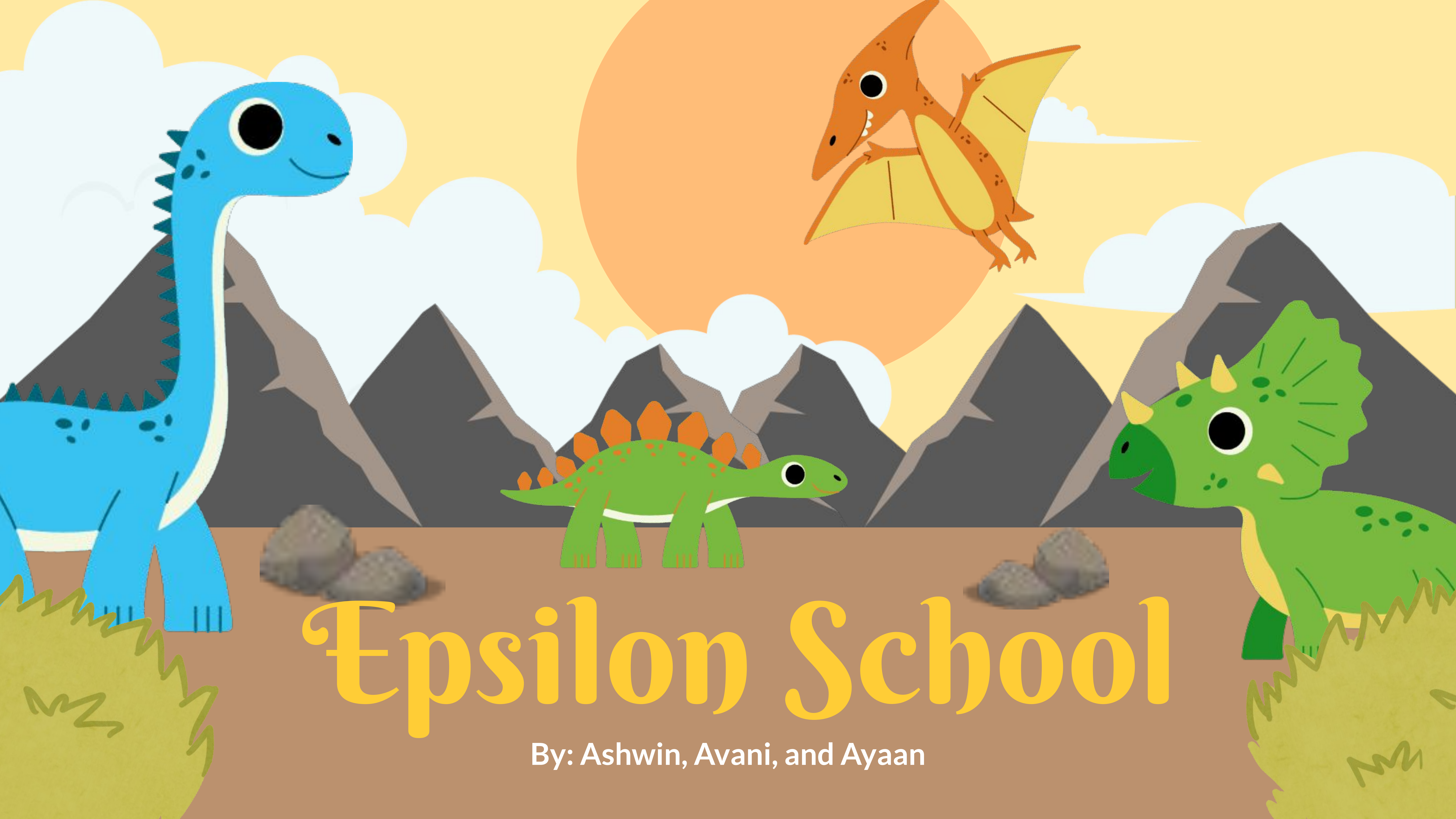

Epsilon School

By: Ashwin, Avani, and Ayaan

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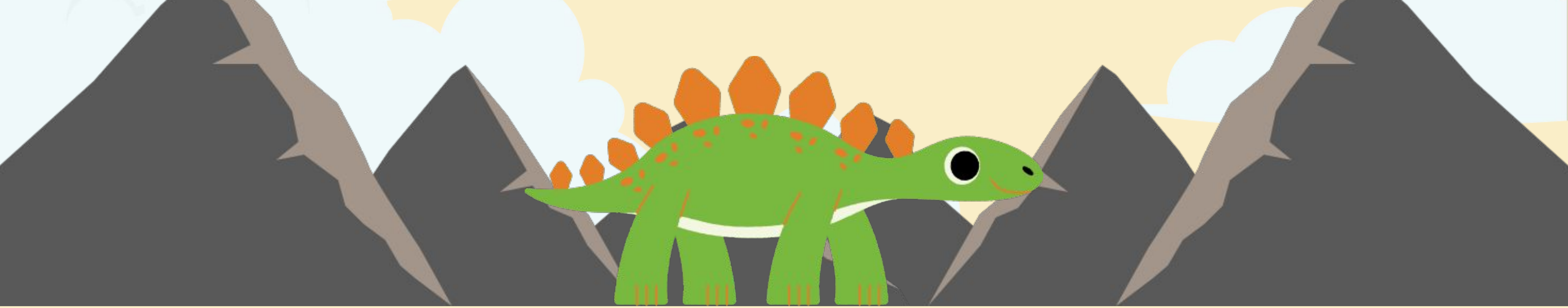


01

Problem Statement

Problem Restatement

A new wing will be added to Epsilon School next year, which allows the student body to grow from 490 to 630. This means the incoming sophomore class will have 140 more students than the leaving senior class. In order to support the growing student body, seven new teachers can be hired. Given the number of teachers per department right now, the current enrollment in departments, and the dropout rates, how can you fairly determine where the seven new teachers should go?

02

Assumptions

Keep in mind....

