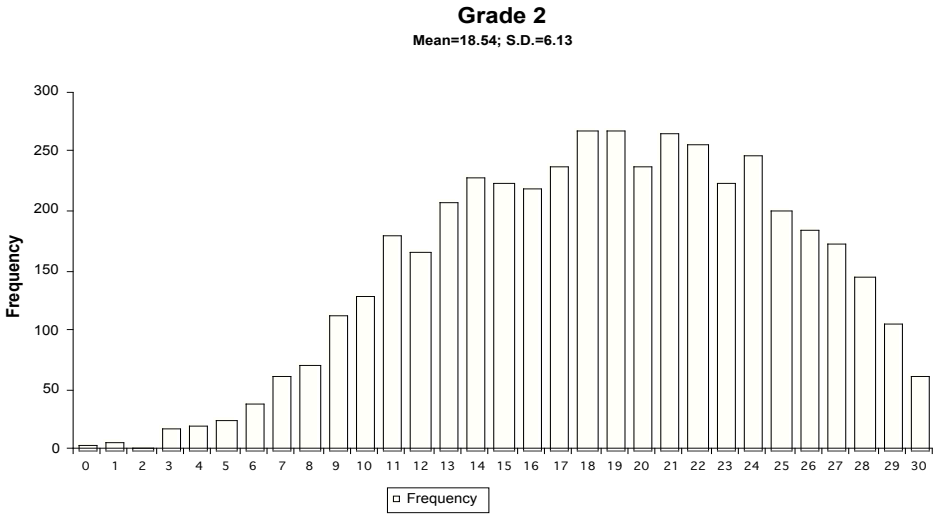
Overall Results for Second Grade

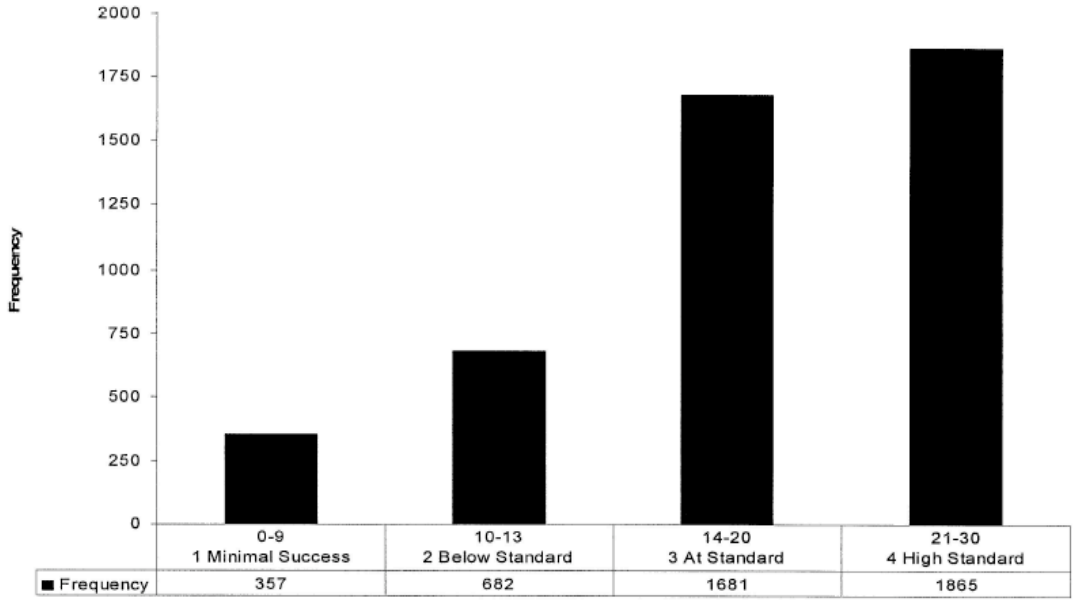
Overall Frequency Distribution by Total Score



