

Algebra I Repetition: Predictive Factors

The purpose of this brief is to investigate and describe what we know about Oregon students who repeat Algebra I. This brief will look closely at the data that helps us understand when a student is most likely to repeat the course and other predictive factors that increase or decrease the likelihood of repeating the course. A number of associations are present, most notably **the relationship between accelerating students in middle school and an increased likelihood that those students will end up repeating Algebra I**, for all but the most high-achieving students.

Looking at Oregon public school students who were high school seniors in 2018-19¹, 22% (more than 6,300 students) enrolled in Algebra I in more than one year², and 4% in more than two years.³ This is in contrast with the repetition rate of the typical courses on either side of Algebra I: pre-Algebra (3%) and Geometry (8%). Algebra I and Integrated Mathematics I (combining Algebra I with other math content) were the most-repeated specific math subjects in 2018-19.

Number of Years of Algebra I by 12th Grade
On-time 12th Graders in 2018-19



Algebra I is often positioned as a gatekeeper course to higher mathematics and science courses,⁴ as well as to pursuing STEM degrees and other postsecondary opportunities. Oregon graduation requirements and assessment standards can create additional pressure around Algebra I, for both districts and students. This review explores data and patterns and offers discussion and recommendations that can provide additional insight for schools in districts related to Algebra I offerings.

Key Takeaways

- Students who repeat Algebra I are [significantly less likely to earn an Oregon diploma](#) within four years of entering high school, and are more likely to earn a modified diploma or not graduate.
- Starting Algebra I before high school is [strongly associated with repeating Algebra I](#). The effect varies by math assessment score, but remains significant even at fairly high score levels. Data from other states found similar patterns, with repetition rates of Algebra I [falling by 80%](#) after San Francisco stopped accelerating students.

¹ A sample of 29,895 students who entered high school for the first time in 2015-16 and had records of Oregon coursetaking in each year from 2013-14 (their 7th grade year) through 2018-19 (their 12th grade year).

² The Oregon Department of Education does not currently collect data on whether a student earned credit for a course taken. In this brief, the indicator of repeating the course is whether the student enrolled in either Algebra I (an intended 1-year course) or Algebra I Part I (the first part of an intended 2-year course) in more than one school year.

³ 9% of the students in this cohort did not have a record of enrolling in Algebra I. Examination of their records indicates that most of these students were in one of the following tracks: highly advanced (their first specific math course reported was geometry or higher), disadvantaged (they did not have a record of specific math courses, or had only records of math below Algebra I, including students enrolled in lifeskills classes), or integrated (students who took integrated algebra and geometry, or applied math courses).

⁴ Gojak, Linda M. "Algebra: Not 'If' but 'When.'" *National Council of Teachers of Mathematics (NCTM) Summing Up* (2013).

- Algebra I repetition is more common among [American Indian/Alaska Native students, students navigating poverty and/or houselessness, migrant students](#), and [students with disabilities](#). It is also strongly associated with starting Algebra I [in an alternative school](#), although this represents a small number of students.

In the context of the COVID-19 pandemic and educators’ desire to support students in completing [unfinished learning](#), ODE has recommended [accelerating](#) student learning by creating integrated opportunities and investing in relationships in order to cover additional content within a school year. That type of acceleration should be thought of as distinct from the type of acceleration discussed in this brief. Here, acceleration refers to the practice of placing middle school students into high school-level courses.

Dataset

In order to further investigate the relationships and predictive factors involved in these patterns of repetition, a dataset was developed containing 26,066 students who had started high school in 2015-16, taken Algebra I at least once⁵ by 2017-18, and for whom the Oregon Department of Education (ODE) has coursetaking records for each year between 2013-14 and 2018-19.⁶ **21.1% of the students in this dataset took Algebra I in more than one year.**⁷ Students who were English learners while in high school are slightly underrepresented in this dataset relative to the cohort as a whole (where they represent 4.4% of the students in this cohort), as are students navigating houselessness (8.9% of the cohort) which is likely due to higher mobility within these student groups, but otherwise the data are fairly representative of the cohort as a whole.

Student Group	Percentage of Dataset	Percentage of this group repeating Algebra I (unadjusted)
Gender		
Female	49.2%	19.6%
Male	50.8%	22.5%
Non-binary	<1%	* ⁸
Race/Ethnicity		
American Indian/Alaska Native	1.4%	31.6%
Asian	4.6%	7.9%
Black/African American	2.1%	21.0%
Hispanic/Latino/a/x	22.8%	23.9%
Multiracial	5.9%	20.9%
Native Hawaiian/Pacific Islander	0.6%	22.6%
White	62.5%	20.8%
Students with Disabilities (IEP)	11.7%	34.8%
English Learners/Emerging Bilinguals		
While in High School	2.3%	37.1%

⁵ A small number of students took Algebra I in one year and Algebra I Part I in another year – these were excluded from the dataset, as the circumstances of this coursetaking pattern are unclear and likely associated with a change of school.

