

Epsilon Model

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Problem Statement

With an incoming Sophomore class bigger than usual, Epsilon School is hiring 7 more teachers. How can we distribute them among departments so that it is fair?

Should certain subjects be given more teachers than others? Why?

Assumptions

- Every year, students pick different classes
 - Current foreign language teachers can already teach 2 languages
 - 2.5% leave from Sophomore–Junior, and another 2.5% leave from Junior–Senior.
 - Enrollments will follow similar ratios as previous classes
 - Students are each taking 6 classes per year.
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Variables

- Percentage of Subjects Taken
 - Class Sizes
 - Student-Teacher Ratio
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Hypothesis

In order to find Student-Teacher ratios that properly show the school with 140 more students in the Sophomore class, we will model the projected outcome of the incoming 3 years and determine what we think is fair.

METHODOLOGY

1. Find total students by totaling classes taken and dividing by 6.
2. Using the current total amount of students, find the amount of students in each grade for the next 3 years (including the 140 plus and 5% dropout rate)
3. Find the % of classes taken in each subject by year.
4. Apply these percentages to the totals found in step 3 to find the amount of classes taken in the next 3 years.
5. Find the ratios of each year and average them.
6. Give teachers to the classes with the worst ratio.

Total Students/Classes

	10th Grade	11th Grade	12 Grade	Total
Social Studies	183	131	59	373
Physics	50	58	183	291
Music	50	56	49	155
Math	184	201	262	647
Art	31	33	35	99
Biology	198	95	26	319
Chemistry	59	126	109	294
English	183	155	152	490
German	19	22	10	51
French	41	32	49	122
Spanish	51	26	33	110
Current Totals	1049	935	967	2951
# of students	175	156	161	492

Projected # Students/Classes For Next 3 Years

Current Totals	1049	935	967	2951
# of students	175	156	161	492
new # of students	301	171	152	624
new # total classes	1806	1026	912	3744
# students in 2 years	175	293	167	635
# classes in 2 years	1050	1761	1000	3811
# students in 3 years	175	171	286	632
# classes in 3 years	1050	1026	1717	3793

Percent of Classes Taken by Each Class

	Percent 10th Graders		Percent 11th Graders		Percent 12th Graders
Social Studies	17.45%	Social Studies	14.01%	Social Studies	6.10%
Physics	4.77%	Physics	6.20%	Physics	18.92%
Music	4.77%	Music	5.99%	Music	5.07%
Math	17.54%	Math	21.50%	Math	27.09%
Art	2.96%	Art	3.53%	Art	3.62%
Biology	18.88%	Biology	10.16%	Biology	2.69%
Chemistry	5.62%	Chemistry	13.48%	Chemistry	11.27%
English	17.45%	English	16.58%	English	15.72%
German	1.81%	German	2.35%	German	1.03%
French	3.91%	French	3.42%	French	5.07%
Spanish	4.86%	Spanish	2.78%	Spanish	3.41%

Applying Percentages to Projected Totals

(next year)	10th Grade	11th Grade	12 Grade	Total
Social Studies	315	130	56	500
Physics	86	57	173	316
Music	86	55	46	188
Math	317	199	247	763
Art	53	33	33	119
Biology	341	94	25	459
Chemistry	102	125	103	329
English	315	154	143	612
German	33	22	9	64
French	71	32	46	148
Spanish	88	26	31	145
	1806	926	912	3644

(in 2 years)	10th Grade	11th Grade	12 Grade	Total
Social Studies	183	247	61	491
Physics	50	109	189	349
Music	50	105	51	206
Math	184	379	271	834
Art	31	62	36	129
Biology	198	179	27	404
Chemistry	59	237	113	409
English	183	292	157	632
German	19	41	10	71
French	41	60	51	152
Spanish	51	49	34	134
	1050	1761	1000	3811

(in 3 years)	10th Grade	11th Grade	12 Grade	Total
Social Studies	183	144	105	432
Physics	50	64	325	439
Music	50	61	87	199
Math	184	221	465	870
Art	31	36	62	129
Biology	198	104	46	349
Chemistry	59	138	194	391
English	183	170	270	623
German	19	24	18	61
French	41	35	87	163
Spanish	51	29	59	138
	1050	1026	1717	3793

New Student-Teacher Ratios and Average

	Student: Teacher Ratio
Social Studies	100
Physics	105
Music	188
Math	127
Art	119
Biology	115
Chemistry	110
English	122
German	32
French	74
Spanish	72

	Student: Teacher Ratio
Social Studies	98
Physics	116
Music	206
Math	139
Art	129
Biology	101
Chemistry	136
English	126
German	35
French	76
Spanish	67

	Student: Teacher Ratio
Social Studies	86
Physics	146
Music	199
Math	145
Art	129
Biology	87
Chemistry	130
English	125
German	30
French	82
Spanish	69

	AVERAGE RATIO
Social Studies	95
Physics	123
Music	197
Math	137
Art	126
Biology	101
Chemistry	125
English	124
German	33
French	77
Spanish	69

Providing the Classes with Poor Ratios with Teachers

	AVERAGE RATIO		RATIO AFTER AID
Social Studies	95		
Physics	123	1 teacher added	92
Music	197	1 teacher added	99
Math	137	2 teachers added	120
Art	126	1 teacher added	63
Biology	101		
Chemistry	125	1 teacher added	94
English	124	1 teacher added	104
German	33		
French	77		
Spanish	69		

Justification

We felt it was fair to provide the teacher(s) that is/were struggling the most- that is, with the worst ratio- another teacher. The only other reasonable distribution would be to give Math ANOTHER teacher, but this would leave a different subject with a ratio even worse than the ratio Math currently has.

Strengths/Weaknesses

Our model properly represents the incoming 3 years (and even years after that) and deals with the oddities that come with having 140 more students in one class than the others. The model may be unrepresentative of ALL classes, however, as it only uses data from a single year.

Thanks for Listening!
