Making Connections

November 2016

High school graduation rates across English learner student subgroups in Arizona

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Key findings

In a cohort of Arizona grade 9 students in the class of 2014, long-term English learner students had the lowest observed four-year graduation rate (49 percent) among five English learner student subgroups, and never–English learner students had the highest (85 percent). The earlier that English learner students achieved English proficiency, the higher their graduation rate. Academic achievement before entering high school, rather than student demographic characteristics, explained most of the differences in graduation rates across English learner student subgroups and may have been a key factor driving graduation outcomes. Long-term English learner students and new English learner students had the most difficulty graduating within four years of entering grade 9.

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REL 2017–205

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November 2016

This report was prepared for the Institute of Education Sciences (IES) under Contract ED-IES-12-C-0002 by Regional Educational Laboratory (REL) West at WestEd. The content of the publication does not necessarily reflect the views or policies of IES or the U.S. Department of Education, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

Huang, M., Haas, E., Zhu, N., and Tran, L. (2016). *High school graduation rates across English learner student subgroups in Arizona* (REL 2017–205). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory West. Retrieved from http://ies.ed.gov/ncee/edlabs.

This report is available on the Regional Educational Laboratory website at http://ies.ed.gov/ncee/edlabs.

Summary

Recent studies have documented differences in academic achievement between current and former English learner students (Genesee, Lindholm-Leary, Saunders, & Christian, 2005; Hakuta, 2011; Mitchell, 2015; Saunders & Marcelletti, 2013). These differences validate calls for more focused analyses of achievement across English learner student subgroups (Cook, Boals, & Lundberg, 2011; Gwynne, Pareja, Ehrlich, & Allensworth, 2012; Heritage, Walqui, & Linquanti, 2015; Linquanti & Hakuta, 2012). Specifically, there is interest in examining variation in academic success based on the amount of time a student spends classified as an English learner student and the grade in which the student is reclassified as fluent English proficient (de Jong, 2004; Gwynne et al., 2012; Linquanti & Hakuta, 2012).

This study responds to this call for more focused analyses by examining the variation in four-year high school graduation rates across five English learner student subgroups in Arizona:

- ***Long-term English learner students.*** Students who were first identified as English learner students in Arizona prior to grade 6 and had not yet been reclassified as fluent English proficient by the time they entered grade 9.
- ***New English learner students.*** Students who were first identified as English learner students in Arizona in grade 6 or later and entered high school designated as English learner students.
- ***Recently proficient former English learner students.*** Former English learner students who had been reclassified as fluent English proficient in Arizona in grades 6–8.
- ***Long-term proficient former English learner students.*** Former English learner students who had been reclassified as fluent English proficient in Arizona in grades 2–5.
- ***Never–English learner students.*** Students who were either never classified as English learner students in Arizona or who were early English speakers who had been reclassified as fluent English proficient in Arizona prior to grade 2.

Using data for a single cohort of Arizona grade 9 students from the class of 2014, the study examined the observed four-year high school graduation rates across these five subgroups and how predicted graduation rates differed across subgroups when students with both similar demographic characteristics and similar prior academic achievement were compared.

Among the study findings:

- Never–English learner students had the highest observed four-year graduation rate (85 percent), followed by long-term proficient former English learner students (81 percent), recently proficient former English learner students (67 percent), and new English learner students (52 percent). Long-term English learner students had the lowest observed graduation rate (49 percent). Thus, long-term English learner students and new English learner students had the most difficulty graduating within four years of entering grade 9.
- Student demographic characteristics did not explain much of the variation in graduation rates across subgroups. When students with similar demographic characteristics were compared, the differences in predicted graduation rates between

long-term English learner students and other subgroups (except new English learner students) were smaller, though still large, than the differences in observed graduation rates.

- Academic achievement before high school explained most of the differences in graduation rates across subgroups and may have been a key factor driving graduation outcomes. When students with both similar demographic characteristics and similar prior academic achievement were compared, differences in graduation rates across subgroups were vastly diminished.
- The earlier that English learner students achieved English proficiency, the higher their graduation rate.

By describing the variation in high school graduation rates across these subgroups, this report may help educators and education policymakers more effectively promote the college and career readiness of current and former English learner students through better targeted supports.

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Why this study?

Graduating from high school is a milestone on the road to being adequately prepared for college or career success. Nationally, the public high school four-year adjusted cohort graduation rate[1] in 2012 was 80 percent, with differences by state and student subgroups (Stetser & Stillwell, 2014). In Arizona the rate was 76 percent for all students and 24 percent for English learner students,[2] the second lowest among the 47 states that report graduation rates for English learner students (Stetser & Stillwell, 2014).

English learner students as a group tend to lag behind native English speakers in academic outcomes, including high school graduation rates (Kindler, 2002; Olsen, 2010; Ruiz-de-Velasco & Fix, 2000; Short & Fitzsimmons, 2007; Venezia, Callan, Finney, Kirst, & Usdan, 2005). This is due largely to their need to learn English and subject content knowledge simultaneously (Genesee et al., 2005). The difficulty in doing so appears to be more acute for English learner students at the secondary level (Cook, Wilmes, Boals, & Santos, 2008; Grissom, 2004; Haas, Tran, Huang, & Yu, 2015; Kieffer, 2008, 2010, 2011; Salazar, 2007).

Knowing more about the variation in academic achievement among an expanded set of English learner student subgroups as well as a range of student demographic characteristics and prior academic achievement will enable educators to better help high school English learner students and former English learner students graduate on time

However, a few studies have documented higher academic achievement among former English learner students (students who have been reclassified as fluent English proficient) than among native English speakers (see, for example, Genesee et al., 2005; Hakuta, 2011; Saunders & Marcelletti, 2013). There appears to be a point at which reclassified former English learner students progress sufficiently in their English fluency to have academic achievement that is comparable to, and sometimes even greater than, the achievement of their peers who were never English learner students (Hakuta, 2011).

To examine the factors associated with improvement in academic achievement among students who had been designated as English learner students, researchers have called for examining outcomes across a classification of English learner student subgroups that goes beyond the dichotomy of current and former English learner students. Suggested criteria for a more expansive set of subgroups include the duration of a student's designation as an English learner and the grade in which these students are reclassified as fluent English proficient (Gwynne et al., 2012; Linquanti & Hakuta, 2012). Previous research by the Consortium on Chicago School Research (Gwynne et al., 2012) suggests a set of subgroup definitions that fit these criteria. They are used in this study (box 1).

