education northwest

OREGON MESA

Increasing the odds of high school graduation

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Mathematics, Engineering & Science Achievement (MESA) is a national, pre-college academic program that helps underrepresented students develop science, technology, engineering, and math (STEM) skills. It also helps them learn invention and 21st-century skills, such as marketing, communication, collaboration, and critical thinking. The Oregon chapter of MESA was established in 1985 as an after-school program. It seeks to connect STEM and 21st-century skills to students' real lives and aspirations, with the goal of being better prepared to graduate from high school, enroll in postsecondary education, and find meaningful work in the global marketplace.

At the request of Oregon MESA and with the support of the Meyer Memorial Trust and the Lemelson Foundation, researchers at Education Northwest examined the program's impact on the educational outcomes of participants in Oregon middle schools, evaluating whether MESA met its goal of increasing high school graduation. To do this, we collected student-level data from the Oregon Department of Education (ODE) and used statistical methods to identify a group of students with similar characteristics to MESA students but who did not participate in the program. We compared these students' test scores and graduation rates to those of MESA students.

We found that MESA students, on average, had higher science test scores and higher graduation rates than their peers. However, after accounting for the differences between MESA students and their peers (such as their previous academic achievement and personal characteristics), we found that only one measure, the likelihood of graduating from high school, was statistically significant. This demonstrates that MESA has a positive effect on high school graduation—a central goal of the program.

Using a quasi-experimental study design, we found that **MESA students were significantly more likely to graduate from high school than their peers who did not participate in the program.** This relationship suggests MESA participation has a tangible and important effect on high school graduation.

Our analysis accounts for many of the factors that influence students' academic outcomes, such as their prior academic performance, demographic characteristics, and socioeconomic status. However, we could not account for other important factors, such as students' motivation, parents' engagement, and quality of instruction. We encourage readers to think critically and keep these factors, as well as their own experience, in mind as they interpret the findings.

HOW DID WE STUDY MESA?

We compared MESA students to a *matched sample* of Oregon students who did not participate in the program but were otherwise similar in all observable ways. Specifically, we compared their performance on the statewide grade 8 and high school (typically grade 11) English language arts (ELA), math, and science assessments, as well as high school graduation rates.

What is a matched sample?

A matched sample is a way of creating a comparison group that can show what might have happened if MESA participants never joined the program. Comparing academic outcomes between MESA participants and their matched peers demonstrates the impact of the program. Matching ensures we are comparing students who had similar characteristics and academic achievement before they participated in MESA.

We used *coarsened exact matching* to identify a comparison group of students who did not participate in MESA but are otherwise similar to MESA students in all observable ways. This is called a *quasi-experimental design* because instead of an experimental design—which would randomly select which students participate in MESA and which students do not—we used statistical methods to identify a comparison group.

However, unlike random assignment, a matched sample cannot guarantee that participants were not in some way different from non-participants. Although we can test to see whether the matched sample of students and MESA students were similar before the latter joined the program (they were), we cannot do this with characteristics, such as students' motivation or parents' engagement, that are not measurable from administrative datasets.

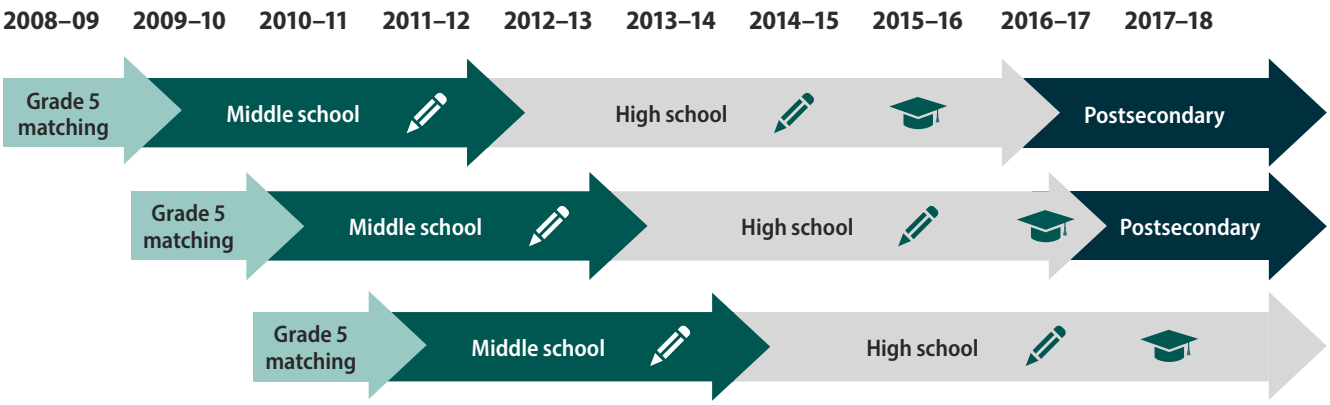
Why did we use matching?

