STRONG DATA VISUALIZATIONS FOR EFFECTIVE COMMUNICATION IN EDUCATION

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LEARNING INTENTIONS

- Explain why communicating with data is important in education
- Utilize four basic design principles to create simple, compelling data visualizations
- Apply design principles to a hypothetical scenario

PAIR-AND-SHARE

What are some of common reasons why educators might struggle to understand data?

K-8 Math Measured Progress Data from Pre-Assessment to Mid-Year Interim, by School and Grade Level (%)

	Grade 3			Grade 4			Grade 5			Grade 6			Grade 7			Pre-Algebra			Grade 8		
	Aug, 2014	Dec., 2014	Growth	Aug, 2014	Dec., 2014	Growth	Aug, 2014	Dec., 2014	Growth	Aug, 2014	Dec., 2014	Growth	Aug, 2014	Dec., 2014	Growth	Aug, 2014	Dec., 2014	Growth	Aug, 2014	Dec., 2014	Growth
School 1	33.8	43.5	+9.7	33.9	38.7	+4.8	25.5	42.4	+16.9	26.5	34.7	+8.2	26.3	29.0	+2.7	n/a	n/a	n/a	24.1	28.3	+4.2
School 2	35.2	47.9	+12.7	31.7	47.9	+16.2	25.2	33.6	+8.4	28.7	30.4	+1.7	26.1	37.5	+11.4	n/a	n/a	n/a	24.3	31.2	+6.7
School 3	28.1	39.6	+11.5	30.1	38.4	+8.3	26.9	34.0	+7.1	27.7	36.7	+9.0	26.8	44.4	+17.6	n/a	n/a	n/a	24.6	35.2	+10.6
School 4	32.4	37.6	+5.2	33.0	36.2	+3.2	28.4	33.4	+5.0	27.1	26.4	-0.7	28.2	31.9	+3.7	n/a	n/a	n/a	24.3	24.2	-0.1
School 5	38.4	48.9	+10.5	41.4	49.7	+8.3	27.5	37.1	+9.6	29.8	31.7	+1.9	26.5	31.0	+4.5	27.0	30.7	+3.7	27.3	30.8	+3.5
School 6	32.1	41.3	+9.2	36.0	46.0	+10.0	22.8	31.1	+8.3	26.5	29.6	+3.1	25.8	37.2	+11.4	n/a	n/a	n/a	23.9	32.5	+8.6
School 7	34.4	42.9	+8.5	34.4	41.3	+6.9	26.7	34	+7.3	28.1	31.7	+3.6	29.6	37.8	+8.2	n/a	n/a	n/a	25.1	33.5	+8.4
School 8	32.6	63.8	+31.2	35.2	45.5	+10.3	25.6	37.6	+12.0	25.7	29.0	+3.3	24.9	44.3	+19.4	28.8	36.4	+7.6	n/a	n/a	n/a
School 9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	24.9	26.9	+2.0
School 10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	21.6	35.6	+14.0
District	**33.6**	**44.5**	**+10.9**	**34.6**	**43.4**	**+8.8**	**26.0**	**35.7**	**+9.7**	**27.7**	**32.0**	**+3.8**	**21.5**	**36.6**	**+15.1**	**27.8**	**33.1**	**+5.3**	**24.5**	**31.6**	**+7.1**

WHY DATA VISUALIZATIONS?

- Efficiently communicate quantitative information
- Compelling, memorable representations of educational problems
- Effective communication with data aides data-driven **action**

PRINCIPLE 1: BEGIN WITH THE END USER IN MIND

effective visualization =

effective data analysis + effective user experience

PRINCIPLE 1: BEGIN WITH THE END USER IN MIND

- What is the "story" you want to communicate with your data?
- What is the capacity of your end user to understand quantitative information?
- What do you want your end user(s) to do with the data?
- Given the above, what is the most appropriate way to visualize your data?

MAKE A LIST: PRINCIPLE 1 IN ACTION

Scenario: You have to prepare a report on discipline data for your district or school.

- What might be some audiences for your data?
- What might be some questions each audience would need to have answered?

Orientation

St. John the Baptist Parish

Key Discipline Data

Why is discipline important?

Discipline and Student Achievement

How often are we taking disciplinary action?

Frequency of Disciplinary Action

How many students does are involved?

Students with Regular Discipline Problems

Why is discipline important? An example.