Level Frequency Distribution Chart and Frequency Distribution

2004 -Numbers of students tested in 2nd grade:4585
Grade 2

Level	% at ('04)	% at least ('04)
1	8%	100%
2	15%	92%
3	37%	77%
4	41%	41%

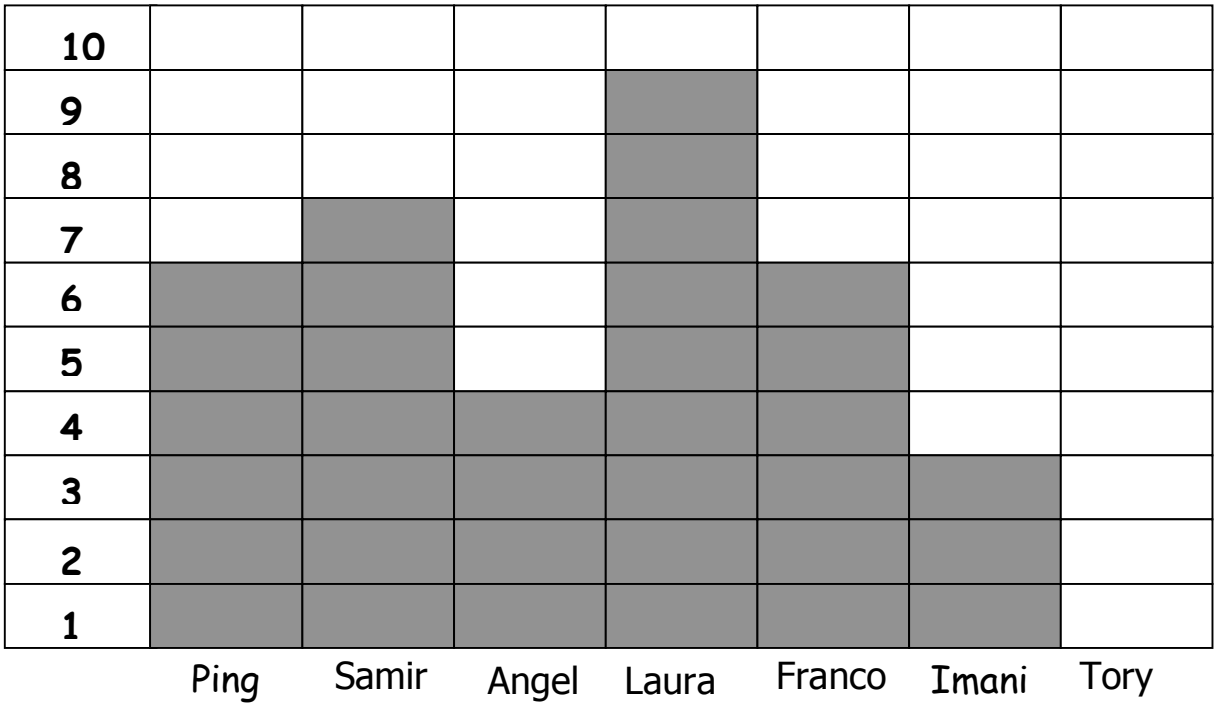


2nd grade Task 1 TEETH

Student Task	Use the information about the number of teeth lost by a second grade group of children to answer questions.
Core Idea 5 Data Analysis	**Students collect, organize, display, and interpret data about themselves and their surroundings.** • Represent and interpret data using graphs or other representations. • Describe and compare data using qualitative and quantitative measures.
Core Idea 2 Number Operations	**Understand the meanings of operations and how they relate to each other, make reasonable estimates, and compute fluently.** • Demonstrate fluency in adding and subtracting whole numbers.

Teeth

This graph shows how many teeth a group of second grade students had lost.



1. **Tory lost 4 teeth. Show this on the graph.**
2. **How many teeth did Franco lose?** _____
3. **Which student lost the greatest number of teeth?** _____
4. **How many more teeth did Ping lose than Imani?** _____
5. **How many teeth did the students lose in all?** _____

Explain how you figured it out. Show your calculations.