Random assignment is the most rigorous method of determining the impact of a program. Random assignment of enough students ensures all characteristics that could affect student performance are balanced and equal between students who participate in the program and those who do not.

However, random assignment is not always practical or ethical. Since we could not randomly assign students to participate in MESA, we used statistical methods to create a matched sample of students who are similar to program participants in all observable ways—except that they did not participate in MESA.

This underscores the limitation of using quasi-experimental design and matched samples—we cannot completely attribute differences in student outcomes to the program itself. In other words, **we are certain that the students who participated in MESA were more likely to graduate from high school than their peers, but we cannot be certain that participation in MESA was the only cause of the difference;** there may have been other causes that we did not account for.

Figure 1. Description of study cohorts



ELA, math and science state assessment outcomes in grade 8 and high school

Graduation from high school

Note: This figure shows the distribution of grades and outcomes over time for the three cohorts of students who were included in the study. Each cohort was defined by the year they first attended grade 6, which was the first year of possible MESA participation in this study. We identified a comparison group based on grade 5 test scores, program participation, and demographic characteristics. We then compared outcomes in grade 8, in high school, and after graduation.

Who were the MESA students in the study?

To determine which Oregon students were MESA participants, we matched program records to ODE administrative files using students' names, birthdates, and school districts. We identified 431 students who participated in MESA in grades 6–8 from 2009–10 to 2013–14 and who had the minimum necessary data to be included in the study, such as a state test score in grade 8 or high school (see the appendix for the matching procedure).

MESA students in the study sample attended four Oregon school districts: Portland Public Schools, Parkrose School District, Hillsboro School District, and Beaverton School District. The students were members of three cohorts, as defined by their first year of grade 6, which was their first year of possible MESA participation. Depending on their cohort, these students took grade 8 and high school state tests, potentially graduated from high school, and matriculated to a postsecondary education institution in different years (figure 1).

Who were the comparison students?

Students in the comparison group did not participate in MESA but were otherwise similar in observable ways to program participants. Specifically, they were in the same grades and school districts, and they had similar academic achievement and demographic characteristics.

We matched MESA students to comparison group students in districts that offered MESA. We used nine covariates (student-level data points that possibly predict student outcomes) to ensure the students were well matched: race/ethnicity; gender; grade level; state assessment results in ELA, math, and science in grade 5 (one year before students had the option of participating in MESA); and

eligibility for three federal programs: English learner services, special education services, and the free or reduced-price lunch program (a proxy for poverty).

With these characteristics, we matched the 431 MESA students to one or more individuals who were statistically similar to them from a comparison group of 11,839 non-MESA students. We combined all MESA students into one group, regardless of when and for how many years they participated in MESA.

In grade 5—before they participated in the program—MESA students typically had higher test scores than the statewide average in Oregon (table A1 in the appendix). MESA students were also more racially and ethnically diverse than other Oregon students, and a higher percentage of MESA students were English learner students or eligible for the federal lunch program (table A2 in the appendix).

Why did we use standard scores?

Since we are interested in how MESA students perform in comparison to their peers over different years, we cannot directly compare scaled scores. Instead we use standard scores, which illustrate the distance between groups of students on a normal distribution. One standard score is the same as a standard deviation and translates to about 34 percentile points above or below the mean.

MESA students also had slightly higher assessment scores than the comparison group in grade 5 (table 1). However, the differences were not statistically significant (table A3 in the appendix) and were close enough to establish *baseline equivalence,* which means that MESA students and the comparison group students had characteristics that were comparable *(equivalent)* before the former participated in MESA *(at baseline).*

Table 1. Baseline results from grade 5 were well matched

	MESA students (n = 431)	Comparison group students (n = 11,839)
State test standard scores (OAKS)		
ELA	0.11	0.10
Math	0.26	0.23
Science	0.12	0.09
Program participation (ever)		
English learner	35%	29%
Federal lunch program	76%	65%
Special education	23%	15%
Demographic characteristics		
Female	49%	49%
Hispanic/Latino	32%	31%

	MESA students (n = 431)	Comparison group students (n = 11,839)
Asian & Pacific Islander	15%	8%
African American/Black	10%	5%
White	35%	50%
Other[†]	8%	5%

[†] Other includes students who identify as multiracial, Alaska Native, and American Indian.

