ECON1000 - Using Big Data to Solve Economic and Social Problems
Economics and Watson
Brown University
Prof. John Friedman

BROWN

ECON 1000

Empirical Exercise #6 Submission Template

Due TUESDAY 12/5/2023, by 10am EDT on Gradescope

Name: Sonya Rashkovan

Group members with whom you worked[1]:

1.

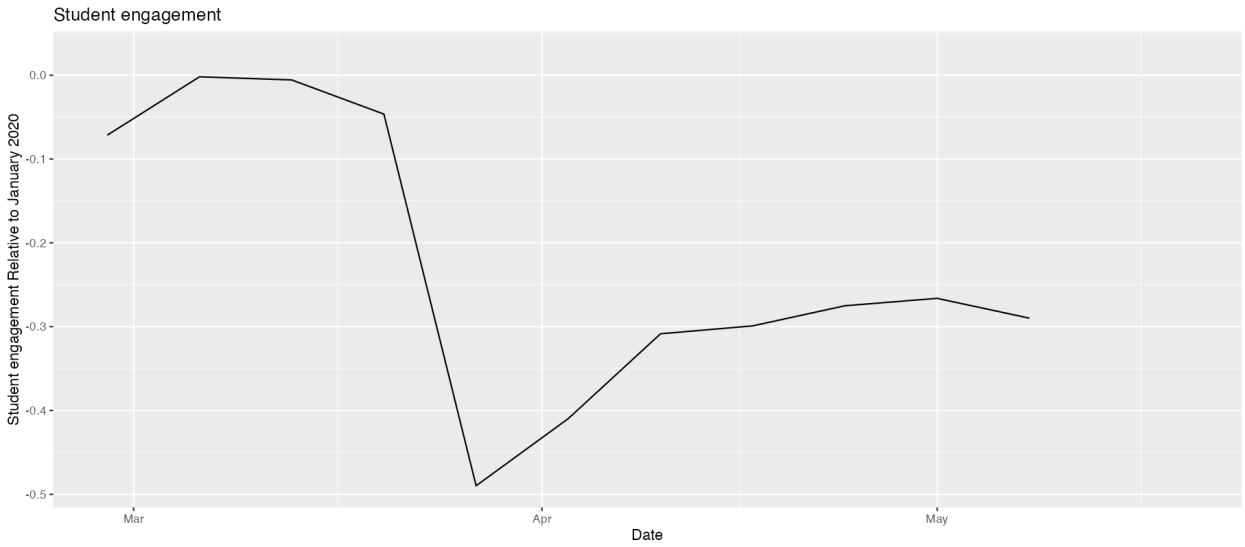
2.

3.

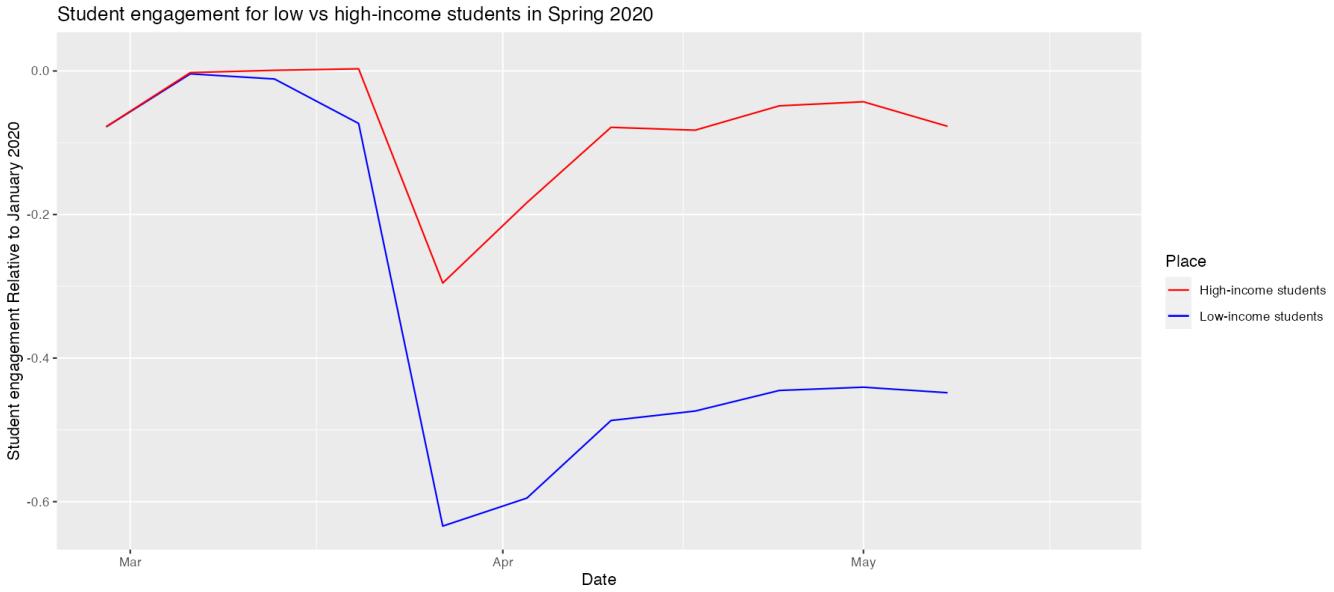
4.