Mathematics Assessment Collaborative
Performance Assessment Rubric Grade 2

	TEETH: Grade 2:	Points	Section Points
	The core elements of the performance required by this task are: • Represent and interpret data using graphs or other representation. • Describe and compare data using qualitative and quantitative measures. • Communicate reasoning using words, numbers or pictures. Based on these credit for specific aspects of performance should be assigned as follows		
1	Fills in a bar height of **4** above Tory	**1**	**1**
2	Gives correct answer as: **6**	**1**	**1**
3	Gives correct answer as: **Laura,** accept **9**	**1**	**1**
4	Gives correct answer as: **3**	**1**	**1**
5	Gives correct answer as: **39,** accept **35** Shows work such as: Adding numbers together (with or without Tory) 6+7+4+9+6+3+4 or 6+7+4+9+6+3+4 Or explains how they got the answer	**1** **1**	**2**
	Total Points		**6**

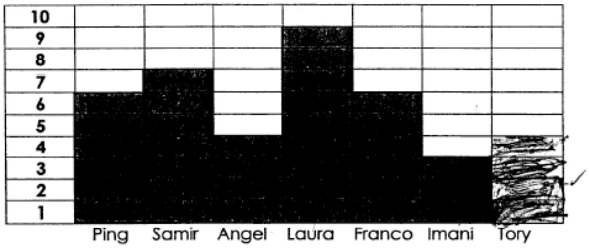
Looking At Student Work - TEETH

Students A through D show strong understandings of displaying and interpreting data. On Student A's paper an explanation is given for the procedure used to obtain the correct answer of 39.

Student A

Teeth

This graph shows how many teeth a group of second grade students had lost.



1. Tory lost 4 teeth. Show this on the graph. ✓ 1
2. How many teeth did Franco lose? 6 ✓ 1
3. Which student lost the greatest number of teeth? Laura ✓ 1
4. How many more teeth did Ping lose than Imani? 3 ✓ 1
5. How many teeth did the students lose in all? 39 ✓ 1

Explain how you figured it out. Show your calculations.

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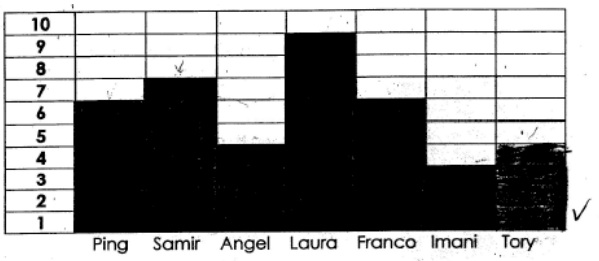
Student B calculated the correct answer using tally marks and explained the procedure used for adding up the total with tally marks.

Student B



1. Tory lost 4 teeth. Show this on the graph. ✓
2. How many teeth did Franco lose? 6 ✓
3. Which student lost the greatest number of teeth? Laura ✓
4. How many more teeth did Ping lose than Imani? 3 ✓
5. How many teeth did the students lose in all? 39 ✓

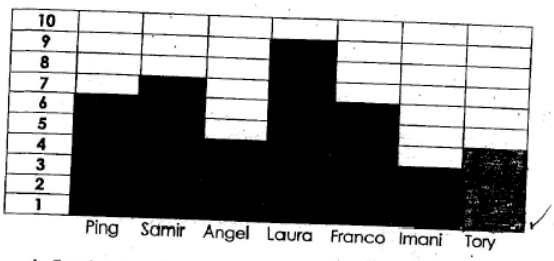
Explain how you figured it out. Show your calculations.

6 + 7 + 4 + 4 + 6 + 3 + 4 = 39

I put check marks on the groups of teeth I had added.

Both Student C and D successfully added partial products to reach the correct answer. Student C is below. Student C found 3 groups of 13.

Student C



1. Tory lost 4 teeth. Show this on the graph. ✓1
2. How many teeth did Franco lose? 6 ✓1
3. Which student lost the greatest number of teeth? Laura ✓1
4. How many more teeth did Ping lose than Imani? 3 ✓1
5. How many teeth did the students lose in all? 39 ✓1

Explain how you figured it out. Show your calculations.

