

## **Institutional Effectiveness: Enforcement of Pre-University Course Policy on Math Proficiency Completion**

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### **Primary Finding**

EWU's enforcement of its PUBS policy through auto-enrolling students is effective in increasing the number of students who complete the math proficiency requirement by their junior year.

### **Introduction & Background**

Eastern Washington University requires all undergraduate degree seeking students to demonstrate proficiency in mathematics before graduating. Students can satisfy this requirement in a number of ways:

- Complete an EWU course that satisfies the proficiency requirement (per the EWU catalog)
- Transfer an equivalent math course from another institution
- Provide proof of an Associate's degree with a Direct Transfer Agreement (DTA)
- Test out of the requirement with sufficiently high ALEKS test score<sup>1</sup>

Some students, based on their ALEKS math placement or transfer work, are required to take pre-university math courses before college-level math courses. If a student is deemed not college ready for math it is possible that a student must take, pay for, and pass these pre-university courses before being permitted to enroll in college-level math courses<sup>2</sup>.

A study completed in 2016 (Hoffman & Dixon, 2016) discovered that 18.69% of Juniors enrolled in Winter term 2016 had not yet completed their mathematics proficiency requirement. This finding was instrumental in kick starting enforcement of the Pre-University Basic Skills (PUBS) course policy (from here on referred to as PUBS policy & PUBS course)<sup>3</sup>. [Per AP 303-21, Sec. 4-2](#):

Students who are required to complete Pre-University level courses must do so prior to earning 45 credits. Each term the student must enroll in at least one Pre-University level course until all Pre-University requirements are complete. The student may not drop a Pre-University level course once enrolled unless permitted by an academic advisor. If a student has not yet fulfilled Pre-University requirements, the university may proactively register the student into Pre-University courses. Students who do not establish placement either by taking a placement exam or through coursework completed prior to attending EWU will be considered under the requirements and restrictions of the policy. Courses to which this policy applies are: MTHD 103, MTHD 104, and MTHD 106.

Enforcing the policy required a collaborative effort between EWU Center for Academic Advising and Retention (CAAR) and the Records and Registration office to identify and manually enroll students who had yet to successfully complete the PUBS courses. The goal of the PUBS policy was to increase the number of students who had completed their mathematics requirement by the time they reached junior

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<sup>1</sup> An Aleks score  $\geq 41$  is required to enroll into college level math

<sup>2</sup> Pre-university math courses do not count towards degree completion

<sup>3</sup> The policy was adopted \_\_\_\_ without a method of enforcement until winter term 2018

standing. The policy was first enforced Winter term 2018 and had been implemented since. With a sufficient amount of time passed, I evaluated the effectiveness of the enforcement action on increasing the proficiency requirement completion.

### Methods & Evaluation

In order to study the effect of the PUBS policy, I deployed a staple econometrics estimation method: Difference-in-Differences. Additionally, I added in year fixed effects and cluster standard errors. This model’s strength lies in its ability to uncover causal relationships in a pre/post, treatment/control type design. In the case of the PUBS policy, I evaluated EWU Juniors before and after the PUBS policy implementation, and classified students into treatment/control based on whether or not they were automatically enrolled into a PUBS course. The treatment group in the period before the policy were the students who would have been subject to the enforcement of the PUBS policy and would have been auto-enrolled into a PUBS course.

Unlike (Hoffman & Dixon, 2016), I evaluated students at the term when they first reached junior standing and evaluated the proportion of students who had completed the requirement by that time. I chose to evaluate all students who reached junior standing from Winter 2019 to Winter 2021. This allowed time for the students first subject to the policy in Winter 2018 to reach junior standing. Following similar methodology, I evaluated students from Winter 2016 to Winter 2018 as my pre-period group. Again, individuals were assigned treatment based on actually being automatically enrolled (post-period) or would have been automatically enrolled (pre-period).

A number of covariates were brought into the analysis to control for factors other than the PUBS policy that may have affected a student’s ability to complete the mathematics proficiency requirement. Standard errors were clustered at the major level in an effort to control for individuals within the same major having similar characteristics.

**Table 1**

		Pre			Post		
		Control	Treatment	All	Control	Treatment	All
<u>Outcome</u>							
	Completed Math Proficiency Requirement	78.45%	59.32%	77.50%	83.12%	72.28%	82.44%
<u>Covariates</u>							
<u>Gender</u>							
	Male	45.30%	40.7%	45.07%	40.77%	44.02%	40.98%
	Female	54.70%	59.3%	54.93%	59.23%	55.98%	59.02%
<u>Race/Ethnicity</u>							
	American Indian or Alaska Native	1.16%	1.13%	1.16%	1.35%	0.54%	1.30%
	Asian	2.80%	1.69%	2.74%	2.96%	3.80%	3.01%
	Black or African American	2.47%	8.47%	2.77%	3.03%	9.24%	3.42%
	Hispanic/Latino	15.98%	20.34%	16.20%	17.83%	22.83%	18.14%
	Native Hawaiian or Other Pacific Islander	0.36%	0.00%	0.34%	0.29%	0.54%	0.31%
	Two or more races	6.99%	9.60%	7.12%	7.12%	9.78%	7.29%
	Unknown	2.26%	1.69%	2.23%	6.65%	0.00%	6.23%
	White	67.98%	57.06%	67.43%	60.76%	53.26%	60.29%