Discipline and Lost Instructional Time

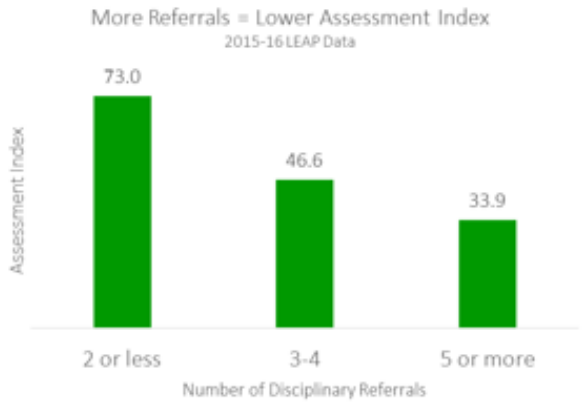
St. John the Baptist Parish

Key Discipline Data

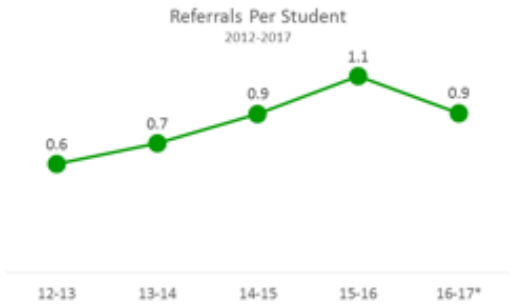
Discipline and Student Achievement

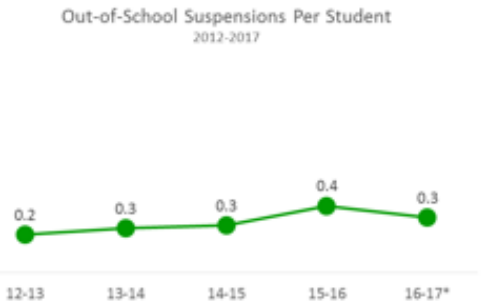
5.5

Assessment Index points, on average, are lost each time a student receives a disciplinary referral.



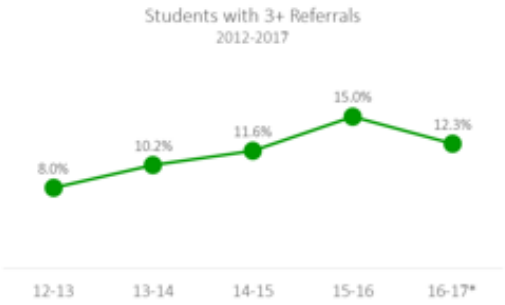
Frequency of Disciplinary Action

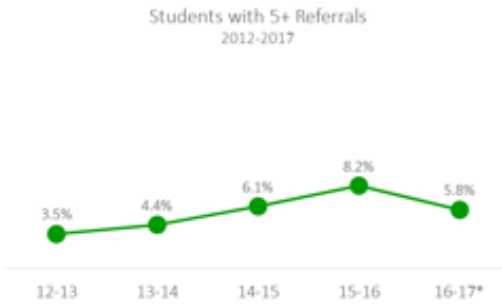




** Through April 26, 2017.*

Students with Regular Discipline Problems





Discipline and Lost Instructional Time

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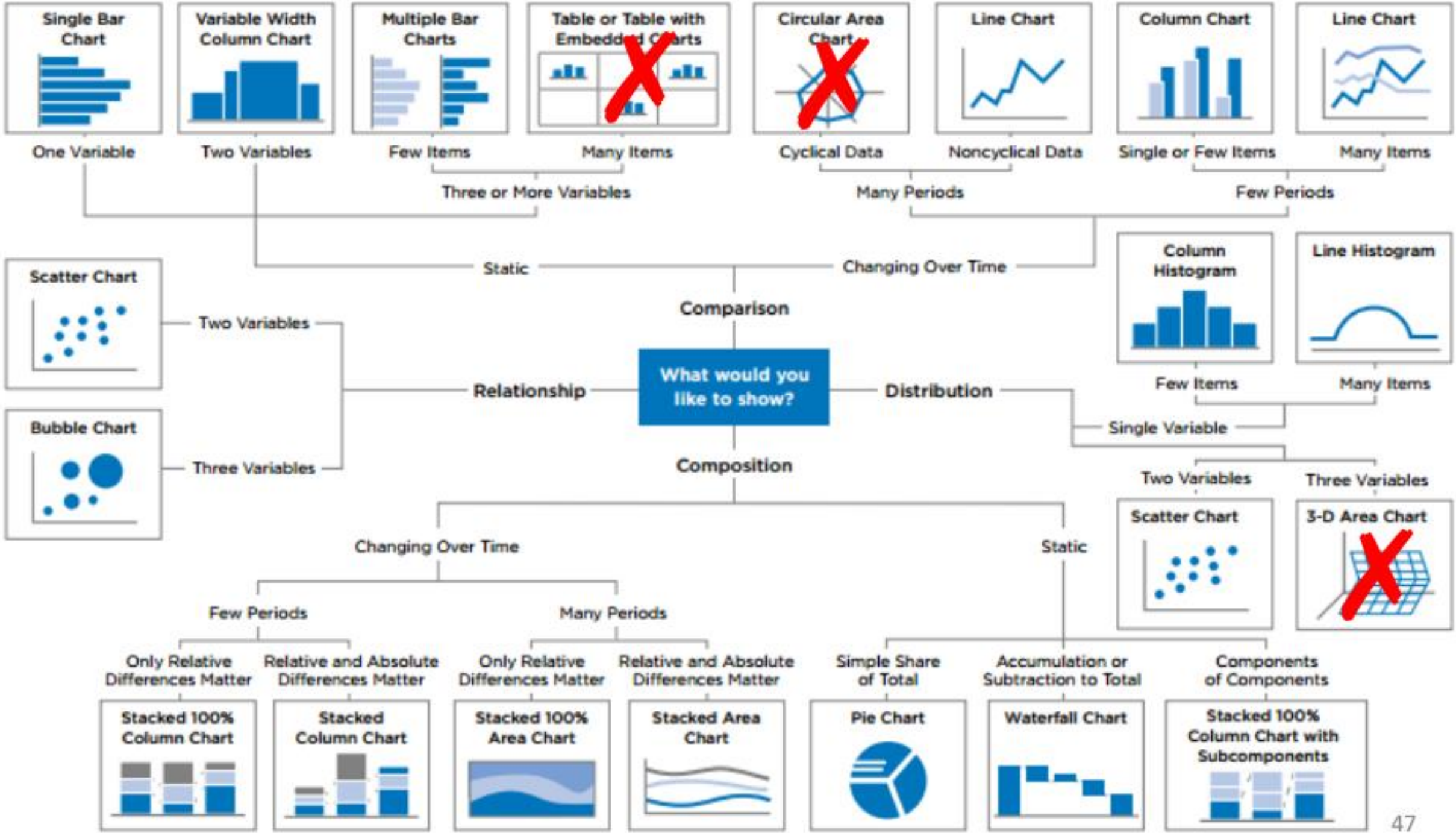