Analyses of academic achievement patterns among English learner students are further complicated by the fact that English learner students and former English learner students are diverse in many ways (Kindler, 2002) that may affect academic outcomes: gender, race/ethnicity, socioeconomic status, eligibility for special education services, and prior academic achievement (Flores, Batalova, & Fix, 2012; Freeman & Freeman, 2007; Gwynne et al., 2012; Haas, Huang, Tran, & Yu, 2016; Olsen, 2010; Haas, Tran, & Huang, 2016; Valentino & Reardon, 2015). Thus, a more complete examination of the factors associated with English learner academic achievement, such as graduation rate, will also include these characteristics.

Knowing more about the variation in academic achievement among an expanded set of English learner student subgroups as well as a range of student demographic characteristics and prior academic achievement will enable educators to better help high school English learner students and former English learner students graduate on time. In particular, to the

Box 1. Classifications of English learner student subgroups

The students in this analysis were classified into five subgroups according to the number of years they spent as English learner students and the grade in which they were reclassified as fluent English proficient. The subgroup definitions are based on criteria from a study by Gwynne et al. (2012). Because the current study examined the four-year graduation rate of a cohort of grade 9 students, subgroup membership was determined at the beginning of grade 9. Students who entered an Arizona public high school after grade 9 were excluded from the analysis.

Long-term English learner students. Students who were first identified as English learner students in Arizona at some point prior to grade 6 and had not yet been reclassified as fluent English proficient (based on their score on the Arizona English Language Learner Assessment) by the time they entered grade 9. These students had spent four or more years designated as English learner students by the time they entered grade 9. This group includes some students who were English learner students in grade 9 and were reclassified later during high school.

New English learner students. Students who were first identified as English learner students in Arizona in grade 6 or later and entered high school designated as English learner students. These students had spent one to three years designated as English learner students by the time they entered grade 9. Like long-term English learner students, this group includes some students who were English learner students in grade 9 and were reclassified later during high school.

Recently proficient former English learner students. Former English learner students who had been reclassified as fluent English proficient on the Arizona English Language Learner Assessment in grades 6–8. These students were reclassified as fluent English proficient within the three years prior to entering grade 9.

Long-term proficient former English learner students. Former English learner students who had been reclassified as fluent English proficient on the Arizona English Language Learner Assessment in grades 2–5. These students were reclassified as fluent English proficient at least four years prior to entering grade 9.

Never–English learner students. Students who were either never classified as English learner students in Arizona or who were early English speakers who had been reclassified as fluent English proficient in Arizona prior to grade 2, including native English speakers, initially fluent English proficient students, English learner students who were reclassified as fluent English proficient in kindergarten and grade 1 in Arizona, and English learner students who were reclassified in any grades K–8 in other states before moving to Arizona.

extent that graduation outcomes differ across subgroups, state and local education agencies can target resources toward particular subgroups that will likely need additional, and possibly different, support in order to graduate.

The Arizona Department of Education wanted to examine the four-year high school graduation rates across English learner student subgroups in Arizona. Few studies have conducted this type of analysis in other states or based on statewide data. Only one similar analysis was conducted, which used data from Chicago Public Schools (Gwynne et al., 2012). This study adds to the research literature by providing empirical evidence on the variation in four-year high school graduation rates across five subgroups based on the

duration of students' classification as English learner students and the grade in which they were reclassified (or not) prior to entering grade 9 in Arizona.

What the study examined

This study examined the four-year high school graduation rates among five English learner student subgroups for a cohort of students who enrolled in Arizona public high schools in grade 9 in 2010/11 and were expected to graduate in spring 2014. Students who entered an Arizona public high school later than grade 9 were excluded. About 14 percent of the remaining grade 9 students were excluded because key data values required by the analysis were missing. Thus, the analytic sample was a stable cohort of grade 9 students with complete records during their time in Arizona public schools. All students in the analysis were classified into a subgroup based on their English learner status during the seven school years before entering grade 9 (table 1). See appendix A for details on the data sources and methods and appendix B for details on the analytic sample and student characteristics.

This study examined the four-year high school graduation rates among five English learner student subgroups for a cohort of students who enrolled in Arizona public high schools in grade 9 in 2010/11 and were expected to graduate four years later

Two research questions guided the study:

- How do observed four-year high school graduation rates in Arizona differ across English learner student subgroups?
- How do predicted four-year high school graduation rates in Arizona differ across English learner student subgroups when students with both similar demographic characteristics and similar prior academic achievement are compared?

The observed four-year high school graduation rate was calculated as the percentage of students in each subgroup who graduated within four years of entering grade 9. The predicted four-year high school graduation rate (for the second research question) was calculated using a two-level logistic regression analysis. To explore the source of the variation in graduation rates across subgroups, the regression analyses were conducted first by controlling for only student demographic characteristics and then by controlling for both student demographic characteristics and prior academic achievement (see appendix A for detailed methodologies and appendix C for detailed results). The results of the logistic regression analysis were used to calculate the predicted graduation rate for each subgroup using the average characteristics of students in the analytic sample.

Table 1. Number and percentage of Arizona students in the analytic sample, by English learner student subgroup

Subgroup	Number	Percent
Long-term English learner students	1,221	1.9
New English learner students	380	0.6
Recently proficient former English learner students	5,444	8.6
Long-term proficient former English learner students	7,662	12.1
Never–English learner students	48,437	76.7
Total analytic sample	63,144	100.0

Note: Percentages may not sum to 100 because of rounding.

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

The student demographic characteristics accounted for in the second research question are gender, race/ethnicity, eligibility for the federal school lunch program (a proxy for socioeconomic status), and eligibility for special education services. The prior academic achievement accounted for in the second research question was based on three variables: whether a student had ever been retained in a grade level in Arizona public schools before high school and grade 8 scale scores in English language arts and math on Arizona's Instrument to Measure Standards.

What the study found

Four-year high school graduation rates in Arizona varied across the five English learner student subgroups. The maximum difference in the observed graduation rate was 36 percentage points between never–English learner students and long-term English learner students (table 2). When students with similar demographic characteristics were compared, the differences across subgroups were about the same as the differences in observed graduation rates. However, when students with both similar demographic characteristics and similar prior academic achievement were compared, the differences across subgroups narrowed to 6 percentage points or less.

