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Understanding the Teacher Pipeline for Indiana's K–12 Public Schools

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Understanding the Teacher Pipeline for Indiana's K–12 Public Schools

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Leaders at the Indiana Commission for Higher Education and the Indiana Department of Education are concerned about teacher shortages and want a better understanding of the teacher pipeline for the state's K–12 public schools. This study tracked 11,080 students who first enrolled in an Indiana public college or university in 2010/11, 2011/12, or 2012/13 and pursued a bachelor's degree in education at any point in college. Among those entrants 41 percent completed a bachelor's degree in education by 2017/18. Of those degree completers 55 percent earned an initial instructional license, and of those licensed, 69 percent entered teaching in an Indiana public school. Compared with the initial group of students entering education programs, students who completed a bachelor's degree, those who earned an initial instructional license, and those who entered teaching in an Indiana public school were less likely to be from a racial/ethnic minority group or to have been eligible for the national school lunch program in high school. Students who entered an education program in their third year of college or later were less likely to complete a bachelor's degree in education than students who entered in their first year, after other differences in student characteristics and the characteristics of the first college they attended were adjusted for. Students who received an Indiana 21st Century Scholarship in their first year of college or who received financial aid beyond their first year were more likely to complete a bachelor's degree in education, while students who received a Pell Grant were less likely. Finally, students who started at a two-year college and transferred to a four-year college were more likely to complete a bachelor's degree in education than students who started at a four-year college.

Why this study?

Leaders at the Indiana Commission for Higher Education and the Indiana Department of Education are concerned about teacher shortages and want a better understanding of the teacher pipeline for the state's K–12 public schools. Like many states, Indiana has had difficulty attracting college students to the teaching profession and retaining licensed teachers (Aragon, 2016). A recent survey revealed that 94 percent of responding Indiana districts had a teacher shortage at the beginning of the 2017/18 school year and that more than 20 percent of the districts used substitute teachers to fill full-time positions (Weddle, 2017). Recent enrollment declines in Indiana teacher preparation programs have contributed to concerns about teacher shortages. Between 2011/12 and 2014/15, enrollment in teacher preparation programs declined 51 percent, the number of students completing education degrees declined 22 percent, and the number of initial teacher licenses issued declined 44 percent (U.S. Department of Education, n.d. c).

Nationwide, high school graduates are showing diminishing interest in becoming educators. Only 4 percent of the more than 1.9 million 2015 U.S. high school graduates who took the ACT said that they intended to pursue a career in education, down from 5 percent in 2014 and 7 percent in 2010 (ACT Inc., 2016). Research on teacher recruitment and retention identifies several major reasons for the low interest in teaching and several barriers to teacher recruitment, including the additional costs and time involved for teacher credentialing, low teacher salaries, and the perceived erosion of respect for the teaching profession (see, for example, Podolsky et al., 2016; Ramirez, 2010).

For additional information, including technical methods and supporting analyses, access the report appendixes at https://go.usa.gov/xsY4z.

Addressing the teacher shortage is a top priority for leaders at the Indiana Department of Education and the Indiana Commission for Higher Education (Herron, 2017; Mau et al., 2008). They have requested comprehensive information about the numbers and characteristics of students who enroll in education programs in Indiana, complete a bachelor's degree in education, earn an initial instructional license, and enter and remain teaching in an Indiana public school. Leaders at the Indiana Commission for Higher Education also want to better understand what factors might be related to undergraduate students' persistence in and completion of education degrees. For example, they want to know whether completion of an education degree differed for students by the year in college in which they enrolled in an education program and whether and how completion was related to financial aid in college.

Despite the growing body of research on teacher preparation, including research on the effectiveness of teachers according to their certification route (for example, Boyd et al., 2006; Clark et al., 2015; Harris & Sass, 2007), there is little research on the characteristics, experiences, and outcomes of undergraduate education students. Some research suggests that students who are interested in pursuing an education degree have lower-than-average achievement levels in high school (see, for example, ACT Inc., 2016). There also is evidence that racial/ethnic minority students are underrepresented in undergraduate education programs and that the low racial/ethnic diversity among education students carries over to the teacher workforce. For example, 25 percent of students enrolled in university-based undergraduate teacher preparation programs in the 2012/13 school year were individuals of color compared with 37 percent of all undergraduate students (regardless of major) in those same universities (U.S. Department of Education, 2016). Few research studies on college attrition, time to degree, and graduation have focused on undergraduate education students. For instance, research indicates that choosing a major by the end of the second year of college is associated with better academic achievement (Foraker, 2012) and higher rates of on-time graduation (Venit, 2016), but no studies have examined the association between the timing of enrollment in an education program and completion of an education degree.

This study examined the characteristics of and outcomes for undergraduate education students in Indiana public colleges and universities and the factors related to completion of an education degree. Leaders at the Indiana Department of Education and the Indiana Commission for Higher Education can use the findings to inform the design of policies and strategies to plug leaks in the teacher pipeline and alleviate teacher shortages. They can also share and discuss the findings and implications with education programs and other stakeholders.

Research questions

This study looked at three cohorts of undergraduate education students (see box 1 for definitions of key terms) who first enrolled in an Indiana public college or university in 2010/11, 2011/12, or 2012/13 and pursued a bachelor's degree in education at any point in college (entrants). The study followed the entrants who graduated from college (completers), earned a license, and entered the teaching workforce in an Indiana K–12 public school. Students were followed to the 2017/18 school year for college enrollment and degree completion and to the 2018/19 school year for employment in Indiana's K–12 public schools. The study also analyzed students' demographic (gender, race/ethnicity) and background characteristics (whether they received special education services, were eligible for the national school lunch program, or were English learner students in high school) as well as their high school academic preparation (whether they passed an Advanced Placement exam or earned an honors diploma).

Box 1. Key terms

21st Century Scholarship. An Indiana scholarship program that awards financial grants for up to four years at an Indiana college or university. To receive a 21st Century Scholarship, students must meet income eligibility requirements and sign up in grades 7 or 8. Students who enroll must meet certain academic expectations in high school and college to earn and maintain their scholarship. Students also receive supports to help them stay on track for and succeed in college.

Barron's rating. An index published annually by Barron's that rates accredited four-year colleges and universities in the United States based on their admissions selectivity. Colleges are grouped into six categories: most competitive, highly competitive, very competitive, competitive, less competitive, and noncompetitive (Barron's Educational Series, 2013). Rating factors include students' college entrance exam scores (SAT and ACT scores), rank in high school graduating class, high school grade point average, and applicants-to-freshman class ratio. The index is not a rating of the competitiveness or quality of undergraduate programs. Two-year colleges are not rated.

Degree completer (completer). An undergraduate education student awarded a bachelor's degree in education in a public college or university in Indiana.

Degree completer with a license (completer with a license). An undergraduate education student awarded a bachelor's degree in education in a public college or university in Indiana who has earned an initial instructional license.

Education program. An instructional program at a four-year college or university that focuses on the theory and practice of learning and teaching and on related research, administrative, and support services (U.S. Department of Education, n.d. d).

High school academic preparation. Whether entrants, completers, or completers with a license passed an Advanced Placement exam or earned an honors diploma.

Honors diploma. A high school diploma granted to students who have completed all the requirements for Core 40 (Indiana's core requirements for secondary graduation), completed additional credits, and met certain grade minimums. The term includes both the Core 40 with Academic Honors diploma and the Core 40 with Technical Honors diploma.

Initial instructional license. A license that qualifies its holder to teach in an Indiana elementary or secondary school. Instructional licenses with the credential type Professional Educator License, Professional, or Standard were considered initial instructional licenses.

Median time. The time within which half the sample (or subgroup) attained a particular outcome (completed a bachelor's degree or a bachelor's degree in education), estimated based on regression analyses.

Other factors. When describing the relationship between a characteristic of interest and the outcome, "other factors" refers to all student and institutional characteristics included in the regression analyses other than the characteristic being discussed. See table B8 in appendix B for a full list of characteristics included in the analyses.

Remediation. Students in Indiana public colleges and universities who enrolled in a remedial course in English language arts or math. Indiana colleges and universities have different ways of identifying students needing remediation. Typically, credits earned in remediation do not count toward the credits required for a degree program.

Teacher evaluation rating. A summative rating of teachers in Indiana public schools (on a scale of ineffective, improvement necessary, effective, and highly effective) under a school district's teacher evaluation system. Indiana districts are required to evaluate teachers using multiple measures, including student academic growth, classroom observations, and other rigorous measures of effectiveness defined by local school districts.