⁶ All data presented in this brief reflects years before the COVID-19 pandemic. The pandemic resulted in the temporary suspension of coursetaking data collection in 2019-20.

⁷ While ODE is not able to determine precisely how many of these repetitions are a result of completing the course and not earning credit, in general students who repeated Algebra I were enrolled for nearly the same number of days each year as those who did not repeat. The median days of enrollment differ by only about a week between groups, and in both cases the preponderance of students were enrolled for a full school year. Students who repeated Algebra I did have a slightly higher rate of short enrollments, but the overwhelming majority were still enrolled in the course for most of a school year in each year that they attempted Algebra I.

⁸ Suppressed due to small number of students in this group; non-binary gender identification was first added to ODE data in the 2018-19 school year.

Student Group	Percentage of Dataset	Percentage of this group repeating Algebra I (unadjusted)
Exited Prior to High School	18.3%	20.0%
Students Navigating Poverty⁹	55.1%	24.5%
Migrant Education Program Participant	3.2%	29.3%
Talented and Gifted (TAG)	10.7%	11.6%
Students Navigating Houselessness	5.8%	31.2%

Without adjustment for other factors, the repetition rate appears to be elevated for American Indian/Alaska Native students, students with disabilities, students navigating houselessness, and especially for students who were identified as English Learners while in high school. The finding for English Learners is consistent with other research^{10,11} in this area, which has documented the elevated likelihood of this group repeating Algebra I courses. This may be partially explained by the transition from middle school courses offered in the student's language of origin to high school courses offered in English, or by the higher likelihood of disrupted educational history among these students.

The dataset also contained some related academic factors, including the course the student enrolled in prior to their first attempt at Algebra I, whether they enrolled in single-year Algebra I or the first part of a multi-year sequence (Algebra I Part I), a student's 8th grade math score on Oregon's statewide assessment, and whether the student first attempted Algebra I in an alternative school. Math scores were available for 96.5% of the dataset, with a mean score of 2575 (standard deviation 110), and were used as a general measure of a student's underlying math proficiency. The statewide assessment scores range from approximately 2000 to 3000, and use a minimum score of 2586 on the 8th grade assessment to designate performance at Level 3: proficient for [statewide accountability](#) purposes.

Predictor	Percentage of Dataset	Percentage of this group repeating Algebra I (unadjusted)
Year of First Algebra I Enrollment		
2013-14 (7 th grade)	6.7%	35.3%
2014-15 (8 th grade)	28.0%	26.2%
2015-16 (9 th grade)	61.2%	17.2%
2016-17 (10 th grade)	3.4%	22.0%
2017-18 (11 th grade)	0.6%	15.3%
Started Algebra I in Alternative School	0.6%	37.9%
Type of Course		
Algebra I	95.5%	21.1%
Algebra I Part I	4.5%	20.1%

Unadjusted for other factors, starting algebra in grades other than 9th appears to be associated with a higher likelihood of repeating Algebra I in at least one year, as does starting algebra in an alternative school. There appears to be little difference in repetition rate between single-year and multi-year course designs, though offering Algebra I courses designed to be completed over multiple years is relatively uncommon.

⁹ Students eligible for school meals at reduced/no charge.

¹⁰ Jaquet, Karina, and Anthony B Fong. "How Do Algebra I Course Repetition Rates Vary among English Learner Students by Length of Time to Reclassification as English Proficient? Rel 2017-222." Regional Educational Laboratory West (2017).

¹¹ Thompson, Karen D. "What Blocks the Gate? Exploring Current and Former English Learners' Math Course-Taking in Secondary School." *American Educational Research Journal* 54, no. 4 (2017): 757-98.

Model

A logistic regression model was constructed to estimate the impact of the factors listed above on the odds of a student repeating Algebra I at least once. The course the student was enrolled in prior to first attempting Algebra I was removed from the model due to its strong correlation with the student's start year¹², and the limited availability of this factor within our dataset. The distinction between single and multi-year Algebra I course designs was, as suggested by the raw data above, also non-significant and eliminated from the final model.

Demographics without Interaction

All results presented below are from the same model except where noted, but given the model's complexity, they are presented in multiple sections for ease of interpretation. Results in the table below are presented as [odds ratios](#), which can be interpreted as a percentage change in the odds of an outcome occurring (in this case, repeating Algebra I). Odds ratios above 1.0 indicate an increased likelihood, while odds ratios below 1.0 indicate a decreased likelihood. For example, an odds ratio of 1.15 for male students indicates that the odds of a student repeating Algebra I are 15% higher when the student is male than when they are female (the baseline group).

