portion of DE credits based on subject matter and where the DE course was offered (e.g., high school, community colleges) (Borden et al., 2013). According to Hodara and Pierson (2018), only 15% of students in the 2015 cohort were able to transfer less than half of their earned DE credits to the Oregon public university they attended after high school. State policies often face the dilemma of providing higher education institutions with sufficient autonomy to accept DE credits and guaranteeing transferability of DE credits (Sunderman, 2017). Particularly for more selective universities that are less likely to accept DE credits (Modarelli, 2014) and at the same time have higher cost of attendance (Craig & Raisanen, 2014), the accumulated college credits may not necessarily translate into reduced college costs for participating students.

APPENDIX A6

DE and Career and Technical Education

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In many respects, dual enrollment (DE) and career and technical education (CTE) are diametrically opposed approaches for preparing students for life beyond high school. DE, often referred to as dual-credit or concurrent enrollment,1 began spreading in the 1990s as a way to provide high-achieving high school students with access to rigorous, college-level courses. These courses are largely, though not exclusively, offered in academic content areas such as English, social studies, math, and science. And while participation in DE has broadened considerably over time, high-achieving students are still far more likely to participate than lower achieving students and Black, Latinx, and low-income students are underrepresented in dual-enrollment (Taylor, Borden, & Park, 2015; Xu, Solanki, & Fink, 2021). In contrast, CTE – known as vocational education before the passage of the fourth iteration of the Carl D. Perkins Act (2006) – was conceived as a way to provide low-achieving students not bound for postsecondary education with opportunities to develop real-world skills that would facilitate their transition into the labor market after high school (Dougherty & Lombardi, 2016). Though formal tracking has largely been eliminated in American high schools (Lucas, 1999), vocational education was historically viewed as a "dumping ground" for marginalized and educationally disadvantaged students (Dougherty & Lombardi, 2016; Giani, 2019). The populations for whom dual-enrollment and CTE courses were designed, their curricular content, and their intended outcomes were fundamentally distinct.

Yet the integration of technical or vocational content with college-aligned curricula for high school students has a long history, and a new chapter is currently being written. Career Academies, Tech Prep, High Schools That Work (HSTW), Project Lead the Way (PLTW), P-TECH high schools, and the Concurrent Courses Initiative (CCI) are just a few examples of programs and educational models that have blended elements of CTE and college content. The Every Students Succeeds Act (ESSA) not only emphasized dual-enrollment and CTE courses separately, but also provided incentives for states to blend these two approaches into programs of study that conferred both high school and college credit. And the Strengthening Career and Technical Education for the 21st Century Act (Perkins V, 2018) placed greater emphasis on – and provided states with more funding and flexibility for – developing "college in high school" programs with a CTE focus than any prior iteration of the Carl D. Perkins Act. The completion of postsecondary credits is even a core indicator of CTE program quality in Perkins V. Given the growing evidence base showing that both dual-enrollment programs (An, 2013a, 2013b; An & Taylor, 2019; Giani, Alexander, & Reyes, 2014; Tobolowsky & Ozuna Allen, 2016; What Works Clearinghouse, 2017) and CTE courses and programs of study (Giani, 2019) can positively influence students' postsecondary outcomes, there is burgeoning interest in how schools can provide opportunities for students to develop real world skills while simultaneously earning college credits to facilitate their transition into postsecondary – models of DE-CTE.

Despite the history of states and schools experimenting with ways to integrate DE and CTE and a number of studies exist examining the efficacy of DE-CTE models, no reviews have systematically examined the empirical literature on the various ways in which DE and CTE have been combined and the relationship between DE-CTE and student outcomes. The purpose of this manuscript is to conduct such a review to inform policymakers and practitioners about what appear to be the most promising approaches for marrying DE and CTE and to chart a future research and evaluation agenda for deepening the field's understanding of this approach. This section begins by providing a brief overview of dual enrollment and CTE in terms of their definitions, conceptualizations, models, and policy frameworks. The section then systematically reviews the empirical literature to explore what scholars have found about how student characteristics shape their participation in DE-CTE and the relationship between various DE-CTE models and student outcomes, with an emphasis on students' transitions into postsecondary. I conclude by synthesizing these findings and discussing common themes that emerged from the review.

DEFINING CTE

Defining CTE is somewhat challenging. The definition in Perkins V suggests that the core component of CTE is a sequence of courses that provides students with "rigorous academic content and technical knowledge and skills needed to prepare for further education and careers in current or emerging professions, which may include high-skill, high-wage, or in-demand industry sectors or occupations." This sequence of courses should also lead to a recognized postsecondary credential, such as an industry-recognized license, certificate, or associate's degree. But beyond the sequence of courses, CTE programs should also include "competency-based, work-based, or other applied learning," coordination between high schools and colleges through "articulation agreements, early college high school programs, dual or concurrent enrollment program opportunities, or other credit transfer agreements that provide academic standing," and career exploration or advising for middle and high school students. CTE is therefore defined by a constellation of factors: curriculum, pedagogy, industry alignment, institutional collaboration, and supplemental student supports.

Similarly, the goals of CTE are equally complex and, at times, have conflicted. The National Assessment of Vocational Education, which evaluated Perkins III and the Tech Prep program, produced a final report to Congress (Silverberg et al., 2004) that concluded:

> Perkins III offers a conflicted picture of federal priorities for vocational education improvement—academic achievement, technical skills, high school completion, postsecondary enrollment and degree completion, and employment and earnings. Without a clearer focus for the federal investment—amounting to about 5 percent of local spending—around which to rally the commitment and efforts of vocational teachers, counselors, and administrators, ongoing program progress in any particular direction is less certain (p. 2).

The report also noted that the Tech Prep program, which promoted a "two-plus-two" design linking two years of high school coursework to two years of college course work, was only being implemented with fidelity in roughly 10% of Tech Prep consortia representing 5% of all Tech Prep students, likely due to conflicting priorities related to CTE overall. This "identity crisis" of vocational education may have contributed to the eventual rebranding to CTE.

This complexity in the design of CTE programs combined with variation in approaches to DE has produced a diversity of integrated DE-CTE models. On one end of the spectrum, students can complete individual CTE courses that confer college credit, most often aligned to technical or workforce education at the postsecondary level (often referred to as articulated credit). Data from the National Center for Education Statistics (NCES) collected even before the implementation of Perkins V shows that 73% of public school districts offer CTE courses that allow students to earn both high school and postsecondary credits (Gray & Lewis, 2018), suggesting the majority of high school students have the opportunity to earn college credit through CTE courses. However, only 32% of districts structure all of their CTE programs as career pathways aligned with postsecondary programs, suggesting that many CTE programs that offer college credit options may not be fully aligned with programs of study at the college level. On the other end of the spectrum, models such as Career Academies and ECHS that focus on a particular industry theme or career cluster tend to combine coherent sequences of courses aligned with particular industries or occupations, student advising and supports, and opportunities to earn college credit in high school.

The effects of integrating DE with CTE on students' high school and postsecondary outcomes surely depends on how students engage with DE-CTE, from completing stand-alone courses to earning an associate's degree in a CTE domain through an ECHS. Although the complexity of DE-CTE models combined with the limited number of rigorous quantitative studies examining their effects makes it challenging to identify the most promising programs or tease out the core components of effective DE-CTE approaches.

LITERATURE FINDINGS

Because of the diversity of DE-CTE models, findings from the systematic literature review are organized by the type of DE-CTE model that was investigated. We begin by reviewing some basic statistics on the prevalence of DE-CTE and the types of students who participate before reviewing the literature on the most widespread DE-CTE models in the United States.

How Prevalent is DE-CTE? As mentioned previously, the majority of public school districts (73%) offer CTE courses where students can earn college credit (Gray & Lewis, 2018). However, I was not able to identify any nationally representative statistics on the number of schools that offer DE-CTE courses or programs, the number or percentage of students who participate in these courses, or how DE-CTE participation rates vary according to school (size, urbanicity, demographics) or student (race/ethnicity, gender, SES) characteristics.

However, some states have produced reports detailing DE-CTE participation which helps reveal the scope of this strategy. Data from Colorado in 2017-18 shows that roughly 13,000 students participated in what they describe as CTE concurrent enrollment, which represented 43% of all concurrent enrollment students in the state (Vente & Tucker, 2018). Of the population of concurrent enrollment students, roughly half (48.7%) were considered degree-seeking, and 13.5% (27.7% of degree-seekers) were pursuing certificates. A total of 2,375 concurrent enrollment students earned certificates while in high school, suggesting a considerable number of students are combining DE and CTE in Colorado. Data from Iowa are comparable (Iowa Department of Education, 2020). Roughly 36% of all concurrent enrollment students in that state were taking DE-CTE courses, while the other 64% were enrolled in academic concurrent enrollment courses. DE-CTE programs in health care, business and marking, manufacturing, and engineering technology demonstrated the highest enrollment rates in Iowa. And while data on the rates of student participation were not available, a report from Wyoming showed that the majority of high schools in the state had articulation agreements with partnering community colleges for the purpose of implementing DE-CTE (Wyoming State Department of Education, 2017). However, not all states exhibit the same breadth of DE-CTE coursetaking. In Texas, just seven percent of all semester credit hours delivered through dual-credit were for CTE courses, and all of the most popular dual-credit courses are in the core academic subjects (Miller et al., 2017). In short, nationally representative estimates on the scope of DE-CTE participation is lacking, but DE-CTE appears to be a prevalent practice in many—but not all—states.

Career Academies One of the oldest high school reform models aimed at equipping students with knowledge and skills directly relevant to the labor market is that of Career Academies. Either operating as a whole school or, more commonly, as a school-within-a-school or small learning community (SLC), Career Academies consist of multi-year programs with a curriculum that "integrates academic and career/technical education courses, organized around one or more broad career themes" (Stern, Dayton, & Raby, 2010, p. 4). While the first Career Academy became operational in 1969, the model began spreading rapidly in the 1990s, and by 2010 more than 1,000 Career Academies were educating students. The National Academies Foundation (NAF), the largest organization dedicated to supporting the expansion and certification of academies, reports that 60% of Career Academy students receive free-or-reduced-price lunch, 80% are students of color, and 47% are female (NAF, n.d.).

The first wave of research on Career Academies in the mid-1980s to late-1990s found that students who participated in these schools earned more HS credits, earned better grades, and were more likely to graduate compared to their peers (Hayward & Talmadge, 1995; Kemple, 2001; Kemple & Snipes, 2000; Maxwell & Rubin, 1997, 2000; Stern, Dayton, Paik, Weisberg, & Evans 1988; Stern, Dayton, Paik, & Weisberg, 1989). However, one of the few experimental studies of Career Academies (Kemple & Scott-Clayton, 2004; Kemple & Willner, 2008) showed that while the model appeared to provide men with significant improvements in their employment prospects, no such benefits were found for women. Additionally, Career Academy participation appeared to decrease college enrollment, particularly for "higher risk" students, and had a null or negative impact on college attainment.