01

Minimize class size

Students work better in smaller class sizes

02

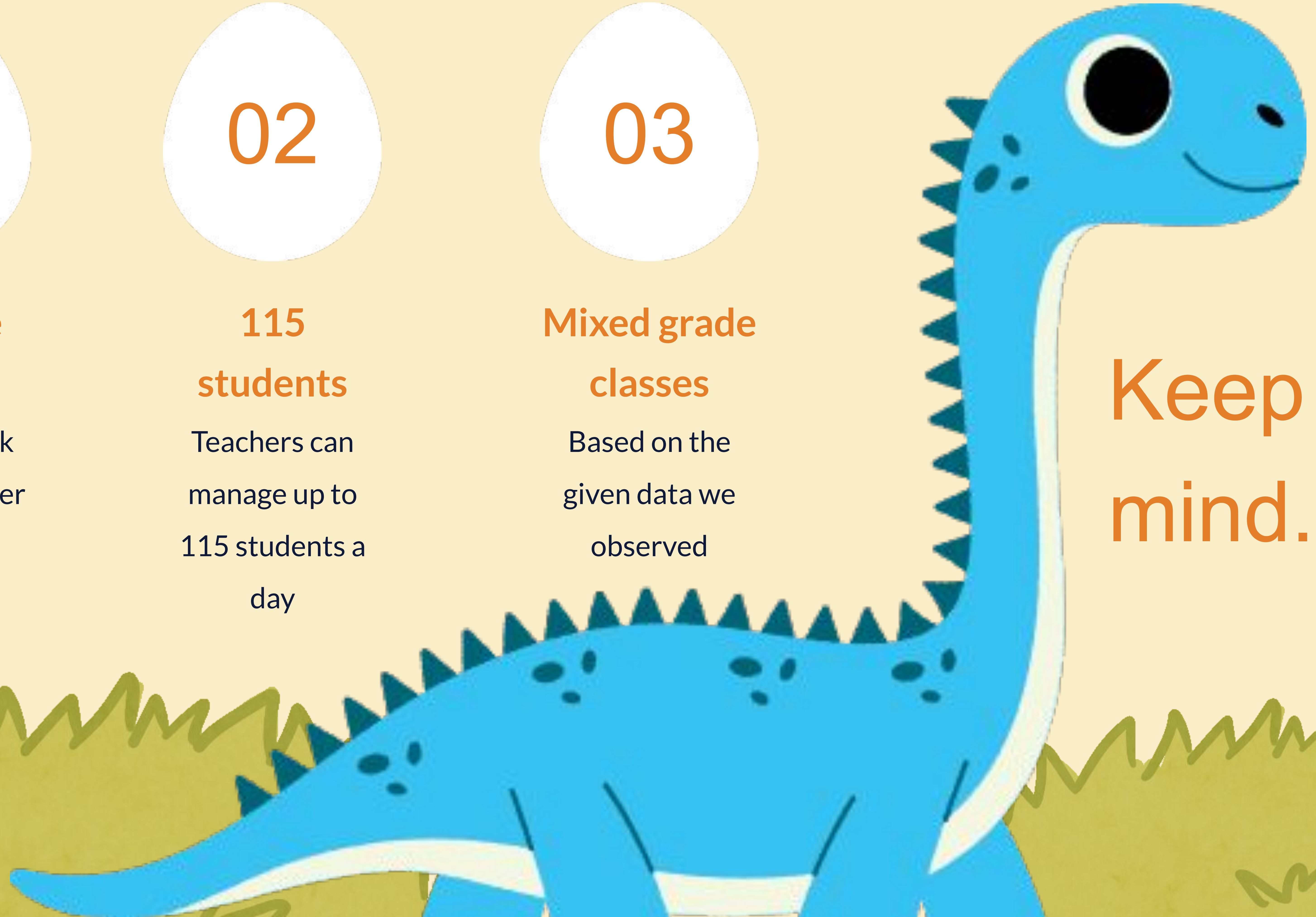
115 students

Teachers can manage up to 115 students a day

03

Mixed grade classes

Based on the given data we observed



04

3 Language Teachers

Each teacher teaches one language

05

4 Year English

Despite being a STEM school

06

Music Class Size

Larger due to a band / orchestra setting

Keep in mind....

07

Ratios of students in classes

Remains constant year after year

08

Music, Art, Languages

Students stay with these for three years

09

Dropouts

All occur after junior year

Keep in mind....

03

Design of Model

Model Design

1. The goal was to use the student : teacher ratio to determine where to put the 7 new teachers as the classes with higher ratios should get more teachers
2. Using the English enrollments, the new sophomore class has 292 students
3. For a given class in a grade: multiply percentage of current students by total new students
   a. Ex) Art has 31 students, currently. We know that the current sophomore class has 183 students. So, we can find the percentage of the current sophomores taking art. If we multiply the percentage (31/183) by the incoming class (292), we will know the amount of incoming sophomores taking art (49).

4. This process was repeated for the rest of the incoming 10th grade class

Dept	**10**
Art	49
Bio	315
Chem	94
Eng	292
French	65
German	30
Spanish	81
Math	294
Music	80
Physics	80
SS	292

Model Design

5. For the incoming juniors, the same process is repeated but instead of dividing by 183, we will divide by 155 because that was the amount of students in the incoming senior class. Then it will be multiplied by 183 instead of 292 because that is how much students are in the incoming junior class

Ex) For Biology, there was 95 students. So, (95/155) * 183 = 112 students in the incoming junior biology class