Predictors (no interaction with math score)	Odds Ratio (95% Confidence Interval) for Repeating Algebra I ¹³
Male students (vs female students)	↑ 1.15 (1.07 – 1.23)
Race/Ethnicity (vs white students)¹⁴	
American Indian/Alaska Native	↑ 1.66 (1.29 – 2.12)
Asian	↓ 0.33 (0.25 – 0.42)
Black/African American	↓ 0.52 (0.41 – 0.67)
Hispanic/Latino/a/x	0.95 (0.86 – 1.06)
Multiracial	0.93 (0.80 – 1.08)
Native Hawaiian/Pacific Islander	1.04 (0.69 – 1.55)
Students Navigating Poverty	↑ 1.44 (1.33 – 1.57)
Migrant Education Program Participant	↑ 1.35 (1.12 – 1.62)
Talented and Gifted (TAG)	↓ 0.64 (0.55 – 0.74)
Students Navigating Houselessness	↑ 1.43 (1.25 – 1.63)
English Learner (Former, Exited prior to HS)	↓ 0.80 (0.71 – 0.89)

The estimates above represent the direct impact of each factor studied, adjusted for the impacts of the other factors. Each factor may have both direct and indirect impacts on the outcome of repeating Algebra I. For example, a student's race/ethnicity may impact the outcome directly (e.g. by reflecting discrimination that the student experiences within the education system), but also indirectly, by impacting (for example) a student's likelihood of navigating poverty or houselessness (e.g. reflecting a legacy of discriminatory housing policies), which themselves impact the likelihood of the outcome of repeating Algebra I. The estimates above reflect the portion of the impact which is not mediated through another factor.¹⁵

¹² Many middle school students are reported with grade-level math, rather than a specific subject; e.g. "Mathematics (Grade 8)."

¹³ ↑ indicates an increased likelihood of repeating Algebra I that is significant at $p < 0.05$. ↓ indicates a decreased likelihood of repeating Algebra I that is significant at $p < 0.05$.

¹⁴ This model does not adjust for the impact of local district policies. When a model with a random intercept to adjust for the baseline impact of district policies was developed, the impacts for most racial/ethnic groups were reduced in significance, suggesting that these impacts reflect, in part, varying district policies across Oregon.

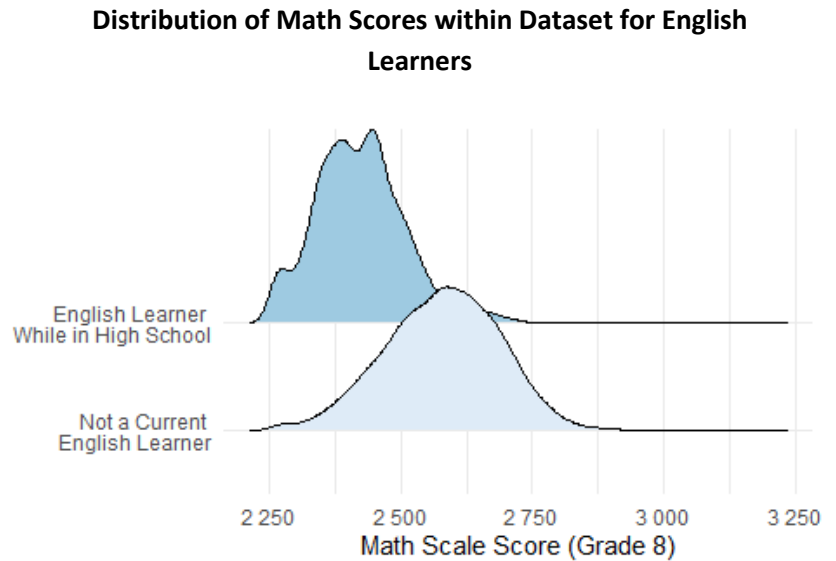
¹⁵ Westreich, D., & Greenland, S. "The table 2 fallacy: presenting and interpreting confounder and modifier coefficients." *American Journal of Epidemiology* (2013): 292–298. <https://doi.org/10.1093/aje/kws412>

Math Assessment Score

A student's 8th grade math statewide assessment score was, as expected, strongly correlated with their likelihood of repeating Algebra I. For students without disabilities, who started Algebra I in 9th grade and were not enrolled in an alternative school at that time, an increase in math score of one standard deviation (110 points, a relatively large increase) was associated with about a 2/3 reduction in the likelihood of repeating Algebra I (OR 0.35; 95% CI 0.33 – 0.38). The score did have significant interactions with some characteristics, which are detailed in the following sections.

English Learners

Current English Learner status is, as seen in the [unadjusted](#) percentages, strongly correlated with Algebra I repetition in an unadjusted model. When a student's grade 8 math statewide assessment score is added to the model, however, the strong correlation between English Learner status and math scores (as seen in the chart on the right) causes the English Learner status to drop out of significance. This does not indicate that English Learner status is not important, but rather that it likely impacts a student's assessment results¹⁶ in very similar ways to the way it impacts a student's likelihood of repeating Algebra I, as seen in related research.¹⁷



Research has also found that English Learners in middle schools often receive “sheltered” instruction in content areas, and that this instruction tends to be by novice teachers and can be less rigorous or even stigmatized compared to mainstream instruction.^{18,19} These factors may likewise influence opportunities and access for these students, in ways that play out similarly for both math assessment scores and Algebra I repetition rates.