Although the experimental results showed no positive effects on long-term degree attainment, it is unclear the extent to which DE-CTE was used in the academies in that study, or is used in Career Academies writ large. At least one study of ten mature Career Academies did find that while rates of completion of AP courses were roughly equivalent between students enrolled in Career Academies and a comparison group, Career Academy students were far more likely to take at least one college course while in high school compared to their peers (65% vs. 31%) (Orr, Hughes, & Karp, 2002). Given that many Career Academies focus in areas such as health care, business and finance, and transportation technology that are potentially aligned with sub-baccalaureate programs at local community and technical colleges, DE-CTE and Career Academies are highly coherent. NAF also emphasizes the benefits of integrating DE into the Career Academy model. However, the lack of comprehensive or representative data on Career Academies and their use of DE-CTE makes it difficult to know how prevalent this approach is.

Tech Prep The Tech Prep program was the first significant attempt in Perkins legislation to promote DE-CTE and greater alignment between the knowledge and skills students were gaining in CTE and the postsecondary pathways available to them. On a positive note, Tech Prep did seem to spur greater collaboration between secondary and postsecondary institutions. As the final report of the national Tech Prep evaluation stated, "Before Tech-Prep, at least some [articulation] agreements had been adopted by schools in 51 percent of today's local [Tech Prep] consortia; by 1995, articulation agreements were in place in 96 percent of all consortia" (Hershey et al, 1998). Tech Prep thus helped establish the administrative infrastructure to allow DE-CTE to occur.

But whereas Tech Prep students were found to earn articulated college credit at considerably higher rates than their non-Tech Prep peers (Bragg, Kirby, & Zhu, 2006), Tech Prep seemed to have little to no effect on college enrollment (Bragg et al., 2002) and likely diverted students from four-year to two-year colleges (Brown, 2016; Cellini, 2006). In addition, far more students appear to have been eligible for earning college credit through Tech Prep than the proportion that actually took advantage of that option. The national evaluation of Tech Prep estimated that only 15% of Tech Prep participants actually received articulated credit (Hershey et al, 1998). The most significant barriers noted in the evaluation were: (1) lack of systematic promotion to students; (2) procedural hurdles at the college level before credits earned can be awarded; (3) diversity of Tech-Prep students' career interests and educational aspirations; and (4) the relatively diffuse and unstructured form in which Tech-Prep is usually implemented, which makes it hard to emphasize the envisioned seamless transition. These issues combined with evidence showing that Tech Prep models were rarely implemented with fidelity seems to have resulted in the gradual phase-out of the model of DE-CTE.

Pathways and Programs of Study As Tech Prep programs began to be discontinued, Perkins IV (2006) and Perkins V (2018) placed greater emphasis on career pathways and the programs of study within them. Perkins IV specifically mandated that all CTE programs "offer secondary to postsecondary programs of study (POS), which integrate rigorous academics, offer dual enrollment options, and lead to an industry-recognized degree or credential" (Alfeld & Bhattacharya, 2013, p. i). As Alfeld and Bhattacharya (2013) note, although many of the elements of POS were present to some extent before Perkins IV, the 2+2 approach of Tech Prep and previous iterations of this idea did not place as strong of an emphasis on providing opportunities for college credit in high school or integrating academic and technical content into a coherent sequence of courses.

Research on the Concurrent Courses Initiative (CCI), in which the James Irvine Foundation provided support to eight secondary/postsecondary partnerships in California to develop career-focused dual-enrollment POS specifically targeted to populations historically underrepresented in higher education, provided tentative support of this model. Multivariate and propensity score matching analyses suggested that participants in this DE-CTE model were more likely to attend a four-year institution, persist to their second year, and earn more college credits by the end of their first year compared to their peers, and they were also less likely to enroll in basic skills courses (Rodriguez, Hughes, & Belfield, 2012). The finding that the model was associated with an increased likelihood of four-year enrollment was particularly intriguing given the CTE focus of the programs and the research on the diversionary effects of Tech Prep (e.g. Cellini, 2006).

Alfeld and Bhattacharya's (2013) longitudinal, multi-site, mixed-methods investigation of three colleges with mature POS highlights a number of key components of this model as well as barriers to its successful implementation. One of the most critical benefits of the POS model of DE-CTE is that students would be sure to receive the credit they had earned. The researchers found that "each of the sites had begun enrolling high school students taking dual credit courses in the affiliated college, so that a college transcript would be generated and college transcripts automatically transcripted. This was a solution to the problem of paper certificates being lost or escrowed credits not being claimed by students" (p. 17). However, the researchers also observed greater secondary-postsecondary alignment in regards to the CTE courses compared to the horizontal alignment of the CTE and academic content: "Academic instruction often occurred in a separate, unrelated sequence" (p. 18). In addition to the automatic credit transcription, mature POS also exhibited strong secondary-postsecondary partnerships with a shared vision for student success, active advisory committees, and dedicated staff to support the development and implementation of POS. Although the quantitative portion of the study was limited by a small sample size and lack of a reasonable comparison group, students participating in mature POS generally agreed that the experience motivated them to want to come to school and helped them make connections between their education and careers they were interested in.

Despite the potential benefits of DE-CTE as envisioned through POS and examples of successful implementation of this model, POS are not always implemented as intended. In a study of three urban districts in three different states' implementation of POS (Castellano et al., 2014), researchers found that students earned more CTE credits and were more likely to graduate high school when they enrolled in POS. But participation in DE-CTE courses and the receipt of industry-based credentials was low, two key design features of POS. In fact, POS completers were less likely to earn college credits during high school in instances where there were significant differences between the two groups. The authors mused that this finding should not come as a surprise if students completing a POS had aspirations to attend a four-year institution and assumed completing AP courses would be a better option than DE. However, the POS were not intentionally designed to integrate AP and CTE coursework, and the authors' speculation raises questions about the target population and purpose of POS in the first place. We will return to these issues in a subsequent section.

Early College High Schools Early College High Schools (ECHS), in which high school students can often earn up to 60 credits and an associate's degree, were diffused across the country largely through the Bill and Melinda Gates Foundation's Early College High School Initiative (ECHSI). One of the original core principles of the ECHS model is that students "earn an associate's degree or 2 years of college or credit *toward the baccalaureate* while in high school" (Berger et al., 2007, p. 14, emphasis added). This model may therefore preclude the adoption of DE-CTE if CTE coursework is perceived as being mis-aligned with the core ECHS principles. However, the comprehensive study evaluating the implementation of ECHS across the country found at least a small number of ECHS that were offering paths to career and vocational training in addition to the standard two-year associate's degree path. As one ECHS leader stated: "You have to be careful saying 60 [credits] is a goal for all of the students…Sixty should be a goal, but maybe not for every student" (Berger et al., 2007, p. 16). The report concluded by raising the question of whether the core principles of ECHS should be revised to allow a greater emphasis on CTE pathways.

Since that report, the literature on ECHS has greatly expanded, and the vast majority of studies find that students who participate in ECHS are significantly more likely to graduate from high school, attend college, and complete a postsecondary credential compared to a control group, even when assignment to ECHS participation was random (Edmunds et al., 2010; Edmunds et al., 2017; Edmunds et al., 2020; Song & Zeiser, 2019; Song, Zeiser, Atchison, & Brodziak do los Reyes, 2021). Yet the literature review did not identify studies that specifically examine the efficacy of ECHS with a CTE focus, nor was data identified on the number or percentage of ECHS which utilize DE-CTE as a strategy to facilitate students' transition into postsecondary. Thus, it is unclear how frequently DE-CTE is used in the context of ECHS or how effective that approach may be vis-à-vis the traditional academic focus of ECHS.

Novel Models: Linked Learning and P-TECH As alluded to above, the significant changes brought to CTE through Perkins IV and the rapid expansion of dual-enrollment have led to a number of novel models of DE-CTE, many of which have not been formally studied or results are not publicly disseminated yet. But a few of these newer models are worth mentioning. The California Linked Learning District Initiative, also funded by the James Irvine Foundation, can be understood as an extension of the original Concurrent Courses Initiative but aimed at district- and school-wide implementation. Linked Learning pathways are organized around one of California's 15 major industries and integrate academic and technical content, incorporate work-based learning and internships, and prioritize dual-enrollment as part of pathways. An evaluation of nine of the first district adopters of the model found that students with low prior achievement appeared to particularly benefit from the program: they were 4.5 percentage points less likely to drop out, 7.6 percentage points more likely to graduate, and 5.7 percentage points more likely to enroll in college (Caspary & Warner, 2017; Warner et al., 2016). African-American students who participated in Linked Learning pathways were also more likely than matched peers to enroll in a four-year college. Although these positive results were not as evident for the full sample of students, the Linked Learning Initiative has grown considerably since that study began, and research on the implementation and efficacy of the model is ongoing.

Another novel and growing DE-CTE approach is P-TECH 9-14, which began in New York City through a partnership between IBM, the New York City Department of Education (NYC DOE), and the City University of New York (CUNY). The P-TECH 9-14 model includes many of the same core components as models discussed above: career-oriented curriculum, industry and college partnerships, work-based learning with job shadowing and paid internships, and the completion of college courses in high school. But at least one aspect of the model appears unique: students in the program have an opportunity to complete a cost-free, industry-recognized associate's degree from a CUNY college after completing high school. Preliminary results from an evaluation of the P-TECH model has found that students randomly admitted to a P-TECH school accumulated significantly more credits, attempted and passed more Regents exams, and were qualified to take dual-enrollment courses from CUNY at higher rates than a control group (Rosen et al., 2020). In future years, the evaluation will examine students' college credit accumulation, transition to college, and eventual college attainment.

BARRIERS TO DE-CTE

The previous section reviewed much of the extant empirical literature on various models of DE-CTE. While each model was discussed individually, a set of themes emerged from the literature review relating to barriers to the successful development of DE-CTE programs that can effectively prepare students for life after high school. These themes are briefly discussed here.

Many of the barriers to developing successful DE-CTE models are common to both DE and CTE programs individually. Should the courses be provided at the college to provide an authentic college experience, or do transportation and logistical issues make it more feasible to provide the courses at the high school? What qualifications do teachers of DE-CTE courses need to have, and how can they be recruited, trained, and retained? What is the funding model for DE-CTE – federal funds, state

appropriations, district expenditures, college allocations, or student fees? How can programs be designed that are relevant to the needs of business and industry? And what do effective models of collaboration and co-development of programs between secondary and postsecondary entail? These themes were repeated throughout the literature review in studies on Career Academies, Tech Prep, Programs of Study, and other DE-CTE models.