6. The same process repeats for the rest of the incoming junior classes

Dept	**11**
Art	31
Bio	112
Chem	149
Eng	183
French	32
German	19
Spanish	51
Math	237
Music	50
Physics	68
SS	155

Model Design

7. Now for the incoming senior class, we must account for the dropout rates. The same process will be repeated, but the amount we will be dividing by will be 152 (the amount of students in the graduating class), and the amount we will be multiplying will be 155 (amount of incoming seniors).

8. So, with the assumption that the whole 5% will drop out going into senior year, we will take away 5% from the previous product.

Ex.) For chemistry, the percentage will be 109/152, and that will be multiplied by 155. The product will be 111 students. But accounting for the dropout rate, you will multiply 111 by .95 to get the remaining amount of students, which is 105 students

Dept	**12**
Art	31
Bio	25
Chem	105
Eng	147
French	47
German	21
Spanish	25
Math	254
Music	53
Physics	177
SS	57

Model Design

9. The total for all the subjects were then calculated

10. Since we know the amount of students in each class for every grade, we can calculate the student to teacher ratio
  - Total number of students / total teachers for that subject

11. By examining the current ratios and comparing them to our set ratio (115), those subjects with ratios higher than 115 were given new teachers

12. New ratios were calculated based on the updated teacher list in order to make sure each ratio was under the set ratio

Student/Teacher	New student/teacher
~111	~111
~113	~113
~116	~87
~124	~104
~144	~72
~70	~70
~157	~79
~131	~98*
~183	~92
~108	~108
~101	~101

Model Design

Dept	10	11	12	Total
Art	49	31	31	111
Bio	315	112	25	452
Chem	94	149	105	348
Eng	292	183	147	622
French	65	32	47	144
German	30	19	21	70
Spanish	81	51	25	157
Math	294	237	254	785
Music	80	50	53	183
Physics	80	68	177	325
SS	292	155	57	504