Starting Algebra I in an Alternative School

For a student with an average math assessment score, starting Algebra I in an alternative school was associated with a substantially higher likelihood of repeating Algebra I (OR 3.69; 95% CI 2.53 – 5.32). The difference shrinks for lower-scoring students, however, and eventually becomes non-significant for the lowest-scoring students. Math score overall had a weaker impact on the likelihood of repeating Algebra I for these students, compared to the impact for students starting Algebra I in a regular or charter school.

¹⁶ The statewide math assessment is available in both English and Spanish.

¹⁷ Thompson.

¹⁸ Dabach, Dafney Blanca. ““I Am Not a Shelter!”: Stigma and Social Boundaries in Teachers’ Accounts of Students’ Experience in Separate “Sheltered” English Learner Classrooms.” *Journal of Education for Students Placed at Risk (JESPAR)* 19, no. 2 (2014): 98-124.

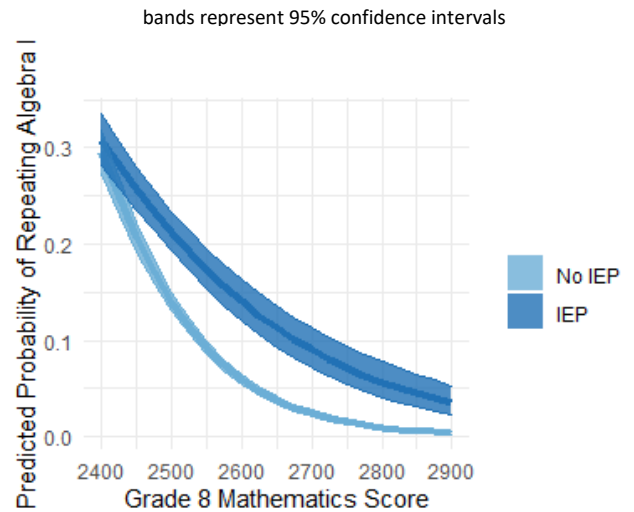
¹⁹ Dabach, Dafney Blanca. “Teacher Placement into Immigrant English Learner Classrooms: Limiting Access in Comprehensive High Schools.” *American Educational Research Journal* 52, no. 2 (2015): 243-74.

Students with Disabilities

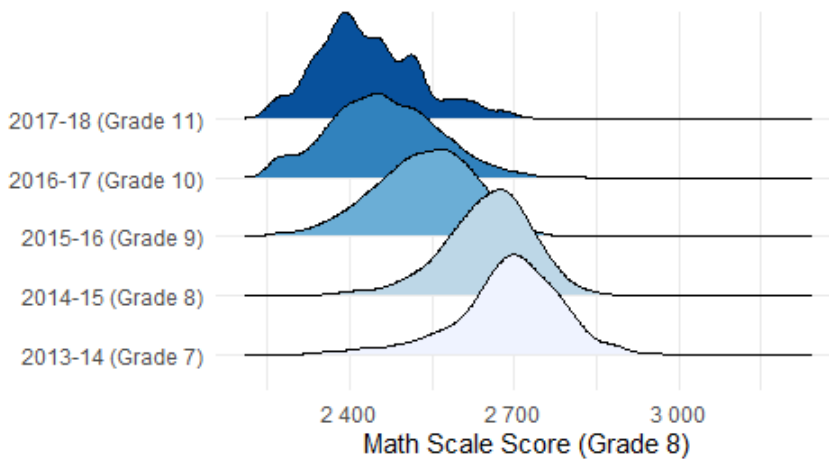
Students with disabilities (served through an IEP in high school) were more likely to repeat Algebra I than those without disabilities at nearly every math score level, though the difference shrinks and eventually becomes non-significant for the lowest-scoring students, who had around a 30% predicted probability of repeating Algebra I (for baseline students²⁰).

One study of students with learning disabilities found that many identified Algebra as their least favorite class, mainly reporting that the coursework was difficult or complex, with a smaller group reporting that they found their teachers to be intimidating or uncaring.²¹ Most students in the study reported that they needed additional assistance, more attention, and better/slower paced explanations in order to succeed in the course.

Predicted Probability of Repeating Algebra I by IEP status, Baseline



Distribution of Math Scores within Dataset by Year of first Algebra I Enrollment



Impact of the Timing of Initiating Algebra I

Similarly, the year a student first attempted Algebra I was strongly correlated with grade 8 math scores, with higher scorers generally more likely to attempt Algebra I in an earlier grade, as shown in the chart to the left.