What would you like to show?
Comparison
Relationship
Distribution
Composition
Static
Changing Over Time
Two Variables
Three Variables
Single Variable
Few Periods
Many Periods
Single Bar Chart
One Variable
Variable Width Column Chart
Two Variables
Multiple Bar Charts
Few Items
Table or Table with Embedded Charts
Many Items
Three or More Variables
Circular Area Chart
Cyclical Data
Line Chart
Noncyclical Data
Many Periods
Column Chart
Single or Few Items
Line Chart
Many Items
Few Periods
Scatter Chart
Bubble Chart
Column Histogram
Few Items
Line Histogram
Many Items
Scatter Chart
3-D Area Chart
Changing Over Time
Few Periods
Only Relative Differences Matter
Relative and Absolute Differences Matter
Many Periods
Only Relative Differences Matter
Relative and Absolute Differences Matter
Stacked 100% Column Chart
Stacked Column Chart
Stacked 100% Area Chart
Stacked Area Chart
Static
Simple Share of Total
Accumulation or Subtraction to Total
Components of Components
Pie Chart
Waterfall Chart
Stacked 100% Column Chart with Subcomponents

PRINCIPLE 2: LESS IS MORE

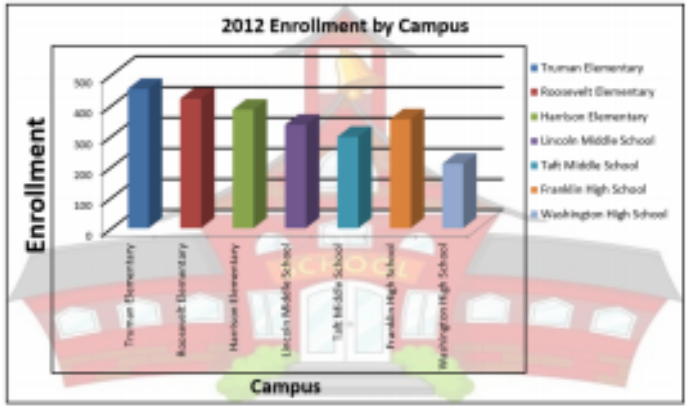
- Too much information is cognitively disorienting.
- Get rid of all "clutter" and leave just the essential parts

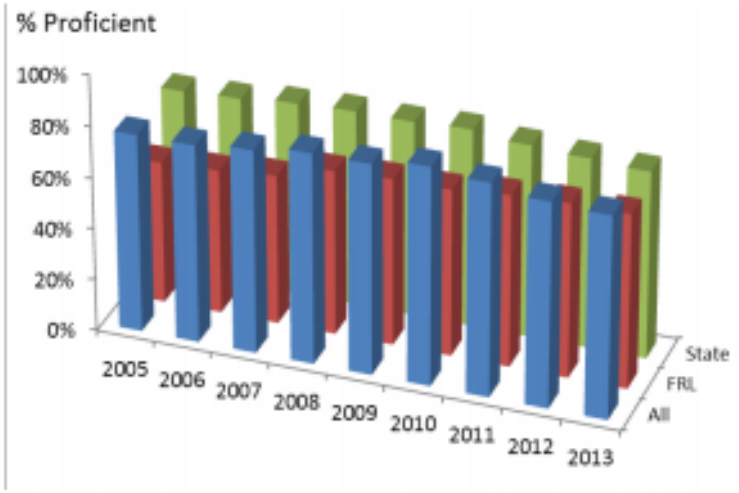
SOME COMMON "EXTRAS" THAT YOU CAN OFTEN LEAVE OUT

- Gridlines
- Colored background
- 3-D effects
- Gradients
- Axis labels
- Data labels
- Borders and outlines

- KEY QUESTION: Does each part of your chart communicate something *vital*? If does not, cut it!