[1] In this class we encourage working in groups because you will learn a great deal from your peers. At the end of the day, however, it is important that you write up your own analysis. Your exploration and your narrative should be your own. Please then list all group members with whom you worked. If you have any questions, please ask.

1. Plot student engagement (number of students using the Zearn platform) by week for the full US for Spring 2020.

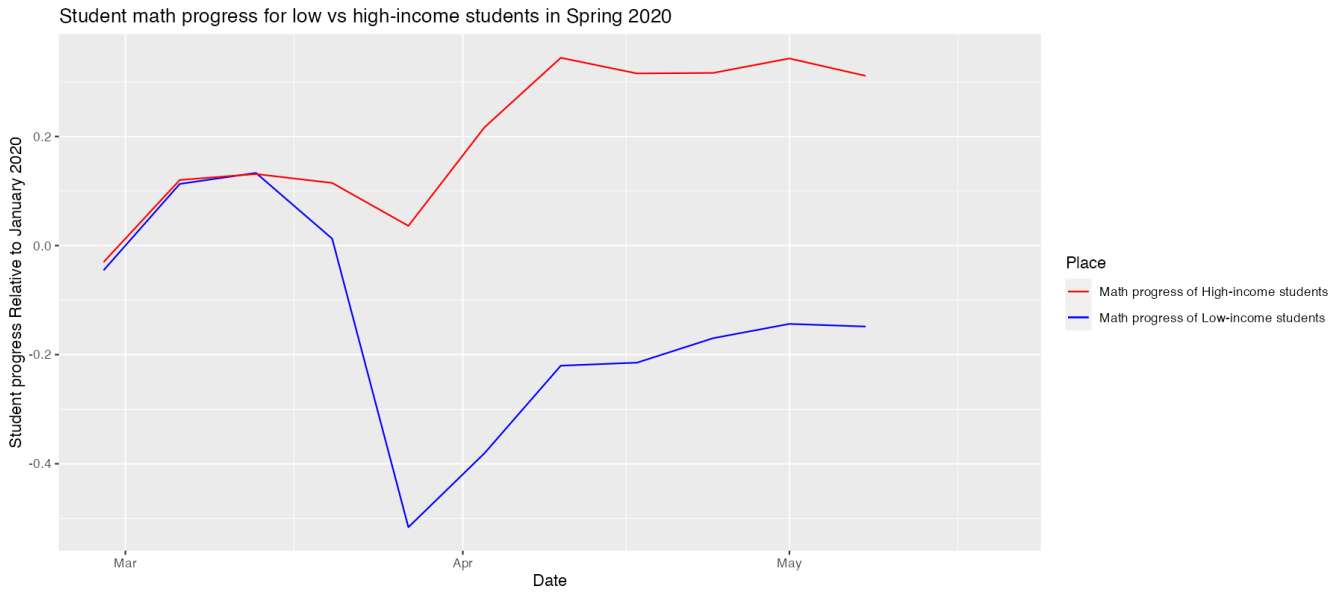


2. Plot student engagement for high vs low-income students in Spring 2020.



The student engagement of high-income students on the Zearn platform dropped much less than that of low-income students at the beginning of COVID-19 when schools were closed. This might suggest that when schools were closed due to COVID-19, low-income students had less access to technology, and thus we see a significant drop to as low as -0.6 engagement in late March relative to January 2020.