Note: N-values vary by test and group; exact numbers are in table A3 in the appendix. Results do not account for weights assigned during the matching process and do not control for prior achievement, program participation, or student demographic characteristics.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

How did we compare MESA students to their peers?

We used regression analysis to examine the relationship of MESA participation to student performance. Regression allowed us to estimate the contribution of MESA on student learning based on students' performance on state standardized achievement tests or its impact on graduation. Regression also allowed us to compare student test scores or outcomes while accounting for other factors (such as prior achievement and demographic characteristics, as well as eligibility for special education services, English learner services, and the federal lunch program).

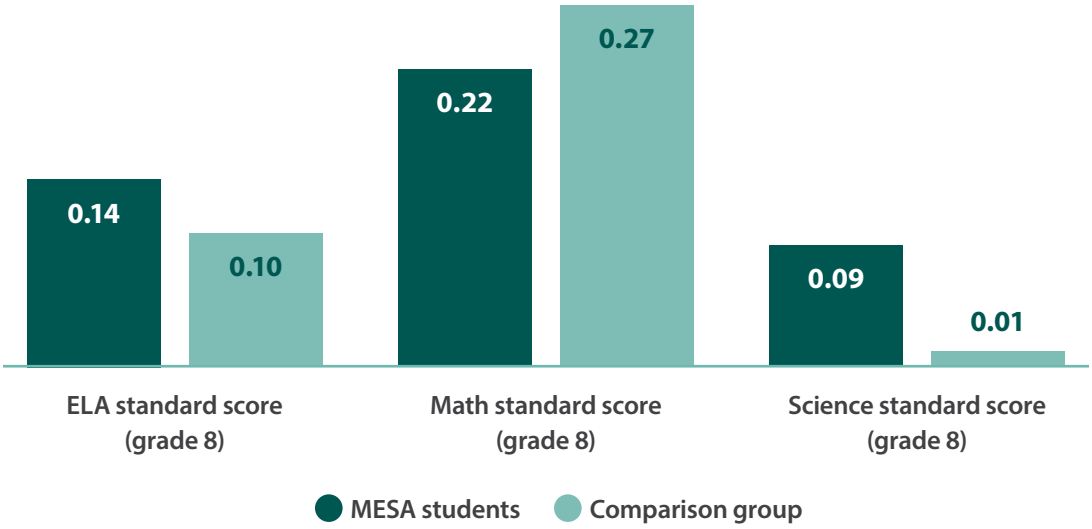
WHAT DID WE FIND?

MESA students were significantly more likely to graduate from high school than their peers who did not participate in the program. We did not find any other statistically significant differences between MESA students and their matched peers on the statewide grade 8 and high school ELA, math, and science assessments.

MESA students had higher science assessment scores in grade 8 and high school than their peers, but these differences were not statistically significant

On average, MESA students had higher science test scores than their matched peers in the comparison group (table A3 in the appendix) in both grade 8 (figure 2) and high school (figure 3). MESA students' ELA test scores were higher than the comparison group in grade 8, and the difference was nearly indistinguishable in high school. MESA students' math scores were lower than the comparison group in grade 8, and the difference was indistinguishable in high school.