BAD

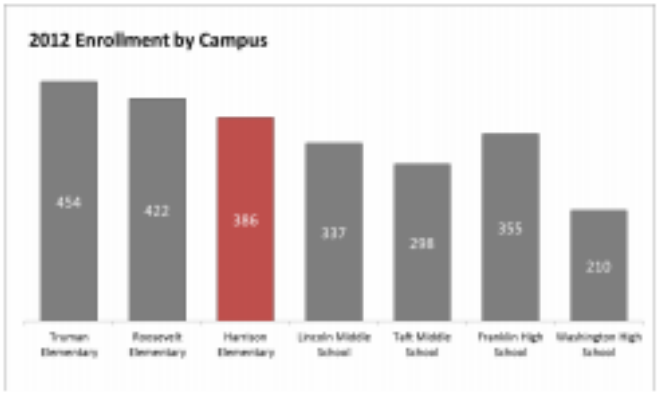


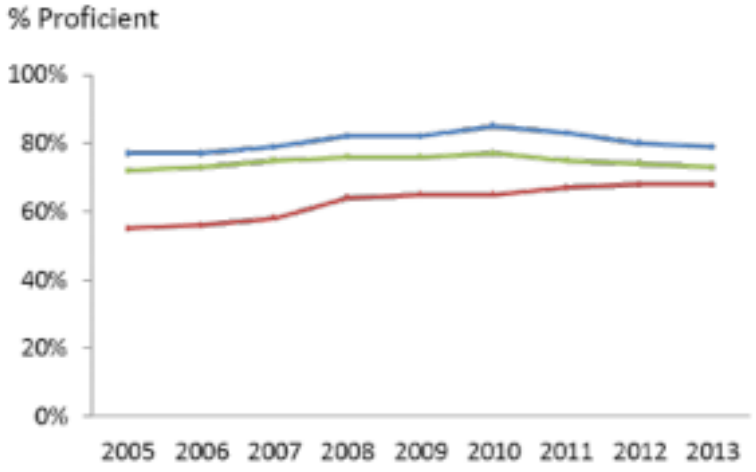


Charter School Stats
by State 2009-2010

State	Number of Students	% of Charter School Students	FRL	Non-FRL
Arizona	115,137	10.7%	49,884	65,253
California	317,422	5.1%	141,449	175,973
Colorado	66,826	8.0%	19,896	46,930
District of Columbia	27,660	38.0%	17,524	10,136
Florida	137,788	5.2%	58,249	79,539
Louisiana	31,549	4.6%	24,842	6,707
New York	44,523	1.6%	33,818	10,705
Texas	149,070	3.1%	99,043	50,027
Totals	889,975	9.5%	444,705	445,270

BETTER (with minimal effort)





