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Exploring the Outcomes of Standards-Based Concurrent Enrollment and Advanced Placement in Arkansas

Jason L. Taylor
&
Rui Yan
University of Utah
United States

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Abstract: Accelerated programs (concurrent enrollment and Advanced Placement) are expanding across the US, yet there is little evidence on the relationships between participation in different accelerated programs, standards-based concurrent enrollment programs (e.g., accredited programs), and educational outcomes. This study used data from a cohort of Arkansas high school graduates and school-level fixed effects to assess how different accelerated programs predict students' likelihood of enrolling in and being retained in an Arkansas college. We found that participation in concurrent enrollment and Advanced Placement predicts college access and college retention. However, we found no differences in college access and retention based on whether students participated in a NACEP-accredited concurrent enrollment program or not. The results suggest the need to expand access to both concurrent enrollment and Advanced Placement and the need for more research on standards-based concurrent enrollment programs such as those that are NACEP-accredited.

Keywords: college access; college retention; concurrent enrollment; Advanced Placement; quality; policy; NACEP

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Explorando los resultados de la inscripción concurrente basada en estándares y *Advanced Placement* en Arkansas

Resumen: Los programas acelerados (inscripción simultánea y *Advanced Placement*) se están expandiendo en los EE. UU., Aunque hay poca evidencia sobre las relaciones entre la participación en diferentes programas acelerados, programas de inscripción concurrente basados en estándares (por ejemplo, programas acreditados) y resultados educativos. Este estudio utilizó datos de una cohorte de graduados de la escuela secundaria de Arkansas y efectos fijos a nivel escolar para evaluar cómo los diferentes programas acelerados predicen la probabilidad de los estudiantes de inscribirse y ser retenidos en una universidad de Arkansas. Descubrimos que la participación en la inscripción simultánea y la *Advanced Placement* predice el acceso a la universidad y la retención universitaria. Sin embargo, no encontramos diferencias en el acceso a la universidad y la retención en función de si los estudiantes participaron en un programa de inscripción simultánea acreditado por NACEP o no. Los resultados sugieren la necesidad de ampliar el acceso tanto a la inscripción concurrente como a la *Advanced Placement* y la necesidad de más investigación sobre programas de inscripción concurrente basados en estándares, como los que están acreditados por NACEP.

Palabras llave: acceso a la universidad; retención universitaria; inscripción concurrente; *Advanced Placement*; calidad; política; NACEP

Explorando os resultados de inscrição simultânea com base em padrões e Advanced Placement no Arkansas

Resumo: Programas acelerados (inscrição simultânea e Advanced Placement) estão se expandindo nos EUA. Embora haja poucas evidências sobre as relações entre a participação em diferentes programas acelerados, programas de inscrição simultâneos com base em padrões (por exemplo, programas credenciados) e resultados educacionais. Este estudo usou dados de uma coorte de graduados do ensino médio do Arkansas e efeitos fixos em toda a escola para avaliar como diferentes programas acelerados prevêem a probabilidade de os alunos se matricularem e serem mantidos em uma universidade de Arkansas. Descobrimos que a participação em matrículas simultâneas e Advanced Placement prevê o acesso à universidade e a retenção universitária. No entanto, não encontramos diferenças no acesso à universidade e à retenção, dependendo se os alunos participaram ou não de um programa de inscrição concorrente credenciado pela NACEP. Os resultados sugerem a necessidade de expandir o acesso tanto a inscrições simultâneas quanto a *Advanced Placement* e a necessidade de mais pesquisas sobre programas de inscrição simultânea com base em padrões, como aqueles credenciados pelo NACEP.

Palabras llave: acesso à universidade; retenção universitária; registro concorrente; *Advanced Placement*; qualidade política; NACEP

Introduction

The need to prepare high school students for college, accelerate them through college, and ensure their timely completion of college has been mounting in recent years. President Obama announced the American Graduation Initiative (AGI) in 2009, an effort to increase the proportion of adults with college degrees by 2020. Although the United States has experienced considerable steady progress in college access and attainment, Obama made the policy argument that the United States needs to invest in higher education to remain competitive in a global economy (The White House, 2009). In 1990, the immediate college enrollment rate for high school completers was 60%, and this rate has steadily increased to 68% in 2014 (Kena et al., 2016). Similarly, degree attainment in the United States has been on the rise over the past half century. Data from the U.S. Census shows that the percentage of adults with a bachelor's degree increased from just 5% in 1940 to 33% by 2015 (Ryan & Bauman, 2016). The long-term trends in college access and success are positive, but there are still significant proportions of students who do not make it into or through college.

One mechanism to support college access and success is accelerated programs that allow high school students to enroll in and/or receive college credit. Many types of credit-based transition programs and academic pathways exist to support students' transition into and through college such as Advanced Placement, International Baccalaureate, Tech Prep, dual and concurrent enrollment, bridge programs, and Early and Middle College High Schools (Bailey & Karp, 2003; Bragg, Kim, & Barnett, 2006). Bragg et al. (2006) define these types of programs as "boundary-spanning curricula, instructional and organizational strategies, and meaningful assessments that either link or extend from high school to college, including both two- and four-year institutions" (p. 6). Among other things, these programs provide opportunities for students to experience college prior to completing high school, to access more rigorous curricular options, and to support the transition from high school to college. Two of the most common acceleration programs are dual/concurrent enrollment[1] and Advanced Placement, and participation in these programs has spiked over the past decade (College Board, 2014; Lacy, 2010; Waits, Setzer, & Lewis, 2005; Thomas, Marken, Gray, & Lewis, 2013).