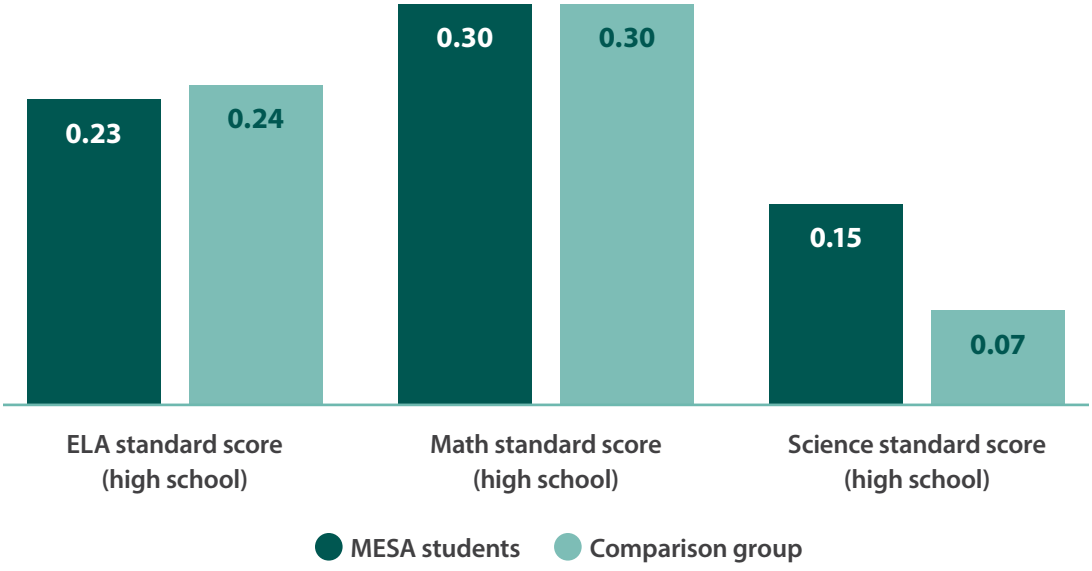
Figure 2. On average, MESA students had higher ELA and science test scores in grade 8 than their peers, but these differences were not statistically significant



Note: These figures show average standard scores on Oregon state assessments. The assessment scores apply weights assigned during the matching process but do not control for prior achievement, program participation, or student demographic characteristics. Table A3 in the appendix provides full results.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

Figure 3. On average, MESA students had higher science test scores in high school than their peers, but these differences were not statistically significant



Note: These figures show average standard scores on Oregon state assessments. The assessment scores apply weights assigned during the matching process but do not control for prior achievement, program participation, or student demographic characteristics. Table A3 in the appendix provides full results.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

However, after accounting for prior achievement, program enrollment, and demographic characteristics, these differences were not statistically significant (table A5 in the appendix). This means the differences between MESA students and the comparison group could have been due to chance or normal population variation rather than program participation.

MESA students had significantly higher graduation rates than their peers

MESA students were more likely to graduate from high school than comparison group students. Specifically, 87 percent of MESA students graduated from high school in four years compared with 73 percent of the comparison group (figure 4).

Figure 4. MESA students had a higher four-year graduation rate than their matched peers

Note: The graduation outcomes apply weights assigned during the matching process but do not control for prior achievement, program participation, or student demographic characteristics. Table A4 in the appendix provides full results.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

We found that these differences were statistically significant ($p < .001$), even after accounting for prior achievement, program enrollment, and demographic characteristics (table A6 in the appendix). The difference in the four-year graduation rate between MESA students and comparison group students was also large. Specifically, we found that **students who participated in MESA had 3.13 times the odds to graduate from high school in four years than the odds of students who did not participate in MESA** (table A6 in the appendix).

Of the 335 MESA students who graduated from high school, all but one did so in four years (table A4 in the appendix). In contrast, among the 8,457 comparison group students who graduated from high school, 756 (9 percent) needed more than four years. Even with this additional time to graduate,

What is an odds ratio?

There are different ways of expressing the outcomes of a regression analysis, but none of them are easy to understand. Findings from a logistic regression (which examine binary outcomes, such as whether or not a student graduates) compare the likelihood of an event occurring among different groups. One way of describing likelihood is an odds ratio.

An odds ratio describes the probability that an event will occur for one group relative to another group. In our analysis, an odds ratio of 1 would mean that two groups of students have the same odds of graduating from high school. An odds ratio of more than 1 shows higher likelihood of graduating from high school, and an odds ratio of less than 1 shows a lower likelihood.

We found an odds ratio of 3.13, which means a MESA student is more than three times as likely to graduate from high school in four years compared with their peers who do not participate in MESA.

MESA students were still significantly more likely to ever graduate from high school than comparison group students (table A6 in the appendix).

