



Epsilon School

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Math
Modeling
Section D

Contents



- ❑ Problem Statement
- ❑ Initial thoughts
 - ❑ Assumptions
 - ❑ Variables
 - ❑ Hypotheses
- ❑ Analysis
- ❑ Design
- ❑ Justification
- ❑ Solution
- ❑ Discussion

A spiral-bound notebook with a white page and a red cover is centered on a green background. The notebook has ten black spiral rings at the top. On the left side, there are two sticky tabs: a yellow one on top and a pink one below it. In the center of the page, the number '01' is written in a bold, black font, enclosed within a light green circular arrow graphic. Below this, the words 'Problem Statement' are written in a bold, dark red font.

01

Problem Statement

Problem Statement

The Epsilon School of Mathematics and Science added a new wing so they can accommodate **more students** in the upcoming sophomore class. **7 additional faculty** will be added. What subjects should the hired faculty teach so the decision is **fair**?

Problem Statement

Givens

- The upcoming sophomore class will have 140 more students than the graduating senior class
- The total student population will increase from 490 to 630
- Current department enrollment and faculty hires (pictured right)
- A foreign language instructor could teach over one language
- Courses are year-long
- 5% of the incoming class drops out prior to graduation

Departmental Enrollment Totals: September 2024

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

6	Mathematics faculty	5	English faculty
3	Chemistry faculty	3	Foreign language faculty
3	Physics faculty	1	Music instructor
4	Biology faculty	1	Art instructor
5	Social studies faculty		

02

Initial Thoughts

Assumptions, variables,
and hypothesis



Assumptions

- Each full-time teacher teaches 5 classes
 - The music teacher only teaches 2 classes (at Epsilon)
- 1 of the new language teachers teaches both Spanish and French
- The ratios of students in each class in each grade will remain the same due to grade requirements
 - The 5% dropout rate is made insignificant
- The art and music teachers can support more students/class
- The ideal number of students per class is from 18 to 22 for the average subject

Variables

- Teachers per subject prior to hiring
- Teachers per subject after hiring
- Classes taught per teacher in each subject
- Students per class after hiring
- Students taking each subject prior to hiring
- Students taking each subject after hiring
- Students per grade

Hypotheses/Predictions

- Math and Biology needed new teachers based on the number of students enrolled in both subjects
- French needed a new teacher
- Music did not need any new teachers
- Art did not need a new teacher
- German did not need a new teacher

03

Analysis and Design

Justifications and
modeling



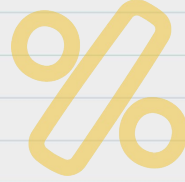
Designing the Model - This year

- First set up the info we knew
 - Students per class per grade
 - Number of teachers
- Set up our assumptions
 - Classes each teacher is teaching
- Made calculations!
 - Calculated the number of students per class
 - Students taking class / (number of teachers * classes taught per teacher)

Designing the Model cont. - growth year

- Used assumption of similar ratios
 - Found conversion rate for 10th grade class size (1049/1950)
 - Projected enrolment to new 10th grade
 - Used same class sizes for 11th and 12th grade
- Added to create a total enrolment per subject
- Divided total subject sizes by teacher amount and classes taught per teacher
- Added teachers where the class sizes were to big

10 (9)	11(10)	12(11)	Total
57.62631	33	35	125.63
368.0648	95	26	489.06
109.6759	126	109	344.68
340.1811	155	152	647.18
76.21544	32	49	157.22
35.31935	22	10	67.319
94.80458	26	33	153.8
342.04	201	262	805.04
92.94566	56	49	197.95
92.94566	58	183	333.95
340.1811	131	59	530.18



Our Solution

Strengths
and
Weaknesses

Solution:

Dept 2025	Teachers	Added Teachers	New Teachers	New Classes/Teacher	New Students/Class
Art	1	0	1	5	25.12526215
Bio	4	1	5	5	19.56259295
Chem	3	1	4	5	17.23379409
English	5	1	6	5	21.57270416
French	1	0.6	1.6	5	19.65193041
German	1	0	1	5	13.46387035
Spanish	1	0.4	1.4	5	21.97208226
Mathematics	6	2	8	5	20.12600095
Music	1	1	2	2	49.48641563
Physics	3	0	3	5	22.26304417
Social Studies	5	0	5	5	21.207245



Discussion

Strengths and
Weaknesses of the
model

Strengths



- Workload of teachers
- Similar amount of students per class
- Relatively few assumptions
- Maintains ratio of subjects taken per grade
- Relatively fair based on subject
- Reusable for different enrollments

Weaknesses

- Lots of assumptions
 - Assumption of class size
 - Assumption of ratio of classes taken based on grade
- Subjective analysis of subjects
- Some class size variation



Thanks!

Any Questions?

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