As participation in these programs has expanded, so has interest in their quality. Advanced Placement (AP) has been critiqued for expanding access without ensuring quality success of students (e.g., Noonan, 2016), meaning that students might have the opportunity to take AP courses but they only receive college credit if they take and pass the exam (and if the exam score is accepted by a college). Concerns about quality or efficacy even prompted Dartmouth College to stop accepting AP credits for incoming students (Chappel, 2013); however, this is the exception rather than the rule and the vast majority of colleges widely accept AP scores. Concurrent enrollment (CE) programs have been critiqued more because unlike AP, there is not a standard quality mechanism that regulates CE. Researchers critical of CE quality suggest that these courses are less rigorous than college courses delivered on college campus, do not provide students with an authentic college experience, or are not adequately monitored for quality (Andrews, 2000; Boswell, 2001; Clark, 2001; Windham, 1997). Most of these claims are not empirically supported and based only on anecdotal evidence, yet there is legitimate educational interest in CE providing students with a high-quality experience. The quality of CE courses is particularly relevant if colleges and universities expect CE students to achieve certain learning outcomes, gain specific knowledge and skills, have an authentic college experience in a college class, or be proficient in a particular content area that will enable

[1] There is no standard for use of these terms in policy or the literature, and the terms dual credit, dual enrollment, and concurrent enrollment are often used interchangeably. We use the term *concurrent enrollment* in this paper.

them to be successful in subsequent college courses once they matriculate to college. Recently, the Higher Learning Commission released new guidelines indicating that high school teachers who teach CE courses must have a master's degree or at least 18 graduate-level credit hours in the discipline or specialty area (Smith, 2015). The presumption is that high school faculty with these credentials are adequately prepared to teach college-level courses and have the same academic credentials as faculty who teach at the college.

One of the primary arbiters of CE standards is the National Alliance for Concurrent Enrollment Partnerships (NACEP). NACEP is a voluntary accreditation association for concurrent partnerships that "helps these programs [concurrent enrollment programs] adhere to the highest standards so students experience a seamless transition to college and teachers benefit from meaningful, ongoing professional development" (NACEP, 2018a, n.p.). Although NACEP's reach has expanded to a national network of CE partnerships, there is little evidence on the influence of CE programs accredited by NACEP; we refer to these programs in this manuscript as standards-based CE programs. The variation in accelerated programs, the unique interest in standards-based CE programs, and the lack of rigorous research on the impact of various accelerated and CE programs are the primary factors motivating this study. The purpose of this study is to address these gaps in evidence and provide policy- and practice-relevant research.

Literature Review

Accelerated programs generally refer to programs that allow high school students to earn college credits while in high school, typically through CE or credit-by-examination (Adelman, 2004). Bragg, Kim, and Barnett (2006) examined academic pathways from high school to college and created a comprehensive inventory of these "boundary-spanning curricula," which included nine distinct pathways (p. 6). Among these pathways were AP and CE, as well as programs such as Early and Middle College High Schools and Tech Prep, which include CE courses and other support services. Accelerated programs are relevant because they are intended to facilitate college access, transition, and success for students (Bailey & Karp, 2003; Bragg, Kim, & Karp, 2006). That is, they allow high school students to participate in and/or receive college credit to help increase students' chances of attending college and to better smooth students' transition from high school to college.

Since 1955, the AP program has provided high school students an opportunity to take college-level courses and examinations offered by the College Board (Mattern, Marini, & Shaw, 2015). With a rapid expansion of AP programs during the past four decades, by 2009, more than 70% of public high schools had students participating in the AP program (Lacy, 2010). Between 2003 and 2013, the number of students taking AP exams has doubled and the number of exams taken has tripled. The College Board reports that for the high school class of 2013, a little over 1 million students took more than 3.1 million AP exams (College Board, 2014).

Concurrent enrollment, dual enrollment, and dual credit generally refer to the phenomenon of high school students enrolling in college courses and receiving college credit, and students often receive high school credit as well. Research sometimes uses these three terms interchangeably, but some states, locales, and organizations have specific definitions of these terms. Relevant to this paper is the term CE. According to NACEP, "Concurrent enrollment provides high school students the opportunity to take college-credit bearing courses taught by college-approved high school teachers" (NACEP, 2018a, n.p.). NACEP's CE definition includes a few distinct characteristics: a) courses delivered on the high school campus and not on the college campus; b) courses taught by a high school instructor; c) courses not delivered via distance education; d) courses where students immediately earn college credit upon course completion and do not require students to matriculate

to the college to receive credit; and e) not exam-based courses such as APand International Baccalaureate. As described below, NACEP accredits CE programs to ensure that courses taught by high school teachers on high school campuses meet minimum eligibility criteria.

Because there is variation in CE programs based on course instructor type and course delivery location, as well as inadequate data at the national and state levels, it is difficult to quantify basic participation in CE. The best national data were collected from a survey conducted by the National Center for Education Statistics (NCES). NCES estimated that there were approximately 2 million enrollments in CE courses in the 2010-11 academic school year (all types of CE, not just NACEP's definition), and 82% of public high schools reported students were enrolled in CE in that academic year (Thomas, Marken, Gray, & Lewis, 2013). These data suggest that CE is a growing phenomenon as it expanded from 1.2 million enrollments in 71% of public high schools since the 2002-2003 academic year (Waits, Setzer, & Lewis, 2005).

Accompanying the growth in CE participation is an expansion of state CE policies that vary extensively in terms of policies that address dimensions of quality such as student eligibility criteria, faculty credentials and certification, and data collection, for example (Borden, Taylor, Park, & Seiler, 2013). Some states have policy mechanisms for ensuring the quality of CE (Lowe, 2010), but many states either have no quality assurance policy or quality assurance is conducted locally (Borden et al., 2013; Zinth, 2015).

Accreditation, Standards, and Quality Control in Higher Education

The voluntary system of accreditation is the primary arbiter of institutional and programmatic standards and quality in the United States. Eaton (2009) articulates four essential purposes of accreditation: a) accreditation is the primary way that quality is assured to the public and to students; b) institutional accreditation provides access to federal financial aid because aid funds are only available to accredited institutions; c) accreditation provides confidence to the private sector for the purpose of employment, tuition support, and private giving; and d) accreditation supports transfer of courses among other accredited institutions. Some also argue that accreditation is "a process for holding postsecondary institutions accountable to voluntary nongovernmental agencies for meeting certain minimum education standards" (Schmidtlein & Berdahl, 2005, p. 86). The aforementioned accreditation purposes are salient characteristics of the American system of higher education.