When the model adjusted for both factors, it was found that starting Algebra I in an earlier year was strongly associated with needing to repeat Algebra I for lower-scoring students, with the effect attenuating and eventually becoming negligible for the highest scoring students as shown in the plot below. Even students scoring at the 75th percentile were significantly more likely to repeat Algebra I if

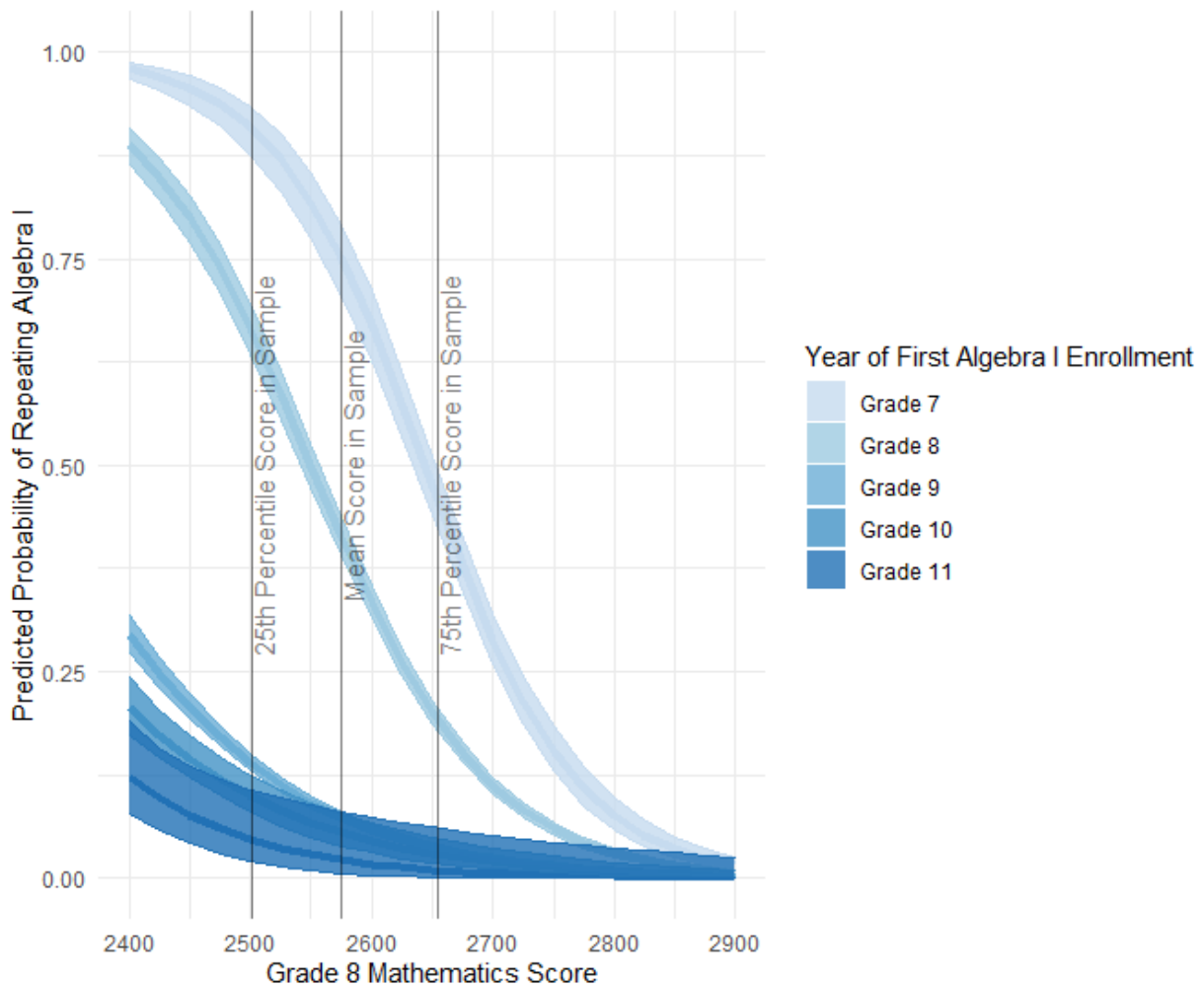
they started it before 9th grade, however. For students starting Algebra I in high school, there was little significant difference between the repetition likelihood in grades 9-11 except for students scoring below the 25th percentile, who may benefit from delaying Algebra I initiation. While higher grade requirements (e.g. C or better) for middle school math to count for high school credit may explain some of the increased repetition rates, they are not likely to account for the whole picture.

²⁰ Students who are white, female, started Algebra I in 9th grade in a regular or charter school, and were not navigating poverty or homelessness, served by the migrant education program, identified as TAG, or a former English Learner.

²¹ Kortering, Larry J, Laurie U de Bettencourt, and Patricia M Brazier. "Improving Performance in High School Algebra: What Students with Learning Disabilities Are Saying." *Learning Disability Quarterly* 28, no. 3 (2005): 191-203.

Predicted Probability of Repeating Algebra I By Year of First Enrollment, Baseline

bands represent 95% confidence intervals



As shown in the chart above, a student with a math score of 2650 (a relatively high-scoring student, scoring around the 75th percentile in the sample) has a predicted likelihood of repeating Algebra I of just under 50% if they start it in 7th grade (95% CI: 44-51%), but less than 5% if they start it in 9th grade (95% CI: 3-4%).