Student/Teacher	New student/teacher
~111	~111
~113	~113
~116	~87
~124	~104
~144	~72
~70	~70
~157	~79
~131	~98*
~183	~92
~108	~108
~101	~101

Legend

Base student number
Classes they stay with for 4 years
Good ratios
Ratios that were altered
*2 teachers added instead of 1

04

Justification of Model

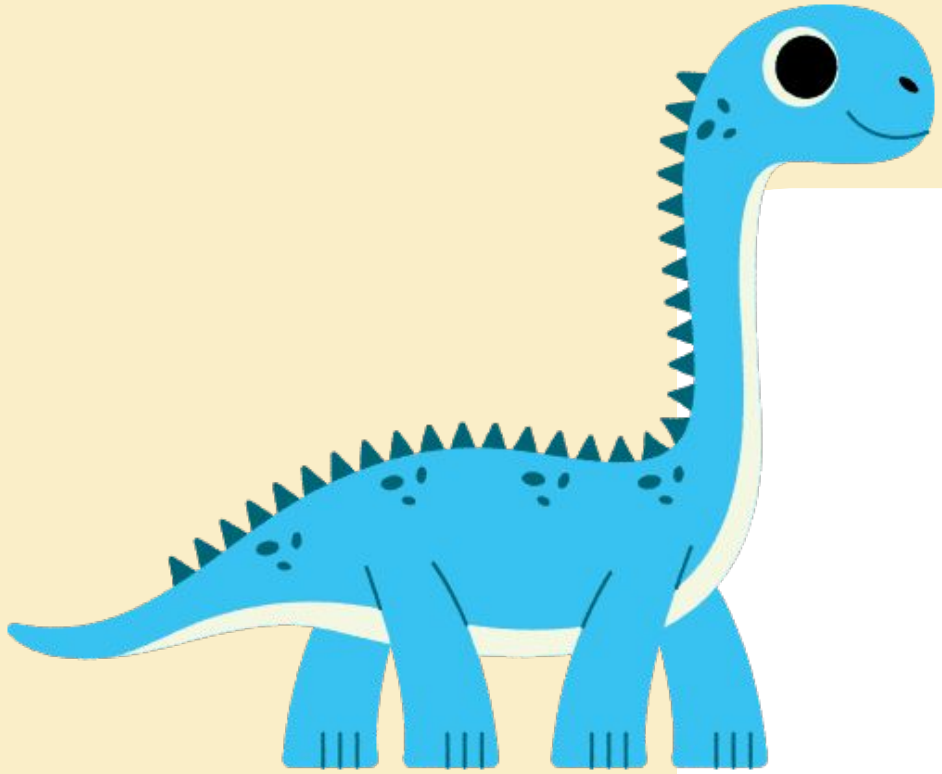
Justification of Model

- This model is justified by the fact that all the ratios calculated were correct and the process was logical
    - If the student:teacher ratio was too high, additional teachers will be hired
    - The ratio was determined by talking to current teachers and based on sending schools
- This model can be tested practically anywhere, as long as there is a standard student to teacher ratio
    - Model can be tested by using it on a school district where data for the past two years is known
    - Model can be further tested by using it on a school district where data for two years is known and the school has expanded (similar situation to Epsilon School)