Four-year high school graduation rates in Arizona varied across the five English learner student subgroups: the maximum difference in the observed graduation rate was 36 percentage points between never–English learner students and long-term English learner students

Table 2. Observed and predicted four-year high school graduation rates in the analytic sample, by English learner student subgroup, 2014 (percent)

Subgroup	Observed graduation rate[a]	Predicted graduation rate[b]	
		When only student demographic characteristics were controlled for	When both student demographic characteristics and student prior academic achievement were controlled for
Long-term English learner students	48.6***	55.0***	80.6***
New English learner students	52.4***	46.9***	83.0
Recently proficient former English learner students	67.1***	68.3***	84.5
Long-term proficient former English learner students	81.3***	81.1***	86.1***
Never–English learner students	84.7	78.1	84.1

*** Significantly different from the value for never–English learner students at $p < .001$.

a. A chi-square test was used to examine whether the value differed from that of never–English learner students.

b. The student demographic characteristics controlled for were gender, race/ethnicity, eligibility for the federal school lunch program in grade 9, and eligibility for special education services in grade 9. The prior academic achievement measures controlled for were whether a student had ever been retained in a grade level in Arizona public schools before high school and grade 8 scale scores in English language arts and math on Arizona's Instrument to Measure Standards. Logistic regression was used to examine whether the value for each subgroup differed significantly from the value for never–English learner students. Regardless of whether student demographic characteristics and prior academic achievement were controlled for, differences between long-term English learner students and recently proficient former English learner students, between long-term English learner students and long-term proficient former English learner students, and between recently proficient former English learner students and long-term proficient former English learner students were statistically significant ($p < .01$).

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Never–English learner students had the highest observed graduation rate across all subgroups, and long-term English learner students had the lowest

Never–English learner students had the highest observed graduation rate, at 85 percent. This was 36 percentage points higher than the observed graduation rate of long-term English learner students (49 percent), who had the lowest rate among the five English learner student subgroups (figure 1). Fifty-two percent of new English learner students graduated on time compared with 67 percent of recently proficient former English learner students and 81 percent of long-term proficient former English learner students.

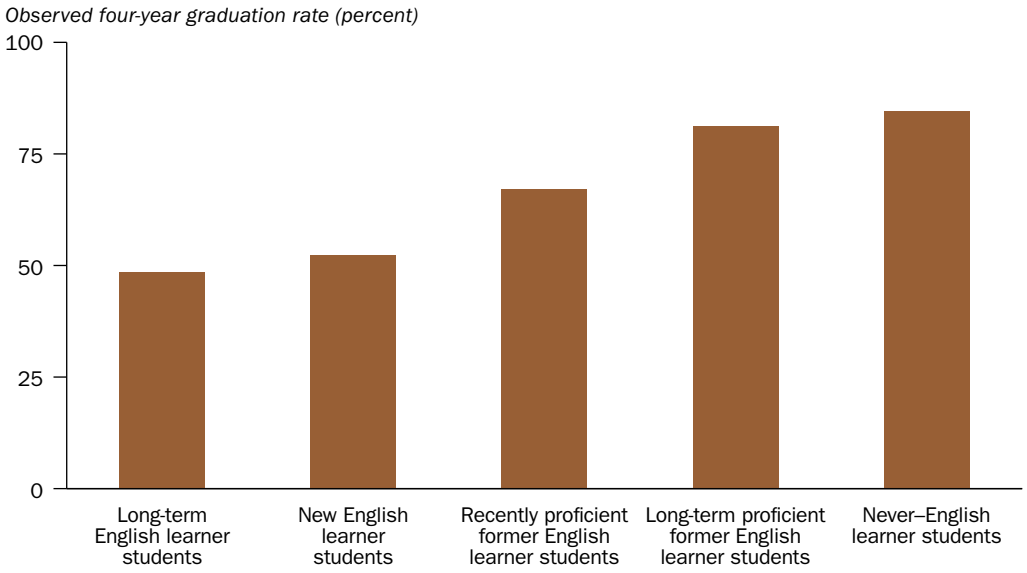
Student demographic characteristics did not explain much of the variation in graduation rates across subgroups

Some 85 percent of never–English learner students graduated within four years, compared with 49 percent of long-term English learner students

When students with similar demographic characteristics were compared, the differences in predicted graduation rates between long-term English learner students and other subgroups (except new English learner students) were smaller than the differences in observed graduation rates, but they were still large (figure 2). The difference between long-term English learner students and never–English learner students in predicted graduation rates was 23 percentage points, which is smaller than the 36 percentage point difference in observed graduation rates between the two subgroups.

Long-term proficient former English learner students had the highest predicted graduation rate across subgroups—81 percent, a 0.2 percentage point difference from the observed rate. Never–English learner students had the second highest predicted graduation rate: 78 percent, 7 percentage points lower than the observed rate of 85 percent. Recently proficient former

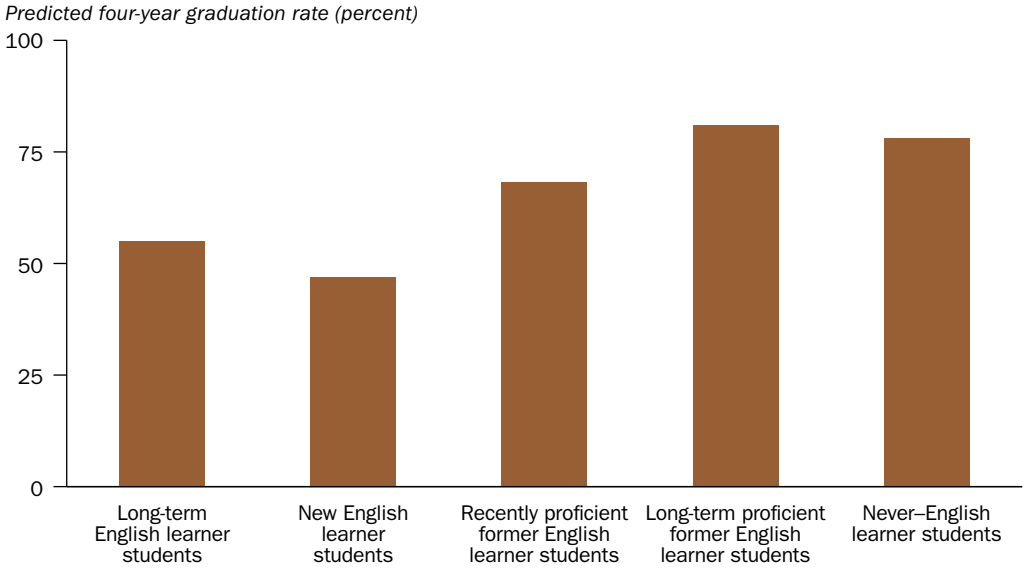
Figure 1. The observed four-year high school graduation rate was 36 percentage points higher for never–English learner students in the analytic sample than for long-term English learner students, 2014



Note: Chi-square tests show that the value for each English learner student subgroup differed significantly from the value for never–English learner students ($p < .001$).

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Figure 2. After student demographic characteristics but not prior achievement were controlled for, the predicted four-year graduation rate was 23 percentage points higher for never–English learner students in the analytic sample than for long-term English learner students and was highest among long-term proficient former English learner students, 2014



Note: The student demographic characteristics controlled for were gender, race/ethnicity, eligibility for the federal school lunch program in grade 9, and eligibility for special education services in grade 9. The regression analysis showed that the value for each English learner student subgroup differed significantly from the value for never–English learner students ($p < .001$), and a joint F test shows that values differed significantly across English learner student subgroups ($p < .001$).