How the Oregon Math Project is Supporting Students

Delayed initiation of Algebra I may represent a stronger foundation – for example, an opportunity to study pre-algebra or other algebraic concepts in more depth before attempting Algebra I. The [Oregon Math Project](#) seeks to minimize repeated or skipped content and to keep students moving along a learning progression throughout elementary, middle, and high school, both in order to increase equity and to help students build and deepen their foundational math skills. These skills are critical to success in higher math courses, and are also aligned with the math skills necessary for many workplaces. The Project's 2+1 framework starts most students in Algebra I in 9th grade, which is considered high school grade level math, followed by geometry, data, and/or statistics in 10th grade, and a branching specialized third credit option for 11th/12th grade.

Supporting Evidence from California

A similar policy that was implemented in San Francisco in 2014-15, ending the practice of enrolling students in Algebra I before 9th grade, produced results that are consistent with this analysis, with substantially decreased rates of Algebra I repetition across all race/ethnicity groups after the policy change.²² The district found that Algebra I repetition rates dropped from 40% to 8% after the change, with an increase in the overall number of students taking courses beyond Algebra II.²³ Teachers also reported that their students were better prepared, which improved their job satisfaction.

“When students take Algebra I...is less important than whether students are ready to take it.”

Previous research in California found that most students with lower math assessment scores who were placed into Algebra I as 8th graders were not proficient in Algebra I at the end of their 8th grade year. The authors concluded that, while “placement in Algebra I in grade 8 for the state’s most prepared math students” serves them well, the “one size fits all” approach of making this placement for all 8th graders in the state “sets up many students to fail.”²⁴

Another California study found similar results, and recommended that “the decision about when a student should take Algebra I...should be based on a careful review of the student’s record to date in mastering pre-algebraic concepts,” including conversations with students and their parents/guardians.²⁵ The authors concluded that “when students take Algebra I...is less important than whether students are ready to take it.” They also found that students who move too quickly through math sequences without developing the appropriate foundations may never reach Algebra I proficiency.

Talented and Gifted Students

While TAG status overall is a protective factor against repeating Algebra I, with TAG students having 36% lower adjusted odds of repeating compared to non-TAG students, Algebra I repetition is still a concern for this student group. Unadjusted for other factors, 11.6% of TAG students in this sample repeated Algebra I at least once, and that rate may be artificially reduced by the unrepresentative demographics²⁶ of this student group, as well as their on-average greater access to supports and interventions, such as private tutoring, outside of the public school system.

Acceleration into Algebra I may still be beneficial for some students in this group, but districts and schools should consider relevant preparatory factors (see [discussion](#)) for all students, including TAG students, when making placement recommendations.

²² Sawchuk, Stephen. “A Bold Effort to End Algebra Tracking Shows Promise.” *EducationWeek*, June 2018.

<https://www.edweek.org/teaching-learning/a-bold-effort-to-end-algebra-tracking-shows-promise/2018/06>

²³ National Council of Teachers of Mathematics, “Work to End Tracking and Offer Four Years of Meaningful Math Instruction.”

https://www.nctm.org/uploadedFiles/Standards_and_Positions/San-Francisco-Unified-School-District-Work-to-End-Tracking-and-Offer-Four-Years-of-Meaningful-Math-Instruction.pdf

²⁴ Williams, Trish, Edward Haertel, Michael W. Kirst, Matthew Rosin, and Mary Perry. “Preparation, Placement, Proficiency: Improving Middle Grades Math Performance. Policy and Practice Brief.” *EdSource* (2011). <https://eric.ed.gov/?id=ED516660>.

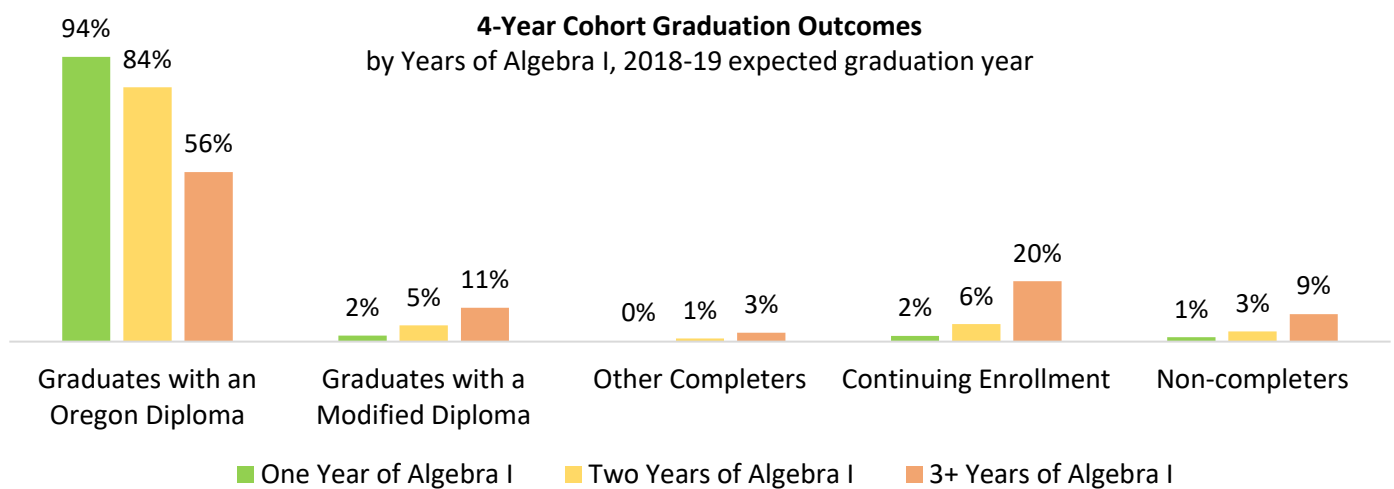
²⁵ Finkelstein, N., Fong, A., Tiffany-Morales, J., Shields, P., & Huang, M. (2012). “College bound in middle school and high school? How math course sequences matter.” *The Center for the Future of Teaching and Learning at WestEd*. https://www2.wested.org/www-static/online_pubs/resource1274.pdf