05

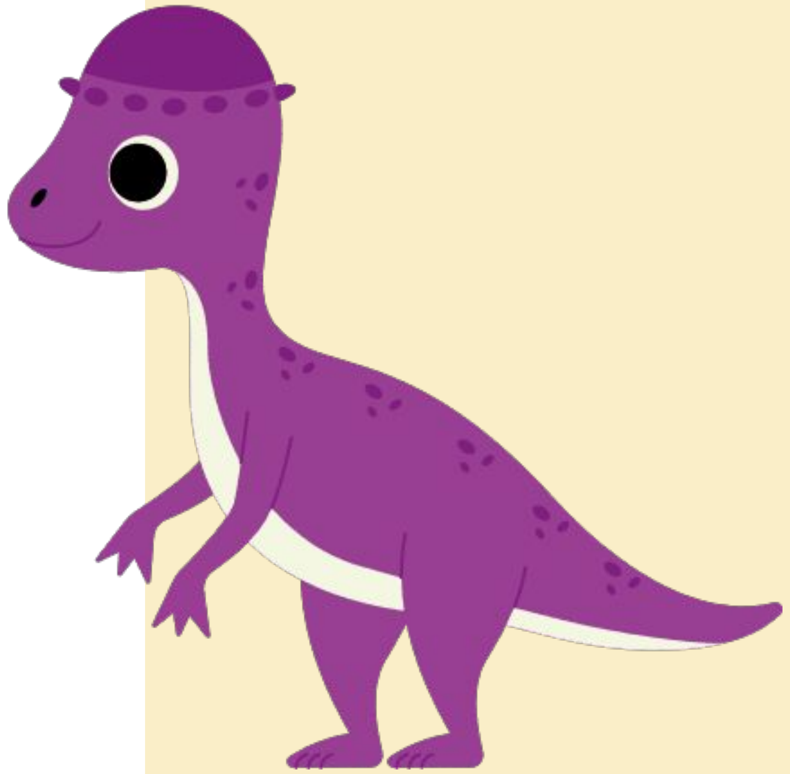
Solution

Solution



We added one new teacher to chemistry, english, french, spanish, and music. We added two new teachers to math.

We determined this based on our student:teacher ratios and the set ratio we determine. Each subject that was over the ratio of 115 students per teacher was given an additional teacher. After this, math and biology had the highest ratios. We determined that the one remaining teacher should go to math, since math is more hands-on and biology teachers tend to just read off slides.



New Teachers

Math

Old Ratio - 131:1

New Ratio - 98:1

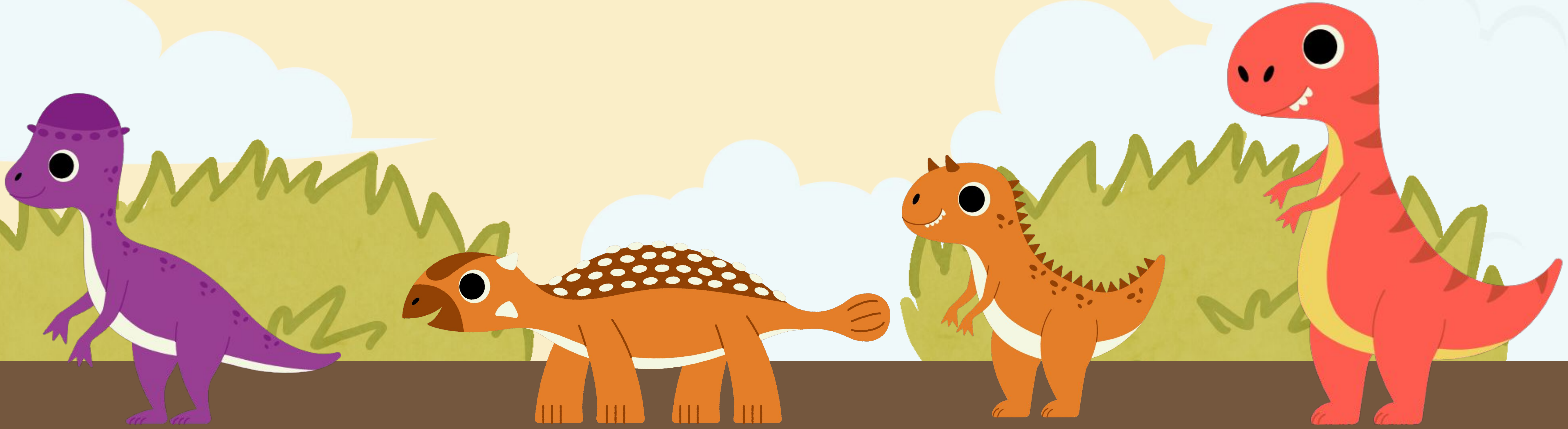
Math

French

Old Ratio- 144:1

New Ratio- 72:1

New Teachers



Chemistry
Old Ratio - 116:1
New Ratio - 87:1

Music
Old Ratio - 183:1
New Ratio - 92:1

English
Old Ratio - 124:1
New Ratio - 104:1

Spanish
Old Ratio - 157:1
New Ratio - 79:1

06

Strengths and Weaknesses

Strengths and Weaknesses

Strengths

- Factored in dropout rates
- Method can be easily applied to different numbers of students
- Allows for mixed-grade classes which do happen
- Efficient allocation of our teachers
    - We had one extra teacher

Weaknesses

- Simplifies dropout rates
- Does not take advantage of multidisciplinary language teachers
- Ratio of classes may not be consistent year to year
- Not all subjects might be mixed-grade