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

After student demographic characteristics were controlled for, long-term proficient former English learner students had the highest predicted graduation rate across subgroups —81 percent, a 0.2 percentage point difference from the observed rate

English learner students had the third highest predicted graduation rate—68 percent, 1 percentage point higher than the observed rate of 67 percent. Long-term English learner students had the second lowest predicted graduation rate—55 percent, 6 percentage points higher than the observed rate of 49 percent. And new English learner students had the lowest predicted graduation rate—47 percent, 5 percentage points lower than the observed rate of 52 percent.

Generally, never–English learner students had lower demographic risk factors and higher prior academic achievement than students in other English learner student subgroups did. Long-term English learner students were 2.4 times more likely than never–English learner students to be eligible for the federal school lunch program (84 percent versus 35 percent) and 4.4 times more likely to be eligible for special education services (40 percent versus 9 percent; see table B3 in appendix B). Long-term English learner students scored 93 points, or 1.8 standard deviations, lower than never–English learner students in English language arts on Arizona's Instrument to Measure Standards in grade 8 (449 versus 542; see table B4 in appendix B).

Academic achievement prior to high school explained most of the differences in graduation rates across subgroups and may have been a key factor driving graduation outcomes

When students with both similar demographic characteristics and similar prior academic achievement were compared, the difference in predicted graduation rates between

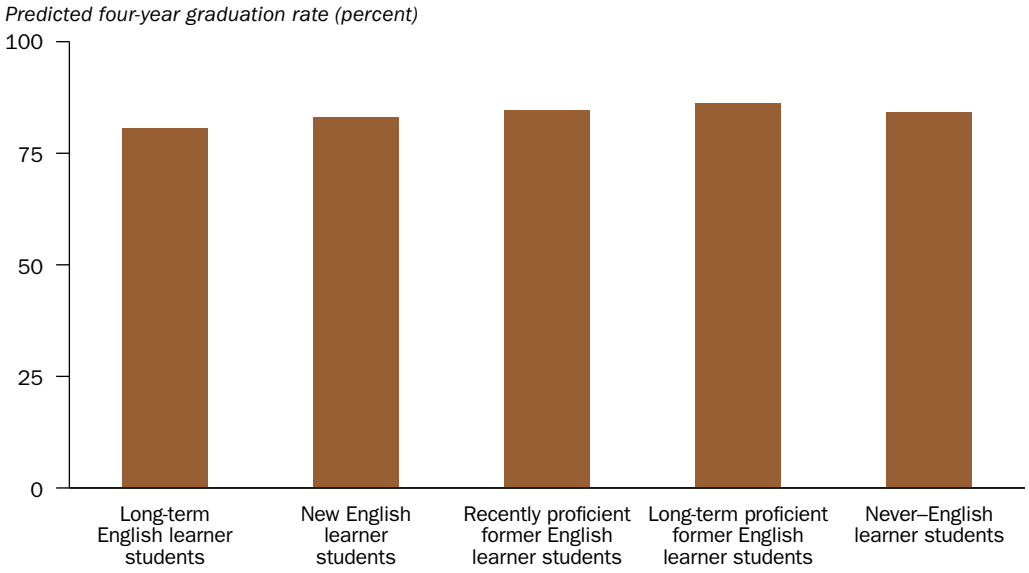
long-term English learner students and never–English learner students narrowed to 4 percentage points (figure 3). This is much smaller than the 36 percentage point difference in observed graduation rates (see figure 1) and the 23 percentage point difference in predicted graduation rates when only student demographic characteristics were controlled for (see figure 2). In other words, 36 percent of the difference in graduation rates between long-term English learner students and never–English leaner students is accounted for by differences in demographic characteristics, and 90 percent is accounted for by differences in both demographic characteristics and prior academic achievement.[3]

When both student demographic characteristics and prior academic achievement were controlled for, the predicted graduation rate for each student subgroup exceeded 80 percent (ranging from 81 percent to 86 percent; see figure 3). This is higher than the observed four-year graduation rates (49–85 percent; see figure 1) and the predicted graduation rates when only student demographic characteristics were controlled for (47–81 percent; see figure 2).[4]

Prior academic achievement accounts for most of the variation in graduation rates between long-term English learner students and never–English learner students

Together, these results suggest that, though there were large differences in both student demographic characteristics and prior academic achievement between long-term English learner students and never–English learner students, prior academic achievement accounts for most of the variation in graduation rates between these two subgroups and among all the subgroups.

Figure 3. After both student demographic characteristics and prior achievement were controlled for, the predicted graduation rate was 3.5 percentage points higher for never–English learner students in the analytic sample than for long-term English learner students, 2014



Note: The student demographic characteristics controlled for were gender, race/ethnicity, eligibility for the federal school lunch program in grade 9, and eligibility for special education services in grade 9. The prior academic achievement measures controlled for were whether a student had ever been retained in a grade level in Arizona public schools before high school and grade 8 scale scores in English language arts and math on the Arizona's Instrument to Measure Standards. The regression analysis showed that the value for never–English learner students differed significantly from the value for long-term English learner students and the value for long-term proficient former English learner students ($p < .001$), and a joint F test showed that the values differed significantly across English learner student subgroups ($p < .001$).

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

When only student demographic characteristics were controlled for, the predicted graduation rate for never–English learner students was statistically different from those for all other English learner student subgroups. However, when both student demographics and prior academic achievement were controlled for, the predicted graduation rate for never–English learner students was not statistically different from those for new English learner students and for recently proficient former English learner students (see figures 2 and 3 and appendix C). These results suggest that the differences in predicted graduation rates between never–English learner students and new English learner students and between never–English learner students and recently proficient English learner students would have disappeared if new English learner students, recently proficient English learner students, and never–English learner students had similar student demographics and similar prior academic achievement.

The earlier that English learner students achieved English proficiency, the higher their graduation rate

The observed graduation rate was higher for English learner students who were reclassified in elementary school than for English learner students who were reclassified in middle school. The pattern holds for the predicted four-year graduation rate when only demographic characteristics are controlled for and when both demographic characteristics and prior academic achievement are controlled for

Regardless of whether student demographic characteristics were controlled for, the earlier that English learner students were reclassified as fluent English proficient, the higher their four-year graduation rate was. The observed graduation rate was higher for English learner students who were reclassified in elementary school (long-term proficient former English learner students; 81 percent) than for English learner students who were reclassified in middle school (recently proficient former English learner students; 67 percent; see figure 1). The pattern holds for the predicted four-year graduation rate when only demographic characteristics are controlled for (81 percent versus 68 percent; see figure 2) and when both demographic characteristics and prior academic achievement are controlled for (the estimated differences are smaller, though still statistically significant, 86 percent versus 85 percent; see figure 3). This pattern could be due to the fact that the timing of achieving English proficiency is strongly correlated with risk factors in student demographic characteristics and academic performance—that is, recently proficient former English learner students had higher demographic risk factors (eligibility for the federal school lunch program and special education services) and lower prior academic achievement than long-term proficient former English leaner students did (see tables B3 and B4 in appendix B).