These purposes are achieved through the accreditation review process. The review process occurs periodically (a few years to as many as 10 years) and includes three general steps: a) a self-study in which the institution prepares evidence of quality and alignment with standards; b) peer review in which peers from member institutions conduct a site visit to the institution; and c) the determination of accreditation status by the accrediting body (Eaton, 2009). At the heart of accreditation and an essential purpose described by Eaton (2009) is quality assurance. Quality is operationalized via a set of accreditation standards, and the accreditor's role is to ensure that institutions meet these standards. Regional accreditors and program accreditors, for example, have a clear set of standards on which institutions are judged and an accreditation decision is determined by a panel of peers. As Eaton (2009) notes, adherence to these standards then signals to students, the government, and employers that a higher education institution meets the quality standards.

Volkwein, Lattuca, Harper, and Domingo (2007) observed that despite the proliferation of accreditation practice in higher education, we have few studies on the relationship between accreditation and student learning and student outcomes. Most existing studies are in the context of professional accreditation (rather than regional accreditation), particularly in medicine and engineering. The small number of studies have found that individuals graduating from accredited

medical and healthcare education programs had better certification or exam pass rates than individuals who attended education programs that were not accredited (Cladwell et al., 2011; Dickenson et al., 2006; van Zanten & Boulet, 2006). Volkwein et al. (2007) examined the impact of engineering accreditation programs on student learning outcomes and found that engineering graduates reported higher learning gains post adoption of new accreditation standards compared to graduates pre-adoption of standards. Although the evidence base is thin, it suggests that accreditation positively influences students' learning outcomes after program completion.

NACEP Accreditation

The purpose of NACEP is to accredit CE partnerships for quality assurance and program improvement. Courses and programs that are accredited by NACEP are referred to as standards-based CE in this manuscript. Similar to regional and program accreditation, NACEP accreditation is based on a set of voluntary standards, and accreditation is achieved through a comprehensive review by a team of peers (Lowe, 2010). However, unlike regional accreditation, many institutions deliver CE without NACEP accreditation. Partnerships of postsecondary and secondary institutions conduct a self-study and provide evidence they meet the 17 NACEP standards for program quality in five areas: curriculum, faculty, students, assessment, and program evaluation. Initial accreditation is sought when partnerships engage in a self-study for one year prior to submitting an accreditation application. The accreditation cycle is seven years and institutions repeat the accreditation process when their accreditation period expires. According to NACEP, accreditation offers the following advantages:

> (a) serves as a guarantee to students, policy-makers, and other post-secondary institutions that the accredited partnership meets rigorous national standards; (b) distinguishes a concurrent enrollment partnership, thereby enhancing its ability to recruit new partners and students; (c) aids students and families when they seek credit recognition for their college credits earned through concurrent enrollment; (d) allows programs to display the NACEP logo on their websites and in other publications; (e) offers national leadership opportunities to concurrent enrollment professionals. Staff from NACEP-accredited concurrent enrollment programs may hold an elected position on the NACEP Board of Directors or be appointed as a Committee Chair to help shape the future of concurrent enrollment around the country (NACEP, 2018a, n.p.).

Unlike regional accreditation, access to federal aid is not associated with NACEP accreditation. However, NACEP reports that nine states either require or incentivize postsecondary institutions to be NACEP-accredited, and in 10 states, the state concurrent enrollment standards are modeled or partially reflect NACEP standards (NACEP, 2018b).

Advanced Placement and Standards

The College Board has established a framework for ensuring standards and quality, mostly through a curriculum development process and through credit-by-exam. The AP curriculum for each subject area is created by a panel of experts and college-level educators in that field of study. Then AP courses offered to students are audited by the College Board to ascertain if they satisfy the AP curriculum. By 2014, over 30 exams in six areas (English, mathematics and computer science, sciences, history and social sciences, arts, and world languages and cultures) were taken by students throughout the US and around the world (Godfrey, Matos-Elefonte, Ewing, & Patel, 2014). In order to receive college-level credit, students must take a standardized exam and receive an acceptable score.

Effect of Concurrent Enrollment and Advanced Placement

The scholarly literature on the effects of CE participation is an emerging body of literature, and evidence is accumulating that CE participation has positive short-term effects and long-term effects. It is important to note that few distinguish between the effects of different CE program characteristics (such as instructor type and course location). Several studies at the institutional, state, and national levels have examined the effect and influence of CE and suggest that CE participation positively impacts important high school outcomes such as high school graduation (Karp et al., 2007) and high school students' college aspirations (Howerter; 2012; Karp 2012), college access outcomes such as enrollment in college (Karp et al., 2007; Speroni, 2011; Struhl & Vargas, 2012; Taylor, 2015) and college readiness (An, 2013a; An & Taylor, 2015; Kim & Bragg, 2008), and college performance and retention (Karp et al, 2007; Kim & Bragg, 2008; Shaughnessy, 2009; Swanson, 2008). A few studies have found a positive relationship between CE and long-term outcomes such as college completion (Allen & Dagdar, 2012; An, 2013b; Geise, 2011; Shaughnessy, 2009; Speroni, 2011; Struhl & Vargas, 2012; Westcott, 2009; Taylor, 2015).

Some researchers have examined differences in CE student outcomes based on course location and instructor type and the results are mixed. For example, Lochmiller, Sugimoto, Muller, Mosier, and Williamson (2016) and D'Amico, Morgan, Robertson, and Rivers (2013) found that student outcomes were better for CE courses delivered on college campuses compared to courses delivered on high school campuses. However, Phelps and Chan (2016) found that students in courses taught on high school campuses by a career and technical education instructor had better college and employment outcomes than students in courses taught on the college campus. Dixon and Slate (2014) also examined differences by course location and found mixed results based on the type of course.