But perhaps the greatest barrier to successful design and implementation of DE-CTE models is philosophical ambiguity: What populations of students are these models designed for? Is their primary purpose to facilitate successful entry into the labor market directly after high school, postsecondary technical education, or preparation to pursue a four-year degree? Should programs be designed for students to explore multiple pathways and career fields during high school, or should students be

encouraged to concentrate in a particular area to prepare for the transition into that field after high school? And how can rigorous academic and applied content be seamlessly integrated while maintaining a clear focus on the purpose of the program?

Of course, there are no singular answers to these questions. What constitutes an effective DE-CTE program depends on the characteristics of the population(s) of students being served, the geographic and socioeconomic context of the community, the types of higher education partners in the area, and the available alternatives to secondary education. And while preparing students for college *or* career may be a false dichotomy, designing programs that facilitate students' transition into the labor market or postsecondary education remains a challenge.

APPENDIX A7

Early College High Schools

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WHAT ARE EARLY AND MIDDLE COLLEGES?

Early College High Schools (early colleges for short) are one of the most promising models of implementing dual enrollment. Because the term early college is used differently in different states, it is important to define the term for purposes of this literature review.

The term early college can mean anything from simply being another name for the state's dual enrollment program (as in Maine) to a very specific school model with specific requirements (e.g., Texas and other states). For purposes of this review, I consider the criteria used by most states: early colleges are focused schools (or, in some cases, programs) that blur the line between high school and college and that have an expectation that all students in the program will earn a substantial amount of college credits, frequently up to an associate degree or two years of college credit at the same time that they earn their high school diploma. Early colleges are generally targeted at students who are underrepresented in college, such as those who are first generation college-goers, economically disadvantaged or members of racial and ethnic groups underrepresented in college. Early colleges also take a more comprehensive approach than just providing students with dual-enrollment courses; they usually implement comprehensive academic and affective supports and may be expected to make other changes in curriculum, instruction, and the professional working environment.

These schools may often be called middle colleges as well, although in some states there are differences between early and middle colleges. For example, in North Carolina, middle colleges start in grade 11 while early colleges start in grade 9. Historically, some groups saw the distinguishing factor between early and middle college as the population served, with early colleges serving gifted students and middle colleges serving underrepresented students. As the model has evolved, the distinction between the two has become blurred and I use the term early college here to encompass both. Table 1 below summarizes different key definitions of early colleges in states with some of the higher levels of early college implementation.

OVERVIEW AND METHODOLOGY OF LITERATURE REVIEW

Because early colleges are a comprehensive, generally whole-school, approach to implementing dual enrollment, the literature covers a wider range of issues than just those related specifically to college-level coursetaking in high school. Additionally, studies that look at the impact of early colleges are really looking at the impact of taking dual enrollment courses within a context of broader school changes and structures.

I used the search terms "early college", "early college high school", "middle college" and "middle college high school" in the following online databases: Academic Search Complete, ERIC, Education Source, and PsychInfo. I included peer-reviewed journal articles, dissertations, formal evaluation reports, and book chapters (when available). I reviewed the abstracts for a total of 185 references for their focus, methodology, and key findings including: 5 books or chapters; 60 dissertations; 2 general interest journals; 86 peer-reviewed journal articles; and 32 reports. I reviewed the full content of the articles or reports for the impact and cost studies, in addition to the complete articles for most of the peer-reviewed articles.

LITERATURE REVIEW FINDINGS

Despite their relatively recent expansion, there is a fair amount of research on early colleges, likely at least partially due to their innovative nature. Much of the early literature was descriptive in nature, describing programming and understanding student experiences. Approximately a fifth of the citations reviewed were program descriptions. The early college model did benefit early on from being the subject of a large-scale descriptive evaluation of the national Early College High School Initiative.*Table 1: Early College Definitions and Policies across Selected States*

Characteristic	National Early College Initiative Core Principles (Berger et al., 2009)	Indiana	North Carolina	Michigan (also uses term Middle College)	Texas
Legislation/ policies	NA	Authorizing legislation, Core Principles for "endorsing" early college	Authorizing legislation for Cooperative Innovative High Schools, schools must apply to state to operate, recommended Design Elements	Authorizing legislation, schools must apply to state to operate	Authorizing legislation, schools must apply to state to be designated as an early college and must meet specific Design Elements articulated in a Blueprint
Structure	NA	Grades 9-12; generally implemented in comprehensive schools	Small schools (no more than 100/grade), often on college campuses, option for fifth year, same flexibility as charter schools	Can be stand-alone school or programs within a larger school, must offer 5th year; Recommended to be on college campus	Stand-alone schools, programs within schools, grades 9-12

Target population	Serve students underrepresented in higher education	First generation, economically disadvantaged, underrepresented minorities	First generation, at-risk of dropping out, student who benefit from accelerated instruction	NA	At-risk students and students who are underrepresented in college
Partnerships	LEA, IHE, community	Relationships with IHE, business	Partner with IHE, recommend business partnerships	Formal agreement with IHE	Formal agreement with IHE
Coursetaking expectations	1-2 years of college credit	Associate degree or 30 hours of gen. ed. coursework; core high school courses	Associate degree, technical certificate, two years of gen. ed courses	60 transferable credits, associate degree, technical certificate, registered apprenticeship, curriculum to meet h.s. graduation requirements	Associate degree, 60 transferable credits, curriculum to meet h.s. graduation requirements
Supports	Comprehensive academic and affective supports	Comprehensive academic and affective supports	Comprehensive advising and support, parental outreach	Recommended small size to create a learning community	Comprehensive supports, including individualized plans
Other	Advocate for supportive policies	Emphasis on rigorous instruction, college-going culture, leadership, data use	Emphasis on innovative and college-ready instruction, leadership and professional practice	Recommended multiple opportunities for student assessment, democratic school governance, and professional development	Leadership team, must offer TSI exam with preparation, must have college liaison, professional development

Funded by the Bill & Melinda Gates Foundation, the seven-year program evaluation explored many aspects of implementation of the early college and provided descriptive information about student outcomes (American Institutes of Research & SRI International, 2008; Berger et al., 2009; Berger, Adelman, & Cole, 2010). These reports provide a strong and extensive snapshot of the early college work through 2009. The findings suggested that early college students had positive academic outcomes and

were more likely to enroll in college, particularly two-year colleges, than similar populations nationally, although this study could not account for differences in student characteristics between early college attendees and potential comparison students. Key findings relative to implementation indicated that the model was more effective when it was on a college campus, suggesting the "power of the site." Early colleges provided extensive supports but were also trying to create independent learners. The evaluation also found that collaboration between secondary and postsecondary education was not as strong as it needed to be.

As the number of early colleges has also expanded, the amount of research has significantly grown, and researchers have begun looking at more specific aspects of the early college and have also been able to look more rigorously at the outcomes. Overall, the research findings could be considered very positive with almost all articles describing positive outcomes and experiences for the participating students. There are a small number of articles that take a more critical approach, investigating what happens if students are not successful in the model or the stresses that can be associated with it. The overall positive findings from the early college model have led the federal government to regularly reference it as an example of a proven model (Benson, 2021).

Because the early college is a more comprehensive model that includes dual enrollment as only one component, the research covers a wider range of topics, including topics that are more tangentially related to dual enrollment. This literature should not be discarded, however, as the research can be considered as providing insights not only on dual enrollment but on the other factors that might be necessary to facilitate the success of dual enrollment opportunities. For example, early college researchers have sought to understand issues such as college readiness (how to prepare students for college courses) as well as how to support students who are taking dual enrollment courses. These are issues that are critical to the successful expansion of dual enrollment but may not always be considered by traditional dual enrollment researchers.

Because of the range of topics covered by the early college literature, I am focusing this review on what we have learned about early colleges in five areas: 1) student participation; 2) impacts; 2) their cost and cost-benefits; 3) various aspects of implementation; 4) students' experiences; and 5) efforts to scale up early colleges in other settings. At the end of this literature review, there is a complete list of references. The hope is that this list will be a resource for other researchers who might be interested in very specific parts of the early college experience.

Participation By design, early colleges are focused on students who are underrepresented in college. The national evaluation found that early colleges, at least in the early years, had higher enrollments of minority students and low-income students than the districts in which they were located (American Institutes of Research & SRI International, 2008). More recent studies suggest that early colleges served students whose race and income levels were representative of the districts in which they were located; however, early colleges also had lower proportions of students with disabilities, male students, and students who had 8th grade achievement below grade level (Edmunds, Unlu, Furey, Glennie, & Arshavsky, 2020). One qualitative study examined the recruitment and admissions procedures of five early colleges in Texas and found that, although early college staff understood the target population, the admissions process favored students who were more academically inclined and motivated, primarily because those were students who were seen as best able to succeed in the model (Duncheon, 2020).
It is important to note that there is no national database on early colleges, so it is not clear how many of these schools exist, although individual states such as Texas, North Carolina and Michigan keep track of their numbers. The American Institutes of Research (AIR) has received a new grant from the Institute of Education Sciences that will cover the development of such a database so this information will likely be available within the next couple of years.

Impact The structure of early colleges—most of which are schools of choice with more applicants than they can accommodate—lends itself more easily than regular dual enrollment to a rigorous examination of the impact of the model. There are three large-scale impact studies that used lottery-based experimental designs to examine the impact of the model on students' high school and postsecondary outcomes. The first is a seventeen-year study of more than 4,000 students who applied to 19 early colleges in North Carolina (Edmunds et al., 2012; Edmunds et al., 2020; Edmunds, Unlu, et al., 2017). The second is a retrospective study of 2,500 students in 10 early colleges throughout the country, including some from the North Carolina study (Berger, Turk-Bicakci, Garet, Knudson, & Hoshen, 2014; Berger et al., 2013; Haxton et al., 2016; Song & Zeiser, 2019) and the third is an experimental study of the P-Tech model, a specific early college model that has a strong focus on work-based learning (Rosen et al., 2020). In all three studies, students applied to attend an early college and then were randomly selected either to attend or not to attend. The studies then compared results for those accepted through the lottery (treatment group) and those not accepted (control group). All three studies have been determined to meet What Works Clearinghouse standards without reservations, which means that the results can be considered to provide valid evidence of effectiveness.

Both of the broader early college studies have relatively consistent findings with positive impacts on both high school and college outcomes. The Edmunds et al. study found early college students had fewer absences and suspensions in high school and that students were more likely to complete the high school courses necessary for entrance into a four-year university (Edmunds et al., 2012; Edmunds, Willse, Arshavsky, & Dallas, 2013). The AIR impact study found that early colleges had a positive impact on students' English Language Arts test scores but no impact on math test scores (Berger et al., 2013). Both studies found that students were more likely to remain in and graduate from high school, although the difference was not always significant at the traditional .05 level (Berger et al., 2013; Edmunds, Unlu, et al., 2017). Both studies found that early college students were more likely to enroll in postsecondary education and receive a postsecondary credential with a larger impact on attainment of associate degrees (Edmunds et al., 2020; Song & Zeiser, 2021). Edmunds et al. also found that students completed their degree in less time and that treatment and control students had the same GPAs (Edmunds et al., 2020). The P-Tech study was not able to look at postsecondary outcomes but did find that P-Tech students earned more credits than comparison students and were more likely to pass the English-Language Arts Regents exam with a score making them eligible for college-level courses (Rosen et al., 2020).