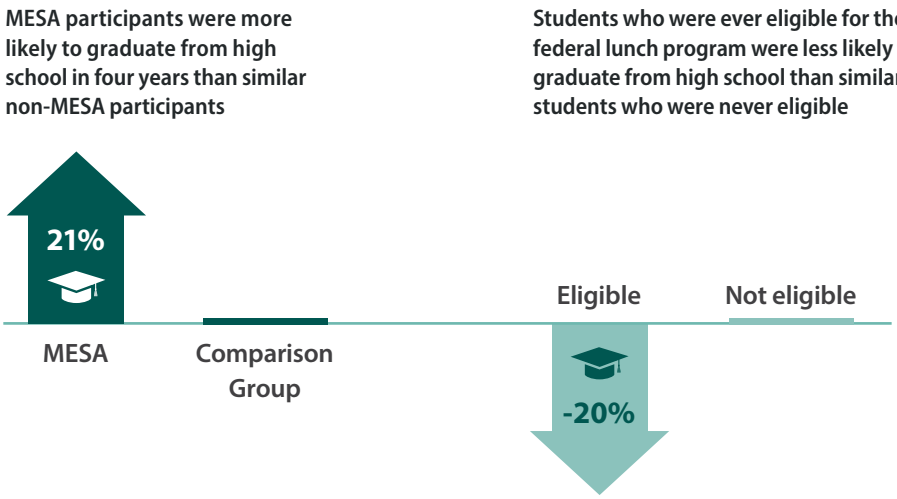
Finally, we did not find any *interaction effects,* that is, statistically significant differences in how MESA interacts with graduation outcomes by students' gender, race/ethnicity, eligibility for the federal lunch program, or English learner status. This means participating in MESA is likely to boost the likelihood of graduating from high school in four years for all students.

HOW DO WE UNDERSTAND THE SIZE OF MESA'S EFFECT ON GRADUATION?

MESA students were 3.13 times more likely to graduate from high school in four years than comparison group students. Stated another way, we found that participating in MESA appears to increase the probability of graduating from high school in four years by 21 percentage points (table A7 in the appendix).

In comparison, being affected by poverty (defined as being eligible for the federal lunch program) had a similar magnitude of effect on the likelihood of graduation. However, unlike MESA participation, this effect was negative—MESA participants were 21 percentage points *more likely* to graduate from high school in four years than comparison group students, and students affected by poverty were 20 percentage points *less likely* to graduate from high school in four years than their peers (figure 5, table A7 in the appendix).

Figure 5. Participating in MESA had the same magnitude of effect on high school graduation as being affected by poverty



Note: See table A7 in the appendix for full results.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

How do these findings relate to other programs that affect graduation?

Another way to understand the magnitude of MESA's effect on four-year high school graduation is by comparing it to other programs that are linked to improved graduation rates. We identified one intervention in the U.S. Department of Education's *What Works Clearinghouse* and one in a recently published review of after-school programs (Neild et al., 2019a, 2019b) that appear to have a statistically significant impact on high school graduation. MESA's impact on graduation, measured by an odds ratio (3.13), was larger than either of the comparison programs.

Citizen Schools is an after-school program for low-income youth in grade 8 that includes career exposure, high school and college preparation, and academic enrichment. A quasi-experimental design study found that Citizen Schools participants were 1.70 times more likely to graduate from high school in four years than comparison group students (Acaira et al., 2010).

Early College is a dual enrollment program that supports underserved students as they take college courses while they are still in high school. An experimental study found that students participating in Early College were 1.48 times more likely to graduate from high school than students who were not selected to participate in the program (Berger et al., 2013).

Figure 6. MESA's impact on high school graduation, as measured by odds ratio, was larger than two comparison programs

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18); Acaira et al., 2010; Berger et al., 2013.

How do these findings relate to previous research on MESA?

In 2016, MESA and Education Northwest partnered to conduct an evaluation of the impact of MESA's after-school program on the educational outcomes of middle school students in Salem-Keizer Public Schools (Greenberg Motamedi & Singh, 2016). We found that Salem-Keizer MESA students had higher grades in science and math than their peers in 2015–16, as well as a higher-grade point average (GPA) in their core ELA, math, science, and social studies classes. Similar to this study, we did not find any statistically significant differences in test scores between Salem-Keizer MESA students and comparison group students.

Grades are generally a better predictor of a student's likelihood of graduating from high school (Easton et al., 2017) and matriculating to college (Hodara & Lewis, 2017) than test scores. In retrospect, the higher grades our earlier study found among Salem-Keizer MESA students may have been the first sign that they were more likely to graduate from high school than their peers.

MOVING FORWARD TO POSTSECONDARY OUTCOMES

MESA and Education Northwest are continuing to work together to understand the relationship between MESA participation and attending a postsecondary institution, such as a two-year community college or four-year university. To do this, we will identify MESA students and comparison group students who are registered and attending classes at a postsecondary institution in Oregon using National Student Clearinghouse data.

APPENDIX

This appendix includes details about our matching procedures, analysis, as well as data and regression tables.