Similar to CE, many studies found a positive impact of AP program participation on college enrollment, performance, and graduation. Several studies found that students who participate in AP programs tend to have higher enrollment and retention in college. For example, Chajewski et al. (2011) used national sample of more than 1.5 million students and found that the odds of enrolling in a four-year institution increased by 171% for students who took one AP Exam compared with students who took no AP Exams. Mattern, Shaw, and Xiong (2009) applied ANCOVAs and logistic regressions to examine the relationships between AP scores for English Language, Biology, Calculus, and U.S. History and first-year college GPA, retention to the second year, and institutional selectivity, while controlling for SAT composite scores and high school GPA. They found that students who took AP were more likely to be retained their second year of college than non-AP students and AP participation positively influenced college completion. Although the results were significant, the effect sizes were quite small (range from -0.8 to 0.85). Dougherty, Mellor, and Jian (2006) controlled for student and school characteristics using regression and found a significantly positive relationship (coefficients range from 19% to 32%) between AP exam performance and student graduating from college within 5 years, except for African-American students. Similarly, Mattern, Marini, and Shaw (2013) controlled for student and school characteristics and found that AP students had higher four-year graduation rates than non-AP students, and students who earned higher AP exam scores had a higher likelihood of graduating from college within four years compared to other AP students.

The evidence on CE and AP is generally positive, but this study addresses a few important gaps in the literature. First, few studies examine differences in outcomes between types of accelerated programs such as AP and CE (An, 2013a; Speroni, 2011). This comparison is warranted because these two programs are the most common programs for high school students to earn

college credit. Although some argue that these programs do not need to compete with each other (e.g., Klopfenstein & Lively, 2012), policymakers and schools often need to make decisions with limited resources, consider the costs to students and families, and assess the relative advantages and disadvantages of each program. Evidence on the relative impact of each program can help policymakers and leaders make critical decisions about supporting different accelerated programs. Second, most studies on CE outcomes do not disentangle the impact of various CE programs based on important factors related to quality such as who teaches the course and the course location. For example, studies that document the positive relationship between CE and postsecondary success (e.g., Allen & Dadgar, 2012; An, 2013a; Karp et al.; Speroni, 2011; Struhl & Vargas, 2012; Swanson, 2008; Taylor, 2015) that use state or national datasets often fail to examine differences in outcomes based on the nature of the CE experience or environment (e.g., instructor type or location). Only a small number of studies have examined differences in CE outcomes by course location and instructor type, and these studies lead to mixed results (e.g., D'Amico et al., 2013; Dixon & Slate, 2014; Lochmiller et al., 2016; Phelps & Chan, 2016). Further, two of these studies use only descriptive statistics and they do not account for factors other than course location and instructor type that might influence student outcomes. The two studies that use regression and HLM report conflicting results. A third important contribution is the focus on standards-based CE (i.e., NACEP-accredited CE). Given the proliferation of concurrent enrollment and the establishment of NACEP as a policy tool to ensure quality, it is important to examine differences in outcomes based on whether students participate in a standards-based CE program such as the NACEP model, and there is only limited qualitative evidence of the topic of CE quality based on the NACEP-accredited standards (Lowe, 2010)

Method

The purpose of this study was to examine participation in various forms of accelerated programs and the relationship between accelerated program participation and college enrollment and retention. This study answered the following two research questions:

1. Which accelerated programs predict students' college enrollment and retention?
2. Does participation in standards-based CE programs predict students' college enrollment and college retention?

Context

CE in Arkansas is authorized by Arkansas Code §6-18-223 and the Arkansas Higher Education Coordinating Board's Policy 5.16. CE is defined as "the enrollment of a high school student in a college course taught on a high school campus (or in selected cases on the college campus or by distance/digital technology) for high school credit and college-level credit" (Arkansas Department of Higher Education, 2017, p. 2-1). State board policy also requires colleges that deliver CE on high school campuses must be accredited by NACEP or be approved by the state; however, the state approval process went into effect as of August 1, 2015, after the observation period of this study. Of the 31 public colleges delivering CE in 2011 (the year in which most students would first participate in CE), 19 were accredited by NACEP and 12 were not accredited by NACEP. Because some colleges were NACEP accredited and others were not, we can were able to compare the outcomes of students who participated accredited programs to non-accredited programs.

Sample and Variables

This study used state administrative dataset from the Arkansas Department of Education (ADE) and Arkansas Department of Higher Education (ADHE). The sample was a cross-sectional

cohort of all students who were freshmen in a public Arkansas high school in fall 2009, and included 37,302 unique student records. This analysis focused on students in this cohort who completed their high school education in public Arkansas high schools in order to isolate a sample of students who had a complete high school educational record. Of the students in the Cohort, 25,187 students graduated from an Arkansas public high school within four years[2]. Due to limitations in the data provided to researchers, we are unable to determine why students did not graduate from a public Arkansas high school. For example, we cannot decipher between students who moved out of state, students transferred to a private high school, or students who were not retained at a public high school (i.e., pushout or dropout). Thus, the final analytic sample includes 25,187 students who successfully completed at an Arkansas public high school within four years.

The dataset developed from state administrative data included de-identified student-level records from ADE and ADHE. The dataset included data on students' demographic characteristics, academic performance in high school, participation and performance in CE and AP, college enrollment records, and college degree completion records. It is relevant to mention that data on CE were reported by the ADHE and included all college courses taken by high school students, independent of whether the student received high school credit or not.

Table 1 shows that of the sample, 57% participated in CE and/or AP and 42% did not participate in an acceleration program. Twelve percent (12%) participated exclusively in CE, 25% participated exclusively in AP, and 20% participated in CE and AP. Thus, approximately 32% (*n*=8,145) of the sample participated in CE and 45% of the sample participated in AP.