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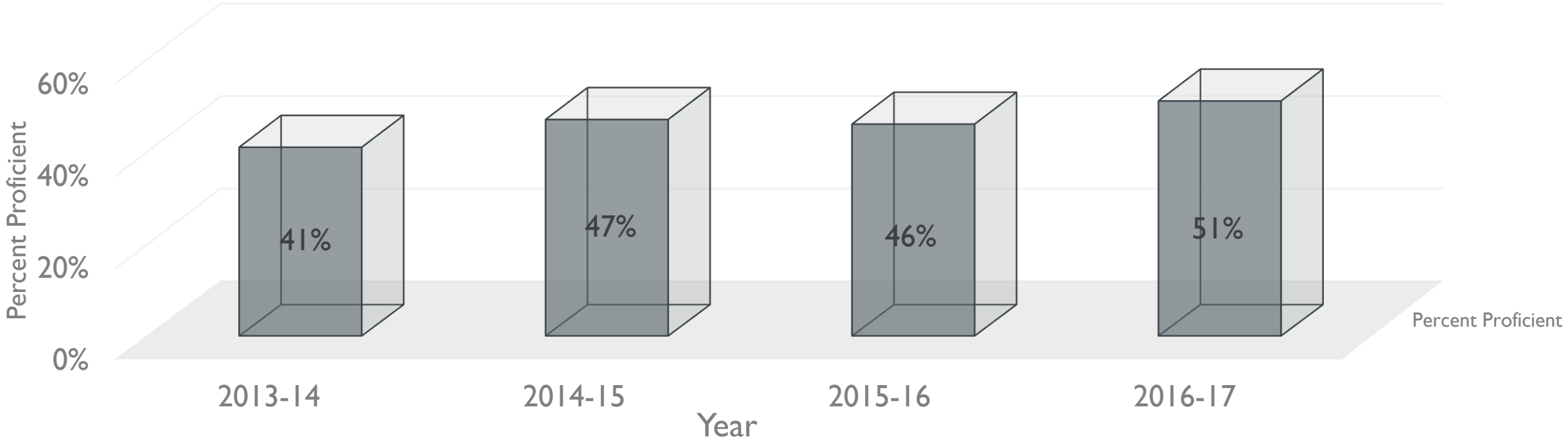
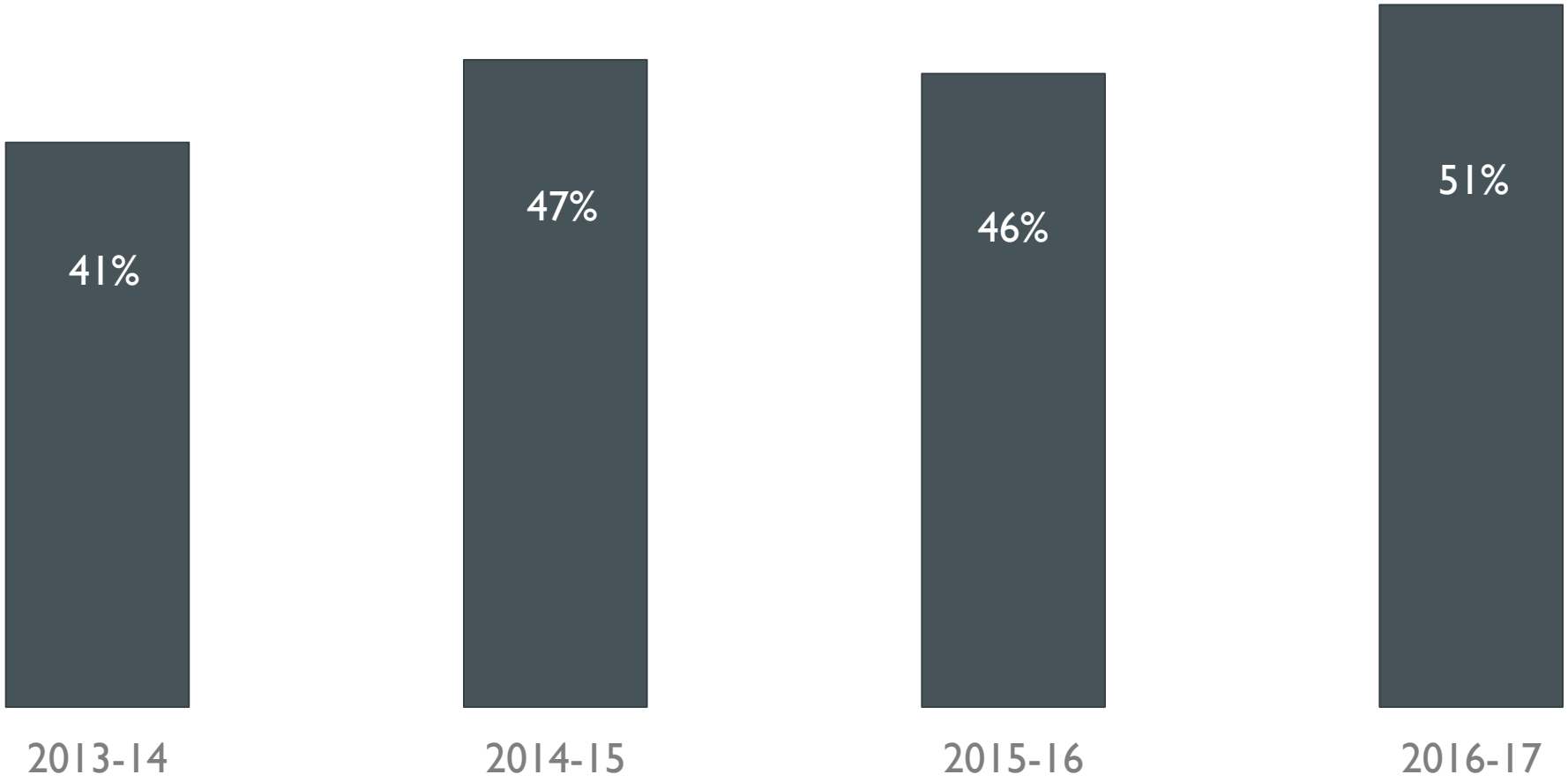
PRINCIPLE 2 PRACTICE

What can be eliminated or cleaned up in each of the following charts?