3. Repeat step 2 with the progress variable (number of Zearn lessons completed each week).



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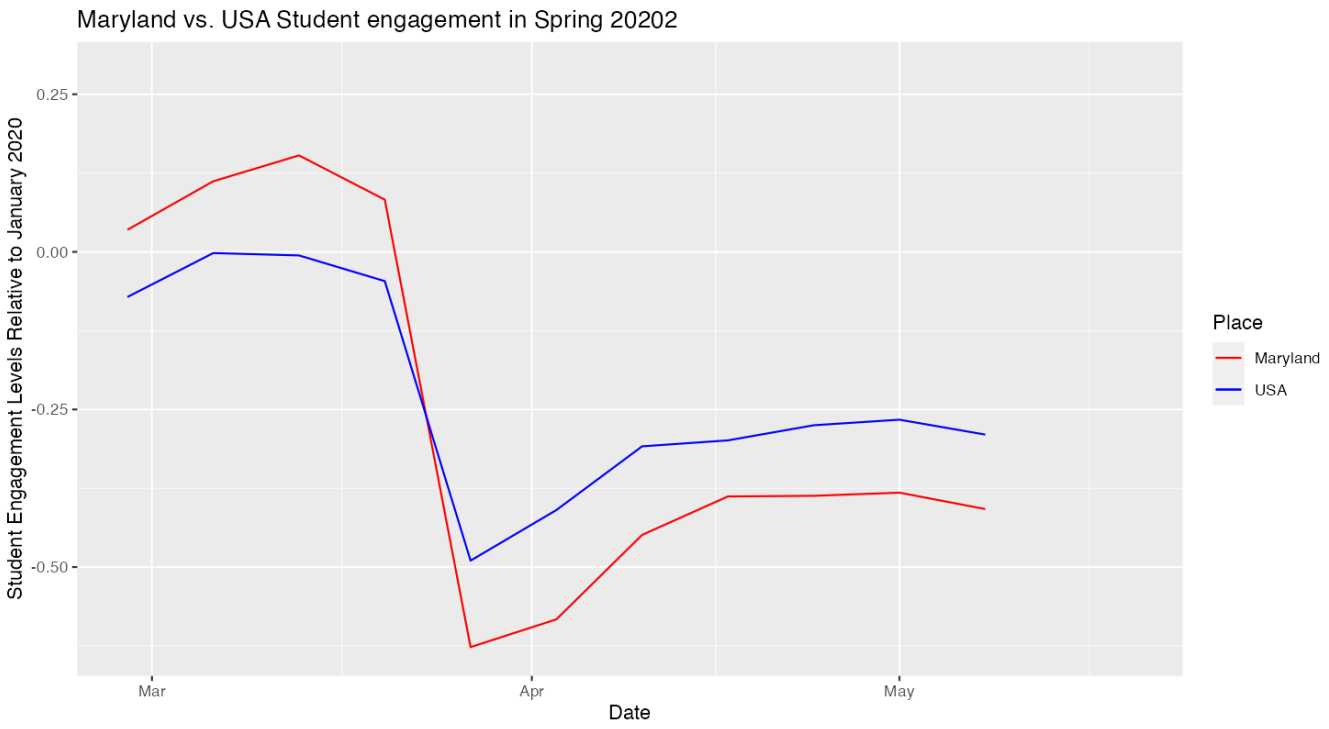
One of the advantages is that students' math progress is more representative of learning than students' engagement because that metric doesn't necessarily mean that there is learning happening. Math progress is actual learning happening that can be tracked.

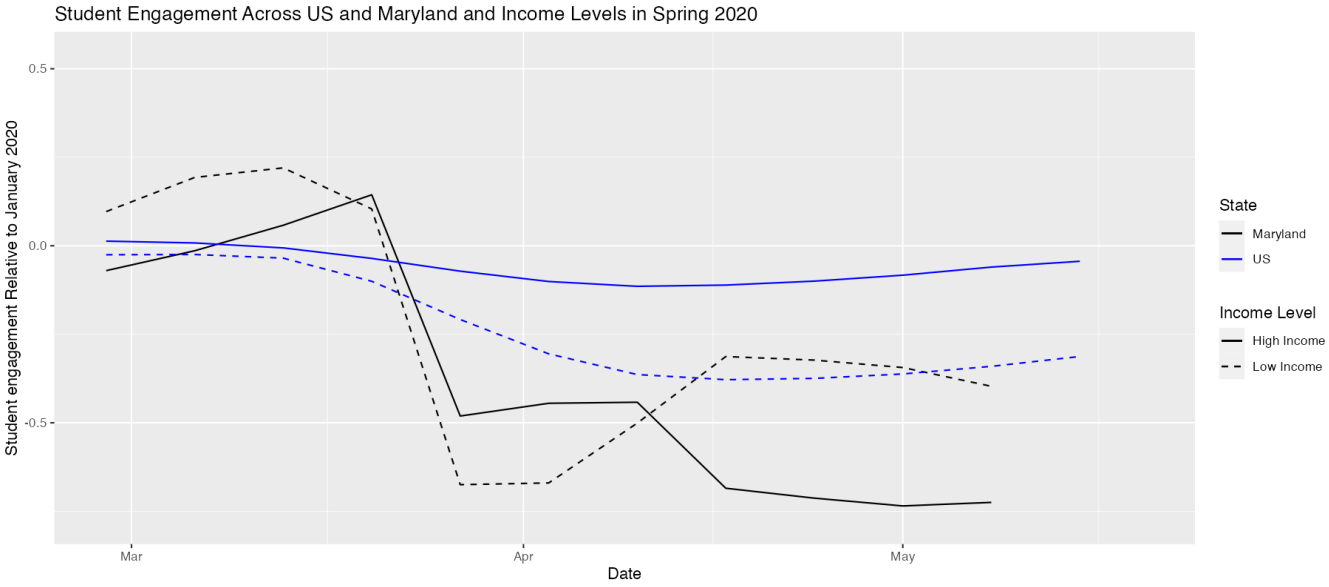
One of the disadvantages is that the "average # of badges per student" can inflate and skew the graph towards more activity because the number of badges could not be equally distributed throughout the classes. Leaning (aka badge earning) might be happening only for a few students while the rest don't do any leaning.