Given early college's emphasis on underserved students, these studies have also looked at results for sub-groups. Results suggest that outcomes are generally more positive for students in the target population. The Edmunds et al. study found stronger impacts for economically disadvantaged students; this population was the only sub-group that had a statistically significant impact of four-year degree attainment within six years of graduating from high school (Edmunds et al., 2020). The AIR study also found that the impact on college degree attainment was significantly stronger for low-income students, minority students and for students with higher incoming achievement (Haxton et al., 2016).

There were also four other quasi-experimental studies that looked at the impact of the small early college model in various settings, two of which suffered from small samples. Two were rigorously designed quasi-experimental studies that looked at the impact of all the early colleges in place in North Carolina at the time of the study (Lauen, Barret, Fuller, & Janda, 2017; Swiderowski, Lauen, Fuller, & Unlu, 2021). On average, these studies came to the same conclusions as the experimental studies, including positive results for student achievement in English and suspensions (Munoz, Fischetti & Prather, 2014; Chapa, Galvan-De Leon, Sols, & Mundy, 2014) and positive impacts on postsecondary enrollment and degree completion (Lauen et al., 2017). A very recently published article from the North Carolina quasi-experimental study reported positive impacts from the early college on voting participation and reduced participation in the criminal justice system with higher impacts for black males and economically disadvantaged white students (Swiderowski et al., 2021).

Funding and Cost When early colleges first started, Jobs for the Future, one of the early supporters of the model, contracted for a cost analysis. The estimates suggested that early colleges cost more to operate than regular high schools, particularly those associated with a four-year university (Webb, November, 2004). Since then, there have been only two other published estimates of the cost of the early college model. One was an estimate done by the Washington Institute for Public Policy (2019), which found that early colleges cost an additional $4,200 per student but the return on investment was 17:1. Similar findings came from a cost study that was part of AIR's experimental impact study that found that the early college cost more to implement than a regular high school (roughly $1,000 for each student annually) but that the return on investment was very high, on the order of

$15 in returns for every $1 invested (Atchison, Zeiser, Mohammed, Levin, & Knight, 2019). This second study did have its strengths, in that it was able to connect to impact estimates that were determined experimentally; however, it did face challenges in that they were only able to use existing administrative data, which is likely to have not captured all of the relevant expenses associated with the model. There was one additional small qualitative case study that described how early colleges were funded in one state (Leonard, 2013).

Implementation Much of the existing research focuses on varying aspects of implementation of the early college, including supports provided to students, college readiness, the secondary-postsecondary partnerships, and a limited amount of research on instructional practices. This section presents a brief overview of this literature.

Supports Nine papers had a specific focus on the supports that students received in the early colleges, although other papers included references to supports in the context of a larger picture. These papers were qualitative or descriptive in nature and described the type of supports that were provided to students. Both early college experimental studies explored the extent of supports students received and found that early college students reported more support than students in the control group (Berger et al., 2013; Edmunds et al., 2013).

Partnerships Nine papers had a primary focus on partnerships. These studies were all qualitative or used a combination of surveys and interviews to understand the nature of the relationships between the high school and college. Most of these studies tried to identify factors that were associated with successful collaboration. For example, one study identified themes from interviews that suggested that success factors included a history of collaboration, collaboration that was seen as in the organizations' self-interest, a favorable political climate, an appropriate cross section of members, a shared stake in the process and outcomes, shared decision-making, concrete goals and objectives, and a shared vision (Bush, 2017).

College Readiness Nine papers had a primary focus on college readiness with half of the articles using some quantitative measures of college readiness, finding that early college students were either better or similarly prepared as students who entered college via a traditional route. For example, one study compared performance on reading and math end-of-course exams for early college students with comparison students, controlling for background achievement. The study found that early college students were more prepared in reading but not in math (Chapa et al., 2014), which is similar to the findings from the AIR study (Berger et al., 2013). Three of the studies also explored conceptualizations of college readiness, with the general consensus that college readiness needs to be considered as a multifaceted approach (Duncheon & Munoz, 2019; Edmunds, Arshavsky, et al., 2017; Reynolds, 2017). One article used data from an experimental study and found that early college students were more likely to be ready for college on a variety of factors; this article also described strategies that early colleges were using to promote students' college readiness (Edmunds, Arshavsky, et al., 2017).

Other implementation issues Researchers have also engaged in some exploration of other issues associated with implementation. The national evaluation conducted classroom observations of high school and college classes, focusing on instruction. Approximately half of the lessons showed high rigor although only a third showed high support for rigor from the instructors with support lower from the college instructors (American Institutes of Research & SRI International, 2008). One dissertation looked at perceptions of instruction and three papers looked at literacy instruction or experiences.

Leadership in the early college was a popular dissertation topic with eight doctoral candidates and two peer-reviewed articles qualitatively exploring leadership styles or characteristics of leaders. For example, one dissertation examined the characteristics of middle or early college principals (Rich, 2012).

Student experiences As noted earlier, a substantial portion of the research focuses on understanding and describing students' experiences, particularly for African-American students or Hispanic/Latino students. Twenty-two studies, almost all of

which were based on qualitative student interviews, focused primarily on students' experiences, although other papers may have included descriptions of student experiences as part of a larger discussion. These articles generally highlighted the positive experiences that students had as part of the early college. For example, one article described how the early college helped Black males conceptualize themselves more as scholars (Adams, Robinson, & Lewis, 2020). One article reported results from a survey conducted as part of the North Carolina experimental study, examining differences in experiences between early college

students and control students attending regular high schools. This article found that early college students reported more support, higher expectations, better relationships with staff and more rigorous and relevant instruction (Edmunds et al., 2013). One article reported on Latina students' experiences in an early college, describing how the staff and the small size of the school supported the creation of social capital, although some teachers did have low expectations for students (Locke, Maxwell, & Tello, 2017).

Some studies did identify challenges for students. One study described how a key challenge was managing a demanding college schedule while in high school (Allen, 2016). Another reported that early college students were more likely to experience stress and had fewer social experiences than students who entered college via a more traditional route (Oliver, Ricard, Witt, Alvarado, & Hill, 2010). A third study found that a poor experience in a college-level science class made early college students less likely to take subsequent science classes (Alaie, 2011).

There is a small amount of research that explores students' experiences once they leave the early college and enroll in further postsecondary education. One study interviewed three early college graduates, who all felt they were academically and socially prepared, and did not believe that they were missing anything because of their participation in the early college (Woodcock & Beal, 2013). The Edmunds et al. experimental study did look at students' academic performance in college and found there was no difference in GPA between early college and control students (Edmunds et al., 2020). However, there has not yet been any large-scale examinations of students' post-early college experiences.

Scaling up early colleges. Given the positive outcomes of the small early college model, there has been considerable interest in attempting to scale up the model to serve larger numbers of students. The U.S. Department of Education has funded five large-scale efforts to implement early college strategies in comprehensive high schools; two of those efforts—one implemented in Texas and Colorado and one in Michigan and Connecticut—have completed evaluations. Both efforts sought to change comprehensive high schools by fostering a more college-going culture, changing instructional practices, increasing student support, expanding the number of students taking dual enrollment courses, and changing the way school staff worked together.

Overall, the evaluations found that it was challenging to implement the changes required by early colleges in comprehensive high schools. The evaluation of the Early College Expansion Project, which was implemented in Texas and Colorado, found no impacts on the percentage of students successfully completing a college preparatory course of study and no impact on the number of Carnegie units earned in college-level courses, although there were already very high rates of students taking college-level courses (close to 90% in Texas). In Texas, treatment schools had lower high school dropout rates than comparison schools, but the opposite was seen in Colorado (Edmunds, Klopfenstein, Lewis & Hutchins, 2018). The evaluation of the STEM Early College Expansion Project was only able to rigorously examine outcomes of the work in Michigan. Findings from that quasi-experimental study showed that the model was able to expand access to college courses and increase the number of credits earned by students, although there was no significant impact on dropout rates (Edmunds, Dudley, Hutchins, Arshavsky, & Lewis, 2019).

APPENDIX A8

Dual Enrollment Faculty, Professional Development, and Faculty Background and Training

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Research into faculty perspectives can provide another critical layer of insight into DE's efficacy and challenges. To that point, what do instructors perceive to be the benefits of dual enrollment for students, school systems, communities, and themselves? What challenges and concerns mark the work they do? How do experiences and training help instructors develop strategies to meet learner needs? What professional relationships and support do they find to be beneficial or lacking? How do they perceive their roles, and what ideas do they have for improving the dual enrollment experience?

The goal of this review is to examine the literature regarding faculty perspectives on dual enrollment teaching and learning. This review examines cultural, pedagogical, and professional factors that affect the experiences of DE instructors. Findings from this review reveal complexity in the dual instructor role that suggests the need for DE teachers to possess particular attributes—not necessarily correlated to credentialing, alone—that lead to success in DE teaching and learning. Information from this review can inform educators in their efforts to recruit, support, and retain high-quality DE instructors as they build robust programs. For the purposes of this review, the term "dual enrollment" is used interchangeably with other comparable names for college credit in high school programs.

METHODOLOGY OF REVIEW

Peer-reviewed empirical studies of dual enrollment college faculty and adjuncts, high school concurrent/dual enrollment (DE) instructors, and early college high school (ECHS) teachers were selected for this review. Specifically, the studies selected provide data regarding instructors' perspectives on teaching and learning in dual enrollment spaces. Several studies also incorporated the views of students, administrators, and/or other school professionals.

During the initial search, concepts of "professional development," "preparation," "dual enrollment," and "high school teachers" were utilized. A combination of terms was searched in article title (TI), abstract (AB) and descriptor/subject (DE/SU) fields. Researched-based terms were then added to the searches for an additional set of results. ERIC, Education Source, and APA PsychInfo were the databases utilized for the initial search with combined descriptors of "preparation" + "dual enrollment" + "secondary/teachers" yielding 124 results in ERIC, 102 results in APA PscyhInfo, and 55 results in Education Source. The majority of results from the initial search that matched the criteria for this project were dissertations. In order to be inclusive of research into perspectives on teaching and learning of dual enrollment college faculty, adjuncts, and ECHS instructors, a more refined search followed the initial search.