Undergraduate education student (entrant). A student who at some point pursued a bachelor's degree in education in a public college or university in Indiana, including students who ever enrolled in a four-year education program and students who completed a bachelor's degree in education (regardless of whether they enrolled in a four-year education program). Students who majored in fields other than education who had a minor in education and who were never awarded a bachelor's degree in education were not included.

The study examined the following research questions:

1. In which year in college did students who first enrolled in an Indiana public college or university in 2010/11, 2011/12, or 2012/13 enroll in an education program? What were their characteristics?

2. What percentage of these entrants completed a bachelor's degree in education by 2017/18? What were their characteristics?

3. What percentage of degree completers earned an initial instructional license by 2017/18? What were their characteristics?

4. What percentage of degree completers with a license entered teaching in an Indiana K–12 public school by 2018/19? What were their characteristics?

5. What percentage of degree completers with a license who entered teaching remained teaching in an Indiana K–12 public school by 2018/19? How did they perform under their district's teacher evaluation system?

6. Did the proportion of degree completers with a license who entered teaching, their retention rates, or their evaluation results vary by the characteristics of the education program they attended?

7. How were the timing of first enrolling in an education program, individual characteristics, and institutional characteristics related to completing a bachelor's degree in education and completing a bachelor's degree in any field for undergraduate education students, after other student and institutional factors were adjusted for?

Box 2 summarizes the data sources, sample, and methods used to answer the research questions, and appendix B provides additional details.

Box 2. Data sources, sample, and methods

Data sources. The study used a combination of administrative data collected by the Indiana Department of Education and the Indiana Commission for Higher Education and publicly available data.

The Indiana Department of Education provided the following data:

- High school graduation records for students who graduated between 2009/10 and 2017/18, which provide information on students' demographic and background characteristics as well as their high school academic preparation.
- Employment data for licensed educators, which contain annual snapshots of licensed educators working in Indiana public schools between 2012/13 and 2018/19, collected from May 1 to June 30 of each year.
- Teacher evaluation data, which provide teachers' summative ratings from each evaluation under their district's teacher evaluation system between 2012/13 and 2017/18. Teachers in the dataset have 0–13 evaluation records each year; the majority had one or two evaluations each year.
- Teacher licensure data, which include records for all educator licenses active in Indiana between 2013/14 and 2017/18.

The Indiana Commission for Higher Education provided the following data:

- College enrollment and degree records for all students enrolled in Indiana public colleges and universities between 2010/11 and 2017/18.

The following publicly available data were obtained from the Integrated Postsecondary Education Data System:

- Data on the characteristics of Indiana colleges and universities between 2010/11 and 2012/13 (U.S. Department of Education, n.d. b).

The following publicly available data were obtained from the U.S. Department of Education Title II data website:

- Data on the characteristics of Indiana education programs by institution between 2010/11 and 2017/18 (U.S. Department of Education, n.d. a).

Sample. The study examined cohorts of first-time undergraduate students who started at an Indiana public college or university between 2010/11 and 2012/13 and pursued a bachelor's degree in education at any point in college. The sample included students who started at a four-year college as well as students who started at a two-year college and transferred to a four-year college and pursued a bachelor's degree in education. The study did not include students in graduate programs or alternative certification programs.

The analytic sample for research question 1 included 11,080 undergraduate education students (4,395 students in the 2010/11 cohort, 3,496 students in the 2011/12 cohort, and 3,189 students in the 2012/13 cohort). The study tracked these undergraduate students in college through the 2017/18 school year and their employment status in Indiana public schools through the 2018/19 school year. The analytic sample for research questions 2–6 included students in the initial sample who reached each milestone in the teacher pipeline (completed a bachelor's degree in education, earned an initial instructional license, and entered teaching in an Indiana K–12 public school). The approximately one-fourth of the students in the samples who had missing data on demographic and background characteristics and high school academic preparation were not included in the description of student characteristics and high school preparation for research questions 1–4. Supplemental analyses for research question 1 also included 13,448 undergraduate education students in the 2013/14–2017/18 cohorts.[1] The analytic sample for research question 7 was the same as that for research question 1 except that 41 students were excluded as outliers (see appendix A for details on the breakdown of students excluded for different reasons). Thus, 11,039 students were in the sample for research question 7, including students with missing background and high school data. (The study team used a statistical technique to handle missing data for this research question; see appendix A.)

Methodology. Unique student identifiers in the data files enabled students' high school data to be linked with their college data, certification status, and workforce experience.

For research question 1 the study team calculated the frequencies and percentages of students in each cohort who enrolled in an education program during each year of college and described their characteristics .

For research questions 2 and 3 the study team calculated the number and percentage of students who completed a bachelor's degree in education (completers) and the percentage of completers who earned an initial instructional license and described the characteristics of students who reached these milestones.

For research questions 4 and 5 the study team identified completers who earned an instructional license and were employed in an Indiana K–12 public school each year between 2012/13 and 2018/19. The study team then calculated the percentage of those with a license who were ever employed in an Indiana public school during the period and those who remained teaching in an Indiana K–12 public school for a second, third, and fourth year. The study team described the distribution of evaluation ratings for those teachers in their first, second, and third years of teaching.

For research question 6 the study team examined whether employment, retention, and evaluation of teachers with an instructional license varied by the percentage of racial/ethnic minority students in their education program or the average number of student teaching hours required by their education program. The study team first classified education programs into three groups (low, medium, high) based on cut values that corresponded to the 25th and 75th percentile values of the percentage of racial/ethnic minority students and of the average hours required for student teaching. The study team then calculated the percentages of completers in each group that attained each of the outcomes.

For research question 7 the study team used regression models to examine the relationship between completing a bachelor's degree in education and various individual and institutional factors (covariates). Because students who pursued a bachelor's degree in education at any point in their college education might end up completing a bachelor's degree in another field, the study team also examined students who completed a bachelor's degree in any field as a secondary outcome. Each outcome (completing a bachelor's degree in education and completing a bachelor's degree in any field) is a dichotomous variable that takes a value of 1 when a student completed the degree in a given year and 0 if the student did not complete the degree in that year. Multiple imputation was used to address missing data in covariates, which involved creating several different plausible imputed data sets and appropriately combining the results. The findings are reported as comparisons of the probability of obtaining the outcome in a given year. The regression results were also used to calculate the estimated median time to completion for different student subgroups (for example, for female students compared with male students).

For research questions 1–6 group differences of 5 percentage points or greater for an outcome or a characteristic were considered meaningful and are reported in the main report. For research question 7, relationships that were statistically significant at the .05 level are reported in the main report. Appendix A provides more detail on the methodology, and appendix B reports the results of supplemental analyses.

Note

1. The size of the 2013/14–2017/18 cohorts of undergraduate education students was smaller than that of the 2010/11–2012/13 cohorts for two reasons. First, enrollment in education programs had been declining from year to year fairly rapidly before 2013/14 but started to stabilize and remained at the 2013/14 level in subsequent years. Second, the later cohorts were tracked for fewer years, and the counts would increase as more students entered education programs in subsequent years.

Findings

This section presents the main findings for undergraduate education students in the 2010/11–2012/13 cohorts. Additional findings for these students and findings from the supplemental analyses are in appendix B.

About 84 percent of undergraduate education students in the 2010/11–2012/13 cohorts first enrolled in an education program in their first two years of college

Of the 11,080 students in the 2010/11–2012/13 cohorts who pursued a bachelor's degree in education, 67 percent enrolled for the first time in an education program in their first year of college, and 17 percent did so in their second year. Just 9 percent enrolled in their third year, and 7 percent did so in or after their fourth year. (See table B1 in appendix B for a breakdown by cohort.)[1]

Students pursuing an education degree were more likely than the population of all students pursuing a bachelor's degree in any field to be White (88 percent versus 82 percent) and female (73 percent versus 54 percent) and less likely to have passed an Advanced Placement exam in high school (16 percent versus 22 percent).

Fewer than half of undergraduate education students completed a bachelor's degree in education, and slightly more than half of degree completers earned an initial instructional license by 2017/18

Of the 11,080 students in the 2010/11–2012/13 cohorts who pursued a bachelor's degree in education, 41 percent completed a bachelor's degree in education by 2017/18 (figure 1). An additional 2 percent completed an associate's degree or lower in education.[2] About 22 percent completed a bachelor's degree in a field other than education,[3] and 3 percent completed an associate's degree or lower in a field other than education. The remaining 32 percent did not earn any degree or certificate.