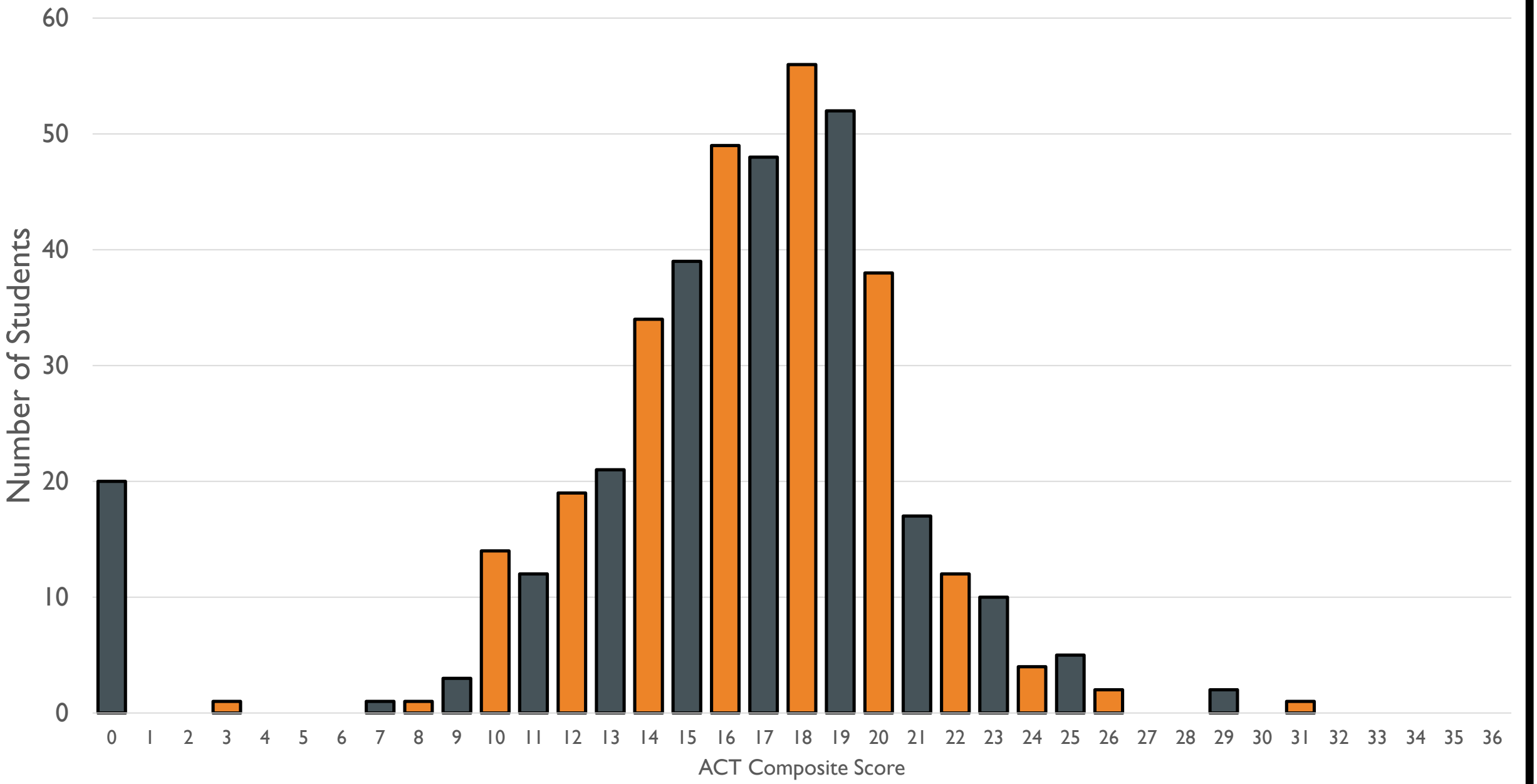
Students with Disabilities in Our District: Percent Proficient