Identifying MESA students

MESA records and ODE data do not share a common student identifier. We used *fuzzy matching* procedures to link MESA students with their ODE records. We used MESA students' first and last name, school district, and date of birth to link the records. Computer algorithms used all available information to calculate a similarity score that quantified how alike two records were in the different datasets.

We included MESA records for 497 individual students in grades 6–8 who applied to the program and attended two or more MESA meetings from 2009–10 to 2013–14. Of these, we found exact matches in the ODE data for 346 records and probable matches for an additional 117 records. There were only 34 records for whom no probable matches were found in the ODE data. We also identified and resolved duplicate records. The overall match rate was 93 percent, or 463 ODE students from 497 MESA records.

Compared with the statewide average, MESA students had higher test scores in all grades and all subjects (table A1). MESA students were also more racially and ethnically diverse than other Oregon students (table A2).

Table A1. Unweighted assessment scores for MESA students and all Oregon students

	ELA		Math		Science	
	n	standard score	n	standard score	n	standard score
Grade 5 assessment scores						
MESA students	455	0.11	459	0.26	420	0.11
Oregon average	171,419	0.01	171,707	0.04	133,391	0.01
Grade 8 assessment scores						
MESA students	449	0.14	447	0.22	392	0.09
Oregon average	117,040	0.05	116,915	0.14	104,886	0.00
High school assessment scores						
MESA students	364	0.24	366	0.31	277	0.15
Oregon average	103,961	0.23	103,028	0.26	86,709	0.09

Note: The assessment scores do not account for weights assigned during the matching process and do not control for prior achievement, program participation, or student demographic characteristics.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

Table A2. Unweighted demographic characteristics for MESA students and all Oregon students

	MESA students (n = 463)	Statewide average (N = 274,936)
Program participation (ever)		
English learner	35%	22%
Federal lunch program	76%	63%
Special education	23%	21%
Demographic characteristics		
Female	49%	49%
Hispanic/Latino	32%	27%
Asian & Pacific Islander	15%	8%
Black/African American	10%	6%
White	35%	53%
Other[†]	8%	6%

[†] Other includes students who identify as multiracial, Alaska Native, and American Indian.

Note: These demographic characteristics do not account for weights assigned during the matching process and do not control for prior achievement, program participation, or student demographic characteristics.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

Matching procedures

We were able to use *coarsened exact matching* procedures to match 431 MESA students (87 percent of the original sample of MESA records) to a similar group of comparison students. Students were matched in districts that offered MESA using the following student-level variables:

- *Prior achievement* on the grade 5 ELA, math, and science assessments
- *Socioeconomic status* using students' eligibility at any time before 2018–19 in Oregon K–12 public schools for free or reduced-price lunch
- *Special education services* eligibility at any time before 2018–19 in Oregon K–12 public schools
- *English learner services* eligibility at any time before 2018–19 in Oregon K–12 public schools
- *Gender* identity, either male or female, while enrolled in middle school (other gender options were not available in the data)
- *Race/ethnicity* using ODE's six categories

Based on these variables, we identified 11,839 students in the comparison group, out of a total of 187,172 non-MESA students in Oregon K–12 public schools (6 percent). We established *baseline equivalence* of MESA students and the comparison group using *Hedge's g,* a statistical test measuring how much one group differs from another. We found that the differences ranged from 0.09 to 0.13 standard deviations (table A3). This range of difference meets the *What Works Clearinghouse* standards with reservations for baseline equivalence with statistical controls for the characteristics in the analysis (What Works Clearinghouse, 2020).

We then compared the two groups' assessment outcomes in grade 8 and high school (table A3) and high school graduation rates (table A4).

Table A3. Weighted assessment scores for MESA and comparison group students

	ELA		Math		Science	
	n	standard score	n	standard score	n	standard score
Grade 5 assessment scores						
MESA students	429	0.11	430	0.26	401	0.12
Comparison	11,797	0.10	11,812	0.23	11,507	0.09
Hedge's g		0.13		0.09		0.09
Grade 8 assessment scores						
MESA students	418	0.14	416	0.22	364	0.09
Comparison	10,425	0.10	10,395	0.27	9,136	0.01
High school assessment scores						
MESA students	340	0.23	341	0.30	261	0.15
Comparison	8,148	0.24	8,004	0.30	6,019	0.07

Note: The assessment scores apply weights assigned during the matching process but do not control for prior achievement, program participation, or student demographic characteristics.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