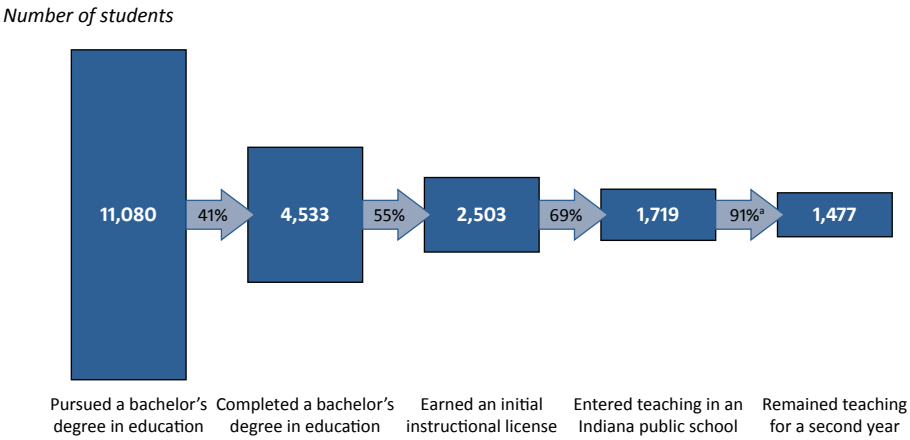
About 55 percent of students who completed a bachelor's degree in education earned an initial instructional license in Indiana by 2017/18 (see figure 1).[4] An instructional license qualifies its holder to teach in an Indiana elementary or secondary school. In addition, 2 completers earned an administrative license, and 14 earned a student services license.

Completers and completers who earned an initial instructional license were less diverse in background characteristics, had better academic preparation in high school, and performed better in their first year of college compared with entrants

There were some differences in the demographic and background characteristics and high school academic preparation of entrants, completers, and completers with a license. About 73 percent of education program entrants were

1. Some 23 students (0.2 percent) never enrolled in an education program but completed a bachelor's degree in education.
2. This includes students who enrolled in a four-year college (but did not complete a bachelor's degree there) and later completed an associate's degree or lower in education at a two-year college and students who completed an associate's degree or lower in education at a two-year college and later transferred to a four-year college and enrolled an education program there but did not complete a bachelor's degree there. It does not include students who completed an associate's degree or lower in education at a two-year college without ever attending a four-year college. In Indiana, awards lower than an associate's degree include certificates (awards of at least one but less than two academic years) and awards of less than one academic year.
3. The 22 percent of students who completed a bachelor's degree in another field included the 8 percent of students who completed a degree in social and behavioral sciences, the 6 percent who completed a degree in arts and humanities, the 4 percent who completed a degree in business and communication, the 3 percent who completed a degree in health, and the 1 percent who completed a degree in science, technology, engineering, or math.
4. To be eligible for an Indiana instructional license, applicants must hold a bachelor's degree, complete an approved education program, and pass the state-required tests (the CORE assessments). The first-time pass rate in 2017/18 was 63 percent for reading and English language arts, 59 percent for social studies, 78 percent for science, and 66 percent for math (Indiana Department of Education, 2018).

Figure 1. Fewer than half of undergraduate education students in the 2010/11–2012/13 cohorts completed a bachelor's degree in education by 2017/18



Note: The values shown in the arrows are percentages of the number in the box preceding the arrow.

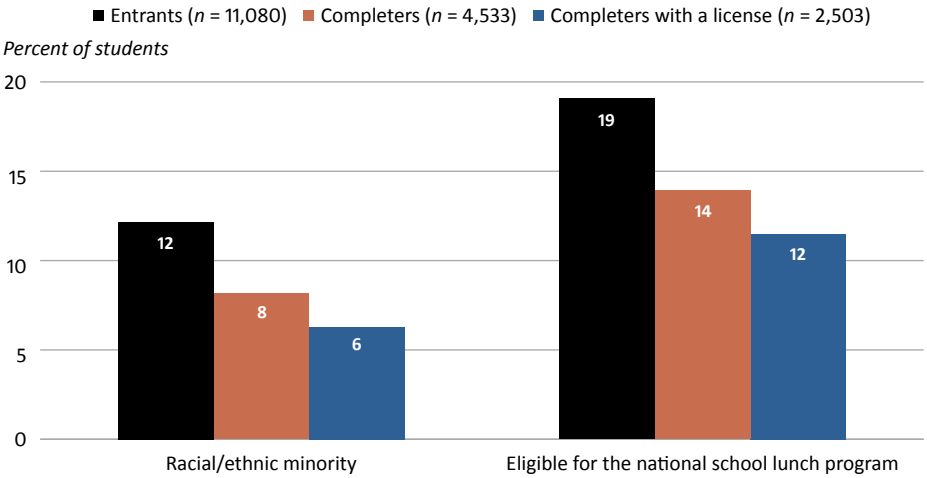
a. The percentage of teachers who entered teaching before 2018/19 and remained teaching for a second year. The calculation excluded 96 teachers who entered teaching in 2018/19 for the first time.

Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education.

female compared with 79 percent of completers and 78 percent of completers with a license; 12 percent of entrants were racial/ethnic minority students compared with 8 percent of completers and 6 percent of completers with a license; and 19 percent of entrants were eligible for the national school lunch program in high school compared with 14 percent of completers and 12 percent of completers with a license (figure 2; see also table B2 in appendix B).

Completers and completers with a license had better academic preparation in high school than entrants: 23 percent of completers and 25 percent of completers with a license passed an AP exam compared with 16 percent of entrants, and 64 percent of completers and 65 percent of completers with a license earned an honors diploma compared with 48 percent of entrants (see table B2 in appendix B).

Figure 2. The percentage of racial/ethnic minority students and the percentage of students eligible for the national school lunch program in high school were smaller among completers and among completers with a license than among entrants in the 2010/11–2012/13 cohorts



Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education.

There were also differences in the college experiences of entrants, completers, and completers with a license. A lower percentage of completers and completers with a license (24–30 percent) than of entrants (32–37 percent) were Pell Grant recipients during the first four years of college (see table B3 in appendix B). Completers and completers with a license were less likely than entrants to enroll in remedial courses, had a higher grade point average, and earned a higher average number of credits in each year of college.

About 69 percent of completers with a license had taught in an Indiana public school for at least one year by 2018/19, and 91 percent of completers with a license who had entered teaching before 2018/19 remained teaching in an Indiana public school for a second year

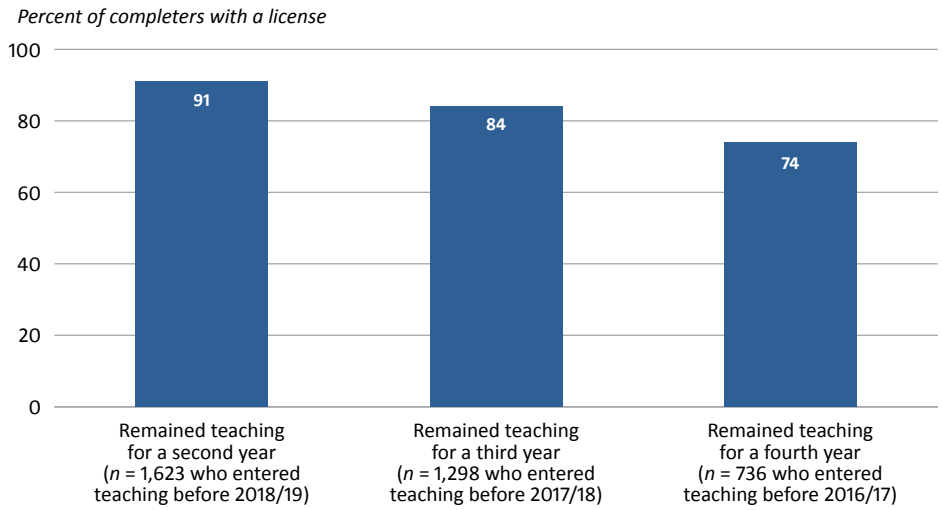
Among the 2,503 completers with a license in the 2010/11–2012/13 cohorts, 69 percent had taught in an Indiana K–12 public school for at least one year by 2018/19. The student demographic and background characteristics and high school academic preparation of these teachers were similar to those of all completers with a license (see table B2 in appendix B).