²⁶ Asian, white, and multiracial students are substantially more likely to be identified as TAG, compared to American Indian/Alaska Native, Black/African American, Hispanic/Latino, and Native Hawaiian/Pacific Islander students. 17% of Asian students were identified as TAG, compared to only 1.7% of American Indian/Alaska Native students, in 2020-21. TAG students were also disproportionately unlikely to receive services for a disability through an IEP, or to be navigating poverty. [Oregon Statewide Report Card 2020-21](#), page 62.

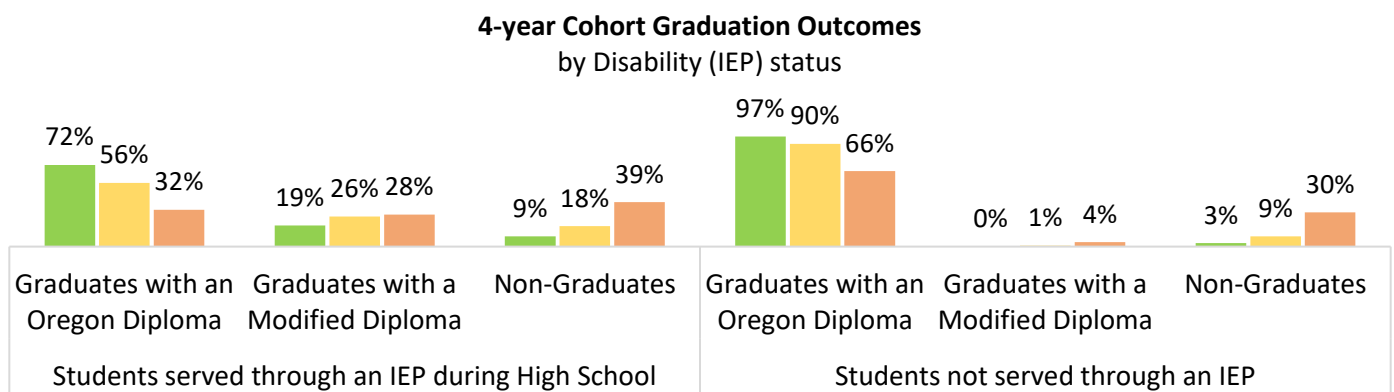
Relationship to Graduation

Oregon’s current graduation requirements are primarily based on the number of credits earned in each subject, with the expectation that instruction will be aligned to content standards in each area. The notable exception is in mathematics, where the Oregon Diploma (awarded to the majority of Oregon’s graduates) requires 3 credits, and specifies that those credits must include Algebra I and two credits above Algebra I. The Oregon Modified Diploma (awarded to a smaller number of students) does not require specific math courses.

Students who repeated Algebra I are significantly less likely to graduate on-time with an Oregon diploma.²⁷ They are more likely to graduate with a modified diploma (which requires two total math credits, and does not specify that they must be Algebra I or above), earn another credential (primarily GEDs), continue enrollment for a fifth year, or exit without a credential (non-completers).²⁸ In engagement sessions around diploma requirements, multiple special education directors identified math as a barrier to earning an Oregon diploma, with one telling ODE that, “high school math credits starting at Algebra or above is the biggest barrier for [an Oregon] diploma and any student who can't successfully complete algebra and one other math course, has to get a modified diploma.”²⁹



Although modified diplomas are predominantly awarded to students with disabilities (served through an Individualized Education Program, or IEP), the overall patterns shown above remain when stratified by disability status, shown below.



²⁷ Data are based on the intact cohort described at the beginning of this brief. Graduation rates may be estimated at higher rates due to the exclusion of students who entered Oregon public education after 7th grade, exited prior to 12th grade, or were served in a placement that does not report coursetaking records to ODE, such as a private alternative program.

²⁸ As above, this data excludes students without consistent coursetaking records within Oregon. For more information on outcomes for students entering Oregon during high school, see [Student Mobility in Graduation](#).

²⁹ Comments provided as part of ODE’s engagement conducted under Senate Bill 744 (2021).