Two main databases were employed for the refined search: ERIC and Education Source. The attempt was to capture records to studies, which might discuss any aspect of professional development and collaboration along with dual enrollment; and separately, any records, which included the terms "faculty" or "teachers" with the phrase "dual enrollment." Both of these search

approaches were more comprehensive than combining all concepts. Search 1 included the terms "preparation," "professional development," and variants of those terms along with "collaboration" (and its variants) combined with "dual enrollment" (and its variants). Search 2 included the terms "teachers" and "faculty" and variants of those terms combined with "dual enrollment" (and its variants). The searches were limited to academic journals. Search 1 in ERIC elicited 233 results. Search 2 in ERIC elicited 64 results. Search 1 in Education Source elicited 154 results, and Search 2 in Education Sources elicited 55 results. While overlap was inherent in these searches and the initial search, the approach provided confidence that all relevant articles were retrieved. Among the articles retrieved were issue briefs, editorial essays, policy analyses, descriptive studies, and "best practices" manuscripts. These, along with the dissertations found in the initial search, were eliminated, as they did not fit the parameters of this particular research project, which called for peer-reviewed empirical studies.

Overview of Research Studies

METHODOLOGIES

The 25 studies selected for review all used qualitative or mixed-methods approaches. The majority of studies utilized individual or focus group interviews (Burdick & Greer, 2017; Charlier & Duggan, 2009; Denecker, 2020; Duncheon & Munoz, 2019; Duncheon & Relles, 2020; Edmunds, et al., 2010; Ferguson, Baker, & Burnett, 2015; Gilson & Matthews, 2019; Howley, et al., 2013; Hughes & Edwards, 2012; Kaniuka & Vickers, 2010; McWain, 2018; Mollet, et al., 2020; Omer, et al., 2017; Russo, 2020; Schneider, 2010; Staats & Laster, 2018; Thompson & Ongaga 2011; Wilkinson, 2019). Several researchers gathered survey data (Charlier & Duggan, 2009; Chumbley, 2016; Burdick & Greer, 2017; Denecker, 2013; Denecker, 2020; Edwards, et al., 2010; Hanson, Prusha, & Iverson, 2015; Kaniuka & Vickers, 2010; McCrimmon, 2010; Stein & Klosterman, 2020; Gilson & Matthews, 2019; Russo, 2020). Seven studies incorporated document analysis (Charlier & Duggan, 2009; Denecker, 2013; Edmunds, et al., 2020; McWain, 2018; Russo, 2020; Schneider, 2010; Wilkinson, 2019); one study had participants keep an action research log (Hughes & Edwards, 2012), and four studies included observational data (Charlier & Duggan, 2009; Duncheon & Relles, 2020; Edmunds, et al., 2010; Gilson & Matthews, 2019). Sequential questionnaires were used by yet another study (Swafford & Waller, 2018), and one study incorporated ethnographic elements (Denecker, 2013).

PARTICIPANTS

While studies that focused on dual enrollment faculty/instructor perspectives were sought for this review, just 12 were solely limited to this population (Burdick & Greer, 2017; Denecker, 2021; Denecker, 2013; Duncheon & Munoz, 2019; Ferguson, Baker, & Burnett, 2015; Kaniuka & Vickers, 2010; McCrimmon, 2010; Russo, 2020; Staats & Laster, 2018; Stein & Klosterman, 2020; Wilkinson, 2019). Four studies collected data from teachers and students (Omer, et al., 2017; Kaniuka & Vickers, 2010; Schneider, 2010; Thompson & Ongaga 2011). Seven studies collected data from teachers, administrators, and/or others, such as technology coordinators and guidance counselors (Charlier & Duggan, 2009; Chumbley, 2016; Duncheon & Relles, 2020; Hanson, Prusha & Iverson, 2015; Howley, et al., 2013; McWain, 2018; Mollet, et al., 2020). Two studies collected data from teachers, administrators, and students (Edmunds, et al., 2010; Gilson & Matthews, 2019).

PURPOSES

A number of purposes guided the studies included in this review. These ranged from inquiry into DE's educational culture and impact to course rigor and student academic performance. In addition, researchers examined instructors' preparation, pedagogical approaches, and interaction with students.

Howley, et al. (2013) and Gilson & Matthews (2019) looked into educators' perspectives of the benefits and challenges of dual enrollment initiatives. Similarly, Edmunds, et al., (2010, Hanson, Prusha, & Iverson (2015), and Schneider (2010) researched instructors' perspectives on dual enrollment's impact on schools and students, while Chumbley's (2016) study focused on the school and student impact of a dual enrollment agricultural program.

Ferguson, Baker, & Burnett (2015) inquired into the rigor of dual enrollment courses to similar courses taught at the community college, while Kaniuka & Vickers (2010) gathered information pertaining to the academic performance of students in an early college setting as compared to students in a traditional high school.

Two studies researched preparation, support, and/or participation in professional development designed for dual enrollment instructors (Charlier & Duggan, 2009; Denecker, 2020). Four studies asked dual enrollment instructors to define critical terms, such as "college readiness" and its support (Duncheon & Munoz, 2019), "rigor" in college writing instruction (Denecker, 2020), and "college-level writing" (Burdick & Greer, 2017; Denecker, 2013). Likewise, four composition-based studies delved into the general experiences of dual enrollment instructors (McCrimmon, 2010; Wilkinson, 2019), as well as how dual enrollment affects professional identity (Russo, 2020) and academic freedom (McWain, 2018).

Several studies focused on pedagogical approaches within early college or dual enrollment classrooms (Duncheon & Relles, 2020; Hughes & Edwards, 2012; Stein & Klosterman, 2020). Staats & Laster (2018) also focused on pedagogy, specifically concerning Universal Design for Learning (UDL) in algebra courses; their approach included consideration of underrepresented populations served by early college high school. Likewise, Mollet, et al. (2020) studied the institutional culture of early college high school in its support of underrepresented students as compared to support in the college setting. Teacher and student relationships at early college high schools were the focus of two studies (Thompson & Ongaga 2011; Omer, et al. 2017).

EDUCATIONAL SETTINGS

In terms of educational settings, ten studies elicited feedback from high school faculty (Burdick & Greer, 2017; Chumbley, 2016; Denecker, 2020; Hanson, Prusha & Iverson, 2015; Hughes & Edwards, 2012; Russo, 2020; Staats & Laster, 2018; Stein & Klosterman, 2020; Swafford & Waller, 2018; Wilkinson, 2019). Nine studies focused on the perspectives of teachers at early college high schools (Duncheon & Munoz, 2019; Duncheon & Relles, 2020; Edmunds, et al., 2010; Gilson & Matthews, 2019; Kaniuka & Vickers, 2010; Mollet, et al., 2020; Omer, et al., 2017; Schneider, 2010; Thompson & Ongaga 2011). Ferguson & Burnett (2015), McWain (2018), and McCrimmon (2010) included both high school and community college instructors in their studies, while Denecker (2013) queried high school instructors along with faculty at a four-year private university. Howley, et al. (2013) incorporated the perspectives of educators from high schools, community colleges, technical colleges, and universities. Charlier & Duggan (2009) focused their research on community college dual enrollment instructors. Eight of the studies drew insights from DE composition instructors (Burdick & Greer, 2017; Denecker, 2013; Denecker, 2020; McCrimmon, 2010; McWain, 2018; Russo, 2020; Schneider, 2010; Wilkinson, 2019).

GEOGRAPHICAL REPRESENTATION

U.S. locations represented in the study included Missouri and Kansas (Burdick & Greer, 2017), Ohio (Denecker, 2020; Mollet, et al., 2020; Schneider, 2010), Georgia (Mollett et al., 2020), North Carolina (Edmunds, et al., 2010; Mollet, et al., 2020; Kaniuka & Vickers, 2010), Texas (Mollet, et al., 2020; Duncheon & Relles, 2020; Duncheon & Munoz, 2019), Iowa (Hanson, Prusha, & Iverson, 2015), Minnesota (Staats & Laster, 2018), Washington (Stein & Klosterman, 2020), California (Hughes & Edwards, 2012), New Mexico (Chumbley, 2016), Kentucky (Wilkinson, 2019), and Virginia (Russo, 2020). Two additional studies were described as being located in the Midwest (McWain, 2018; Howley et al., 2013), and one was described as situated in the Southern U.S. (Ferguson, Baker, & Burnett, 2015).

FINDINGS OF THE REVIEW

Dual enrollment college faculty, adjuncts, and high school instructors are situated in what McWain (2018) described as a liminal space and thus are uniquely positioned to provide insight into a number of aspects of teaching and learning. Specifically, participants commented on contextual as well as structural, curricular, foundational, and pedagogical differences between secondary and post-secondary education (Denecker, 2013; Duncheon & Relles, 2020; Duncheon & Munoz, 2019; Hughes & Edwards, 2012; Gilson & Matthews, 2019; Kaniuka & Vickers, 2010; McCrimmon, 2010; McWain, 2018; Mollet, et al., 2020; Omer & Killacky, 2017; Russo, 2020; Schneider, 2010; Staats & Laster, 2018; Stein & Klosterman, 2020; Thompson & Ongaga 2011; Wilkinson, 2019). Several studies delved into dual enrollment instructors' often complicated identities, as well as their professional development needs and what they perceive as college readiness and college-level work (Burdick & Greer, 2017; Charlier & Duggan, 2009; Chumbley, 2016; Denecker, 2020; Duncheon & Munoz, 2019; Howley, et al., 2013; McWain, 2018; Russo, 2020; Thompson & Ongaga 2011; Wilkinson, 2019). In addition, participants provided insight into DE's effects on students, instructors, and school systems (Chumbley, 2016; Edmunds, et al., 2010; Ferguson, Baker, & Burnett, 2015; Hanson, Prusha, & Iverson, 2015: Schneider, 2010; Staats & Laster, 2018).

Through a constant-comparative method of coding, the researcher organized findings into three overarching categories: "K-12 and post-secondary institutional differences," "the dual instructor role," and "holistic impact of dual enrollment." Granted, the line between each category is not distinct, and some overlap in the discussion of findings is inherent. Still, the categories provided a framework for organizing and then delving into a synthesized and focused discussion of the studies' findings. The institutional differences category encompasses educational contexts and standards, with subcategories of cultural expectations, labor conditions, and foundational discourse. The dual instructor role category includes subcategories of instructors' expertise and dispositions, professional development, and pedagogical approaches. The holistic impact of dual enrollment category examines instructors' perceptions of dual enrollment's effects on students, teachers, and organizations and includes a sub-category of relationship building.