About 91 percent of completers with a license who had entered teaching before 2018/19 remained teaching in Indiana for a second year, 84 percent who had entered before 2017/18 remained for a third year, and 74 percent who had entered before 2016/17 remained for a fourth year (figure 3).

Most completers with a license who entered teaching received a summative evaluation rating of effective or highly effective in each of their first three years of teaching

Among completers with a license who entered teaching and were evaluated under their district's teacher evaluation system, 83 percent received a rating of effective in their first year of teaching, and 12 percent received a rating of highly effective (figure 4). The percentage rated highly effective increased to 25 percent among those evaluated in the second year of teaching and to 33 percent among those evaluated in the third year.[5]

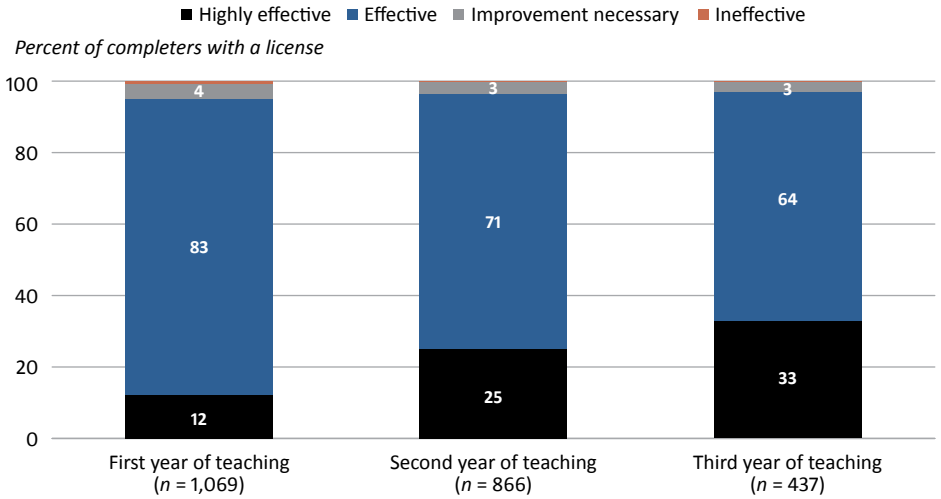
Figure 3. About 74 percent of completers with a license in the 2010/11–2012/13 cohorts who entered teaching by 2016/17 remained teaching in an Indiana public school for a fourth year



Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education.

5. The percentage of completers with a license who were rated effective or highly effective was similar to that for the population of teachers with evaluation data each year between 2013/14 and 2017/18 (see table B4 in appendix B). However, the percentage of

Figure 4. Most completers with a license who taught in an Indiana public school and were evaluated between 2012/13 and 2017/18 earned a rating of effective or highly effective in each of their first three years of teaching



Note: The percentage of completers with a license receiving a rating of Ineffective was less than 1 percent, and the rating is not labeled in the figure.

Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education.

The percentage of completers with a license who entered teaching and their retention rates varied by the characteristics of their education program

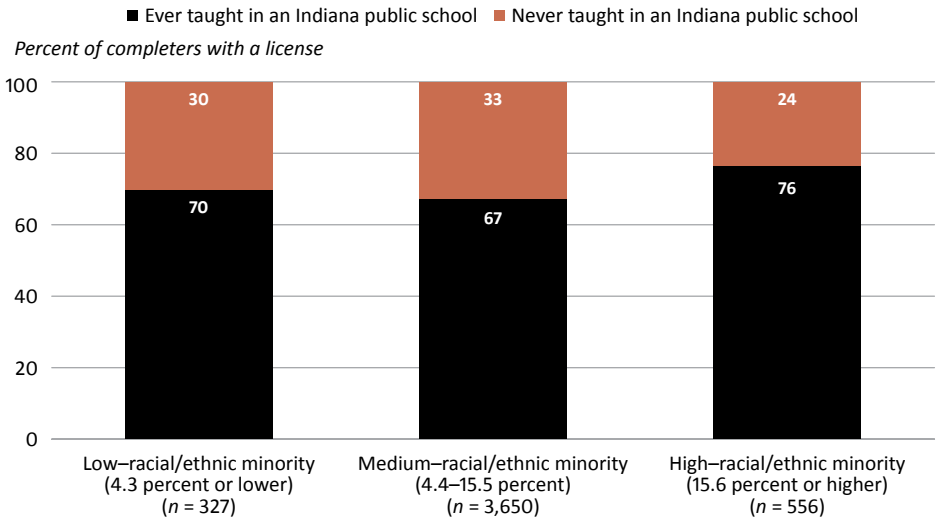
The percentage of completers with a license entering teaching was related to two characteristics of their education program: percentage of racial/ethnic minority students and number of hours of student teaching required. Among completers with a license, those who had completed an education program with a high percentage of racial/ethnic minority students were more likely to enter teaching in an Indiana public school (76 percent) than those who had completed a program with a medium percentage (67 percent) or a low percentage (70 percent; figure 5). Among completers with a license, those who had completed an education program that required 491–639 hours of student teaching were less likely to enter teaching in an Indiana public school than those who had completed a program that required more or fewer hours of student teaching (figure 6).

However, the proportion of completers who remained teaching in an Indiana public school for a second year was related only to the percentage of racial/ethnic minority students in an education program. Among completers with a license, those who completed an education program with a low percentage of racial/ethnic minority students had higher retention rates after the second year (94 percent for a third year and 88 percent for a fourth year) than those who completed a program with a medium percentage of racial/ethnic minority students (83 percent and 73 percent) or a high percentage (85 percent and 78 percent; see table B5 in appendix B).

Teachers' evaluation ratings in their first three years of teaching were not associated with the percentage of racial/ethnic minority students in their education program or the number of student teaching hours required at teachers' preservice education programs (see table B6 in appendix B).

completers with a license who were rated highly effective was lower than that for the population of teachers—39–47 percent of all teachers evaluated each year between 2013/14 and 2017/18 earned a rating of highly effective.

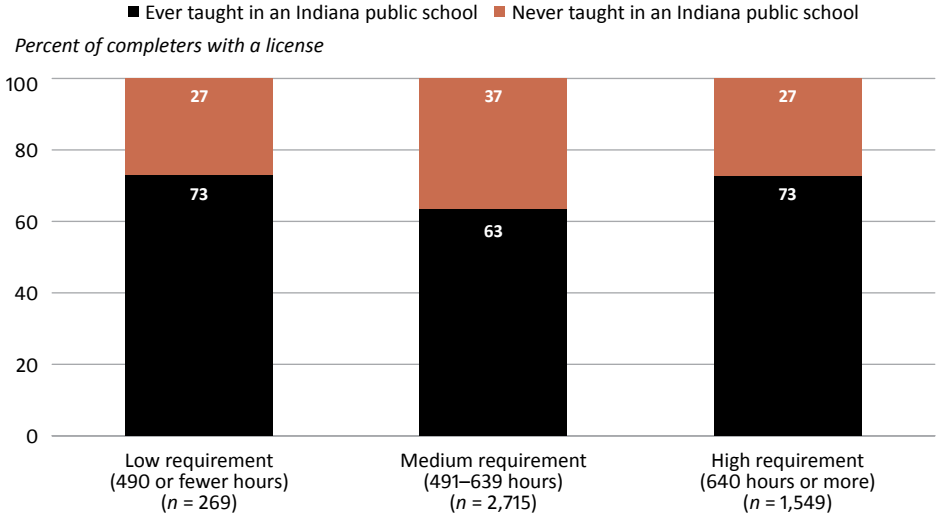
Figure 5. Among completers with a license in the 2010/11–2012/13 cohorts, those who completed an education program with a high percentage of racial/ethnic minority students were more likely to enter teaching in an Indiana public school



Note: Education programs in the low-, medium-, and high-minority percentage groups are those in the lowest 25 percent, middle 50 percent, or highest 25 percent of programs in terms of percentage of racial/ethnic minority students among all public education programs in Indiana (averaged across 2014–18).

Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education and publicly available data from the federal Title II data website (U.S. Department of Education, n.d. a).

Figure 6. Among completers with a license in the 2010/11–2012/13 cohorts, those who completed an education program that required 491–639 hours of student teaching were less likely to enter teaching in an Indiana public school than those who completed a program that required more or fewer hours



Note: Education programs in the low, medium, and high groups are those in the lowest 25 percent, middle 50 percent, or highest 25 percent of programs in terms of the number of hours required for student teaching among all public education programs in Indiana (averaged across 2014–18).

Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education and publicly available data from the federal Title II data website (U.S. Department of Education, n.d. a).

After other factors were adjusted for, the probability of completing a bachelor's degree in education was related to the year in college when a student enrolled in an education program, student background characteristics, earning an honors diploma in high school, performance in the first year of college, financial aid receipt in college, and the characteristics of the first college in which a student enrolled

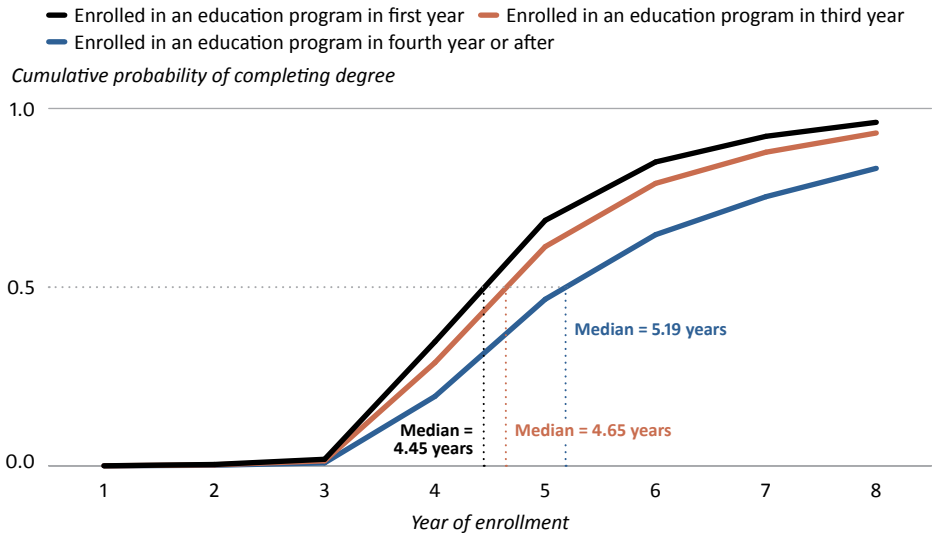
Statistical analyses examined the relationships between various individual and institutional factors and the probability of completing a bachelor's degree in any field and of completing a bachelor's degree in education in each study year and the time to complete the degree (see table B7 in appendix B for the proportion of students awarded a bachelor's degree in any field and the proportion awarded a bachelor's degree in education each year). Because the relationships between these factors and the two outcomes—completing a bachelor's degree in any field and completing a bachelor's degree in education—were consistent in direction and magnitude, the findings reported here focus on the results for completing a bachelor's degree in education (see tables B8 and B9 for the full results). The factors examined included student demographic and background characteristics, high school academic preparation, the year of enrollment in an education program, students' performance and financial aid in college, and characteristics of the first college in which students enrolled (see table B8 for a full list of variables included in the analyses). Each finding reported in this section indicates the relationship between a characteristic of interest and the probability of completing a bachelor's degree in education, after all other factors were adjusted for.

Relative to students who first enrolled in an education program in their first year of college, students who first enrolled in their third year or later were less likely to complete a bachelor's degree in education. Relative to students who first enrolled in an education program in their first year of college, the probability of completing a bachelor's degree in education in any given year was 24 percent lower for students who first enrolled in an education program in their third year and 55 percent lower for students who first enrolled in their fourth year or later, after other factors were adjusted for (see table B8 in appendix B). Relative to students who first enrolled in an education program in their first year of college, the estimated median time to completion was 0.20 year longer for students who first enrolled in an education program in their third year and 0.74 year longer for students who first enrolled in their fourth year or later (figure 7; see also table B9 in appendix B.).

After other factors were adjusted for, male students, students who received special education services in high school, students who were eligible for the national school lunch program in high school, and students who did not receive an honors diploma in high school were less likely to complete a bachelor's degree in education. The probability of completing a bachelor's degree in education was associated with several student demographic and background characteristics as well as high school academic preparation examined in this study (see tables B8 and B9 in appendix B). After other factors were adjusted for,

- Female students were 26 percent more likely to complete a bachelor's degree in education than male students, and their estimated median time to degree completion was 0.17 year shorter.
- White students had the shortest median time to completion (4.50 years). The median time was longer for Black students (4.63 years) and Hispanic students (4.54 years), but the differences were not statistically significant. However, the estimated median time to completion was 0.26 year longer for students of other races/ethnicities—including American Indian students, Asian students, Native Hawaiians or other Pacific Islanders, and students of multiracial background—than for White students, a statistically significant difference.
- Students who received special education services in high school were 39 percent less likely to complete a bachelor's degree in education than students who did not receive special education services, and their estimated median time to completion was 0.38 year longer.
- Students who were eligible for the national school lunch program in high school were 19 percent less likely to complete a bachelor's degree in education than students who were not eligible, and their estimated median time to completion was 0.15 year longer.

Figure 7. The estimated median time to completion was longer for students who first enrolled in an education program in their third or fourth year or later than for students who first enrolled in their first year, 2010/11–2017/18



Note: The figure displays the estimated cumulative probability that students in the sample completed a bachelor's degree in education by a given year. The median is the estimated time at which half the group had completed the degree. Probabilities and median time were calculated using results from regression analyses. Probabilities and median time for students who enrolled in an education program in their second year are not displayed because the probabilities were not statistically different from those for students who enrolled in an education program in their first year (see table B8 in appendix B).

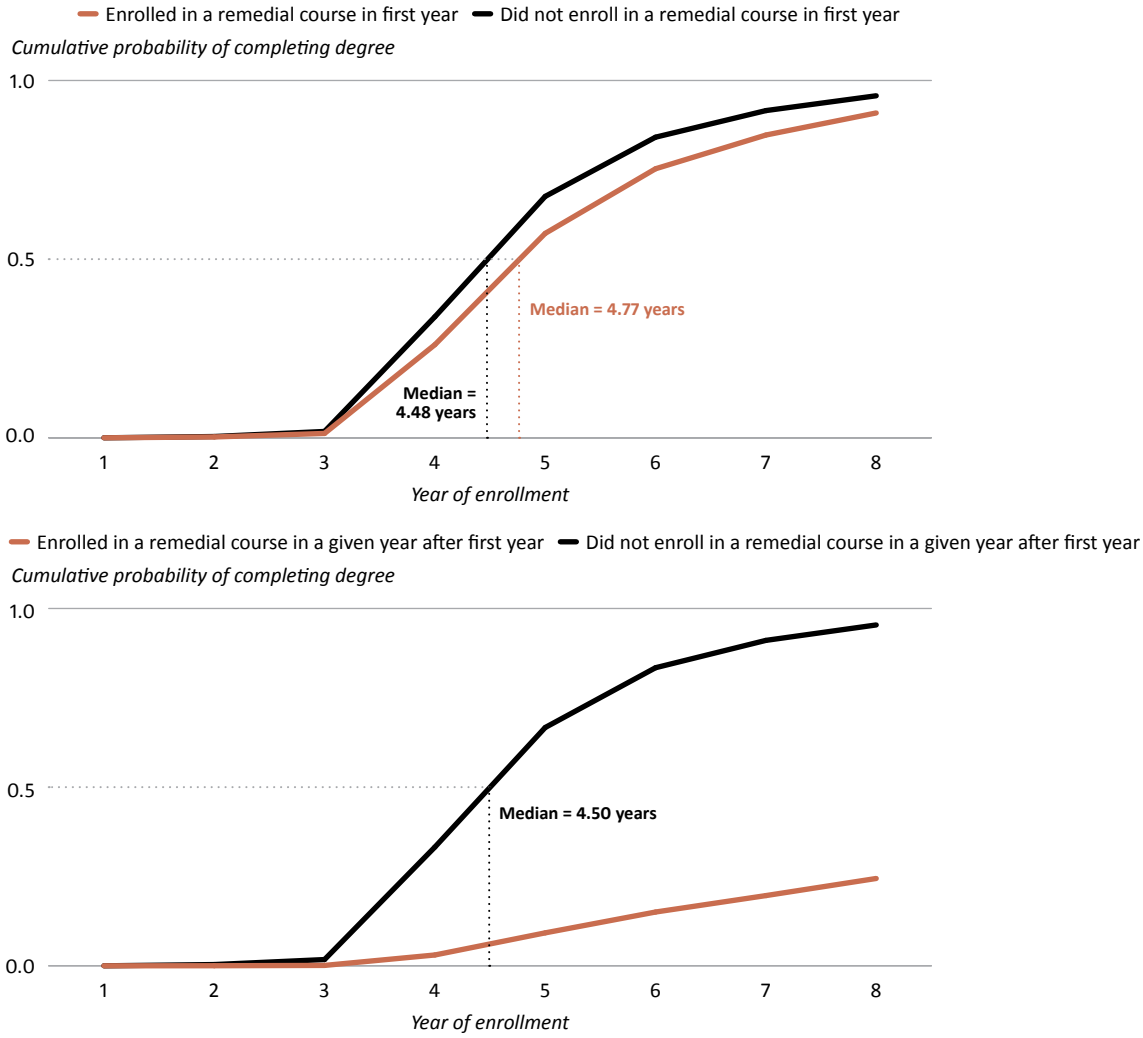
Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education and publicly available data from the U.S. Department of Education (n.d. a, n.d. b).