First Generation	49.32%	54.24%	49.42%	47.35%	43.48%	47.11%
Cumulative GPA	3.19	3.24	3.19	3.19	3.09	3.19
<b>N</b>	<b>3360</b>	<b>177</b>	<b>3537</b>	<b>2737</b>	<b>184</b>	<b>2921</b>

## Results

Students who were automatically-enrolled in MTHD courses were 10.88% points more likely to complete the math proficiency requirement by junior year than those who were not ( $CI = 95\%$ ,  $p < 0.01$ ). The 90% confidence interval for the estimate is [.042, .175] indicating that at its lowest level, the policy is still estimated to have a positive effect. The  $R^2$  associated with the model is 0.8144, telling us that roughly 81.44% of the variation in the model is explained by the variables included.

**Table 2**

N = 6458, $R^2 = 0.8144$						
Variable		Dependent variable: Math Proficiency completion [0,1]				
		Estimate	Std. Error	t value	Pr(> t )	
<u>Variable of Interest</u>						
	PUBS Auto-Enrollment	0.109	0.040	2.706	0.007	***
<u>Control Variables</u>						
	Male	0.034	0.012	2.773	0.006	***
	First Generation	0.009	0.010	0.859	0.390	
	Cumulative GPA	0.209	0.012	17.550	0.000	***
<u>Race/Ethnicity Controls</u>						
	American Indian or Alaska Native	0.084	0.062	1.348	0.178	
	Asian	0.170	0.051	3.369	0.001	***
	Black or African American	-0.062	0.049	-1.259	0.208	
	Hispanic/Latino	0.139	0.041	3.370	0.001	***
	Native Hawaiian or Other Pacific Islander	-0.007	0.096	-0.070	0.944	
	Two or more races	0.084	0.045	1.850	0.064	*
	Unknown	0.083	0.047	1.768	0.077	*
	White	0.114	0.044	2.584	0.010	*

\*  $p < .10$ ; \*\*  $p < .05$ ; \*\*\*  $p < .01$

Regressions controls for changing curriculum catalog requirements during the sample period, specifically; Math 141 meeting the proficiency requirement in Fall 2018, and the introduction of the MATH 130/131 co-requisite program. Regression controls for year fixed effects. Standard errors are clustered at the Major level.

## Chart 1

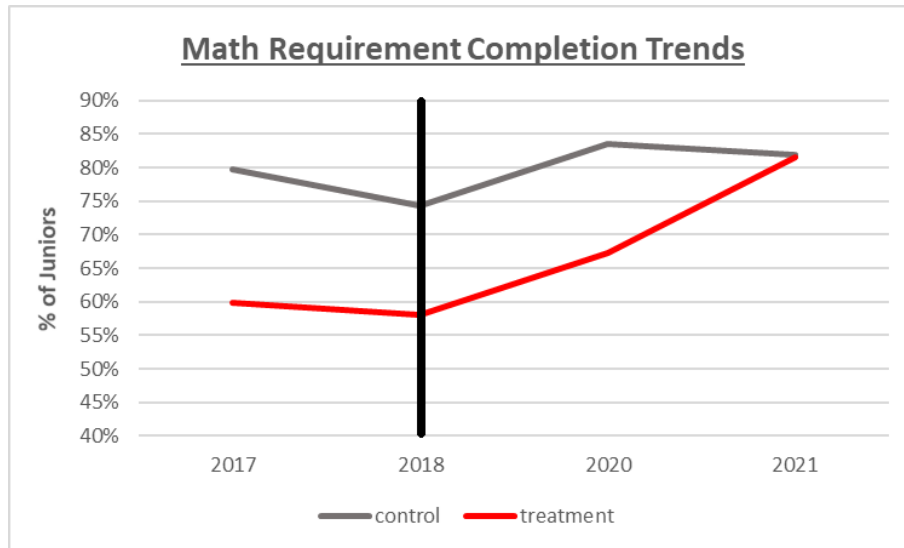


Chart 1 displays the math completion trends for the treatment and control group prior to and after the PUBS policy enforcement in 2018. The vertical line in 2018 demonstrates the cutoff for the pre/post period. The treatment group's math completion percentages are now trending near equal to the control group's percentage.

### Conclusion, Recommendation, and Future Analysis

The data demonstrates that the enforcement of the PUBS policy is effective in helping students complete their mathematics proficiency requirement by their junior year. The model provides statistically significant results to suggest a 10.88 percentage point increase in math proficiency completion by junior year for students who are auto-enrolled in developmental math courses.

The model may be improved through a number of routes. First, more time leading to more data. The PUBS Policy has existed for a sufficient amount of time, however the number of students who have been treated and reached junior standing remains low. Revisiting this analysis once more treated students have reached junior standing will allow us to re-evaluate effect size and statistical significance. Secondly, the model may be improved by adding additional covariates that may affect a student's ability to complete the math proficiency requirement, such as course availability or high school GPA. Finally, the model may be used to estimate the impact of students graduating from the university; more time and data will be required to evaluate later academic outcomes such as graduation.

The model presented in this paper generates sufficient evidence to claim a positive effect of the PUBS automatic enrollment policy on the number of Juniors who complete their university mathematics proficiency requirement.