4. Choose a state and repeat steps 1 and 2.

[Include the plot of total progress in your state vs the whole US here.]

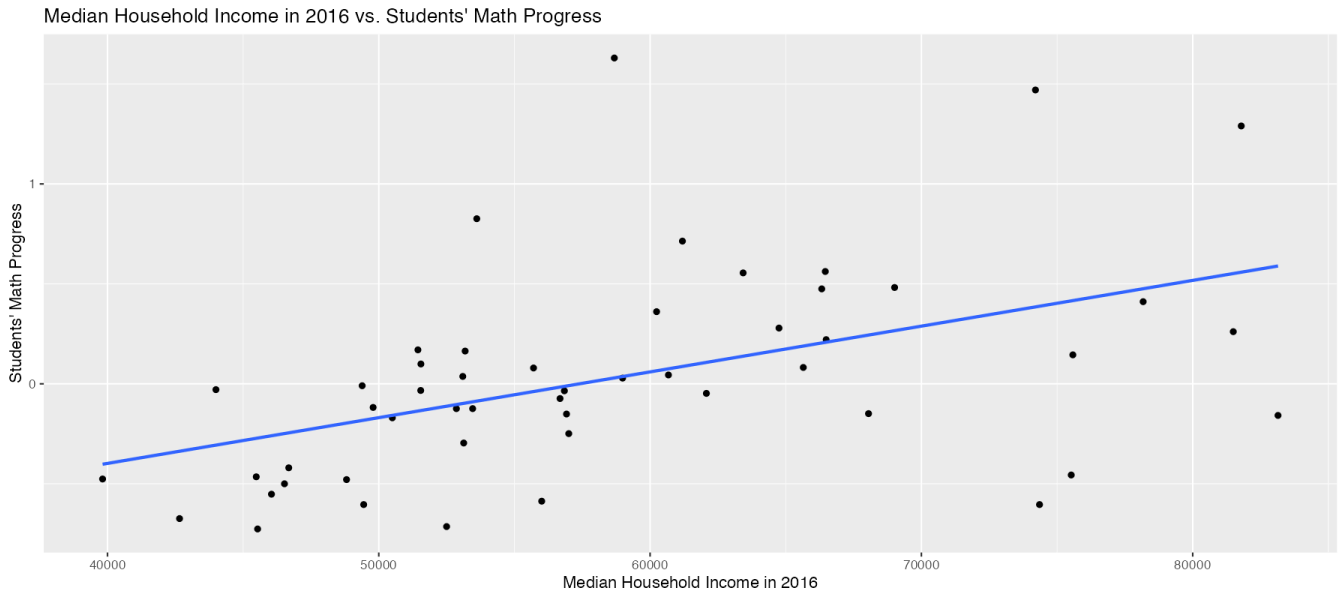


[Include the plot by income level here.]



Even though Maryland started out with a higher student participation rate than the rest of the USA in March, its drop was more significant in April and didn't match the rest of the USA until the end of Spring 2020.

5. Choose a variable and use a scatterplot to analyze the relationship between your variable and education once the pandemic hit.



correlation coefficient: 0.4787454

6. Plot student learning for all of 2020 for a state that opened in-person vs. remote in Fall 2020.

Arkansas (which had almost all students (96.7%) in-person learning and ending the Fall on that same percentage) vs Maryland (that stayed remote in the Fall of 2020 with 0% students in-person in September and the same by the end of Fall)