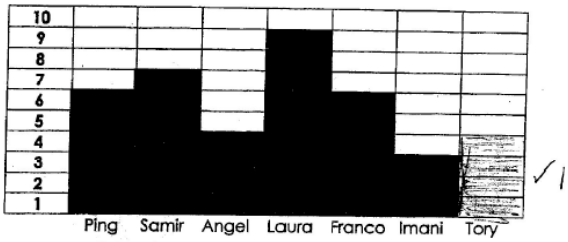
6 +7 +4 +9 +6 +3 +4 = ✓1

13 13 13

39

Student D found the partial products that added to 10 first and then added the remaining 9 to get a correct total of 39.

Student D



✓1

1. Tory lost 4 teeth. Show this on the graph.
2. How many teeth did Franco lose? 6 ✓1
3. Which student lost the greatest number of teeth? Laura ✓1
4. How many more teeth did Ping lose than Imani? 3 ✓1
5. How many teeth did the students lose in all? 39 ✓1

Explain how you figured it out. Show your calculations. ✓1

6+4=10 6+4=10 7+3=10 9=9

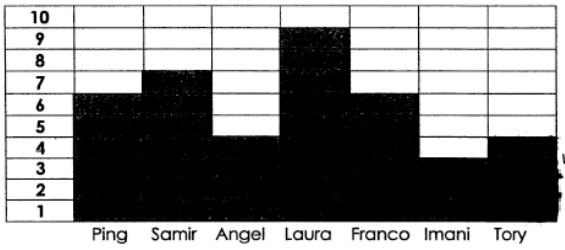
18 -10 = 8 +10 = 30

30 +9 = 39

(6)

Many students were able to interpret the graph and find the total number of teeth lost for this group of students but were unable to mathematically explain how they arrived at their answer. It was adequate to simply say "I added" or "I counted" but "I looked" was not considered to be enough of a justification for how they arrived at their answer. Student E's paper is one that does not give enough mathematical proof.

Student E



1. Tory lost 4 teeth. Show this on the graph. ✓
2. How many teeth did Franco lose? 6 ✓
3. Which student lost the greatest number of teeth? Laura ✓
4. How many more teeth did Ping lose than Imani? 3 ✓
5. How many teeth did the students lose in all? 39 ✓

Explain how you figured it out. Show your calculations.

I Looked at the chart

Students were as likely to make mistakes in adding incorrect addends together as they were to make mistakes in adding the correct addends. It is difficult to tell where Student F made the error. The correct addends are listed but no work is shown. It is clear that Student G struggled as not all the correct addends were combined in this **inequality** – even if you consider that he/she may have combined the 3 and 6 to make a second 9. The partial addends are added incorrectly.

Student F

1. Tory lost 4 teeth. Show this on the graph.
2. How many teeth did Franco lose? 6 ✓
3. Which student lost the greatest number of teeth? Laura ✓
4. How many more teeth did Ping lose than Imani? 3 ✓
5. How many teeth did the students lose in all? 40 ✗

6 − 3 =

Explain how you figured it out. Show your calculations.

6+7+4+9+6+3+4=40 ✓

Student G

1. Tory lost 4 teeth. Show this on the graph.
2. How many teeth did Franco lose? 4 ✗
3. Which student lost the greatest number of teeth? 6 ✗
4. How many more teeth did Ping lose than Imani? 9 ✗
5. How many teeth did the students lose in all? 47 ✗

Explain how you figured it out. Show your calculations.

4 + 6 = 10 + 9 = 19 + 9 = 29

Approximately 93% of our students were able to complete all the demands of TEETH. However, many students had difficulty in explaining their thinking and in gathering information from the data. The comparison subtractions question 4, "How many more teeth did Ping lose than Imani?" was the most troublesome for our students. When answering this question incorrectly, most students answered "6". "6" was how many teeth Ping lost. "6" is more than "3" (the number lost by Imani). About a third as many incorrect respondents answered "9". "6" from Ping and "3" from Imani makes "9". These answers are reflected in the papers of Students G (above) and Student H. For question 4, Student H gives Ping's total as it is "more" than Imani.

