Epsilon Project

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01

Problem
Statement

What's going on?

Epsilon School of Math and Science is expanding. Currently it has 490 students, however, a new wing is being built into the school. This new wing will allow the incoming Sophomore class to have 140 more students than the previous one. The sophomore class is equal to the senior class plus any dropouts that have happened during High School. The information from the Registrar's office claims that 5% of each class drops out before they finish High School. Currently the teacher department distributions are:

Art	1
Biology	4
Chem	3
English	5
French	1
German	1

Spanish	1
Math	6
Music	1
Physics	3
SS	5

This is what the current student distributions are for each class:

Grade	10	11	12	Total
Art	31	33	35	99
Biology	198	95	26	319
Chem	59	126	109	294
English	183	155	152	490
French	41	32	49	122
German	19	22	10	51
Spanish	51	26	33	110
Math	184	201	262	647
Music	50	56	49	155
Physics	50	58	183	291
SS	183	131	59	373

02 Assumptions
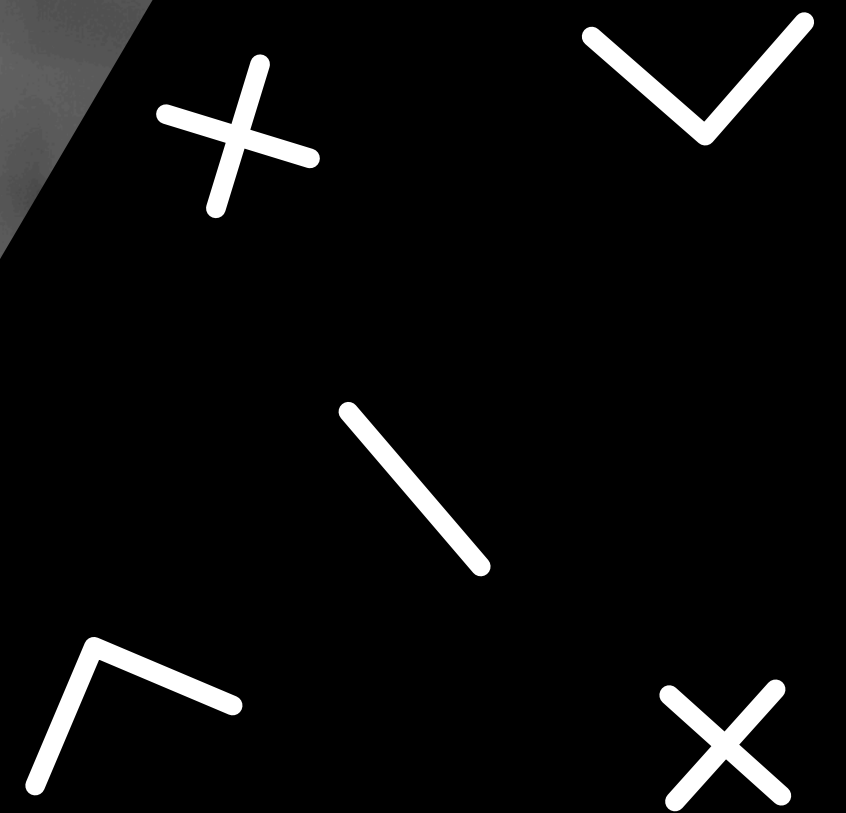
Assumptions

- 5% of seniors have dropped out, 2.5% of juniors, and no sophomores (this would mean 167 sophomores, 163 juniors, 159 seniors)
- New Sophomore class has 307 students
- Rising sophomores and juniors will take classes in same ratio
- No new enrollments per grade
- Each person takes 6 classes a day
- Teachers teach all grades
- Each teacher teaches 5 classes per day
- French/Spanish teacher added teaches 2 French classes and 3 Spanish

What is Fair?

What is fair?