To answer the research questions, we categorized CE courses according to whether the course was NACEP-defined and/or NACEP-accredited. A course was designated NACEP-defined if it was taught on the high school campus by a high school instructor. A course was designated as NACEP-accredited if it was deliveredby a postsecondary partner that was accredited by NACEP by 2011 (the first year in which most students in the sample participated in CE). Table 2 displays a matrix that illustrates how these CE courses were categorized. The first quadrant is the primary quadrant of interest in that these are the CE courses that were NACEP-defined and delivered by programs that went through the NACEP accreditation review process, indicating these courses were delivered by programs that met NACEP quality standards. The second quadrant is a primary comparison group of interest because these were CE courses that were similarly defined as those in the first quadrant (i.e., taught on high school campus by a high school instructor), but were offered and delivered by postsecondary institutions not accredited by NACEP. Those CE courses located in quadrants three and four were not NACEP-defined or NACEP-accredited. Courses in the third and fourth quadrant were taught by a college instructor and/or on a college campus, meaning that these courses were taught in a context regulated by existing quality standards (e.g., regional accreditation).

Table 1
Acceleration Program Participation (*N*=25,187)

Acceleration Program	*n*	%
Exclusively Concurrent Enrollment	3,078	12%
Exclusively Advanced Placement	6,406	25%
Concurrent Enrollment & Advanced Placement	5.067	20%
No Acceleration	10,636	42%

[2] These 25,187 students had a valid graduation date and high school location in the dataset.

Table 2
Concurrent Enrollment Course Matrix

		NACEP-Defined CE Courses	
		Y	**N**
CE Courses Delivered by NACEP-Accredited Postsecondary Institution	**Y**	Quadrant 1 NACEP-Accredited NACEP-Defined	Quadrant 3 NACEP-Accredited Not NACEP-Defined
	N	Quadrant 2 Not NACEP-Accredited NACEP-Defined	Quadrant 4 Not NACEP-Accredited Not NACEP-Defined

Table 3 shows the distribution of courses at the course enrollment level (*n*=30,501) for the 8,145 students that participated in CE. The largest proportion of course enrollments were concentrated in the first and third quadrants; that is, NACEP-accredited courses (i.e., courses that were offered by partnerships that were NACEP-accredited) accounted for 72% of the CE course enrollments in the sample. Table 3 also shows that 39% of the CE course enrollments were NACEP-defined, suggesting that the remaining 61% of CE courses were either delivered on the college campus and/or taught by a college instructor.

Table 3
Concurrent Enrollment Participation by CE Type

		CE NACEP-Defined Courses	
		Y	**N**
CE Courses Delivered by NACEP-Accredited Institutions	**Y**	Quadrant 1 **31%** *n*=9,320	Quadrant 3 **41%** *n*=12,378
	N	Quadrant 2 **8%** *n*=2,305	Quadrant 4 **20%** *n*=6,178

Because many students participated in more than one CE course, we coded students into the following four program categories based on their pattern of CE enrollments: (a) exclusively participated in NACEP-defined and NACEP-accredited CE courses; (b) exclusively participated in NACEP-defined and not NACEP-accredited CE courses; (c) participated in NACEP-defined and combination of NACEP-accredited/not NACEP-accredited CE courses; (d) exclusively participated in non-NACEP-defined CE courses. Table 4 shows the distribution of the 8,145 students based on their participation in these four program types. The results show that 42% of students participated exclusively in courses that were NACEP-defined and NACEP-accredited, which reflects the large number of NACEP-accredited partnerships in Arkansas. A smaller but still substantial proportion of students participated exclusively in courses that were NACEP-defined but not NACEP-accredited (11%). A very small proportion (1%) participated in a combination of the aforementioned two program categories[3]. Finally, 46% participated exclusively in courses that were not NACEP-defined, meaning that they were either taught on the college campus and/or taught by a college instructor.

[3] The majority of the students who took NACEP-defined and combination of NACEP-accredited/not accredited courses were concentrated within three high schools.

Table 4
Concurrent Enrollment Program Participation. (N=8,145)

Concurrent Enrollment Program	*n*	%
Exclusively NACEP-defined and accredited	3,428	42%
Exclusively NACEP-defined and not accredited	862	11%
NACEP-defined and combination accredited/not accredited	113	1%
Exclusively Not NACEP-defined	3,742	46%

Note: The majority of the 113 students who took NACEP-defined and combination of NACEP-accredited/not accredited courses were concentrated within three high schools.

The sample characteristics are displayed in Table 5 and Table 6. Table 5 displays the sample characteristics and differences in student characteristics by accelerated program. We observed slight differences in accelerated program participation by race/ethnicity, income, and gender. A larger proportion of White students participated in at least one type of acceleration program, whereas a larger proportion of Black students did not participate in an acceleration program. Also, a larger proportion of Hispanic students participated in AP-Only relative to the other acceleration programs. There was a large gap by income status whereby a larger proportion of low-income students participated in no acceleration compared to the other three acceleration program categories. There were also differences by gender where a larger proportion of females participated in AP-Only and CE & AP compared to CE-Only or no acceleration. Interestingly, a larger proportion of students with a special education designation participated in CE-Only or no acceleration, and a very small proportion participated in AP-Only or CE & AP. Finally, CE and AP students had the highest average GPAs (3.51), followed by AP-only students (3.15), CE-only students (2.86), and no acceleration (2.51).

Table 5
Demographic Characteristics by Acceleration Program

Variable	CE-Only (*n*=3,078)	AP-Only (*n*=6,406)	CE & AP (*n*=5,067)	No Acceleration (*n*=10,636)	Full Sample
Race/Ethnicity					
Hispanic	5%	12%	4%	9%	8%
AIAN	1%	1%	1%	1%	1%
Asian	1%	3%	2%	1%	1%
Black	24%	19%	12%	26%	21%
HIP	<1%	<1%	<1%	<1%	<1%
White	69%	65%	80%	62%	67%
Free/Reduced Lunch					
Yes	62%	52%	39%	72%	59%
No	38%	48%	61%	28%	41%
Gender					
Male	53%	43%	40%	57%	49%
Female	47%	57%	60%	43%	51%
Special Education Designation	12%	2%	1%	21%	11%
12th Grade GPA (mean)*	2.86	3.15	3.53	2.51	2.92

Note: AIAN is American Indian/Alaskan Native. HIP is Hawaiian/Pacific-Islander. *288 students did not have valid GPAs, so sample size is 24,899.