Bonus

Future Works and Acknowledgements

Future Works & Acknowledgments

Future Work

If the project is continued

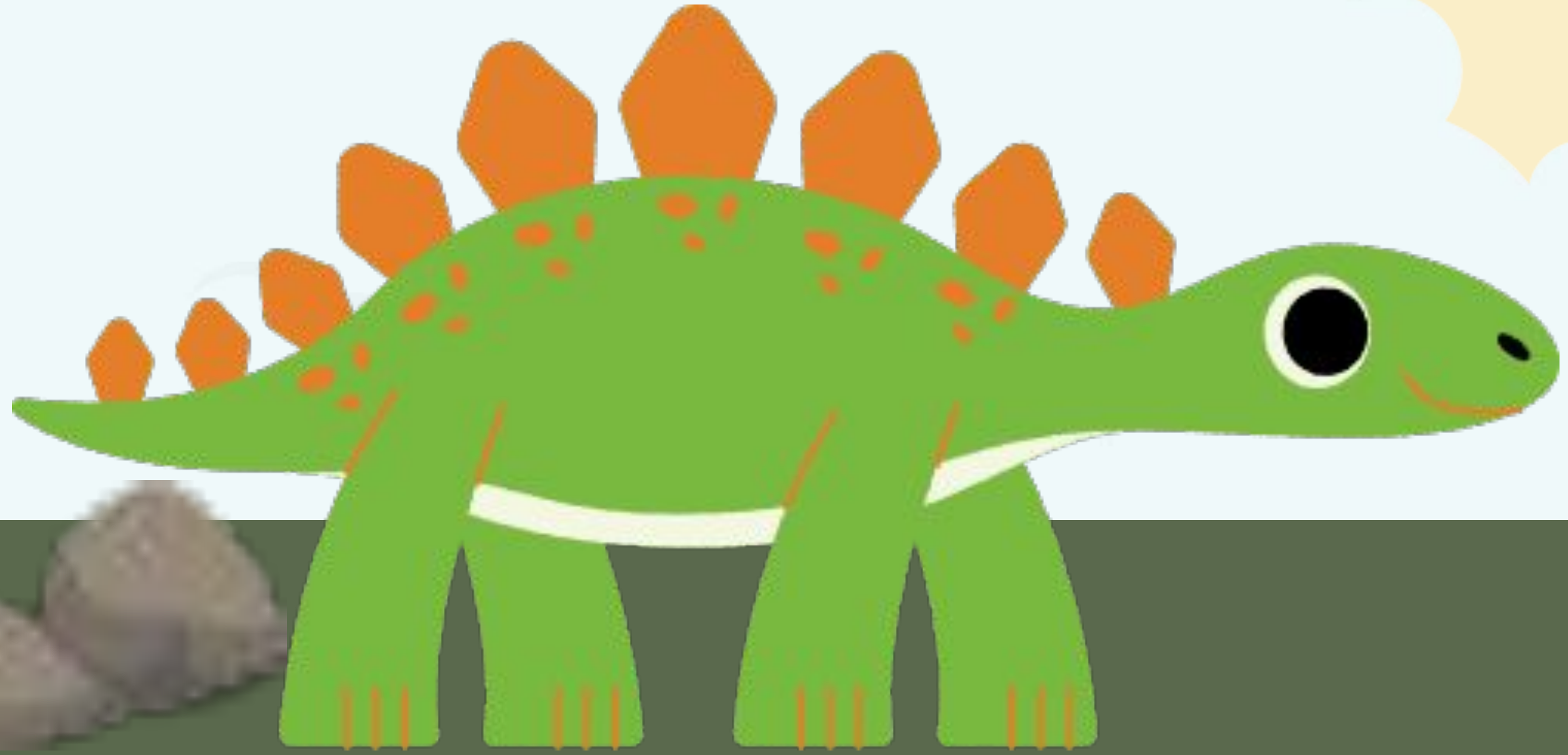
- Design the model to be more accurate in terms of dropout rates
  - Determine dropout rates throughout all four grades instead of one grade (11)
- Figure out a way to shuffle/add/remove teachers in order to get the ratios of student:teacher for every subject to be relatively equal

Acknowledgments

Throughout this project, we received both guidance and assistance from many individuals

- Mrs. Burns
- All those in class we asked about biology teachers
- Sending schools

<u>Thank you for your contributions to this project</u>



THE END