Our definition of fair is for teachers to have assistance if their student to teacher ratio is too high.
Our goal was to determine the highest student to teacher ratios among the classses at Epsilon and assing teachers to the highest ones.
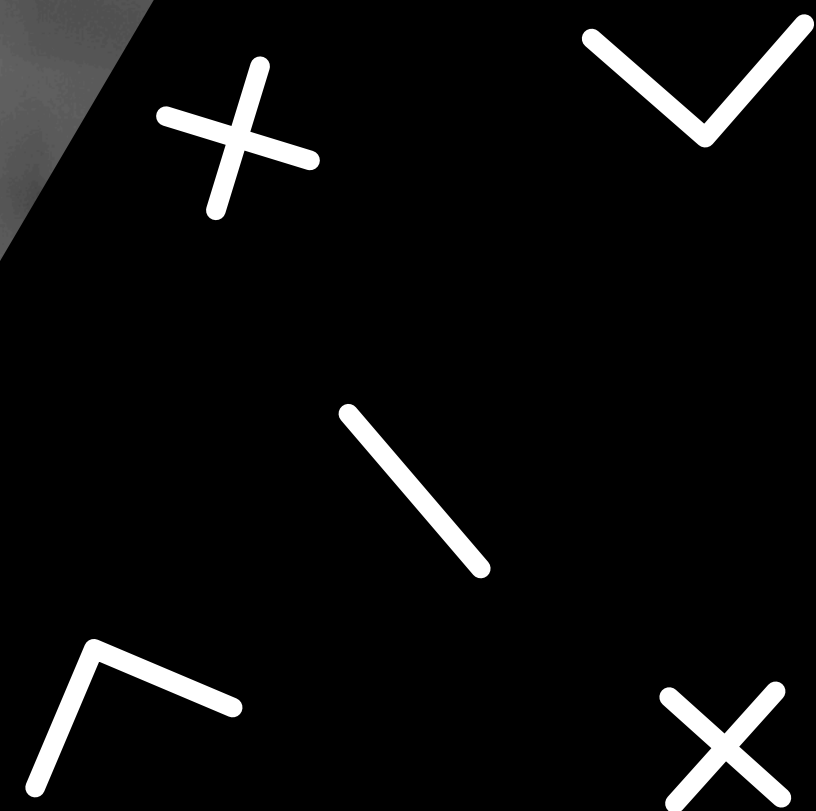In doing this, we first had to make a lot of assumptions to determine the # of students in each grade and class

Grades	10	11	12
Art	31	33	35
Biology	49.5	23.75	6.5
Chem	19.6666667	42	36.3333333
English	36.6	31	30.4
French	41	32	49
German	19	22	10

Spanish	51	26	33
Math	30.666667	33.5	43.666667
Music	50	56	49
Physics	16.6666666	19.3333333	61
SS	36.6	26.2	11.8

03

Explanation

Flowchart

Find number of students in each grade

Student:teacher ratio for each class and grade level

% of kids in each grade taking a respective class

Divide the ratio by 100 and then multiply by the new class size for the class distributions