Student H

1. Tory lost 4 teeth. Show this on the graph.
2. How many teeth did Franco lose? 6
3. Which student lost the greatest number of teeth? 9
4. How many more teeth did Ping lose than Imani? 6
5. How many teeth did the students lose in all? 39

Explain how you figured it out. Show your calculations.

I look at the graph ^ x

Teacher Notes:

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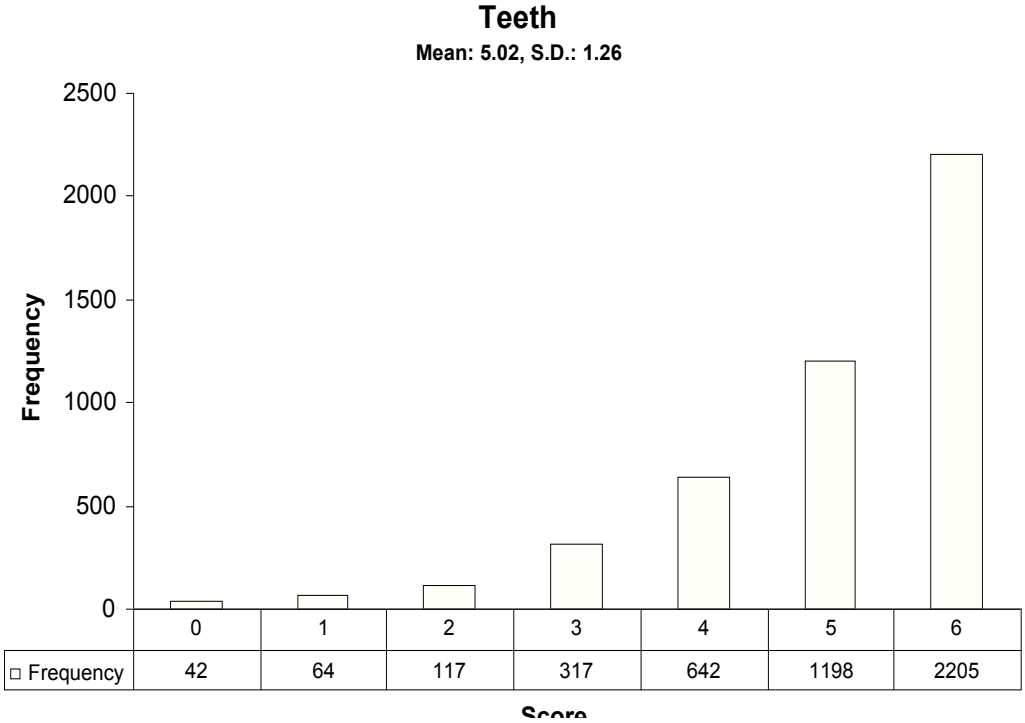
Frequency Distribution for each task - TEETH



Score:	0	1	2	3	4	5	6
% < =	0.9%	2.3%	4.9%	11.8%	25.8%	51.9%	100.0%
% > =	100.0%	99.1%	97.7%	95.1%	88.2%	74.2%	48.1%

The maximum score available for this task is 6 points.
The cut score for a level 3 response is 3 points.

Most of the students, 88%, were able to interpret the chart and answer the descriptive questions around the data. 95% of the students could meet the essential demands of the task. 48% of the students were able to meet all demands including explaining how they found the correct total number of teeth lost. Less than 1% of the students scored a zero on this task. All students attempted to solve this problem.