Long-term English learner students and new English learner students had the most difficulty graduating within four years of entering grade 9

Long-term English learner students and new English learner students had the lowest four-year graduation rates. Only 49 percent of long-term English learner students and 52 percent of new English learner students graduated in four years. By comparison, at least 67 percent of students in the other subgroups graduated in four years (see figure 1). When only student demographic characteristics were controlled for, the predicted four-year graduation rate was 55 percent for long-term English learner students and 47 percent for new English learner students—also lower than the predicted graduation rates (68–81 percent) for the other subgroups (see figure 2). When both student demographic characteristics and prior academic achievement were controlled for, the graduation rates for long-term English learner students and for new English learner students increased to near, but still below, the rates of the other subgroups (see figure 3). However, the difference between the rates for new English learner students and never–English learner students was not statistically significant.

Implications of the study findings

The findings support five implications for policy, practice, and future research.

First, the findings are consistent with concerns about the lack of academic success of English learner students in secondary school, many of whom are long-term English learner students (see, for example, Heritage et al., 2015; Olsen, 2010; Walqui & van Lier, 2010). The current study found that both current and former English learner students graduated from high school at lower rates than never–English learner students did.

Second, the findings show that the time at which English proficiency is attained indicates the probability of high school graduation; however, the relationship may be driven by other associated factors. The analyses indicate that the earlier an English learner student is reclassified as fluent English proficient, the greater the chance of graduating from high school in four years. In particular, Arizona English learner students who were reclassified at least four years before grade 9 (long-term proficient former English learner students) had the highest graduation rate among students who had ever been designated as English learner students in Arizona. This does not necessarily suggest that the date of reclassification alone drives the differences in graduation rates. It is possible that other student characteristics associated with reclassification play an important role. The vast majority of the differences in graduation rates were diminished when students with both similar demographic characteristics and similar prior academic achievement were compared. Students who were reclassified as fluent English proficient in earlier grades are also likely to have fewer risk factors—such as the need for special education services, eligibility for the federal school lunch program, and limited prior schooling—than are students who were reclassified in later grades or had never been reclassified. The absence of risk factors may make these students more likely to succeed in school and more likely to graduate within four years of entering high school (see, for example, Haas, Huang, & Tran, 2014; Haas et al., 2015).

The findings show that the time at which English proficiency is attained indicates the probability of high school graduation; however, the relationship may be driven by other associated factors

It is also possible that students who are reclassified earlier are able to transition to mainstream English-only classes at a point in their schooling when the transition is more advantageous. The level of English fluency necessary for reclassification is generally considered to be lower than the full academic fluency in English necessary for success in English-only content classes, especially in middle and high school (see, for example, Abedi & Dietel, 2004; Abedi & Gándara, 2006; Hakuta, 2011; Hakuta, Butler, & Witt, 2000; Haas, Tran, & Huang, 2016). The gap between the level of English fluency required for reclassification and the level required for full academic fluency is smaller in the elementary grades than in the secondary grades; moreover, students who are reclassified earlier have more time in mainstream classes to learn academic concepts in English prior to graduation (Abedi & Dietel, 2004; Hakuta, 2011). This underscores the importance of additional research focused on identifying literacy development programs and other practices to help English learner students achieve English proficiency while still in the elementary grades.

Third, the study found that prior academic achievement has a stronger connection with four-year graduation rates than do student demographics alone or English learner designation at the start of high school. In particular, when comparing students with both similar demographic characteristics and similar prior academic achievement, the vast majority of the differences in four-year graduation rates across subgroups disappeared. This finding is consistent with previous research showing that grade 9 course performance was a much

stronger predictor of graduation for English learner students than any other factor was (Gwynne et al., 2012; Slama, 2012). This suggests that to graduate within four years, English learner students must enter high school with the skills to be academically successful in mainstream English-only classes. Given that many English learner students enter high school with low academic achievement (see table B3 and B4 in appendix B), additional supports or alternative teaching practices (in both academic content knowledge and English language literacy) may be necessary to enable English learner students to achieve the academic success required to graduate in four years (see, for instance, Heritage et al., 2015; Walqui & van Lier, 2010).

Fourth, the findings suggest that grade 9 English learner students likely need much more, and possibly different, support from what other students need in order to graduate within four years. Grade 9 English learner students—that is, long-term English learner students and new English learner students who just arrived in middle school (often new immigrants or English learner students with interrupted formal school experiences)—had the most difficulty graduating in four years. These students were also more likely to have additional risk factors beyond their classification as English learner students, including higher rates of eligibility for the federal school lunch program and special education services. Additional supports may be necessary to enable these students to graduate from high school within four years.

It is critical for education policymakers and educators to identify, develop, and implement differentiated programs and practices that suit the needs of different English learner student subgroups

Finally, the findings suggest that more research on the characteristics and outcomes of English learner student subgroups is warranted. For example, aside from their length of time as an English learner student and the grade level in which they were reclassified, what characteristics might indicate which English learner students are succeeding and which are struggling? How will the results for English learner student subgroups in Arizona compare with those for similar subgroups in other states with different assessments and standards? Further, how might the characteristics of these English learner student subgroups be used to develop indicators for proactive, rather than retrospective, supports for developing full academic English fluency?

Taken together, the findings indicate that it is critical for education policymakers and educators to identify, develop, and implement differentiated programs and practices that suit the needs of different English learner student subgroups. Developing academic English and content knowledge appears to be essential for high school English learner students to succeed. Previous research suggests that a lack of participation in mainstream classes prior to high school may limit students' access to the academic content necessary for academic success and high school graduation (see, for instance, Planty, Bozick, Ingels, & Wirt, 2006). Limited mainstream class time may have had an impact on the patterns observed in this study. For example, during the study period English learner students in Arizona were required to participate in four hours of language-specific instruction per day until they were reclassified as fluent English proficient, deferring their participation in some of the more rigorous content classes required to graduate (Gándara & Orfield, 2012; Lillie, Markos, Arias, & Wiley, 2012; Rios-Aguilar, Gonzalez-Canche, & Moll, 2012). However, fully understanding the impact of limited participation in mainstream classes requires rigorous investigation specifically designed to answer that question. Finding ways to enable high school English learner students to learn both academic English and subject matter content knowledge within four years could help those students graduate and increase their readiness for college and career.

Limitations of the study

This study has three main limitations.