- Students who received an honors diploma in high school were 28 percent more likely to complete a bachelor's degree in education than students who did not receive an honors diploma, and their estimated median time to completion was 0.18 year shorter.

Enrolling in remedial courses in college was associated with a lower probability of completing a bachelor's degree in education. After other factors were adjusted for, students who enrolled in a remedial course in English language arts or math in their first year were 32 percent less likely to complete a bachelor's degree in education than students who did not (see table B8 in appendix B). The median time to completion was 0.29 year longer for students who enrolled in a remedial course in their first year (figure 8). Students who enrolled in a remedial course in later years were even less likely to complete a bachelor's degree in education. Students who enrolled in a remedial course in a year after their first year were 94 percent less likely to complete a bachelor's degree in education than students who did not, and their median time to completion was more than 8 years (the maximum years of data collected for this study) compared with 4.50 years for students who did not.

Students who received an Indiana 21st Century Scholarship in their first year of college and students who received financial aid beyond their first year were more likely to complete a bachelor's degree in education, whereas students who received a Pell Grant were less likely to complete a bachelor's degree in education. Students who received a 21st Century Scholarship—which provides Indiana students from low-income families up to four years of paid tuition at an eligible Indiana college or university—in their first year of college were 30 percent more likely to complete a bachelor's degree in education than students who did not receive the scholarship in their first year, after other factors were adjusted for, such as eligibility for the national school lunch program in high school and receipt of a Pell Grant (see table B8 in appendix B). Their median time to completion was 0.18 year shorter than

Figure 8. The estimated median time to completion was longer for students who enrolled in remedial English language arts or math courses than for students who did not, 2010/11–2017/18



Note: The figure displays the estimated cumulative probability that students in the sample completed a bachelor's degree in education by the given year. The median is the estimated time at which half the group had completed the degree. Probabilities and median time were calculated using results from regression analyses (see table B8 in appendix B).

Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education and publicly available data from the U.S. Department of Education (n.d. a, n.d. b).

that of students who did not receive the scholarship in their first year (see table B9).[6] However, receiving a 21st Century Scholarship in a year after their first year was not associated with the probability of completing a bachelor's degree in education.

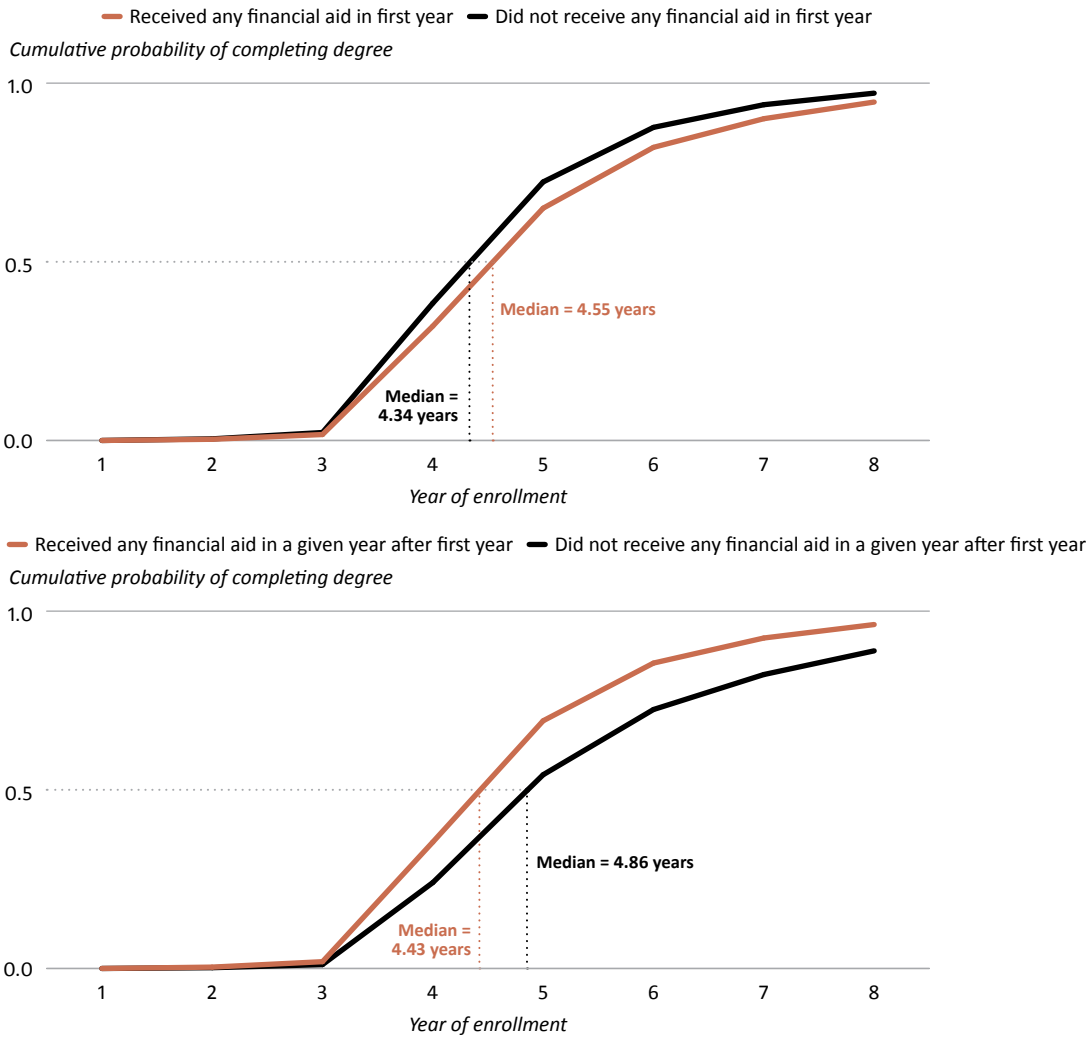
Receiving a Pell Grant—a federal need-based grant for undergraduate students from low-income families[7]—was associated with a lower probability of completing a bachelor's degree in education, after other factors were

6. These findings are consistent with findings from a previous study that showed that Indiana students who received a 21st Century Scholarship had better early college success outcomes than those who received Pell Grants alone (Davis et al., 2018).
7. Pell Grants usually are awarded to undergraduate students who display exceptional financial need and have not earned a bachelor's, graduate, or professional degrees. In some cases, students enrolled in certain postbaccalaureate programs that lead to teacher certification or licensure might receive a Pell Grant. Students need to make satisfactory academic progress toward their degree or certificate (as defined by their school) to maintain their eligibility to receive the grant. Around 23–24 percent of Pell Grant recipients in the study sample also received a 21st Century Scholarship each year.

adjusted for. Students who received a Pell Grant in their first year were 12 percent less likely to complete a bachelor's degree in education in any given year than students who did not receive a Pell Grant in their first year, and their median time to completion was 0.09 year longer (see tables B8 and B9 in appendix B). Students who received a Pell Grant in a year after their first year were 11 percent less likely to complete a bachelor's degree in education, and their median time to completion was 0.08 year longer than students who did not receive a Pell Grant.

After other factors were adjusted for, students who received any financial aid[8] in their first year were 26 percent less likely to complete a bachelor's degree in education than students who did not, and their estimated median time to completion was 0.21 year longer (figure 9; see also tables B8 and B9 in appendix B). However, receiving

Figure 9. Students who received financial aid in their first year of college were less likely to complete a bachelor's degree in education than students who did not, whereas students who received financial aid in a given year other than the first were more likely than students who did not, 2010/11–2017/18



Note: The figure displays the estimated cumulative probability that students in the sample completed a bachelor's degree in education by the given year. The median is the estimated time at which half the group had completed the degree. Probabilities and median time were calculated using results from regression analyses (see table B8 in appendix B).

