



National Center and State Collaborative

Core Content Connectors: Data Analysis, Probability, and Statistics 1

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National Center and State Collaborative

The National Center and State Collaborative (NCSC) is applying the lessons learned from the past decade of research on alternate assessments based on alternate achievement standards (AA-AAS) to develop a multi-state comprehensive assessment system for students with significant cognitive disabilities. The project draws on a strong research base to develop an AA-AAS that is built from the ground up on powerful validity arguments linked to clear learning outcomes and defensible assessment results, to complement the work of the Race to the Top Common State Assessment Program (RTTA) consortia.

Our long-term goal is to ensure that students with significant cognitive disabilities achieve increasingly higher academic outcomes and leave high school ready for post-secondary options. A well-designed summative assessment alone is insufficient to achieve that goal. Thus, NCSC is developing a full system intended to support educators, which includes formative assessment tools and strategies, professional development on appropriate interim uses of data for progress monitoring, and management systems to ease the burdens of administration and documentation. All partners share a commitment to the research-to-practice focus of the project and the development of a comprehensive model of curriculum, instruction, assessment, and supportive professional development. These supports will improve the alignment of the entire system and strengthen the validity of inferences of the system of assessments.



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This document is available in alternative formats upon request.

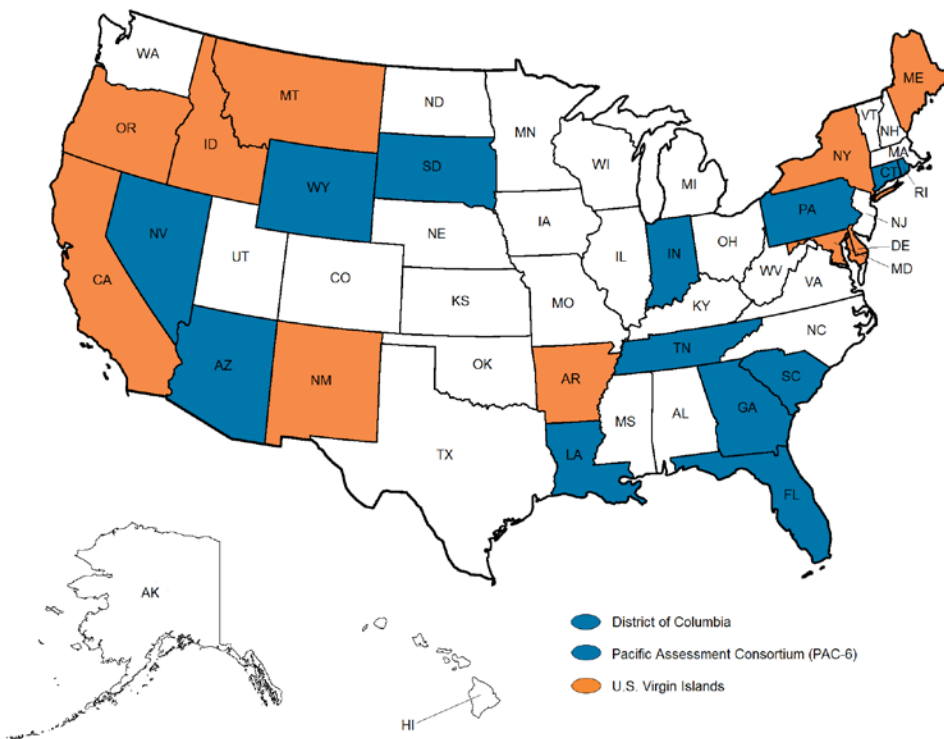


National Center and State Collaborative

NCSC is a collaborative of 15 states and five organizations.

The states include (shown in blue on map): Arizona, Connecticut, District of Columbia, Florida, Georgia, Indiana, Louisiana, Nevada, Pacific Assessment Consortium (PAC-6)¹, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, and Wyoming.

Tier II states are partners in curriculum, instruction, and professional development implementation but are not part of the assessment development work. They are (shown in orange on map): Arkansas, California, Delaware, Idaho, Maine, Maryland, Montana, New Mexico, New York, Oregon, and U.S. Virgin Islands.



*Core partner states are blue in color and Tier II states are orange in color.

¹ The Pacific Assessment Consortium (including the entities of American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Republic of Palau, and Republic of the Marshall Islands) partner with NCSC as one state, led by the University of Guam Center for Excellence in Developmental Disabilities Education, Research, and Service (CEDDERS).



National Center and State Collaborative

The five partner organizations include: The National Center on Educational Outcomes (NCEO) at the University of Minnesota, The National Center for the Improvement of Educational Assessment (Center for Assessment), The University of North Carolina at Charlotte, The University of Kentucky, and edCount, LLC.