The first limitation relates to the scope of the analytic sample with regards to student mobility and missing data. The study addresses the four-year high school graduation rate of students in a grade 9 cohort who were expected to graduate in 2014 and for whom all required data elements during their time in Arizona public schools were available. The data included a detailed exit reason for each student in the cohort, which allowed the study team to determine which students graduated, completed their high school courses but did not graduate with a diploma, dropped out, transferred out, or died during high school. The analytic sample excludes mobile students who entered or left (because they transferred out or died) Arizona public schools after grade 9 and students who had missing values in any of the key data elements during their time in Arizona public schools (see table B1 in appendix B). The analytic sample is thus a more stable group of students than would be present in most schools on any given day.

The analytic sample is a more stable group of students than would be present in most schools on any given day

Since student mobility has been shown to be associated with lower graduation rates (see, for example, Rumberger & Larson, 1998), the graduation rates may be higher in this analysis than those in a student population that includes students who entered Arizona public schools in grades 10–12.[5] Further, English learner students and students who had ever been retained in a grade level may be more likely to be mobile than other students (see table B2 in appendix B), and thus the influence of grade retention on the graduation rate may be underestimated in this analysis. In addition, the missing data issue also affects the values of key data elements. For example, the indicator "ever retained" may have been coded as 0 for students retained before grade 9 in places other than Arizona, so that students newer to Arizona are less likely to have a value of 1 for ever retained. As such, the proportion of ever-retained students might be underestimated across all the student subgroups in this analysis.

The second limitation is that the Arizona Department of Education data go back only to 2003/04, when the grade 9 cohort was in grade 2. As a result, students are classified into different subgroups based on their observed status since grade 2 or since entering Arizona public schools, whichever came later. Therefore, proficient former English learner students may have been included in the never–English learner student subgroup if they were reclassified as fluent English proficient in grade K or grade 1 in Arizona public schools or if they had attained proficiency in another school system and then scored as initially fluent English proficient on entering the Arizona public schools in grades 2–8. As a result, the findings for proficient former English learner students (both long-term proficient and recently proficient) and never–English learner students could differ from what actually happened.

The third limitation is that the data are from a single cohort of students. To the extent that patterns of student demographic characteristics, prior academic achievement, and graduation rates fluctuate across cohorts, the results may not exactly reflect the patterns that would be observed by examining the average outcomes across multiple cohorts of students. Educators and policymakers should be cautious when interpreting the findings from this study and applying them to other student cohorts. Examinations of other student cohorts to determine the consistency of the findings from this study or comparisons of the

student characteristics of the other cohorts with the student characteristics of the cohort in this study would assist in the general application of these results. However, it is also possible that student demographic characteristics and graduation rates will remain stable over a short period of time,[6] and the associations among prior academic achievement, English learner status, and probability of graduating are likely to be stable even if there are changes in the composition of the student population.

Appendix A. Data and methodology

This appendix describes the data and methodology used in the study.

Data

The data are from the Arizona Department of Education data system and include one cohort of student data with all the necessary data elements for the analysis from 2003/04 (grade 2) to 2013/14 (grade 12). The data allowed the study team to track the English learner status of each student from 2003/04 to 2013/14. The data also included a detailed exit reason for each student in the cohort, which allowed the study team to tell which students graduated, completed their high school courses but did not graduate with a diploma, dropped out, transferred out, or died during high school.

Methodology

Observed four-year high school graduation rate. The observed four-year high school graduation rate was calculated as the percentage of students in the analytic sample who were in grade 9 in 2010/11 and graduated within four years (that is, by the end of the 2013/14 school year). A chi-square test was used to examine whether the graduation rates varied across English learner student subgroups and whether the graduation rate of each English learner student subgroup differed from never–English learner students. The calculation excluded students who died during high school or formally transferred out of Arizona public high schools, as well as students with incomplete data during their time in Arizona public schools. Students who dropped out were included if they had complete data prior to dropping out.

Predicted four-year high school graduation rate. The four-year high school graduation rate was predicted using a two-level logit model, where the possibility of graduating from high school within four years was the outcome and student subgroup membership was the main effect, with student demographic characteristics and prior academic performance (including whether the student had ever been retained in a grade before high school and grade 8 academic achievement in standardized content tests) controlled for. The differences in graduation rates between never–English learner students and the other English learner student subgroups were examined by the coefficients and *p* values derived directly from the logit model. A joint F test was used to test the differences in graduation rate across the English learner student subgroups. Equation A1 gives the full model specifications.

$$\begin{aligned}\Pr(graduation = 1) = \text{logit}^{-1}(&\beta_0 + \beta_1(New\ EL)_{ij} + \beta_2(Long\text{-}term\ EL)_{ij} + \\ &\beta_3(Recently\ proficient\ EL)_{ij} + \beta_4(Long\text{-}term\ proficient\ EL)_{ij} + \beta_5 ELA_{ij} + \beta_6 Math_{ij} + \beta_7 Male_{ij} + \\ &\beta_8 FRL_{ij} + \beta_9 IEP_{ij} + \beta_{10} Asian_{ij} + \beta_{11} Hispanic_{ij} + \beta_{12} Black_{ij} + \beta_{13}(American\ Indian)_{ij} + \\ &\beta_{14}(Other\ race/ethnicity)_{ij} + \beta_{15} Retained_{ij} + \zeta_{0j} + \varepsilon_{ij}).\end{aligned} \quad \text{(A1)}$$

$(New\ EL)_{ij}$ is a dichotomous indicator of whether student *i* in school *j* was in the new English learner student subgroup in grade 9, $(Long\text{-}term\ EL)_{ij}$ is a dichotomous indicator of whether student *i* in school *j* was in the long-term English learner student subgroup in grade 9, $(Recently\ proficient\ EL)_{ij}$ is a dichotomous indicator of whether student *i* in school *j* was in the recently proficient English learner student subgroup in grade 9, $(Long\text{-}term\ proficient\ EL)_{ij}$ is a dichotomous indicator of whether student *i* in school *j* was in the long-term

proficient English learner student subgroup in grade 9, and never–English learner students is the reference group and was omitted from the model. ELA_{ij} is student i in school j's standardized content test scale score in English language arts on Arizona's Instrument to Measure Standards in grade 8, and $Math_{ij}$ is student i in school j's standardized content test scale score in math on Arizona's Instrument to Measure Standards in grade 8. $Male_{ij}$ is a dummy variable for whether student i in school j is male; FRL_{ij} is a dummy variable for whether student i in school j was eligible for the federal school lunch program in grade 9. IEP_{ij} is a dummy variable for whether student i in school j was eligible for special education services in grade 9. $Asian_{ij}$, $Hispanic_{ij}$, $Black_{ij}$, $(American\ Indian)_{ij}$, and $(Other\ race/ethnicity)_{ij}$ are dichotomous indicators for race/ethnicity (other race/ethnicity includes multiracial and Pacific Islanders), and White is the reference group. *Retained* is a dummy variable for whether a student had ever been retained in a grade in an Arizona school before high school observed in the Arizona data system (specifically, from grade 2 through grade 8). ζ_{0j} is a high school random effect where $\zeta_{1j} \sim N(0, \upsilon_1)$. And ε_{ij} is the residual error term where $\varepsilon_{ij} \sim N(0, \theta)$.