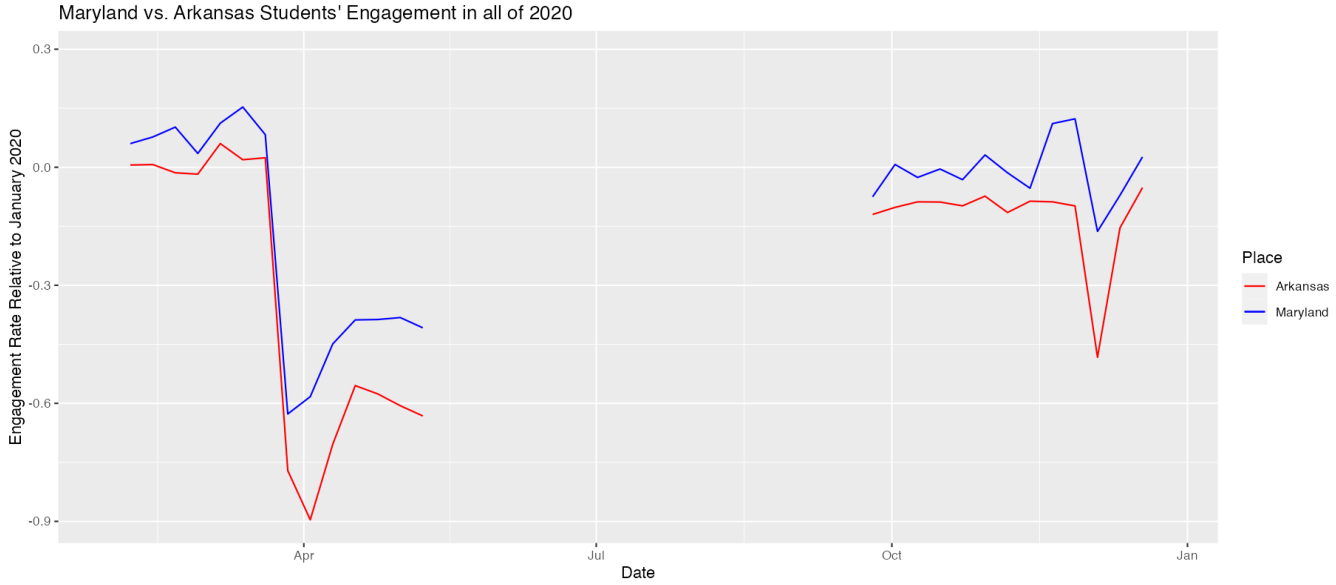
A tibble: 14 × 7

	state_fips	state_abbrev	date	undecided	virtual	hybrid	traditional
	<dbl>	<chr>	<date>	<dbl>	<dbl>	<dbl>	<dbl>
1	5	AR	2020-09-07	0	0	3.33	96.7
2	5	AR	2020-09-14	0	0	3.33	96.7
3	5	AR	2020-09-21	0	0	3.33	96.7
4	5	AR	2020-09-28	0	0	3.33	96.7
5	5	AR	2020-10-05	0	0	3.33	96.7
6	5	AR	2020-10-12	0	0	3.33	96.7
7	5	AR	2020-10-19	0	0	3.33	96.7
8	5	AR	2020-10-26	0	0	3.33	96.7
9	5	AR	2020-11-02	0	0	3.33	96.7
10	5	AR	2020-11-09	0	0	3.33	96.7
11	5	AR	2020-11-16	0	0	3.33	96.7
12	5	AR	2020-11-23	0	0	3.33	96.7
13	5	AR	2020-11-30	0	8	3.33	88.7
14	5	AR	2020-12-07	0	0	3.33	96.7