K-12 AND POST-SECONDARY INSTITUTIONAL DIFFERENCES

Much of the literature points to the ways that dual enrollment instructors perceive differences between secondary and post-secondary institutions in terms of expectations, culture, curriculum, and power dynamics. As noted earlier, McWain (2018) describes dual enrollment as a liminal space. It is neither high school nor college; it is something in between. Similarly, participants in Wilkinson's (2019) study described DE courses as not fully in college or fully in high school. One such indicator is that college students in a first-year writing course do not know one another (presumably); while in contrast, high school students in a DE first-year writing course may know one another well. Thompson & Ongaga (2011) described how the daily routine of high

school differs from that in college, and Wilkinson (2019) described how the pace of a DE course might differ from that of traditional, on-campus course, since some DE courses run an entire academic year versus the traditional semester model.

Cultural Expectations Mollet, et al. (2020) noted that norms for procedures, responsibilities, and academic curriculum were often dissimilar between K-12 and colleges, while participants in Duncheon & Relles' (2020) study reported misalignment between high school and college standards, including differences in expectations for coursework, students' foundational knowledge, and grading scales. As a result, some findings show that DE instructors have to bridge coursework or provide scaffolding and additional academic supports since students might lack adequate preparation to take college courses (Duncheon & Relles, 2020; Hughes & Edwards, 2012). In addition, some instructors feel as if they should provide a "safety net" for students who struggle (Duncheon & Munoz, 2019), and some feel compelled to adjust typical college-level teaching practices to the DE population (Schneider, 2010).

In contrast, instructors in Ferguson, Baker, and Burnett's (2015) study saw DE students as "ahead" academically but less mature in terms of behavior. Several studies cited a cultural expectation of rigor balanced with support in dual enrollment courses (Chumbley, 2016; Duncheon & Munoz, 2019; Ferguson, Baker, & Burnett, 2015; Omer, et al. 2017; Hughes & Edwards, 2017; Gilson & Matthews, 2019; Staats & Laster, 2018).

Howley, et al. (2013) and Wilkinson (2019) described the power structure of DE partnerships as unidirectional, most often with colleges imposing their cultures on high schools. For example, according to Howley, et al. (2013), college faculty do not always readily communicate with their high school counterparts. They often impose their cultural expectations onto the high school setting, refuse to interact with parents or adjust curriculum, and offer critical feedback to high school teachers on instruction; however, they do not elicit advice or feedback from their secondary counterparts (Howley, et al., 2013). Howley, et al. (2013) also noted that while college faculty observed and provided critique to high school instructors, the reverse did not occur. Duncheon & Relles (2020) reported that DE instructors receive inconsistent messaging from their K-12 and higher education partners. One study noted how the power dynamics were reversed when the high school teachers' union voted that no dual enrollment courses could be offered during traditional school hours (Howley, et al., 2013). Likewise, participants in Duncheon & Relles' (2020) study reported high school administration intervening on grading issues, since the high school and college had two different grading scales.

Labor Conditions Duncheon & Relles (2020) described dual enrollment instructors as serving "two masters" (p. 1000), while McCrimmon (2010) described them as caught in the middle between differing educational value-systems. According to Russo (2020), DE instructors experience tension in their professional identities since they are not part of college curricular discussions nor are they consistently listened to or valued by high school administrators. This tension in a dual enrollment instructor's identity is reflected in Wilkinson's (2019) study where participants did not describe themselves as college writing instructors; instead, they described themselves as high school teachers who teach college writing.

McWain's (2018) research unpacked the various pressures faced by high school DE instructors, such as managing differing curricular requirements or interacting with parents. McCrimmon's (2010) study also pointed out the obstacle of parental involvement, while participants in Mollet, et al.'s (2020) studied were uncertain whose job it is to address student behavioral issues. Omer, et al. (2017) described the work of early college high school instructors as intense, since many take on the emotional burdens of supporting students not only inside but also outside the classroom. Dual enrollment teachers also face standardized testing pressures and bureaucratic constraints (Thompson & Ongaga, 2011).

Specifically, the labor conditions of high school English teachers vary greatly from those of college composition instructors, since writing is not taught as a stand-alone course in high school (Denecker, 2013). Likewise, teachers must meet state and national standards and have a larger paper-load than that of the typical college professors (Denecker, 2013). Wilkinson (2019)

reported that DE high school instructors faced the pressure of balancing a full-time job with DE training expectations, such as taking a course in writing pedagogy. Similarly, McWain (2018) noted that DE instructors have less time to work collaboratively and less time for professional development and course planning—findings similar to those of Wilkinson (2019) and Russo (2020) who described DE instructors as feeling isolated from their college counterparts.

These tensions in labor conditions were less apparent in the studies into early college high schools. Several studies reported teacher perceptions of supportive, collaborative work atmospheres (Edmunds, et al. 2010; Thompson & Ongaga, 2011; Kaniuka & Vickers, 2010).

Foundational Discourse In order to navigate the space between high school and college, dual enrollment instructors must speak the language of both worlds; this common terminology is "foundational discourse." Burdick & Greer (2017) reported that high school DE instructors' definitions of college-level writing generally align with those of post-secondary, on-campus writing instructors. However, Denecker's (2013) study teased out differences between high school and college writing instructors' definitions of thesis, process, and "good" college-level writing. In another study, Denecker (2020) explored one group of DE writing instructors' definitions of rigor and found that they reflected those in college writing theory.
Outside the composition field, Duncheon & Munoz (2019) reported divergence in definitions of "college-readiness" among participants and uncertainty as to what constitutes "college-style teaching practices."

THE DUAL INSTRUCTOR ROLE

As described in the labor conditions subcategory, dual enrollment instructors often find themselves straddling institutional boundaries (Duncheon & Relles, 2020) or at odds with college faculty who question their teaching abilities and approaches (Howley, et al. 2013). Studies in this review provide insight into complexity of the dual instructor role.

Instructors' Expertise and Dispositions In several studies, dual enrollment instructors were categorized as experienced educators (Burdick & Greer, 2017; Charlier & Duggan, 2009; Denecker, 2020; Stein & Klosterman, 2020; Wilkinson, 2019). In addition, several studies argued that the attributes of successful dual enrollment instructors go well beyond certification to include knowledge of students, content, and pedagogy, as well as flexibility and problem-solving skills (Burdick & Greer 2017; Denecker 2020; Mollet, et al., 2020). According to Duncheon & Munoz (2019), the dual enrollment instructors in their study also made sense of how to teach college via their own experiences and their family members' experiences with college instruction.

Howley, et al. (2020) described the benefits of educators who can serve as "Border Crossers" (p. 92); these professionals emphasize mutual respect as they bridge secondary/post-secondary expectations. Border Crossers have either prior knowledge and experience or the willingness to interpret and traverse the goals and constraints of secondary and post-secondary educational settings (Howley, et al., 2020). Mollet, et al. (2020) also noted that professionals with K-12 and higher education experience were best at problem solving in DE contexts; in addition, Russo (2020) reported that DE instructors find satisfaction in their border crosser roles.

Professional Development Several studies described professional development, including communication between K-12 and post-secondary partners, as important but not always readily available or consistent (Burdick & Greer, 2017; Charlier & Duggan, 2009; Chumbley, 2016; Denecker, 2020; Denecker, 2013; McWain, 2018; Mollet, et al. 2020; Duncheon & Relles, 2020; Duncheon & Munoz, 2019; Howley, et al. 2013; Kaniuka & Vickers, 2010; McCrimmon, 2010; Russo, 2020; Wilkinson, 2019). According to researchers, professional development opportunities include direct instruction and/or discussions with college faculty (Charlier & Duggan, 2009; Burdick & Greer, 2017; Denecker, 2020; Edumunds, et al., 2020), as well as participation in

graduate courses (Burdick & Greer 2017). However, at least in the case of college composition, professional development is often generalized and not discipline-specific (Denecker, 2020).

When college faculty participated in professional development opportunities with their dual enrollment instructor partners, the results were largely positive (Charlier & Duggan, 2009; Denecker, 2013; Edmunds, et al., 2010; Gilson & Matthews, 2019; Hanson, Prusha, & Iverson, 2015).

Pedagogical Approaches Several studies focused on student-centered pedagogies in dual enrollment instruction. Hughes & Edwards (2012) described the importance of active learning as a pedagogical strategy for meeting students where they are as learners—especially underrepresented students. Hughes & Edwards' (2012) study found success among instructors who crafted meaningful instruction for their specific student population, used multiple means of assessment, incorporated instructional scaffolding, and provided tutoring/outside support. Findings from Stein & Klosterman (2020) corroborate a student-centered approach as most conducive to learning mathematics with teacher-centered approaches as least conducive. Similarly, in their study on Universal Design for Learning (UDL) in equity-focused dual enrollment algebra instruction, Staats & Laster (2018) found UDL as aiding instructors in the shift to student-centered teaching, especially as a positive means for capturing students' mathematical thinking (Staats & Laster, 2018).

In another study, ECHS teachers took a student-centered approach and provided additional support in and out of class: they not only helped students with college scholarships and applications, they also made a commitment to the physical, emotional, and mental wellbeing of students (Omer, et al., 2017). Participants in Gilson & Matthews' (2019) study as well as Edmunds, et al.'s (2010) study exposed students to group work, writing to learn, and active/applied learning.

Duncheon & Relles' (2020) research provided a view into the tension between student-centered and teacher-centered instructional approaches; in many cases, DE teachers are left to resolve this tension on their own. The instructors in Duncheon & Munoz's (2019) study worried about using student-centered approaches because of an assumption that college pedagogy consists mainly of lecture and note-taking, and instructors in Russo's (2020) study found that their workshopping approach was sometimes met with resistance at the high school level.

HOLISTIC IMPACT OF DUAL ENROLLMENT

Instructors' perceptions of dual enrollment's impact on students were largely positive (Chumbley, 2016; Gilson & Matthews, 2019; Hanson, Prusha, & Iverson, 2015; Howley, et al., 2013; Staats & Laster, 2018; Kaniuka & Vickers, 2010; McCrimmon, 2010). Several studies cited increased rigor and expectations as helpful in preparing students for college (Chumbley, 2016; Edmunds, et al., 2010; Hanson, Prusha, & Iverson, 2015; Thompson, & Ongaga, 2011; Staats & Laster, 2018). Chumbley (2016) reported deep learning among students in an agricultural DE program and stated that students gained confidence and developed good study habits. Instructors in Staats & Laster's (2018) study also described witnessing social and emotional growth among DE students.

In contrast, some DE instructors voiced concerns about students taking college coursework. Participants in Howley, et al.'s (2013) study worried that DE forces students to grow up too quickly, while Duncheon & Munoz (2019) noted apprehension about students' motivation, preparation, and ability to take on responsibility for college coursework. Findings from Ferguson, Baker, & Burnett (2015) and Schneider (2010) suggested that DE students might lack the maturity and behavioral dispositions needed for participation in college classes, while Russo (2020) expressed a concern that students are not ready for DE but take it because of limited options at their high schools.