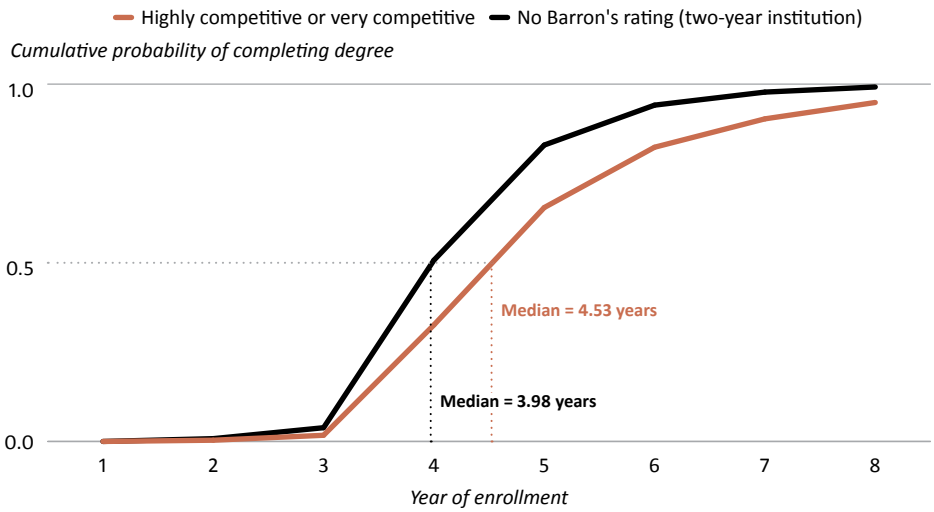
Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education and publicly available data from the U.S. Department of Education (n.d. a, n.d. b).

8. This includes students who received any federal, state, local, or institutional financial aid, grants, or scholarships.

financial aid in a year after the first year was associated with a higher probability of completing a bachelor's degree in education. Students who received financial aid in a given year after their first year were, on average, 77 percent more likely to complete a bachelor's degree in education than students who did not, and the median time to completion was 0.43 year shorter.

The probability of completing a bachelor's degree in education was associated with the characteristics of the first college or university in which a student enrolled, after other factors were adjusted for. A smaller undergraduate enrollment; a higher percentage of first-time, full-time undergraduates receiving Pell Grants; and a higher average Pell Grant amount awarded at students' first college of enrollment were associated with a lower probability of completing a bachelor's degree in education (see table B8 in appendix B). In contrast, a higher average amount of federal, state, local, and institutional aid[9] awarded to first-time, full-time undergraduates at the first college of enrollment was associated with a higher probability of completing a bachelor's degree in education. Finally, students who first enrolled in a college with no Barron's admissions competitiveness rating (that is, a two-year college) and who transferred to a four-year college or university and enrolled in an education program there were 128 percent more likely to complete a bachelor's degree in education than students who first enrolled in a four-year college with a Barron's rating of highly competitive or very competitive. The median time to completion for students who started at a two-year institution was 0.55 year shorter than that for students who started at a college or university with a rating of highly competitive or very competitive (figure 10).

Figure 10. The median time to completion was shorter for students who started at a two-year college and transferred to a four-year college than for students who started at a highly competitive or very competitive four-year college, 2010/11–2017/18



Note: The figure displays the estimated cumulative probability that students in the sample completed a bachelor's degree in education by the given year. The median is the estimated time at which half the group had completed the degree. Probabilities and median time were calculated using results from regression analyses. Probabilities of degree completion for students who started at college with a Barron's rating of competitive or less competitive are not in the figure because the probabilities were not statistically different from those for students who started at an institution with a Barron's rating of highly competitive or very competitive (see table B8 in appendix B).

Source: Authors' analysis of data provided by the Indiana Department of Education and the Indiana Commission for Higher Education and publicly available data from the U.S. Department of Education (n.d. a, n.d. b).

9. This includes any federal and private loans to students and federal, state/local, and institutional grants.

Limitations

This study has four main limitations. First, it examines only students who pursued a bachelor's degree in education at public colleges or universities in Indiana. Students who enrolled in postbaccalaureate education programs were not included. The preparation and certification experiences and pathways for this second group of students vary greatly, and comparable data for analysis were not available. Nor were data available on students enrolled in private education programs.

Second, the study tracked only completers' employment and retention as teachers in Indiana public K–12 schools. The study could not track completers who taught in private schools or schools outside Indiana. The findings on these outcomes therefore do not reflect the entire population of completers.

Third, the study did not examine the teacher pipeline by subject area. Future studies could look more closely at the pipeline of teachers in subject areas that have been consistently identified by the Indiana Department of Education as experiencing teacher shortages, including special education, math, science, technology education, and world languages (U.S. Department of Education, 2017). Findings from such studies could help education leaders target their efforts to increase the supply of new teachers in shortage areas.

Finally, student demographic and background variables were available in high school graduation records but not in college enrollment records. Approximately one-fourth of the students in college enrollment records could not be linked to high school graduation records; therefore, data on students' demographic and background characteristics and high school academic preparation were missing for those students. Students with missing high school data might have graduated from a private high school or a high school outside Indiana or graduated before 2009/10. As a result, the description of student demographic and background characteristics as well as high school academic preparation in the findings for research questions 1 and 5 was limited to students with high school data. The analysis for research question 7 addressed missing data using multiple imputation, considered by many as the optimal method for dealing with missing data (for example, see Van Buuren, 2012). The study team also ran models without student demographic and high school variables, and the results were consistent with those presented in the report. (The results for models without those variables are in table B8 in appendix B.)

Implications

State and teacher education leaders in Indiana might consider strategies to target leaks in the teacher education pipeline to alleviate teacher shortages. Fewer than one-fifth of undergraduate education entrants from the 2010/11 to 2012/13 cohorts went on to teach in an Indiana public school. Leaks occurred at each step in the pipeline. Plugging leaks requires a long-term and comprehensive approach to increase the supply of teachers as well as collaboration among state government, local education agencies, and colleges and universities (Sutcher et al., 2016). In developing strategies and determining where in the pipeline to target limited resources to effectively plug leaks, state and teacher education leaders in Indiana might first want to better understand why individuals leave at each step in the teacher pipeline. While some leaks are inevitable or even desirable because students lose interest in teaching or are not up to the task, efforts should be made to attract more talented individuals into the field and to help aspiring teachers succeed in college and in classrooms. The findings from this study suggest a few areas on which state and teacher education leaders might want to focus.

First, state and teacher education leaders in Indiana might want to prioritize strategies to increase diversity in the teacher pipeline. Completers, those who earned an initial instructional license, and those who entered teaching in an Indiana public school were less likely to be from racial/ethnic minority groups or to have been eligible for the national school lunch program in high school than the initial group of students entering education programs. This decrease in diversity along the teacher pipeline is concerning given an ever-diversifying student body in Indiana.

About 32 percent of students in Indiana public schools in fall 2017 were from racial/ethnic minority groups, a 5 percentage point increase from fall 2011 (U.S. Department of Education, 2013, 2019). Students of color benefit from having effective teachers with cultural backgrounds similar to their own (Dee, 2004; Ingersoll & May, 2011). State agencies and colleges and universities in Indiana could augment current programs (for example, the Next Generation Hoosier Educators Scholarship or the Teacher Residency Grant Pilot Program) to focus on attracting racial/ethnic minority students into education. Further, targeted scholarships, forgivable loans, student debt assistance programs, high school–based cadet and academy programs, and teacher residency models can be effective strategies for recruiting and retaining individuals of color seeking a teaching career (Feng & Sass, 2017; Gill, 2017; Henry et al., 2012; National Education Association, 2009).

Second, the study findings suggest the need for a holistic approach to help students from low-income backgrounds enroll in teacher education programs, complete a bachelor's degree in education, and enter teaching in Indiana. The approach could include increasing financial aid (beyond the Pell Grant and beyond the first year of college) and expanding other supports, such as the college readiness supports provided by the 21st Century Scholarship program. After other factors were adjusted for, students who received a Pell Grant and students who started in a college or university with a higher concentration of Pell Grant recipients were less likely to complete a bachelor's degree in education than those who did not, whereas students who received a 21st Century Scholarship in their first year were more likely to complete a bachelor's degree in education than students who did not. One likely explanation is that the 21st Century Scholarship program provides, in addition to tuition support, college readiness supports throughout middle school and high school and other supports in college. The study also found that receiving financial aid beyond the first year of college was associated with a higher probability of completing a bachelor's degree. Many students lose their financial aid after their first year. Some scholarships are not renewable, or students fail to meet requirements for maintaining or renewing their aid.