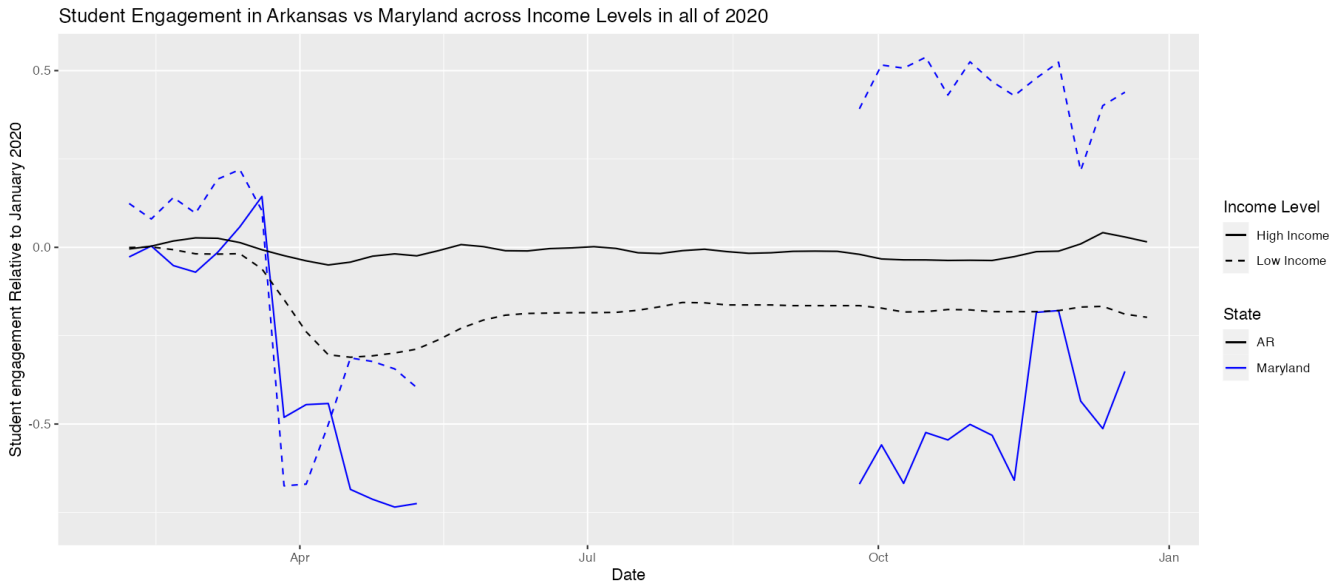
A tibble: 14 × 7

	state_fips	state_abbrev	date	undecided	virtual	hybrid	traditional
	<dbl>	<chr>	<date>	<dbl>	<dbl>	<dbl>	<dbl>

1	24 MD	2020-09-07	0	100	0	0
2	24 MD	2020-09-14	0	100	0	0
3	24 MD	2020-09-21	0	100	0	0
4	24 MD	2020-09-28	0	100	0	0
5	24 MD	2020-10-05	0	97.9	1.25	0.83
6	24 MD	2020-10-12	0	97.1	1.88	1.04
7	24 MD	2020-10-19	0	88.8	10.2	1.04
8	24 MD	2020-10-26	0	86.0	12.9	1.04
9	24 MD	2020-11-02	0	84.6	14.4	1.04
10	24 MD	2020-11-09	0	89.6	10.4	0
11	24 MD	2020-11-16	0	92.7	7.29	0
12	24 MD	2020-11-23	0	92.7	7.29	0
13	24 MD	2020-11-30	0	100	0	0
14	24 MD	2020-12-07	0	99.0	0.96	0



7. Repeat step 6 with separate outcomes for high- and low-income students.



8. A number of schools reopened in person at the beginning of Fall 2020 but returned to remote learning mid-Fall due to rising COVID rates. Plot student learning for Fall 2020 comparing areas that stayed open the whole Fall and went back remote. Assess your result.

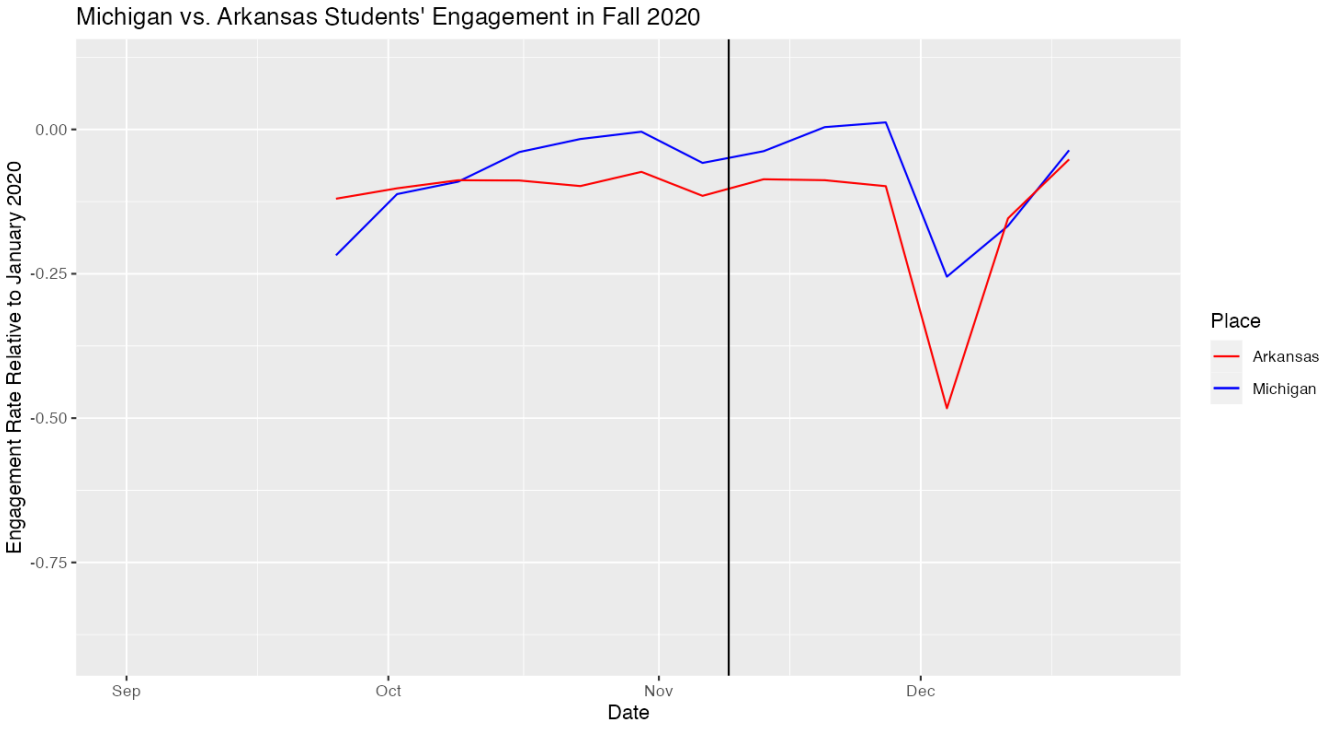
Arkansas (from the beginning of Fall of 2020 was at 96.7% of students in-person school and end the Fall at 96.7% of students in-person) vs Michigan (that started with more than half, 51.7%, of students being in-person but with the breaking point on Nov 16 when the in-person student enrollment dropped to 40.8%. They ended the Fall with only 39.1% of students in-person)