Hanson, Prusha, & Iverson (2015) along with Kaniuka & Vickers (2010), Chumbley (2016), and Gilson & Matthews (2019) described dual enrollment as having a positive impact on school systems, especially in providing challenging coursework resulting in a positive school reputation. Small school size, which allows teachers to know students well, was also cited as a factor for success at early college high schools (Edmunds, et al., 2010; Hughes & Edwards, 2012; Kaniuka & Vickers, 2010; Gilson & Matthews, 2019). The DE instructors in Chumbley's (2016) study described the personal and professional benefits of their work and their desire to keep learning thanks to their DE roles.

Relationship Building Multiple studies into the culture of early college high schools revealed data regarding relationship building. In several cases, participants reported close, family-like teacher-student relationships at early college high schools where teachers were committed to student success and balanced rigor with support (Edmunds, et al., 2010; Gilson & Mattews, 2019; Hughes & Edwards, 2012; Kaniuka & Vickers, 2010; Omer, et al., 2017; Staats & Laster, 2018; Thompson & Ongaga 2011).

Strong collaborative relationships among teachers and/or teachers and administration were reported among participants in three studies (Edmunds, et al., 2010; Kaniuka & Vickers, 2010; Chumbley, 2016), while Thompson & Ongaga (2011) and Chumbley (2016) reported healthy K-12-higher education partnerships. Thompson & Ongaga (2011) also noted that some K-12 educators were not welcoming to college faculty, and Wilkinson (2019) shared that DE instructors struggle to build relationships with on-campus instructors because of time constraints.

APPENDIX A9

Dual Enrollment Implementation, Program Design, and Leadership

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METHOD

To conduct this literature review, I searched the following databases: ERIC, Education Research Complete, Academic Search Premier, and Google scholar. Search terms included: ("dual enrollment" OR "dual credit" OR "concurrent enrollment") AND implementation, ("dual enrollment" OR "dual credit" OR "concurrent enrollment") AND design, ("dual enrollment" OR "dual credit" OR "concurrent enrollment") AND leadership, and ("dual enrollment" OR "dual credit" OR "concurrent enrollment") AND partnerships.

The search resulted in 143 pieces of literature. I reviewed all articles to select those that were empirical research. The review resulted in 33 articles included in this literature review. The sources of the articles included: journals (18 articles), non-profit organizations (8 articles), postsecondary institutions (4 articles), foundations (2 articles), and the Institute of Education Sciences (1 article). Table 1 provides a description of the types of studies and data sources.

Table 1. Description of included articles

Categorization	# of studies	Types of data
Case study of named dual enrollment program(s)	13	Document review, surveys, interviews, and/or focus groups; some studies used student-level data
Perspectives on dual enrollment implementation	12	Surveys, interviews, and/or focus groups
Descriptive research on student participation and/or outcomes	6	Student-level data
Literature review	2	1 article conducted a systematic literature review, 1 article reviewed litigation using legal research methods

Out of the 110 excluded articles, 95 articles were not empirical, and the remaining 15 were empirical but not related enough to the topic of dual enrollment implementation, design, or leadership. Excluded articles fell into four categories:

- Best practices: Forty-nine articles included lessons learned, best practices, and/or recommendations for policy and practice. Authors cited their own expertise, experiences, or prior literature on the topic; no data were collected or analyzed. Seventeen of these articles were published in peer-reviewed journals, the most frequent being New Directions for Community Colleges (4 articles) and New Directions for Higher Education (4 articles). The remaining 31 articles were conference proceedings, policy briefs, policy scans (for example, by Education Commission of the States), and guides released by non-profits (for example, JFF) and other organizations.
- Case studies: Thirty-one articles were case studies of dual enrollment programs with no research. There were no methods section and the description of the program(s) appeared to be based on author experiences or knowledge of the program(s). Eighteen of these articles were published in various peer-reviewed journals across disciplines, the most frequent being New Directions for Community Colleges (7 articles). The remaining 13 articles were released by non-profits, state agencies, and other organizations.
- Off-topic: Twenty-five articles fit under a different topic area and were not related enough to the current topic to warrant inclusion. The other topic areas were primarily career and technical education, tech prep, vocational education, and early college. Some of these articles were not empirical.
- Literature reviews: Five articles were literature reviews with no methods section describing how the literature was selected and analyzed. These literature reviews also included best practices, lessons learned, and/or recommendations. None of these literature reviews were from peer- reviewed journals.

RESULTS

I identified four main themes across the 33 articles. Note that across the literature the most common term used was dual enrollment, and dual credit and concurrent enrollment were also used. Concurrent enrollment and dual credit were either used as synonyms of dual enrollment or to refer to specific forms of dual enrollment. For example, in one study, dual credit was described as dual enrollment where students received dual credit from both the high school and postsecondary institution for the college course (Piontek, Kannapel, Flory, & Stewart, 2016). Regardless, this review uses dual enrollment to refer to all programs/courses included in the reviewed literature. The broad definition of dual enrollment is college courses that high school students can take that award college credit (Edwards, Hughes, & Weisberg, 2011).

DIVERSE STAKEHOLDERS ACROSS SECTORS VALUE DUAL ENROLLMENT AND VIEW IT AS BENEFICIAL TO STUDENTS

Many participants across studies responded positively about the value of dual enrollment and its benefits to students. For example, in an early study that surveyed principals and superintendents from 1,129 schools and districts in 1987 (about half responded), 94 percent of respondents were satisfied with concurrent enrollment opportunities for students in their schools and districts (Mertes, 1988). In a study that surveyed 150 principals, counselors, and instructors in Iowa who had a dual enrollment program at their high schools, 85 percent of respondents agreed concurrent enrollment had a positive impact on their school through offering prerequisite courses to prepare for college, and 92 percent agreed concurrent enrollment had a positive impact on students through gaining in depth knowledge of a subject area (Hanson, Prusha, & Iverson, 2015). In a study that surveyed superintendents in Ohio, despite expressing serious concerns and challenges about Ohio's dual enrollment policy, most perceived dual enrollment as beneficial (Horbeck & Malin, 2019). In a study that conducted interviews with educators at 8 high schools and 3 institutions of higher education in a rural Midwestern state, there was variation in attitudes about the benefits and value of dual enrollment, but all participants were sufficiently supportive of and committed to dual enrollment (Howley, Howley, Howley, & Duncan, 2013). In a study of dual enrollment programs in six Kentucky school districts, interviewees across the 6 districts and the partner postsecondary institutions reported positive outcomes of their programs and agreed that a major outcome of dual enrollment programs is that they offer an increasing number of students the opportunity to earn college credit at a reduced cost while experiencing college-level expectations (Piontek et al., 2016).

Positive attitudes about the perceived value and benefits of dual enrollment are important given the implementation challenges stakeholders experienced. They may help explain, in part, the proliferation of dual enrollment over the years despite implementation hurdles, which will be discussed subsequently.

DUAL ENROLLMENT PROGRAM DESIGN IS COMPRISED OF COMMON FEATURES WITH VARIATION IN IMPLEMENTATION

Across the case studies of dual enrollment programs, somewhat similar design features or program components were described although implementation varied. Design features of dual enrollment programs included: partnerships, funding, courses offered, eligibility requirements, student supports, populations served, program outcomes, course location, course timing, instructor types and qualifications, credit policies, outreach and recruitment, and quality assurance.

Partnerships All case studies provided information about how programs were developed and the relationship or partnership between K12 and postsecondary institutions (Barnett & Kim, 2019; Barnett, Gardner, & Bragg, 2004; Edwards, Hughes, & Weisberg, 2011; Greenberg, 1991; Harnish & Lynch, 2005; Hoffman & Robins, 2005; Miller, 2017; Nodine, Jaeger, & Bracco, 2019a; Nodine, Jaeger, & Bracco, 2019b; Piontek et al., 2016; Rochford & Gelb, 2007; Stephenson, 2014; Sunderman, 2017; Watt-Malcolm, 2011).

Funding Most case studies explained how programs were funded, and funding varied widely (Barnett & Kim, 2019; Barnett, Gardner, & Bragg, 2004; Harnish & Lynch, 2005; Hoffman & Robins, 2005; Nodine, Jaeger, & Bracco, 2019a; Piontek et al., 2016; Sherretz & O'Malley, 2013; Stephenson, 2014; Sunderman, 2017; Watt-Malcolm, 2011). Some programs were funded by state budgets or grants (from various sources, including federal, state, and foundations) so that they were free or low-cost to districts and students. Other programs were funded by districts covering the cost of tuition and fees for their dual enrollment participants. In a small number of cases, particularly with programs located at the college campus, there was no funding and students paid tuition and fees. Some case studies also outlined the costs to districts and students. A key feature of programs that were intended for underrepresented students is that they were free to students. The instability or uncertainty of funding and the high cost to K12 districts and students was a common challenge across programs.

Courses offered Case studies provided information on the number and types of courses offered, including subject areas or course names (Barnett & Kim, 2019; Barnett, Gardner, & Bragg, 2004; Edwards, Hughes, & Weisberg, 2011; Nodine, Jaeger, & Bracco, 2019b; Piontek et al., 2016; Sherretz & O'Malley, 2013; Sunderman, 2017). The most common model tended to be the "singleton" model. Several case studies used this term to describe dual enrollment programs in which students take college courses in no order or sequence (Piontek et al., 2016). Some case studies also profiled programs with course sequences, specific courses offered (for example, in a career pathway), and additional student supports.

Eligibility Requirements Most dual enrollment programs have eligibility requirements that vary widely and are based on SAT, ACT, college placement exams, state standardized tests, prior course grades, teacher recommendation, and/or other measures (Barnett & Kim, 2019; Barnett, Gardner, & Bragg, 2004; Miller, 2017; Nodine, Jaeger, & Bracco, 2019b; Piontek et al., 2016; Rochford & Gelb, 2007; Sherretz & O'Malley, 2013; Sunderman, 2017). This feature was consistently described as a challenge to expanding access to dual enrollment.

Student Supports Many case studies described what kinds of additional services were provided to students, ranging from none to programs embedded in larger initiatives with wrap- around supports (Barnett & Kim, 2019; Edwards, Hughes, & Weisberg, 2011; Hoffman & Robins, 2005; Miller, 2017; Nodine, Jaeger, & Bracco, 2019a; Nodine, Jaeger, & Bracco, 2019b; Piontek et al., 2016; Sunderman, 2017).

Population Served Many case studies discussed the characteristics or types of students served by the program (Barnett & Kim, 2019; Hoffman & Robins, 2005; Miller, 2017; Nodine, Jaeger, & Bracco, 2019a; Nodine, Jaeger, & Bracco, 2019b; Greenberg, 1991; Piontek et al., 2016). There appears to be no consensus on who dual enrollment is for and the population served varied, with some programs serving students who were described as already college-bound or "academically gifted" and other programs designed specifically for students who may not be considering college or a majority-minority school or district population. A small number of studies used student-level data to provide statistics on the demographic make-up of participants. For example, in Memphis, the dual enrollment population somewhat mirrored the district population (for example, 84% of the dual enrollment population and 83% of the district population was Black), indicating that some student groups were equitably represented in dual enrollment (Barnett & Kim, 2019).