Table 6 displays the sample characteristics for those who took CE courses and differences in student characteristics by CE program. Students who participated in NACEP-defined and accredited CE were more diverse based on race/ethnicity than students who participated in NACEP-defined and not accredited programs. Alternatively, a smaller percentage of low-income students participated in NACEP-defined and accredited CE compared to NACEP-defined and not accredited CE. Interestingly, among the different CE programs, the average 12th grade GPA was the lowest for students who participated in CE that was not NACEP-defined.

Table 6
Demographic Characteristics by Concurrent Enrollment Program

Variable	NACEP-Defined & Accredited CE (*n*=3,428)	NACEP-Defined & Not Accredited CE (*n*=862)	NACEP-Defined & Accredit/Not Accredit CE (*n*=113)	Not NACEP-Defined CE (*n*=3,742)	No CE (*n*=17,042)
Race/Ethnicity					
Hispanic	4%	5%	2%	5%	10%
AIAN	1%	3%	5%	1%	1%
Asian	1%	2%	1%	2%	2%
Black	16%	6%	4%	20%	24%
HIP	<1%	<1%	0%	<1%	<1%
White	78%	84%	89%	72%	67%
Free/Reduced Lunch					
Yes	41%	49%	21%	54%	65%
No	59%	51%	79%	46%	35%
Gender					
Male	43%	44%	46%	46%	52%
Female	57%	56%	54%	54%	48%
Special Education Designation	4%	3%	1%	7%	14%
12th Grade GPA (mean)	3.36	3.49	3.67	3.13	2.75

Note: AIAN is American Indian/Alaskan Native. HIP is Hawaiian/Pacific-Islander.

Dependent variables. The dependent variables in this study were college enrollment and college retention. One binary college enrollment variable was created where students who enrolled in an Arkansas college by spring 2014 (within one year of high school graduation) were coded as 1 and all others coded as 0. The second dependent variable was retention in an Arkansas college by fall 2014 and only relevant for students who enrolled in college by spring 2014. Of these spring 2014 enrollees, students who were retained in an Arkansas college in fall 2014 were coded as 1 and all others were coded as 0.

Independent and control variables. The control variables in this study included student demographics and student academic performance (GPA); these are common controls used in other research on accelerated programs. Prior research suggests that students' access to accelerated programs varies based on demographics and prior academic performance (Cogner, Long, & Iatarola,

2009; Karp et al., 2007; Klopfenstein, 2004; Klugman, 2013; Museus, Lutovsky, & Colbeck, 2007; Taylor, 2015), so including these controls helps mitigate baseline differences in how students select or are placed into different programs. Student demographics included gender, race/ethnicity, special education designation, and income status (an indicator if a student qualified for free or reduced lunch any time during high school). GPA from 12th grade was used as a measure of students' academic performance.

The primary independent variables of interest were AP and CE participation. To answer the first and second research questions, students were first coded as either participating in AP and/or CE or not. To decipher CE program participation, we constructed a more nuanced participation measure based on how NACEP defines and accredits CE. Students' CE courses were categorized according to whether the course was NACEP-defined and/or NACEP-accredited. A course was designated NACEP-defined if it was taught on the high school campus by a high school instructor. A course was designated as NACEP-accredited if the course was offered by a postsecondary partner that was accredited by NACEP by 2011 (the first year in which most students in the sample participated in CE).

Data Analysis

To answer the research questions, we used fixed effects logistic regressions. These models were run to examine how participation in CE programs predicted students' probability of college enrollment and retention, while controlling for student demographics and academic performance. The fixed effects models took the following form,

$$Y_{ij} = \beta_0 + \beta_1 \boldsymbol{ACP}_1 + \beta_2 X_2 + \alpha_j + \epsilon_{ij}$$

where $\boldsymbol{Y_{ij}}$ is a dichotomous variable for student *i* in high school *j* for the two outcomes defined above and $\boldsymbol{X_2}$ is a vector of control variables including gender, race/ethnicity, special education designation, income status, 12th grade GPA, and AP participation (AP participation only relevant for research question two). An important control variable is $\boldsymbol{\alpha}$, a school-level fixed effect that controls for unobserved school-level factors that might influence students' college enrollment and retention outcomes such as counseling resources or schools' college-going culture, for example. The *ACP* variable represents acceleration program participation for research question one and CE program participation for research question two, so $\boldsymbol{\beta_1}$ is the primary coefficient of interest. Finally, $\boldsymbol{\epsilon}$ is the error term clustered at the school-level.

Limitations

One limitation of this study is that the outcome data are restricted to college enrollment within the state of Arkansas. Data from ADHE did not include students' college enrollment outside of the state of Arkansas, which likely means that the models underestimate the results because some students enroll in college out of the state. Despite this limitation, the results are still valuable because they address the outcomes specific to the state of Arkansas. A second limitation is unobserved variable bias. The analysis was limited by data available in the state administrative data. It is likely that there are other factors that influence college enrollment and retention that are unaccounted for in this analysis. However, as we previously noted the control variables we used are often used in similar research and help account for differences that might influence selection into programs. Finally, the key independent variables that categorize students' CE courses based on instructor type and course location are only proxies for the quality of students' experiences, even in NACEP-accredited and non-NACEP accredited contexts. That is, this study cannot verify that course quality

and students' experiences in CE courses were at a collegiate level, even if they were accredited by NACEP or not.

Results

Descriptive results for the two dependent variables are presented in Table 7 and Table 8. Table 7 shows the descriptive results by acceleration program, and shows that relative to non-accelerators, students who participated in any form of acceleration programshad higher college enrollment and fall-to-fall retention rates. The highest college enrollment and fall-to-fall retention rates were observed for students who participated in both CE & AP, followed by AP-Only, and CE-Only. Table 8 displays the same results by CE program. Excluding the very small number of students who participated in NACEP-defined and a combination of accredited/not accredited CE courses, students who took NACEP-defined courses had the highest college enrollment rates and fall-to-fall retention rates. Although those students who participated in NACEP-defined and not-accredited courses had slightly higher enrollment rates, their fall-to-fall retention rates were lower than students who participated in NACEP-defined and accredited courses.