New student:teacher ratio

Allocated teachers to those who had a really high ratio
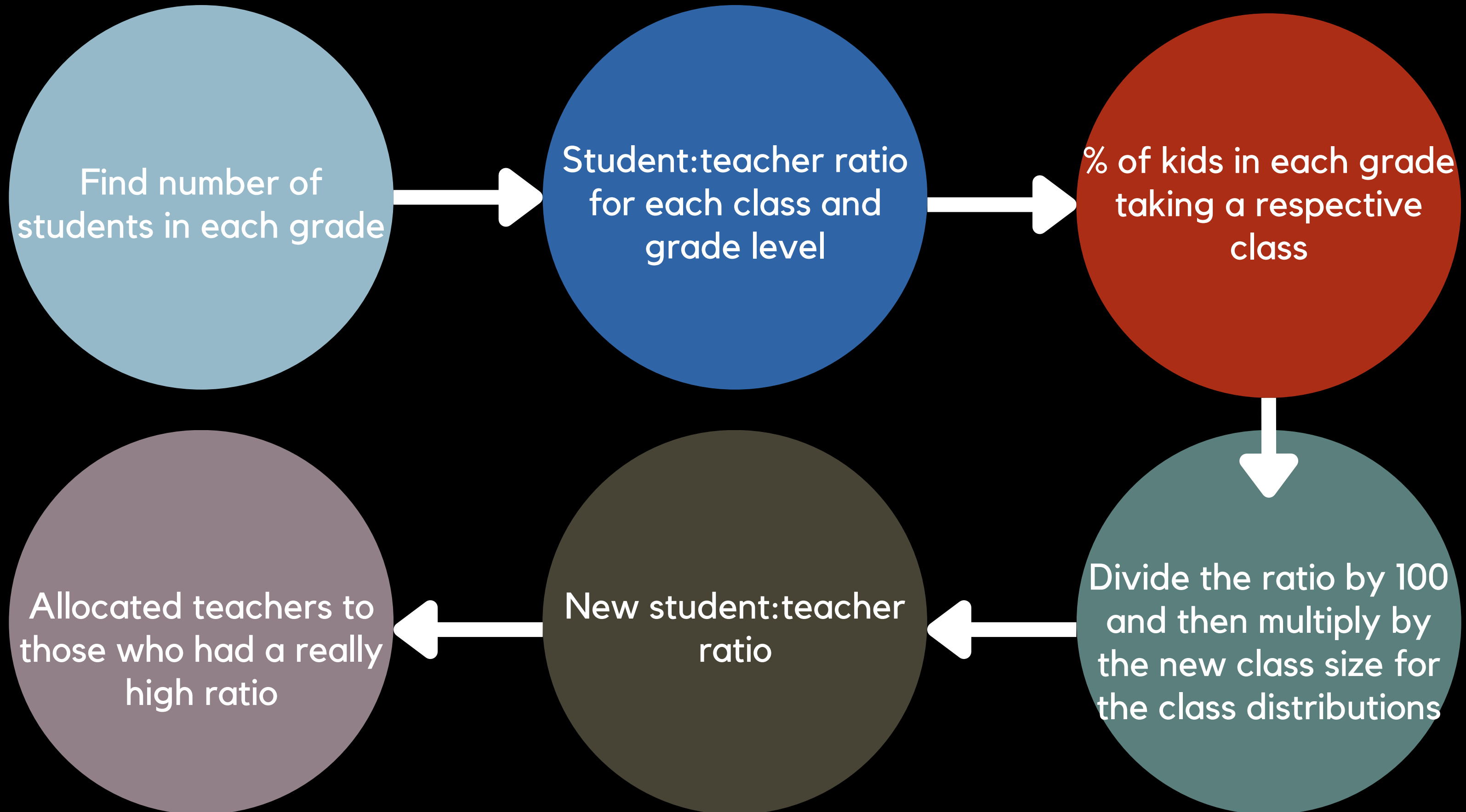
Our Work

Ratios	10	11	12	total
Art	31	33	35	99
Biology	49.5	23.75	6.5	79.75
Chem	19.66667	42	36.33333	98
English	36.6	31	30.4	98
French	41	32	49	122
German	19	22	10	51
Spanish	51	26	33	110
Math	30.66667	33.5	43.66667	107.33
Music	50	56	49	155
Physics	16.66667	19.33333	61	97
SS	36.6	26.2	11.8	74.6

- We found the student: teacher ratio
- Summed them up

10	11	12
18.56287425	20.24539877	22.01258
118.5628743	58.28220859	16.3522
35.32934132	77.3006135	68.55346
109.5808383	95.09202454	95.59748
24.5508982	19.63190184	30.81761
11.37724551	13.49693252	6.289308
31.28834356	15.95092025	20.75472
110.1796407	123.3128834	164.7799
29.94011976	34.35582822	30.81761
29.94011976	35.58282209	115.0943
109.5808383	80.36809816	37.10692