Students with Disabilities in Our District: Percent Proficient



ACT Scores in Our District: 2016-17



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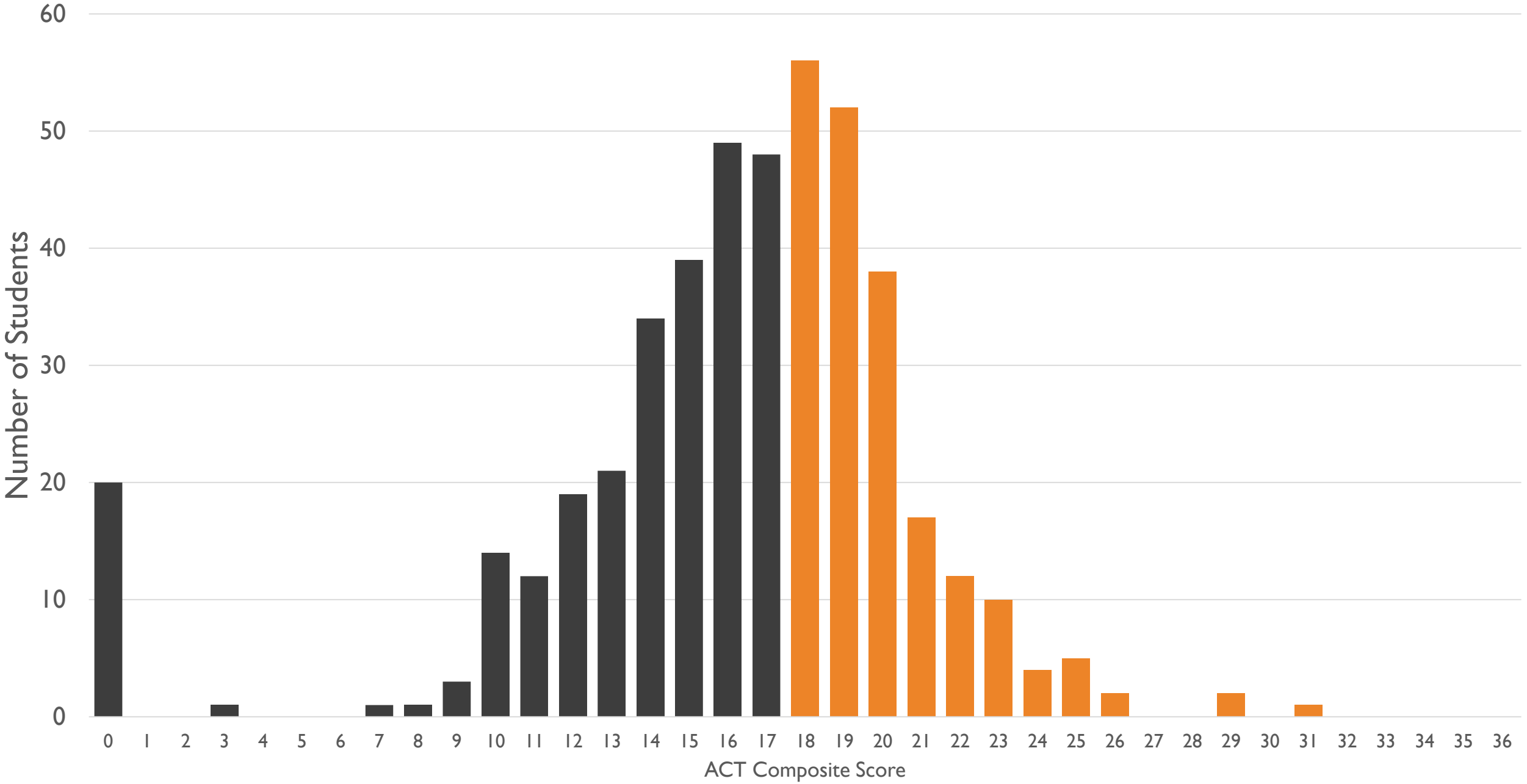
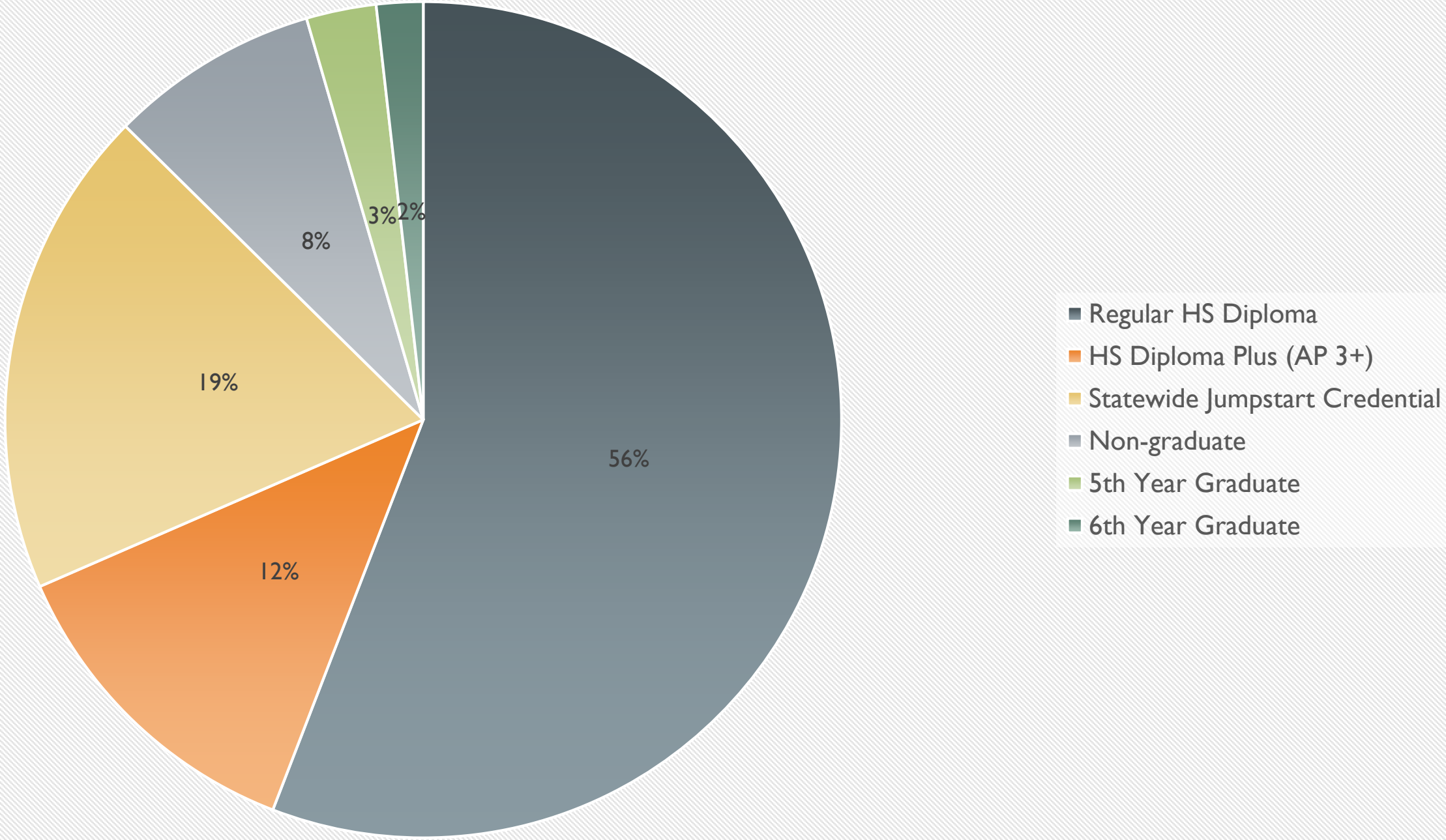


What Happened to Our 2011-12 9th Grade Cohort?