To ease interpretation of the results, each student demographic variable was centered to its grand mean (that is, the average proportion of each demographic in the analytic sample), and grade 8 test scores were centered to their grand means (that is, the average scale score of each test in the analytic sample). For instance, if 55 percent of the students in the analytic sample were male, the centered value for male students would be .45 and the centered value for female students would be –0.55. As such, the estimates of β_0–β_4 were calculated for the students with average characteristics of all the students in the analytic sample: β_0 was for never–English learner students, β_1 was for new English learner students, β_2 was for long-term English learner students, β_3 was for recently proficient former English learner students, and β_4 was for long-term proficient former English learner students. For never–English learner students the predicted graduation rate for the average student was calculated as 100 times the probability calculated from equation A1 by inserting the estimated intercept (β_0) and zeros for the other coefficients. For the other English learner student subgroups the predicted graduation rate for the average student was calculated as 100 times the probability calculated from equation 1 by inserting the estimated intercept (β_0), the coefficient for the relevant English learner student group (β_1, β_2, β_3, or β_4), and zeros for the other coefficients.

The logit function was used because the dependent variable is binary. This model is described more fully by Rabe-Hesketh and Skrondal (2012).

To explore how prior academic performance affects the prediction of the high school graduation rate and what factors might better explain the differences in graduation rates across the student subgroups, one reduced model was used in addition to the full model: one model with student demographic characteristics only as control variables (equation A2).

$$\begin{aligned}\Pr(graduation = 1) = \text{logit}^{-1}(&\beta_0 + \beta_1(New\ EL)_{ij} + \beta_2(Long\text{-}term\ EL)_{ij} + \\ &\beta_3(Recently\ proficient\ EL)_{ij} + \beta_4(Long\text{-}term\ proficient\ EL)_{ij} + \beta_5 Male_{ij} + \\ &\beta_6 FRL_{ij} + \beta_7 IEP_{ij} + \beta_8 Asian_{ij} + \beta_9 Hispanic_{ij} + \beta_{10} Black_{ij} + \\ &\beta_{11}(American\ Indian)_{ij} + \beta_{12}(Other\ race/ethnicity)_{ij} + \zeta_{0j} + \varepsilon_{ij}).\end{aligned} \quad \text{(A2)}$$

Detailed results from each model are presented in appendix C.

Appendix B. Analytic sample and student demographic characteristics

The students in the analytic sample came from a single cohort of high school students who enrolled in an Arizona public high school in grade 9 in 2010/11 for the first time and were expected to graduate in spring 2014. Students were excluded from the analytic sample for the following reasons (table B1):

- They entered an Arizona public high school later than grade 9, since the student subgroups are identified at the time of their entry into grade 9.
- They died before graduating.
- They transferred out of Arizona public schools.
- Values for any of the key data elements (student demographic characteristics, indicator of whether they were ever retained in a grade level before grade 9, and grade 8 scale scores in English language arts and math on Arizona's Instrument to Measure Standards) required by the analysis were missing during their time in Arizona public schools.

Table B1. Number and percentage of students in each step to get the analytic sample

Step	Category	Number	Percent
Start point	Students who enrolled in an Arizona high school in grade 9 or later and were expected to graduate in spring 2014	115,953	100.0
1	Students excluded because they enrolled in an Arizona public high school later than grade 9 (2010/11)	29,099	25.1
2	Students excluded because they transferred out of Arizona public schools or died[a]	11,823	10.2
3	Students excluded because they were missing values for key data elements[b]	11,887	10.3
End point	Students in the analytic sample	63,144	54.5

a. The data used for this analysis included a detailed exit reason for each of the students in the cohort, which allowed the study team to know which students graduated, completed their high school courses but did not graduate with a diploma, dropped out, transferred out, or died.

b. Some 13.7 percent of the 86,854 grade 9 students remaining after step 2 were excluded because of missing values: 0.8 percent were excluded because of lack of information for classification into an English learner student subgroup, and the rest were excluded because of missing values for prior academic performance or student demographic characteristics. The percentages of students excluded varied across the five student subgroups.

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Table B2. Characteristics of students who were in the analytic sample, among students who started grade 9 in 2010/11, and among students who were expected to graduate in 2014

Characteristic	Students who were in the analytic sample		Students who started grade 9 in 2010/11		Students who were expected to graduate in 2014	
	Number	Percent	Number	Percent	Number	Percent
Total	63,144	100.0	86,854	100.0	115,953	100.0
Gender						
Female	31,470	49.8	42,236	48.6	55,603	48.0
Male	31,674	50.2	44,618	51.4	60,350	52.1
Race/ethnicity						
Asian	1,783	2.8	2,424	2.8	3,115	2.7
Hispanic	26,372	41.8	36,388	41.9	50,104	43.2
Black	3,191	5.1	4,843	5.6	7,166	6.2
American Indian	2,787	4.4	4,563	5.3	6,582	5.7
White	27,981	44.3	37,101	42.7	46,775	40.3
Other	1,030	1.6	1,535	1.8	2,209	1.9
Unknown	0	0.0	0	0.0	2	0.0
English learner student in grade 9						
No	61,543	97.5	83,254	95.9	109,981	94.9
Yes	1,601	2.5	3,600	4.1	4,859	4.2
Unknown	0	0.0	0	0.0	1,113	1.0
Eligible for the federal school lunch program in grade 9						
No	34,942	55.3	45,643	52.6	60,313	52.0
Yes	28,202	44.7	41,211	47.5	54,527	47.0
Unknown	0	0.0	0	0.0	1,113	1.0
Eligible for special education services in grade 9						
No	57,192	90.6	77,365	89.1	101,062	87.2
Yes	5,952	9.4	9,489	10.9	13,778	11.9
Unknown	0	0.0	0	0.0	1,113	1.0
Ever retained in Arizona schools before grade 9						
No	60,790	96.3	81,729	94.1	96,643	83.4
Yes	2,354	3.7	5,125	5.9	19,310	16.7

Note: Black includes African American, Hispanic includes Latino, and other race/ethnicity includes multiracial and Pacific Islander. Percentages may not sum to 100 because of rounding.