TEETH

Points	Understandings	Misunderstandings
0-2	A little more than 96% of the students could answer at least one question. Most students were able to transfer the data to the graph. Students were able to name Laura as having lost the most teeth.	Less than 4% of all the students did not complete the graph with Tory's amount. Many students had trouble interpreting the data to answer: How many teeth were lost by Franco? (i.e. Franco lost 4 teeth) Who lost the greatest number of teeth? (i.e."6" for who lost the greatest number of teeth)
3-4	These students were able to fill in the correct number of teeth lost for Tory. Most were able to answer the interpreting questions: How many teeth were lost by Franco? Who lost the greatest number of teeth?	In total, 24% of students had trouble in correctly answering the comparison question – how many more than? Students answered either "6" as Ping lost six and six is more than three or "9" as six plus three is nine.
5	Students were able to answer the questions asking them to complete and interpret the data in the graph. They were able to answer the comparison question.	Students who scored a five had trouble with finding the total or were unable to explain how they found the total. They were as likely to err in adding incorrect addends (i.e. 6+4+9+9+7+3) as they were to add the correct seven addends incorrectly (i.e. writing all seven amounts of teeth lost but finding the total to be 40 or 38). Their explanations of how they got the answer did not explain the mathematics.
6	39% of our students could answer all parts of this task. They showed a range of strategies for finding the total number of teeth lost such as: counting one by one, using tally marks, adding partial sums, and using one column addition.	

Based on teacher observation, this is what second grade students seemed to know and be able to do:

- Fill in a graph
- Read a graph
- Count the bars to find a total
- Subtract 2 single digit numbers
- Find the person with the most/least teeth lost
- Read and answer questions around a simple graph

Areas of difficulty for second graders, students struggled with:

- Could add up all the numbers but they often could not explain how they did so
- Struggled with adding up a column of seven addends
- Struggled with comparing 2 person's lost teeth numbers to find who lost more

Questions for Reflection on TEETH

- What kinds of experiences have your students had with graphs?
- Have your students had the opportunity to line up to do human graphing of data, such as lining up by kinds of pets they have, number of people in their families, or how they get to school in the morning? Have your students had the opportunity to then take this information and organize it in a class graph?
- What types of questions do your students answer that focus on the relationships revealed by the graph?
    - Descriptive:
        - How many children lost six teeth?
        - Who lost the most teeth?
    - Comparative:
        - How many more teeth did Ping lose than Imani?
        - How many children lost more that 5 teeth?
- What types of opportunities do your students get to describe the data set as a whole?
- What types of opportunities do your students get to explain their strategies for finding a solution? Do they do number talks? Do they do problem solving and share solutions? Do they do daily graphs?
- What strategies do your students already have that give them a logical way to count and keep track of the pieces of data to assure that they count each piece once and only once?
- How often do your students get the opportunity to see the same data displayed in different formats? The same data displayed with slightly different categories?

Teacher Notes:

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Instructional Implications:

This numerical data representation was easily accessible for most of our students. Teachers felt, and it is evidenced by our collaborative's results, that students were able to answer descriptive questions around the data set.

Students need more and varied experiences in talking about different sets of collected and recorded data in their classrooms. Students at this grade struggled with finding the total number of teeth lost. Central to this process is creating a logical way to count or add and to keep track of all the data while doing so. Young children need to discuss the various strategies students in their class are using and to find an efficient system for themselves. When looking at a graph, young children are naturally drawn to the point with the most data – the mode. In addition, they are interested in questions around the range: What's the fewest number of teeth lost? Who lost the most teeth? As we continue our discussions around numerical data with our children, we should be stressing those comparative questions as well. How many more teeth did Ping lose than Imani? Our students need to discuss and find a strategy for comparing two pieces of data to find how much more one piece is than another.

Graphs are a way of communicating information. By involving students in describing and comparing data representations we communicate that graphs and charts are active tools. Graphs can even be used to predict and hypothesize beyond the specific information presented on a given graph – "This graph was of a second grade group of children – would we get the same or different information if we collected this data in a third grade classroom? A kindergarten classroom? Why or Why not?"

Resources: **Navigating Through Data Analysis and Probability**(NCTM Publication Pre-K – 2nd Grade), **Navigating Through Problem Solving**(NCTM Publication Pre K-2nd Grade), **Developing Number Sense** (K. Richardson), **Investigations in Number, Data and Space "How Many Pockets? How Many Teeth?** (TERC – Grade 2)

Teacher Notes:

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