Third, education programs might want to encourage students to enroll no later than the end of the second year of college. The study found that entering an education program later could lower the probability of completing an education degree. Colleges and universities could offer additional advisory programs to help students without a declared major make an informed decision based on personal goals and values. Education programs can advise students early on, balancing their content-area coursework with their education coursework. Education programs also could provide supports to students who switch to an education program later in their college years to foster a successful transition and reduce their time to degree.

Finally, state and teacher education leaders could enhance policies and practices that encourage qualified students to transfer from two-year to four-year colleges and enter education programs. The study found that, after other factors were adjusted for, students who started at a two-year college and transferred to a four-year college were more likely to complete a bachelor's degree in education than students who started at a four-year college. In 2013 the Indiana legislature passed a bill requiring state colleges and universities to create a single articulation pathway for programmatic areas in which large numbers of students first complete an associate's degree with the intent of eventually completing a bachelor's degree. The bill led to the creation of Transfer Single Articulation Pathways in 20 program areas as of fall 2020, including early childhood education, elementary education, special education, secondary biology education, secondary chemistry education, and secondary math education (Indiana Commission for Higher Education, n.d.). Students completing Transfer Single Articulation Pathways can transfer all 60 credits into a bachelor's degree program at a four-year public college and enter with junior status. The findings from this study can support the state's ongoing effort to provide a smooth, predictable pathway for students in two-year colleges from an associate's degree to a bachelor's degree in education.

References

ACT Inc. (2016). *Condition of future educators 2015.* https://www.act.org/content/dam/act/unsecured/documents/Future-Educators-2015.pdf.

Aragon, S. (2016). *Teacher shortages: What we know.* Education Commission of the States. https://eric.ed.gov/?id=ED565893.

Barron's Educational Series, Inc. (2013). *Profiles of American colleges 2013* (*30th ed.).*

Boyd, D., Grossman, P., Lankford, H., Loeb, S., & Wyckoff, J. (2006). How changes in entry requirements alter the teacher workforce and affect student achievement. *Education Finance and Policy, 1*(2), 176–216. https://eric.ed.gov/?id=EJ902823.

Clark, M. A., Isenberg, E., Liu, A. Y., Makowsky, L., & Zukiewicz, M. (2015). *Impacts of the Teach for America Investing in Innovation scale-up.* Mathematica Policy Research.

Davis, E., Guarino, N., & Lindsay, J. (2018). *Predicting early college success for Indiana's high school class of 2014.* U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northeast & Islands. https://eric.ed.gov/?id=ED580821.

Dee, T. S. (2004). Teachers, race and student achievement in a randomized experiment. *The Review of Economics and Statistics, 86*(1), 195–210.

Feng, L., & Sass, T. (2017). The impact of incentives to recruit and retain teachers in "hard-to-staff" subjects. *Journal of Policy Analysis and Management, 37*(1), 112–135. https://eric.ed.gov/?id=EJ1163968.

Foraker, M. J. (2012). *Does changing majors really affect the time to graduate? The impact of changing majors on student retention, graduation and time to graduate.* Western Kentucky University. https://www.wku.edu/instres/documents/air_major_change.pdf.

Gill, J. (2017). *State action: Strategies for building the teacher pipeline.* Washington, DC: Council of Chief State School Officers. https://ccsso.org/sites/default/files/2018–03/Strategies%20for%20Building%20Teacher%20Pipelines.pdf.

Harris, D. N., & Sass, T. R. (2007). *Teacher training, teacher quality and student achievement* (Working paper No. 3). Urban Institute, Center for the Analysis of Longitudinal Data in Education Research. https://eric.ed.gov/?id=ED509656.

Henry, G. T., Bastian, K. C., & Smith, A. A. (2012). Scholarships to recruit the "best and brightest" into teaching: Who is recruited, where do they teach, how effective are they, and how long do they stay? *Educational Researcher, 41*(3), 83–92. https://eric.ed.gov/?id=EJ960397.

Herron, A. (2017, November 30). Teacher shortage, diplomas top Indiana 2018 education priorities. *IndyStar.* Retrieved June 15, 2020, from https://www.indystar.com/story/news/education/2017/11/30/teacher-shortage-diplomas-top-indianas-2018-education-priorities/902671001/.

Indiana Commission for Higher Education. (n.d.). Transfer Single Articulation Pathways (TSAP) Database. https://transferin.net/tsap/.

Indiana Department of Education. (2018). *Indiana CORE assessments for educator licensure: Candidate performance data, program years 2017–2018, 2016–2017.* https://www.doe.in.gov/sites/default/files/licensing/annual-data-reports-ielp-092018.pdf.

Ingersoll, R. M., & May, H. (2011). The minority teacher shortage: Fact or fable? *Phi Delta Kappan, 93*(1), 62–65. https://eric.ed.gov/?id=EJ943629.

Mau, W. C. J., Ellsworth, R., & Hawley, D. (2008). Job satisfaction and career persistence of beginning teachers. *International Journal of Educational Management, 22*(1), 48–61. https://eric.ed.gov/?id=EJ800417.

National Education Association. (2009). *Strengthening and diversifying the teacher recruitment pipeline: Current efforts.* https://www.nea.org/sites/default/files/2020-05/TQbook09.pdf.

Podolsky, A., Kini, T., Bishop, J., & Darling-Hammond, L. (2016). *Solving the teacher shortage: How to attract and retain excellent educators.* Learning Policy Institute. Retrieved June 15, 2020, from https://learningpolicyinstitute.org/product/solving-teacher-shortage.

Ramirez, A. Y. (2010). Why teach? Ethnic minority college students' views on teaching. *Multicultural Education, 17*(3), 29–35. https://eric.ed.gov/?id=EJ902696.

Sutcher, L., Darling-Hammond, L., & Carver-Thomas, D. (2016). *A coming crisis in teaching? Teacher supply, demand, and shortages in the U.S.* Learning Policy Institute. https://learningpolicyinstitute.org/sites/default/files/product-files/A_Coming_Crisis_in_Teaching_REPORT.pdf.

U.S. Department of Education. (n.d. a). *Higher Education Act (HEA) Title II report*. Retrieved March 3, 2020 from https://title2.ed.gov/Public/Home.aspx.

U.S. Department of Education. (n.d. b). Integrated Postsecondary Education Data System (IPEDS). Institutional Characteristics Surveys. Institute of Education Sciences, National Center for Education Statistics. Retrieved March 3, 2020 from http://nces.ed.gov/ipeds/datacenter/DataFiles.aspx.

U.S. Department of Education. (n.d. c). *2016 Title II reports: National teacher preparation data.* Office of Postsecondary Education. Retrieved June 15, 2020, from https://title2.ed.gov/Public/Home.aspx.

U.S. Department of Education. (n.d. d). *The Classification of Instructional Programs.* Institute of Education Sciences, National Center for Education Statistics. Retrieved from https://nces.ed.gov/ipeds/cipcode/browse.aspx?y=55.

U.S. Department of Education. (2013). *Digest of education statistics 2013* (Table 203.70). National Center for Education Statistics.

U.S. Department of Education. (2016). *The state of racial diversity in the educator workforce.* Office of Planning, Evaluation and Policy Development, Policy and Program Studies Service. https://eric.ed.gov/?id=ED571989.

U.S. Department of Education. (2017). *Teacher shortage areas nationwide listings 1990–1991 through 2017–18.*

U.S. Department of Education. (2019). *Digest of education statistics 2019* (Table 203.70).

Van Buuren, S. (2012). *Flexible imputation of missing data.* Chapman & Hall/CRC Press.

Venit, E. (2016). *How late is too late? Myths and facts about the consequences of switching college majors* (EAB white paper). Retrieved August 18, 2020, from https://www.eab.com/technology/student-success-collaborative/members/white-papers/major-switching.

Weddle, E. (2017, October 23). Survey: 94% of Indiana schools can't fill teaching jobs. *WFYI Indianapolis.* Retrieved June 15, 2020, from https://www.wfyi.org/news/articles/survey-94-of-indiana-schools-cant-fill-teaching-jobs.

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