Table 7
Descriptive Outcomes by Acceleration Program

	Enrolled by Spring 2014 (*N*=25,187)	Persisted to Fall 2014 (*N*=14,622)*
Concurrent Enrollment-Only	63%	63%
Advanced Placement-Only	64%	71%
Concurrent Enrollment and Advanced Placement	86%	84%
No Acceleration	40%	50%

Note: *Only includes the 14,622 students who enrolled in college by spring 2014.

Table 8
Descriptive Outcomes by Concurrent Enrollment Program

	Enrolled by Spring 2014 (*N*=8,415)	Persisted to Fall 2014 (*N*=6,270)*
NACEP-Defined & Accredited CE (*n*=3,428)	80%	81%
NACEP-Defined & Not Accredited CE (*n*=862)	83%	78%
NACEP-Defined & Accredit/Not Accredit CE (*n*=113)	91%	89%
Not NACEP-Defined CE (*n*=3,742)	72%	74%

Note: *Only includes the 6,270 students who enrolled in college by spring 2014.

Table 9 and Table 10 report the results to the two research questions, respectively. The two fixed effects models in Table 9 display odds ratios for the acceleration programs based on the two outcomes: college enrollment by spring 2014 and fall 2014 college retention. Relative to students who did not participate in an acceleration program, the results suggest that participation in CE, AP, or CE & AP are all significant predictors of college enrollment and fall-to-fall retention, controlling for demographic and academic factors. Interestingly, the largest coefficients were observed for those students who participated in both CE & AP.

The two fixed effects models in Table 10 display odds ratios for the CE programs based on the two outcomes: enrollment in college by spring 2014 and fall 2014 retention. The reference group for the concurrent program variable was students who participated in CE courses that were NACEP-defined but not NACEP-accredited. After controlling for other factors and using school-level fixed effects, the results suggest no difference in enrollment or retention outcomes between models that were and were not NACEP-accredited. Interestingly, the models show that students who participated in program that were not NACEP-defined (i.e., taught on a college campus or by a college instructor) had lower odds of enrolling and being retained in an Arkansas college.

Table 9
College Enrollment and College Retention Fixed Effect Models, by Acceleration Program

	Spring 2014 Enrollment	Fall 2014 Retention+
Variable	Odds Ratio (SE)	Odds Ratio (SE)
Acceleration Program (No Acceleration)		
Exclusively CE	1.922***	1.177*
	(0.099)	(0.080)
Exclusively AP	1.566***	1.215***
	(0.066)	(0.070)
CE & AP	3.577***	1.801***
	(0.201)	(0.121)
Race/Ethnicity (White)		
Hispanic	0.603***	1.992***
	(0.038)	(0.202)
American Indian/Alaskan Native	0.891	0.868
	(0.121)	(0.164)
Asian	0.786*	1.356*
	(0.100)	(0.251)
Black	1.988***	1.287***
	(0.104)	(0.090)
Hawaiian/Pacific-Islander	0.772	0.924
	(0.198)	(0.358)
Free/Reduced Lunch (No)	0.659***	0.586***
	(0.024)	(0.028)
Female (Male)	1.192***	1.033
	(0.037)	(0.043)
Special Education Designation (No designation)	0.345***	0.761**
	(0.018)	(0.069)
12th Grade GPA	2.400***	4.225***
	(0.068)	(0.191)
Model Statistics		
N	24,707	14,438
Pseudo-R-squared	.18	.17

Note: *p<.05, **p<.01, ***p<.001
Note: +Sample restricted to students who enrolled in college by spring 2014.

Table 10
College Enrollment and College Retention Fixed Effect Models, by Concurrent Enrollment Program

	Spring 2014 Enrollment	Fall 2014 Retention+
Variable	Odds Ratio (SE)	Odds Ratio (SE)
CE Program (NACEP-Defined & Not NACEP-Accredited CE)		
NACEP-Defined & Accredited CE	0.730	0.958
	(0.138)	(0.207)
Not NACEP-Defined	0.712*	0.798
	(0.118)	(0.151)
Race/Ethnicity (White)		
Students of Color	1.428***	1.379**
	(0.127)	(0.144)
Free/Reduced Lunch (No)	0.663***	0.542***
	(0.048)	(0.044)
Female (Male)	1.271***	1.086
	(0.081)	(0.079)
Special Education Designation (No designation)	0.427***	0.833
	(0.053)	(0.159)
AP Participant (Non-participant)	1.590***	1.435***
	(0.125)	(0.126)
12th Grade GPA	2.792***	4.513***
	(0.175)	(0.379)
Model Statistics		
N	7,678	5,956
Pseudo-R-squared	.14	.15

Note: *p<.05, **p<.01, ***p<.001
Note: +Sample restricted to students who enrolled in college by spring 2014.

Discussion and Implications

Accelerated and CE programs continue to flourish around the country, and state and federal policymakers are encouraging expansion of accelerated programs (Harnish & Parker, 2014). The results of this study include two primary findings. First, the results confirm previous research (An, 2013a; An & Taylor, 2015; Speroni, 2011) that shows both CE t and AP participation predicts college enrollment and success in college. Further, this study corroborated previous studies that show that after controlling for demographic and academic factors, there were only marginal differences in the longer-term outcome (retention) between CE and AP participants (An, 2013a; Speroni, 2011). For example, both An (2013a) and Speroni (2011) found that the difference in bachelor's degree completion between CE and AP students was minimal. For the shorter-term outcome of college enrollment, however, this study found that the CE coefficient was larger than the AP coefficient, and interestingly, students who participated in both CE and AP had the greatest likelihood of enrolling in and being retained in college. This result is similar to Speroni's (2011) Florida sample, which found CE students were more likely to enroll in college than AP students.