A tibble: 14 × 7

	state_fips	state_abbrev	date	undecided	virtual	hybrid	traditional
	<dbl>	<chr>	<date>	<dbl>	<dbl>	<dbl>	<dbl>
1	5	AR	2020-09-07	0	0	3.33	96.7
2	5	AR	2020-09-14	0	0	3.33	96.7
3	5	AR	2020-09-21	0	0	3.33	96.7
4	5	AR	2020-09-28	0	0	3.33	96.7
5	5	AR	2020-10-05	0	0	3.33	96.7
6	5	AR	2020-10-12	0	0	3.33	96.7
7	5	AR	2020-10-19	0	0	3.33	96.7
8	5	AR	2020-10-26	0	0	3.33	96.7
9	5	AR	2020-11-02	0	0	3.33	96.7
10	5	AR	2020-11-09	0	0	3.33	96.7
11	5	AR	2020-11-16	0	0	3.33	96.7
12	5	AR	2020-11-23	0	0	3.33	96.7
13	5	AR	2020-11-30	0	8	3.33	88.7
14	5	AR	2020-12-07	0	0	3.33	96.7

A tibble: 14 × 7

	state_fips	state_abbrev	date	undecided	virtual	hybrid	traditional
	<dbl>	<chr>	<date>	<dbl>	<dbl>	<dbl>	<dbl>
1	26	MI	2020-09-07	0	42.3	6.02	51.7
2	26	MI	2020-09-14	0	42.3	6.02	51.7
3	26	MI	2020-09-21	0	30.2	6.02	63.7
4	26	MI	2020-09-28	0	30.2	6.02	63.7
5	26	MI	2020-10-05	0	28.6	6.99	64.4
6	26	MI	2020-10-12	0	20.7	8.01	71.3
7	26	MI	2020-10-19	0	18.0	8.25	73.8
8	26	MI	2020-10-26	0	15.8	9.76	74.5
9	26	MI	2020-11-02	0	21.3	6.75	71.9
10	26	MI	2020-11-09	0	24.2	6.75	**69.1**
11	**26**	**MI**	**2020-11-16**	**0**	**55.8**	**3.37**	**40.8**
12	26	MI	2020-11-23	0	56.5	3.61	39.9
13	26	MI	2020-11-30	0	69.8	2.05	28.2
14	26	MI	2020-12-07	0	59.9	1	39.1



The vertical line represents the breaking policy point on November 9th when Michigan's in-person schooling dropped from 69.1% to 40.8%

The change in return-to-school policy doesn't appear to have any significant influence on Maryland vs Arkansas Zealearn student participation however there was a significant drop in Arkansas students' participation at the beginning of December while Michigan saw a lower drop.