- We found the percent of kids in each grade that take each class
- Notice how some are over 100%

New 10	Old 10	Old 11	Total	div by teachers
56.98802	33	33	122.988	122.988
363.988	198	95	656.988	164.247
108.4611	59	126	293.4611	97.82036
336.4132	183	155	674.4132	134.8826
75.37126	41	32	148.3713	148.3713
34.92814	19	22	75.92814	75.92814
96.05521	51	26	173.0552	173.0552
338.2515	184	201	723.2515	120.5419
91.91617	50	56	197.9162	197.9162
91.91617	50	58	199.9162	66.63872
336.4132	183	131	650.4132	130.0826

| ratios order by highest	
197.9162	Music
173.0552	Spanish
164.247	Biology
148.3713	French
134.8826	English
130.0826	SS
122.988	Art
120.5419	Math
97.82036	Chem
75.92814	German
66.63872	Physics

- Assumed the rising sophomores took classes in same ratios
- Used this to find total number of kids in each class in the following year
- Divided by teachers to find new student: teacher ratios

- We then ordered them from highest to lowest

	div by teac	after 1
Art	122.988	61.49401
Biology	164.247	32.8494
Chem	97.82036	24.45509
English	134.8826	22.48044
French	148.3713	105.9795
German	75.92814	37.96407
Spanish	173.0552	108.1595
Math	120.5419	17.22027
Music	197.9162	98.95808
Physics	66.63872	16.65968
SS	130.0826	21.68044

- Here, we observed the classes with the highest student: teacher ratios
- Then, we added one to every class to see the new ratios
- Since none of the ratios with 1 teacher added were still highest compared to the previous ratios with no teacher added, we added to the highest ratios
- Since French and Spanish were both of the highest ratios, they can share a teacher
- The new language teacher teaches three Spanish classes and two French classes and we accounted for this in the new ratios
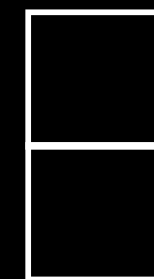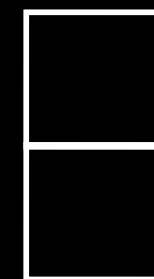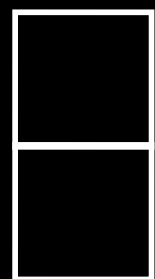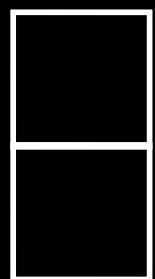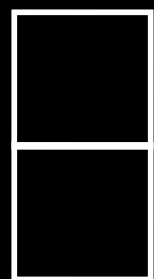
Conclusion

Art		2	1
Biology		5	4
Chem		3	3
English		6	5
French		2	1
German		1	1
Spanish		2	1
Math		7	6
Music		2	1
Physics		3	3
SS		6	5

- This is what our new outline for the staffing looks like

Using our model, we get every class to have as equal student: teacher ratios as possible. This is by adding one art teacher, a Biology teacher, an English teacher, a French and Spanish teacher, a Math teacher, a Music teacher, and a Social Studies teacher.

How can this model be tested?

This model can be used with different schools as well. It can be used to consider the student:teacher ratios in order to determine which teachers need support. It's greatest use is for non-specialized schools.

Strengths and Weaknesses

Strengths:

- Every class will have an about equal ratio of students and teachers
- Equal attention from teachers for the students
- Makes the work teachers have to do more equal rather than one doing more than another

Weaknesses:

- This is a math and science school, so it might be better to have better ratios in math/ science subjects
- Subjects might have different difficulties and therefore don't need equal ratios

Acknowledgements

Mrs. Burns