Discussion and Recommendations

Graduation requirements, in combination with statewide assessment standards that include Algebra II content on the 11th grade math assessment, can create a pressure for schools and districts to place students into Algebra I as early as possible, and to require students to repeat Algebra I excessively. Students who might be better served with an emphasis on middle school algebra content in preparation for high school Algebra (Algebra I) can instead be pushed to start Algebra I early, which may result in unnecessary repetition. One counselor told ODE “The inability to have a pre-algebra or an Algebra I prep class really hurts our math sequence for students who are unprepared in 9th grade, or who come to us from other countries, don't speak English, and have to start with Algebra I.”³⁰ Schools and districts may wish to reconsider their tracking and math sequencing in order to build strong mathematical foundations leading into high school, rather than accelerating students prematurely. In addition to imposing morale costs and limiting coursetaking opportunities for students who repeat Algebra I, some research has found that Algebra I repeaters are also associated with negative impacts on other students in the course, decreasing the likelihood that their classmates will pass the course.³¹

Another source of pressure to accelerate students may come from parents/guardians, some of whom were accelerated themselves as students and want to ensure that their children have the same opportunities. Parents may not be aware that many content standards that had been part of high school Algebra for prior generations are now, with the adoption of the [Common Core State Standards](#) in 2010, part of [Grade 8 math](#). This includes standards around understanding functions and solving systems of linear equations. While acceleration may still be appropriate for students who demonstrate an appropriate level and rate of math, parents/guardians, schools, and districts should be looking for students to show mastery and depth, not just fluency, in the content in order to be accelerated. That is to say, students should, in addition to being able to apply algorithms, be able to deconstruct math problems in order to apply what they know and identify where they need support.

Supports and Best Practices

Districts and schools should ensure that adequate support is available for students who struggle, including individualized help and instructional support, as well as using data teaming and collaboration for early identification of students who may be in greater need of intervention.³² This is one of the areas [High School Success](#) funding supports, particularly for students from [focal populations](#). Efforts to make these services available to students should include actively scheduling time for students to make connections and receive support, rather than relying on students to proactively seek out assistance.

Collaborative problem-solving techniques can assist with developing a growth mindset around math competency and with building confidence in problem-solving ability, as a supplement to individual time to consider and reflect.³³ The [Oregon Math Project](#) provides resources and support for ensuring all students have access to high-quality math

³⁰ Comments provided as part of ODE’s engagement conducted under Senate Bill 744 (2021).

³¹ Hill, Andrew J. "The Costs of Failure: Negative Externalities in High School Course Repetition." *Economics of Education Review* 43 (2014): 91-105.

³² Louie, J., Brodesky, A., Brett, J., Yang, L.-M., and Tan, Y. (2008). “Math education practices for students with disabilities and other struggling learners: case studies of six schools in two Northeast and Islands Region states.” *Issues and Answers Report, REL 2008–No. 053*. U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Northeast and Islands. https://ies.ed.gov/ncee/edlabs/regions/northeast/pdf/REL_2008053a.pdf

³³ Cohen, Brea Justine. "Amplifying Latinx Voice through Interview Study: Highlighting Mathematics Identity as a Pathway to Student Self-Empowerment and Academic Agency." Portland State University, 2020; and additional conversations with the author.

instruction. The Institute of Education Sciences (IES) has also produced a [best practices guide](#) to summarize evidence-based recommendations for teaching Algebra effectively.

Effective support also requires combatting implicit biases and teaching with cultural relevance. All students deserve teachers who can communicate with them effectively, hold them to high standards, and equitably assess their behaviors and needs. These efforts can begin with ensuring that teachers understand cultural diversity and cultural heritage as educational resources, not as detrimental or out of step with educational practices.³⁴ Building relationships is key, and can be done with many of the same strategies and asset-based approaches identified in the [guidance](#) to support acceleration to complete unfinished learning. Students deserve to feel welcomed and supported in all educational contexts, and particularly those in which they are minoritized.

In addition, schools may wish to consider offering applied algebra courses to approach Algebra I content in new ways for students who struggle with their first attempt at the course, rather than having students repeat the same coursework for another year (or more). A prior study found that having students repeat Algebra I is generally not an effective strategy to support students who struggled in their first attempt, and should be replaced with alternative approaches to the content and instructional methods, with the aim of providing more targeted approaches and supports to students who have previously struggled with these algebraic concepts.³⁵

Algebra I is a crucial course for students seeking an Oregon diploma. Students, particularly those with disabilities, may be in need of additional supports in order to successfully take and pass Algebra I in order to remain on track for on-time graduation. For all but the highest-achieving students, promoting Algebra I in middle school grades may be counterproductive and increase the likelihood that these students will need to repeat the course in later grades.

Thanks to our ODE colleagues in Standards & Instructional Support, Assessment, Research & Accountability, and Psychometrics for their contributions to this brief.

³⁴ Gay, Geneva. "Acting on Beliefs in Teacher Education for Cultural Diversity." *Journal of Teacher Education* 61, no. 1-2 (2010): 143-52. <https://doi.org/10.1177/0022487109347320>. <https://journals.sagepub.com/doi/abs/10.1177/0022487109347320>.

³⁵ Finkelstein, et al.