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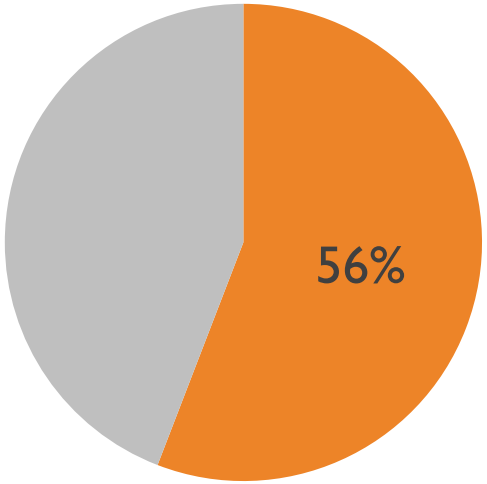
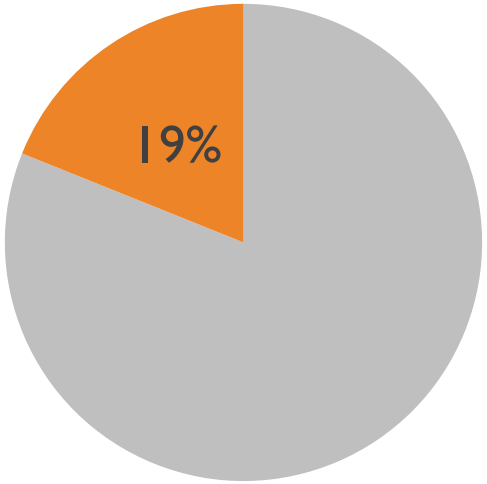
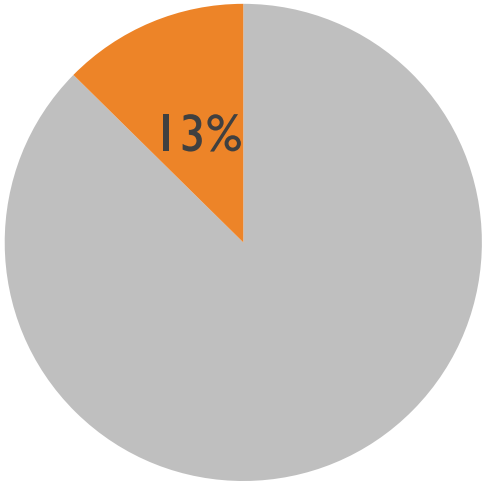


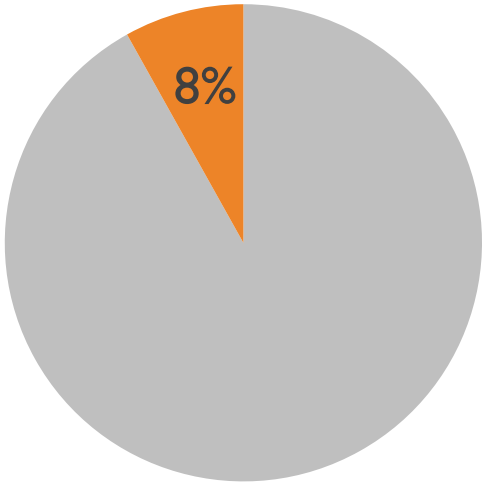
Regular HS Diploma



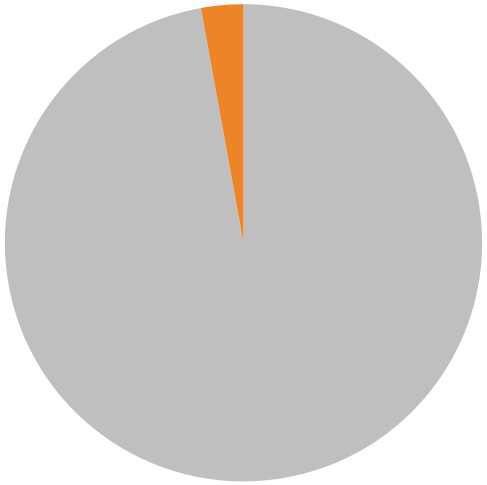
Statewide Jumpstart Credential



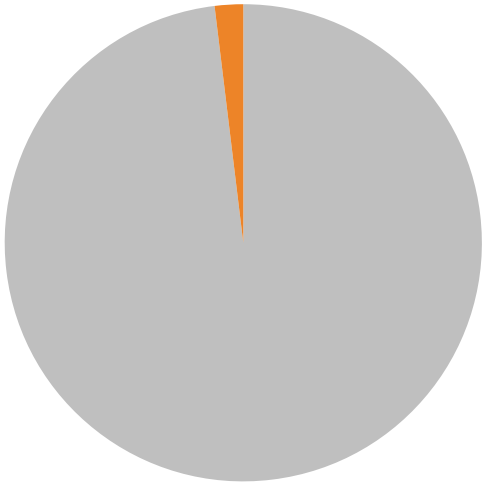
HS Diploma Plus (AP 3+)



Non-graduate



5th Year Graduate



6th Year Graduate

PRINCIPLE 3: CONSISTENCY

- Users should spend minimal time "figuring out" the visualization, and most of their time thinking about its implications.

- Consistent use of the same type of visualization makes the user experience simpler and easier.

PRINCIPLE 4: UTILIZE PLEASING AESTHETICS

Three Key Components

- Fonts
- Colors
- Consistency with any organizational brand

APPLYING THE DESIGN PRINCIPLES

Hypothetical Situation

The data from this year's test scores are in!

Your Superintendent asks you to prepare an analysis of how your district's students did. You begin with the linked data set. Design **one** or **two** data visualizations to tell this story.

Included in this data set are:

- Results from several schools
- Data from last year's test scores