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Table B3. Characteristics of students in the analytic sample, by English learner student subgroup

Characteristic	Long term English learner students		New English learner students		Recently proficient former English learner students		Long term proficient former English learner students		Never English learner students	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Gender										
Female	492	40.3	187	49.2	2,480	45.6	4,103	53.6	24,208	50.0
Male	729	59.7	193	50.8	2,964	54.5	3,559	46.5	24,229	50.0
Race/ethnicity										
Asian	14	1.2	57	15.0	147	2.7	272	3.6	1,293	2.7
Hispanic	1,060	86.8	248	65.3	4,682	86.0	6,554	85.5	13,828	28.6
Black	25	2.1	27	7.1	78	1.4	46	0.6	3,015	6.2
American Indian	98	8.0	12	3.2	383	7.0	493	6.4	1,801	3.7
White	22	1.8	30	7.9	131	2.4	258	3.4	27,540	56.9
Other	2	0.2	6	1.6	23	0.4	39	0.5	960	2.0
Eligible for the federal school lunch program in grade 9										
No	200	16.4	59	15.5	1,240	22.8	2,007	26.2	31,436	64.9
Yes	1,021	83.6	321	84.5	4,204	77.2	5,655	73.8	17,001	35.1
Eligible for special education services in grade 9										
No	738	60.4	362	95.3	4,632	85.1	7,371	96.2	44,089	91.0
Yes	483	39.6	18	4.7	812	14.9	291	3.8	4,348	9.0
Ever retained in Arizona schools before grade 9										
No	1,108	90.8	373	98.2	5,104	93.8	7,417	96.8	46,788	96.6
Yes	113	9.3	7	1.8	340	6.3	245	3.2	1,649	3.4

Note: Black includes African American, Hispanic includes Latino, and other race/ethnicity includes multiracial and Pacific Islander. Percentages may not sum to 100 because of rounding.

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Table B4. Scale scores of students in the analytic sample on Arizona's Instrument to Measure Standards in grade 8 English language arts and math, by English learner student subgroup

Subgroup	English language arts		Math	
	Mean	Standard deviation	Mean	Standard deviation
Long-term English learner students	449	35.97	381	27.79
New English learner students	438	35.70	384	31.89
Recently proficient former English learner students	487	40.04	405	33.95
Long-term proficient former English learner students	529	41.05	435	39.05
Never–English learner students	542	52.55	445	46.26
All students in the analytic sample	534	54.14	439	46.46

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Appendix C. Detailed results from regression analysis

This appendix includes the detailed results from the two-level logit models, including estimated coefficients (table C1) and odds ratios (table C2). The odds ratio shows to what extent the four-year graduation rates of English learner student subgroups differed from that of never–English learner students when only student demographic characteristics were controlled for and when both student demographic characteristics and prior academic achievement were controlled for. For instance, the odds of graduating in four years for long-term English learner students were about 0.34 times those for never–English learner students after student demographic characteristics were controlled for (see table C2).

Table C1. Estimated coefficients in logit models to predict the probability of members of the analytic sample graduating from high school within four years

Statistic	Model I (when only student demographic characteristics were controlled for)	Model II (when both student demographic characteristics and prior academic achievement were controlled for)
Intercept	1.2734***	1.6649***
Long-term English learner students	–1.0728***	–0.2404***
New English learner students	–1.3986***	–0.0769
Recently proficient former English learner students	–0.5048***	0.0293
Long-term proficient former English learner students	0.1816***	0.1601***
Male	–0.4778***	–0.4875***
Asian	0.9251***	0.7404***
Black	–0.2878***	0.1589**
Hispanic	–0.2777***	–0.0743*
American Indian	–0.7113***	–0.3455***
Other race/ethnicity	–0.3385***	–0.2494**
Eligible for the federal school lunch program in grade 9	–0.5953***	–0.4402***
Eligible for special education services in grade 9	–0.3725***	0.7682***
Ever retained in Arizona schools before grade 9	na	–0.8841***
Grade 8 English language arts scale score on Arizona's Instrument to Measure Standards	na	0.0055***
Grade 8 math scale score on Arizona's Instrument to Measure Standards	na	0.0190***

* Significant at $p < .05$; ** significant at $p < .01$; *** significant at $p < .001$.

na is not applicable because the model does not include the variable.

Note: The reference group is never–English learner students. A joint *F*-test showed that high school graduation rates were significantly different across the English learner student subgroups in all models (at $p < .001$). Black includes African American, Hispanic includes Latino, and other race/ethnicity includes multiracial and Pacific Islander.

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Table C2. Estimated odds ratio for each English learner student subgroup in the analytic sample to graduate in four years compared with never–English learner students

Subgroup	Model I (when only student demographic characteristics were controlled for)	Model II (when both student demographic characteristics and prior academic achievement were controlled for)
Long-term English learner students	0.342***	0.786***
New English learner students	0.247***	0.926
Recently proficient former English learner students	0.604***	1.030
Long-term proficient former English learner students	1.199***	1.174***

*** Significant at $p < .001$.

Note: The reference group is never–English learner students.

Source: Authors' analysis of administrative data from the Arizona Department of Education for 2003/04–2013/14.

Notes

1. An adjusted cohort graduation rate is calculated based on the number of students who graduate in four or fewer years with a regular high school diploma divided by the number of students who form the adjusted cohort for the graduating class. An adjusted cohort includes students who begin at grade 9 for the first time, adjusted by adding any students who subsequently transfer into the cohort from another state and subtracting any students who transfer out, emigrate to another country, or die. This study did not use the adjusted cohort graduation rate because students were excluded if they entered an Arizona public high school later than grade 9 or had missing values in any key data elements required by the analysis. See appendix A for details on how the four-year high school graduation rates were calculated for this study and table B1 in appendix B for details on how the analytic sample was constructed.
2. Excludes former English learner students who had been reclassified when the calculation was conducted.
3. Thirty-six percent was calculated as: 100–(23.1/36.1)*100; 90 percent was calculated as: 100–(3.5/36.1)*100.
4. In this analysis predicted graduation rates for English learner student subgroups were inflated (as a result of setting their characteristics and prior academic achievement equal to the sample averages) compared with observed graduation rates. Predicted graduation rates and their likely influences should be interpreted with caution.
5. In this study, the overall four-year graduation rate for the analytic sample is 81.9 percent, which is higher than the published four-year graduation rate of 75.8 percent for the class of 2014 in Arizona. See http://www.azed.gov/research-evaluation/graduation-rates/.
6. For example, in Arizona the percentage of students who were Hispanic ranged from 42 percent to 44 percent, and the percentage of students who were White ranged from 40 percent to 43 percent between 2010 and 2014; the overall four-year graduation rate ranged from 75 percent to 78 percent between 2010 and 2014. See http://www.azed.gov/research-evaluation/arizona-enrollment-figures/ and http://www.azed.gov/research-evaluation/graduation-rates/.

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