The second main finding and the most significant contribution of this study is presented in Table 10. The table shows that there is no difference in college enrollment and retention between

students who participated in NACEP-accredited CE courses and students who participated in similar CE courses that were not NACEP-accredited. That is, students who participated in CE courses located on a high school campus and/or taught by a qualified high school instructor *and* that were accredited by NACEP were neither more or less likely to enroll in college or be retained in college compared to students who participated in similar CE courses that were not accredited. However, these results show that students who participated CE courses that were not NACEP-defined (e.g., located on a college campus or taught by a college instructor) were slightly less likely to enroll in an Arkansas college within the first year. This finding aligns with Phelps and Chan (2016) that shows better educational outcomes for CE courses taught on the high school campus compared to college campus. Collectively, these results suggest that the efforts to expand and encourage accelerated programs (CE and AP) may have positive benefits in terms of students' odds of college enrollment and success. They also suggest that comparisons of CE and AP students are complicated because of the confounding effects of student participation in both programs. Because students who participated in both programs were more successful than non-participants and students who exclusively enrolled in either program, the results suggest that schools and colleges should consider promoting both programs and then assess which students have access and which students benefit from these program. Despite this, descriptive data reported in Table 5 and Table 6 show that participation in AP and CE was not equitable, which aligns with prior literature that shows inequitable access to these programs (Cogner, Long, & Iatarola, 2009; Karp et al., 2007; Klopfenstein, 2004; Klugman, 2013; Museus, Lutovsky, & Colbeck, 2007; Taylor, 2015). Because participation in both programs predicts college enrollment and retention, policymakers and leaders should identify ways to expand access for underrepresented students if they wish to reduce existing disparities in college access and success.

In terms of NACEP's accreditation model, the null effect may indicate there were no differences in the quality of CE programs that were and were not NACEP accredited. This result does not align with other literature on the impact of accreditation in medicine and engineering (Cladwell et al., 2011; Dickenson et al., 2006; van Zanten & Boulet, 2006; Volkwein et al., 2007). The result is somewhat counterintuitive and concerning because NACEP's mission is to ensure that concurrent enrollment programs are high-quality. The assumption is that the quality of students' experience in these programs is greater than similar programs that are not accredited by NACEP. Because the assumption is that students in NACEP-accredited programs receive higher quality instruction, this suggest sthat student would also have better outcomes compared to similar programs that are not accredited. However, this assumption did not hold up based on the results of this study, at least as measured by college enrollment and retention in Arkansas.

What explains the null difference in outcomes between the two models? On the one hand, the null difference may be the result of a weak or ineffective accreditation process. That is, although programs complete a robust NACEP accreditation review process, the process may not be effective or it may be too weak to influence the outcomes measured in this study. On the other hand, the null difference may be the result of factors other than NACEP accreditation. For example, many of the NACEP-accredited institutions were only recently accredited at the time this sample of students participated in CE. The NACEP standards may not have fully influenced programs or had as extensive of an impact compared to programs that had been accredited for many years before the study's observation period. That is, differences in the timing of accreditation status may influence the results. Similarly, it could be that NACEP-accredited institutions needed accreditation more than the institutions that were not NACEP-accredited. Because institutions self-select to pursue NACEP accreditation, it could be that accredited institutions sought accreditation because they already had lower average outcomes compared to non-accredited institutions. Likewise, institutions that did not

self-select to pursue NACEP accreditation might have already had higher average outcomes or they might have established other quality controls that produced acceptable outcomes. More information on pre-accreditation outcomes and implementation would be needed to fully assess these assumptions or more rigorous quasi-experimental designs are needed to eliminate alternative hypotheses and explanations. A final explanation for the results may be that NACEP accreditation increases students' learning and knowledge, but not their decision to enroll in college or stay in college in Arkansas.

The implications of these results for policy and practice are not straightforward because more research is needed to assess the influence of NACEP accreditation. If we assume institutions that were not NACEP accredited were not implementing quality controls similar to NACEP, this study suggests that institutions may not want to pursue NACEP accreditation if their program's goal is to increase college access and success. However, given that the quality of CE courses is of increasing interest to higher education stakeholders, including the regional accreditors (Borden et al., 2013; Smith, 2015; Zinth, 2015), there might be a political or strategic advantage for institutions to seek accreditation because it signals to constituents that programs are high quality and invested in continuous quality improvement.

The results of this study could also mean that NACEP needs to create new standards or require stronger implementation of existing standards that would impact college access and success, if that is desired. Alternatively, the results might suggest that states and institutions could implement quality control measures, similar to what Arkansas adopted in 2015. NACEP reports that nine states either require or encourage NACEP accreditation for concurrent enrollment, but in another ten states, the state has quality standards that are modeled after NACEP (NACEP, 2018b). Even still, research on CE state policy suggests that many states policies do not regulate the quality of CE courses or delegate that regulation to local mechanisms (Borden et al., 2013; Zinth, 2015).

This study leads to several implications for future research. First, researchers should replicate this study in other states and in other contexts. Over 100 institutions in 23 states are accredited by NACEP (NACEP, 2018a), so further research is needed in other contexts to fully assess the influence and value of NACEP accreditation on college access and success. Second, future research should measure and document the existence of quality standards at non-NACEP accredited institutions. Finally, future research should examine additional outcomes of AP and NACEP-accredited CE, including student learning and college GPA.

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About the Authors

Jason L. Taylor
Univeresity of Utah
jason.taylor@utah.edu
http://orcid.org/0000-0002-1946-867X
Jason L. Taylor is an Assistant Professor in the Department of Educational Leadership and Policy at the University of Utah. He received his Ph.D. in Higher Education from the University of Illinois at Urbana-Champaign with a research specialization in evaluation methods and concentration in public policy. His broad research interests are at the intersection of community college and higher education policy and educational and social inequality.

Rui Yan
Indiana University
ruiyan0417@gmail.com
Rui Yan is currently a postdoctoral researcher at Indiana Business Research Center at Indiana University. She received her Ph.D. in Educational Leadership and Policy from the University of Utah. Her research interests focus on principal and teacher labor markets, school leadership, program evaluations, and quantitative research methods.

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