Table A4. Weighted high school graduation rates for MESA and comparison group students

	Total	Four-year Graduation		Ever Graduated	
		n	Percent	n	Percent
MESA students	386	334	87%	335	87%
Comparison	10,572	7,701	73%	8,457	80%

Note: The graduation outcomes apply weights assigned during the matching process but do not control for prior achievement, program participation, or student demographic characteristics.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

Testing the association between MESA participation and student outcomes

To answer the question of whether MESA participation is associated with a change in students' assessment scores in ELA, math, and science (table A5) or graduation (table A6), we fit a series of regression models. They included an indicator for MESA participation and controls for achievement before participating in MESA. We also included controls for students being eligible for the federal lunch program, special education services, or English learner services at any time in any Oregon K–12 public school. Finally, we added controls for student demographic characteristics. We found that MESA participation was not statistically significant ($p > .05$) for any of the assessment outcomes, which suggests that MESA did not meaningfully improve students' assessment outcomes.

Table A5. Regression results for assessment scores

	Grade 8 ELA	High school ELA	Grade 8 math	High school math	Grade 8 science	High school science
MESA participation	0.05 (0.06)	0.00 (0.06)	0.05 (0.07)	0.03 (0.09)	0.10 (0.07)	0.07 (0.08)
Grade 5 achievement						
OAKS ELA	0.67*** (0.01)	0.59*** (0.02)				
OAKS math			0.71*** (0.02)	0.68*** (0.02)		
OAKS science					0.65*** (0.02)	0.59*** (0.03)
Program participation (ever)						
Federal lunch	-0.15*** (0.03)	-0.17*** (0.03)	-0.20*** (0.04)	-0.20*** (0.07)	-0.19*** (0.03)	-0.18*** (0.05)
Special education	-0.20*** (0.03)	-0.27*** (0.04)	-0.15*** (0.04)	-0.14** (0.05)	-0.24*** (0.03)	-0.16* (0.07)
English learner	-0.01 (0.04)	0.08* (0.04)	-0.04 (0.04)	-0.02 (0.04)	-0.07 (0.04)	0.03 (0.04)
Demographic characteristics						
Female	0.17*** (0.03)	0.09*** (0.03)	0.09*** (0.02)	0.04 (0.03)	-0.06* (0.03)	0.01 (0.03)
Hispanic/Latino	-0.14*** (0.04)	-0.11*** (0.03)	-0.14*** (0.04)	-0.12** (0.04)	-0.12*** (0.03)	-0.16** (0.06)
American Indian & Alaska Native	-0.12 (0.11)	-0.38** (0.12)	-0.19 (0.11)	-0.12 (0.09)	-0.19 (0.12)	-0.22 (0.12)
Asian & Pacific Islander	0.05 (0.05)	0.09 (0.05)	0.19** (0.06)	0.26*** (0.08)	0.10 (0.05)	0.10 (0.07)

	Grade 8 ELA	High school ELA	Grade 8 math	High school math	Grade 8 science	High school science
Black/African American	-0.16*** (0.04)	-0.19** (0.07)	-0.17** (0.07)	-0.18* (0.08)	-0.27*** (0.04)	-0.40*** (0.09)
Multiracial	-0.07 (0.06)	0.00 (0.06)	-0.04 (0.06)	0.05 (0.07)	0.02 (0.03)	-0.02 (0.07)
Variance components						
Constant	0.17*** (0.04)	0.31*** (0.04)	0.23*** (0.05)	0.32*** (0.05)	0.26*** (0.04)	0.20** (0.06)
Level 2, constant	-1.85*** (0.11)	-1.91*** (0.10)	-1.16*** (0.09)	-1.772*** (0.109)	-1.51*** (0.08)	-1.02*** (0.11)
Level 2, residual	-0.47*** (0.02)	-0.42*** (0.01)	-0.42*** (0.02)	-0.335*** (0.0182)	-0.46*** (0.01)	-0.27*** (0.03)
Observations	10,827	8,474	10,808	8,339	9,255	6,140

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Note: Standard errors are shown in parentheses.

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

MESA participation was statistically significant ($p < .001$) for both four-year high school graduation and ever-high school graduation outcomes, suggesting that MESA participation was linked to improved likelihood of graduating from high school (table A6).