Program Outcomes Many case studies described monitoring and evaluation as a key feature of the program and/or provided program outcome data (Barnett & Kim, 2019; Barnett, Gardner, & Bragg, 2004; Hoffman & Robins, 2005; Miller, 2017; Nodine, Jaeger, & Bracco, 2019a; Stephenson, 2014; Sunderman, 2017). Program outcomes varied widely and included number of dual enrollment course enrollments (by grade and subject area), credits earned, pass rates, college enrollment and retention rates, and credits transferred. Studies from higher education institutions and agencies all focused on the percentage of dual enrollment students who matriculated at their institution and framed this as a positive outcome of dual enrollment (Baldwin, 1988; Bulluck, Petrow, & O'Dell, 2007; Bunch & Barrax, 1993; Harnish & Lynch, 2005).

Course Location Some case studies did not cover this because courses were at the high school. But for some programs, location varied, and courses were at the high school, college campus, and/or online (Edwards, Hughes, & Weisberg, 2011; Barnett, Gardner, & Bragg, 2004; Harnish & Lynch, 2005; Sherretz & O'Malley, 2013; Sunderman, 2017). Transportation was commonly cited as a challenge for programs located on college campuses.

Course Timing Case studies described the necessary task of aligning secondary and postsecondary schedules to implement dual enrollment programs (Edwards, Hughes, & Weisberg, 2011; Nodine, Jaeger, & Bracco, 2019b; Piontek et al., 2016; Watt-Malcolm, 2011). Alignment of schedules was also commonly cited as an implementation challenge.

Instructor Type and Qualifications Some case studies discussed who taught dual enrollment classes, and this too varied with classes taught by high school teachers with dual enrollment certification, college faculty, or a mix of secondary and postsecondary instructors (Edwards, Hughes, & Weisberg, 2011; Barnett, Gardner, & Bragg, 2004; Miller, 2017; Piontek et al., 2016; Rochford & Gelb, 2007; Watt-Malcolm, 2011). Finding enough qualified instructors was commonly cited as a challenge.

Credit Policies A number of case studies described the types of credits students earned if they passed the course (high school, college, or both) and credit transfer policies (Edwards, Hughes, & Weisberg, 2011; Barnett, Gardner, & Bragg, 2004; Harnish & Lynch, 2005; Miller, 2017; Nodine, Jaeger, & Bracco, 2019a; Sherretz & O'Malley, 2013; Sunderman, 2017). The lack of credit transfer policies or weak credit transfer policies that did not allow students to transfer dual enrollment credits earned in high school to their postsecondary institution after high school was commonly cited as a challenge.

Outreach and Recruitment A smaller number of studies described communication to students and families about dual enrollment (Barnett & Kim, 2019; Barnett, Gardner, Bragg, 2004; Nodine, Jaeger, & Bracco, 2019b; Sunderman, 2017).

Quality Assurance A smaller number of studies described quality assurance procedures (Barnett, Gardner, Bragg, 2004; Miller, 2017; Piontek et al., 2016; Watt-Malcolm, 2011). These varied widely and included common syllabi, course materials, and assessments; course evaluations; postsecondary expectations of high school teachers; classroom observations; professional development for high school teachers; and monitoring of students' grades.

THERE ARE SIGNIFICANT IMPLEMENTATION CHALLENGES RELATED TO BRIDGING K12 AND HIGHER EDUCATION DIFFERENCES, FUNDING, AND CERTIFYING TEACHERS

Across the literature, findings centered on implementation challenges. Here I discuss the three most common dual enrollment implementation challenges.

Bridging K12 and Higher Education Differences Dual enrollment stakeholders discussed the challenge of bridging differences between K12 and higher education systems, policies, structures, curriculum, instruction, norms, and expectations (Denecker, 2013; Duncheon & Relles, 2020; Fitzgibbon, 2015; Harnish & Lynch, 2005; Hornbeck & Malin, 2019; Howley et al., 2013; Miller, 2017; Nodine, Jaeger, & Bracco, 2019b; Pretlow & Patteson, 2015; Stephenson, 2014; Sunderman, 2017; Watt-Malcolm, 2011; Wozniak & Palmer, 2013). From the K12 perspective, there were tensions related to funding, academic eligibility requirements for students, misalignment of schedules and curriculum, and problems with credit transfer, among other issues. From the higher education perspective, there were tensions related to variation in the management, quality, and rigor of dual enrollment programs in local districts and schools, among other issues.

One approach to addressing K12 and higher education misalignment is intentional collaboration between high school and college educators. Denecker (2014) described a model that included a dual enrollment mentorship program where high school and college instructors collaborate, share experiences, and reflect on their teaching philosophies. Howley et al. (2013) identified the importance of "border crossers," who took on a formal role as liaisons between K12 and postsecondary institutions, as well as instructional conversations and mutual respect between high school and college educators.

Two studies were unique in their use of theoretical frameworks to offer approaches to bridge K12 and higher education differences, and both studies suggest that bridging differences requires systems-level change and visionary leadership. Duncheon and Relles (2020) collected data from teachers, counselors, and administrators in Texas and applied the "complexity theory" to better understand what drives dual enrollment implementation and how stakeholders address the secondary-postsecondary divide. Complexity theory maintains that systems are complex, and thus change happens gradually as "agents interact and respond to new policy information" (Duncheon & Relles, 2020, p. 1007). College courses cannot simply be implemented in a high school classroom where teachers are embedded in a K12 system that prioritizes student-centered learning, grading as a measure of effort, and integration of basic skills into the curriculum. Dual enrollment must be part of larger systems-level change that involves both K12 and postsecondary educators interrogating assumptions about college- level rigor, grading systems, and pedagogy.

A study in the Rio Grande Valley in Texas conducted interviews with 41 K12 and 34 higher education stakeholders involved in dual enrollment programs and used the "borderlands" framework to better understand how these individuals implemented and maintained dual enrollment programs for underrepresented students (Martinez, Valles, Cortez, Ponjuan, & Sáenz, 2018). The borderlands framework "acknowledges the physical and figurative borderland space in which people from such communities reside and navigate" (Martinez et al., 2018, p. 523). The authors found four approaches to dual enrollment leadership that enabled the implementation of dual enrollment in the Rio Grande Valley: Dual enrollment leaders were visionary, strategic, reflective, and progressive. They viewed dual enrollment as a key strategy in increasing the postsecondary access and success of their student population, most of whom were Latino/a/x and would be the first in their families to attend college, and they leveraged various strategies, partnerships, and resources to implement dual enrollment. These dual enrollment leaders also had to broaden the scope of their roles outside education and envision and implement a future for South Texas that would improve the region's overall educational attainment, well-being, and economic success.

Funding Lack of funding for dual enrollment was another common challenge across diverse contexts, preventing the expansion of dual enrollment or causing financial burden to districts, students, and families (Fitzgibbon, 2015; Harnish & Lynch, 2005; Hoffman & Robins, 2005; Hornbeck & Malin (2019); Howley et al., 2013; Nodine, Jaeger, & Bracco, 2019a; Nodine, Jaeger, & Bracco, 2019b; Piontek et al., 2016; Pretlow and Patteson, 2015; Sherretz & O;Malley, 2013; Sunderman, 2017; Stephenson, 2014; Wozniak & Palmer, 2013; Watt-Malcolm, 2011). In a survey of superintendents in Ohio after implementation of Ohio's dual enrollment policy (College Credit Plus), 72 percent of superintendents agreed that their district was losing money to fund dual enrollment (Hornbeck & Malin, 2019). Studies emphasized the importance of fully funding dual enrollment or reimbursing school districts, leveraging partnerships to secure funding, and ensuring courses are provided at no cost to students.

Teacher Certification Certifying high school teachers to teach dual enrollment or having enough certified teachers was another recurring challenge (Hornbeck & Malin, 2019; Miller, 2017; Piontek et al., 2016; Pretlow & Patteson, 2015). This challenge was described as a barrier to expanding access to dual enrollment, particularly in rural areas. One approach to address this challenge was in Kentucky where partner postsecondary institutions offered scholarships and tuition discounts to high school teachers to complete graduation courses and obtain dual credit certification (Piontek et al., 2016).

STAKEHOLDERS EXPRESSED A DESIRE TO EXPAND ACCESS TO DUAL ENROLLMENT, BUT MOST PROGRAMS APPEARED TO BE TARGETED TO STUDENTS WHO WERE ALREADY COLLEGE-BOUND

While many stakeholders across the reviewed studies expressed the desire to expand dual enrollment to all students, only a handful of studied programs appeared to do so and profiled how. Dual enrollment programs in Memphis City Schools (Barnett & Kim, 2019), select programs in New England (Hoffman & Robins, 2005), programs in Salinas Valley and Long Beach, California (Nodine, Jaeger, & Bracco, 2019a; Nodine, Jaeger, & Bracco, 2019b), and a program in Tulsa Public Schools and Union Public Schools (Vargas, Roach, & David, 2014) had the explicit goal of expanding access to underrepresented students (mainly, low-income students, students of color, and students who may be the first in their families to attend college). This goal influenced several program features, particularly cost to students, courses offered, eligibility requirements, and student supports. For example, all programs offered course options at the high school (eliminating transportation challenges), with few or no eligibility requirements, at no cost to students, and that included advising and other supports.

Additionally, some of these dual enrollment programs were situated in larger college readiness initiatives intended to improve a school's college-going culture and students' postsecondary access (Barnett & Kim, 2019; Hoffman & Robins, 2005; Nodine, Jaeger, & Bracco, 2019a; Nodine, Jaeger, & Bracco, 2019b).

APPENDIX B

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APPENDIX C

DE Researchers and Educational Policy and Practice Leaders

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Cece Cunningham, Executive Director, Middle College National Consortium

Jonathan Davis, Senior Research Associate, The Education Trust

Austin Estes, Director of Research and Data, Advance CTE

Maureen Ewing, Senior Director of Research, The College Board

Kate Kreamer, Deputy Executive Director, Advance CTE

Nick Mathern, Vice President of K-12 Partnerships, Achieving the Dream

Allison Socol, Vice President for P-12 Policy, Practice, and Research, Education Trust

Karen Stout, President & CEO, Achieving the Dream

Stephen Tremaine, Vice President for Early Colleges, Bard College

Joel Vargas, Vice President of Programs, Jobs for the Future

Michael Werner, Coordinator of Post-Secondary Planning, Mounds View Public Schools

Amy Williams, Executive Director, National Alliance of Concurrent Enrollment Partnerships

Taylor White, National Director, Partnerships to Advance Youth Apprenticeships