9. Reevaluate your state from part 1.

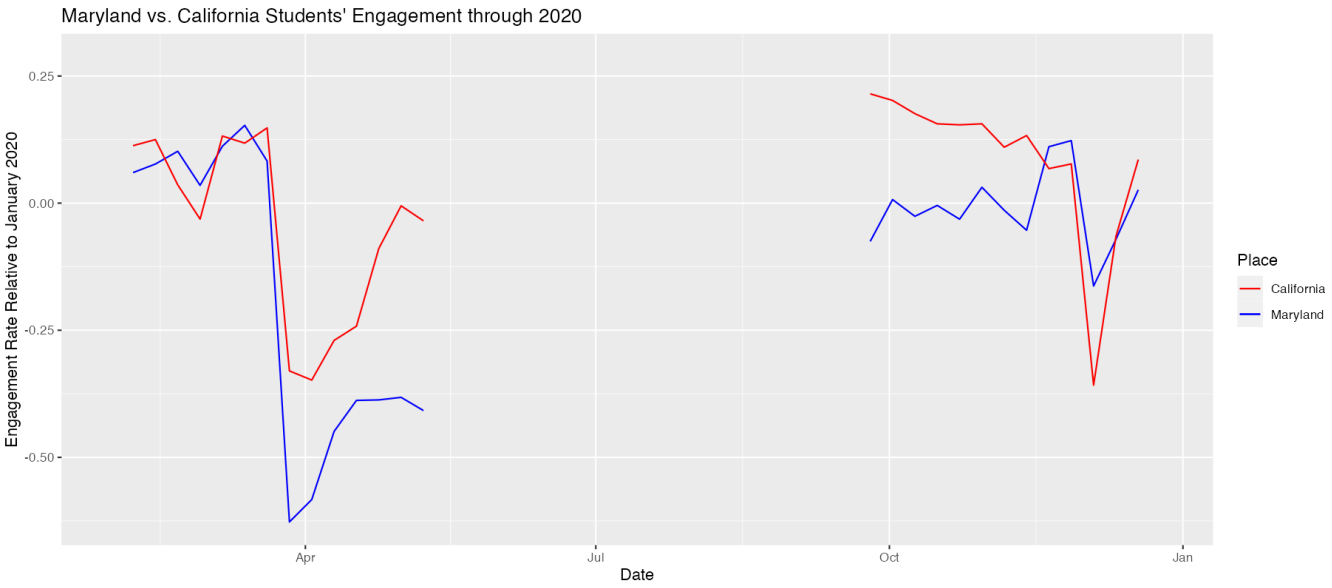
Maryland (100% virtual schooling until October 5th when it began to slightly transition to hybrid/in-person with the lowest level of virtual schooling at 84.6% on November 2nd) vs California (starting at very close to 100% of students virtual at 94.7% and ending with only 60.5% virtual schooling by the end of the Fall)

A tibble: 14 × 7

	state_fips	state_abbrev	date	undecided	virtual	hybrid	traditional
	<dbl>	<chr>	<date>	<dbl>	<dbl>	<dbl>	<dbl>
1	24	MD	2020-09-07	0	100	0	0
2	24	MD	2020-09-14	0	100	0	0
3	24	MD	2020-09-21	0	100	0	0
4	24	MD	2020-09-28	0	100	0	0
5	24	MD	2020-10-05	0	97.9	1.25	0.83
6	24	MD	2020-10-12	0	97.1	1.88	1.04
7	24	MD	2020-10-19	0	88.8	10.2	1.04
8	24	MD	2020-10-26	0	86.0	12.9	1.04
9	24	MD	2020-11-02	0	84.6	14.4	1.04
10	24	MD	2020-11-09	0	89.6	10.4	0
11	24	MD	2020-11-16	0	92.7	7.29	0
12	24	MD	2020-11-23	0	92.7	7.29	0
13	24	MD	2020-11-30	0	100	0	0
14	24	MD	2020-12-07	0	99.0	0.96	0

A tibble: 14 × 7

	state_fips	state_abbrev	date	undecided	virtual	hybrid	traditional
	<dbl>	<chr>	<date>	<dbl>	<dbl>	<dbl>	<dbl>
1	6	CA	2020-09-07	0	94.7	2.84	2.41
2	6	CA	2020-09-14	0	93.7	3.88	2.41
3	6	CA	2020-09-21	0	90.6	6.72	2.67
4	6	CA	2020-09-28	0	86.8	9.05	4.14
5	6	CA	2020-10-05	0	83.4	8.02	8.53
6	6	CA	2020-10-12	0	82.4	8.71	8.88
7	6	CA	2020-10-19	0	75.1	15.7	9.22
8	6	CA	2020-10-26	0	68.3	22.5	9.22
9	6	CA	2020-11-02	0	64.3	25.7	9.91
10	6	CA	2020-11-09	0	61.7	27.7	10.6
11	6	CA	2020-11-16	0	59.6	29.5	11.0
12	6	CA	2020-11-23	0	59.3	29.7	11.0
13	6	CA	2020-11-30	0	59.8	29.0	11.2
14	6	CA	2020-12-07	0	60.5	28.4	11.2



There seems to be an approximate parallel trend on the left side of the graph as Maryland and California were behaving in an approximately similar manner while once there was a policy switch of California going back in person, student engagement steadily declined with a large drop in mid-November/December while Maryland peaks above California.