Table A6. Regression results for high school graduation

	Four-year high school graduation	Ever graduated from high school
MESA participation		
Odds ratio	3.13*** (0.39)	1.76*** (0.25)
Grade 5 achievement		
OAKS ELA	1.16 (0.09)	1.16 (0.08)
OAKS math	1.34 (0.12)	1.39** (0.16)
OAKS science	1.04 (0.07)	1.07 (0.08)

	Four-year high school graduation	Ever graduated from high school
Program participation (ever)		
Federal lunch	0.34 (0.08)	1.54*** (0.28)
Special education	0.85 (0.12)	0.85 (0.13)
English learner	1.68 (0.30)	1.54* (0.28)
Demographic characteristics		
Female	1.24 (0.12)	1.32 (0.13)
Hispanic/Latino	1.15 (0.19)	0.98 (0.16)
American Indian & Alaska Native	0.97 (0.37)	0.72 (0.27)
Asian & Pacific Islander	1.89 (0.50)	1.56 (0.43)
Black/African American	1.50 (0.28)	1.26 (0.20)
Multiracial	1.73 (0.32)	1.53 (0.30)
Variance components		
Constant	3.60 (0.78)	7.64*** (1.91)
Level 2, constant	0.23 (0.05)	0.18** (3.14)
Observations	10,689	10,689

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

We also calculated the marginal effects of MESA on four-year high school graduation. *Marginal effects* are a way to describe the average effect of an intervention on the probability of an outcome occurring. In this case, marginal effects tell us how much MESA participation is associated with changes in the likelihood that a student will graduate from high school in four years.

We found that participating in MESA increases the probability of graduating from high school in four years by 21 percentage points, controlling for previous achievement, program participation, and student demographic characteristics (table A7). Similarly, ever having qualified for the federal lunch program—a measure of poverty—decreases the probability of graduating from high school in four years by about 20 percentage points, and being female increases the probability of four-year high school graduation by about 4 percentage points.

Table A7. Marginal effects analysis results for four-year high school graduation

	Marginal effects	Standard error	z-value	95% confidence interval	
MESA participation* **	21%	0.02	8.53	0.16	0.26
Grade 5 achievement					
OAKS ELA	3%	0.02	1.76	0.00	0.06
OAKS math **	5%	0.02	3.30	0.02	0.09
OAKS science	1%	0.01	0.63	-0.02	0.03
Program participation (ever)					
Federal lunch* **	-20%	0.04	-4.73	-0.28	-0.12
Special education	-3%	0.03	-1.17	-0.08	0.02
English learner **	9%	0.03	2.95	0.03	0.16
Demographic characteristics					
Female*	4%	0.02	2.20	0.00	0.08
Hispanic/Latino	3%	0.03	0.85	-0.03	0.08
American Indian & Alaska Native	0%	0.07	-0.07	-0.14	0.13
Asian & Pacific Islander*	12%	0.05	2.48	0.02	0.21
Black/African American*	7%	0.03	2.18	0.01	0.14
Multiracial **	10%	0.03	2.99	0.03	0.17

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Source: Education Northwest analysis of MESA (2009–10 to 2013–14) and ODE data (2008–09 to 2017–18).

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ABOUT EDUCATION NORTHWEST

Founded as a nonprofit corporation in 1966, Education Northwest builds capacity in schools, families, and communities through applied research and development. At the request of Oregon MESA and with the support of the Meyer Memorial Trust and the Lemelson Foundation, researchers at Education Northwest examined the program's impact on the educational outcomes of participants, evaluating whether MESA met its goals of increasing high school graduation.

Abstract

Education Northwest partnered with Oregon Mathematics, Engineering & Science Achievement (MESA) to measure the effect of program participation by comparing academic outcomes of two groups of students: those who participated in MESA and a matched group of peers who did not. All things that we could measure and are linked to student academic outcomes—prior achievement, federal program eligibility, and demographic characteristics—were the same or similar among individual MESA students and their matched peers. The only observable difference among data collected by the Oregon Department of Education is that one group participated in MESA, and the other did not.

We found that MESA students were significantly more likely to graduate from high school than their peers. Specifically, students who participated in MESA were 3.13 times more likely to graduate from high school in four years than students who did not participate in the program. Stated another way, participating in MESA appears to increase the probability of graduating from high school in four years by 21 percentage points. We did not find any differences in how MESA interacts with graduation outcomes by students' gender, race/ethnicity, eligibility for the free or reduced-price lunch program, or English learner status. This means MESA is likely to boost the likelihood of high school graduation in four years for all students.

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