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Core Content Connectors: Data Analysis, Probability, and Statistics 1

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Identifying the Core Content of the Learning Progressions Framework for the Common Core State Standards for Students Who Participate in AA-AAS

Introduction

The purpose of this paper is to describe the development and prioritization of the academic content for students with significant cognitive disabilities. This prioritized academic content is referred to as Core Content Connectors (CCCs). This work is part of the NCSC GSEG and provides the foundation for the development of curriculum resources, professional development, instructional resources, and alternate assessment based on alternate achievement standards (AA-AAS). A unique feature of the development and prioritization of academic content is the use of learning progressions framework (LPF), which is built to include relationships with the Common Core State Standards (CCSSs). The LPF does not provide details of grade-specific curriculum, but describes a path for student learning as an ongoing developmental progression and is a starting point for thinking about how students develop competency in an academic domain (Hess, 2010). The following sections describe the use of LPFs for identifying specific grade-level Common Core State Standards (CCSS), and the development of the CCCs for providing more specificity for teachers.

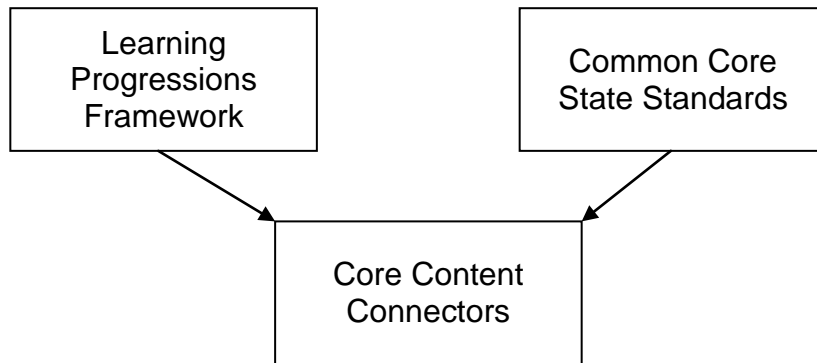
Learning Progression Framework

The National Alternate Assessment Center, under the leadership of Karin Hess, developed LPFs. Hess's (2008) definition of LPs is based on four interrelated guiding principles: (a) LPs are developed and refined using available research and evidence, (b) LPs have clear binding threads that articulate the essential core concepts and processes of a discipline sometimes referred to as the "big ideas" of the discipline, (c) LPs articulate movement towards increased understanding, and (d) LPs go hand-in-hand with well-designed and aligned assessments.

The grade span learning targets of the LPF were identified by national content experts and are a broad description of the essential content and general sequencing for student learning and skill development. The LPF does not provide details of grade-specific curriculum, but describes a path for student learning as an ongoing developmental progression. The LPF is currently available at http://www.nciea.org/publications/Math_LPF_KH11.pdf

Core Content Connectors

The Core Content Connectors (CCCs) are the prioritized academic content designed to frame the instruction and assessment of students with significant cognitive disabilities. The CCCs create a connection between the Learning Progressions Framework (LPF) and Common Core State Standards (CCSS) for these students.



The purpose of the CCCs is to identify the most salient core academic content in ELA and math found in both the CCSS and the LPF Progress Indicators (LPF PIs) (i.e., observable learning along the learning continuum for each strand in the LPFs). The CCCs illustrate the necessary knowledge and skills students with significant cognitive disabilities need to reach the learning targets or critical big ideas within the Learning Progression Frameworks (LPF, Hess et al., 2010) and the Common Core State Standard. This identified core content serves as a connection or stage between the LPF (designed for typically developing students) and the CCSS (which define grade level content and achievement). The CCCs are intentionally dually aligned with both the LPFs and the CCSSs. The CCCs identify priorities for the instruction for students in this population, and the alternate assessment. CCCs are designed to contribute to a fully aligned system of content, instruction, and assessment.

Progress Indicator: M.NO.1e describing, representing, and comparing absolute value relationships		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.NO.1e1 Determine the meaning of absolute value	Expressions and Equations 6 NS Apply and extend previous understandings of numbers to the system of rational numbers.	6.NS.7c Understand ordering and absolute value of rational numbers. a) Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars write $ -30 = 30$ to describe the size of the debt in dollars.
Progress Indicator: M.NO.1f recognizing equivalence of representations using fractions, decimals, and percents and using them solve ratio problems		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.NO.1f1 Find a percent of a quantity as rate per 100	Ratios and Proportional Relationships 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.3c Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. c) Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.
6.NO.1f2 Write or select a ratio to match a given statement and representation	Ratios and Proportional Relationships 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."
6.NO.1f3 Select or make a statement to interpret a given ratio	Ratios and Proportional Relationships 6 RP Understand ratio concepts and use ratio reasoning to solve problems.	6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

The CCCs preserve the sequence of learning outlined in the LPFs to the extent possible while disaggregating the progress indicators (which describe concepts and skills along the learning continuum for each grade span in the learning progression) into teachable and assessable segments of content. The connectors and corresponding curriculum resource guides were written to help promote how students can engage in the CCSS while following the learning progression.

The CCCs have the following characteristics:

- Sequenced according to the LPFs to help guide meaningful instruction for students and lead to enduring skills in successive grades
- Written as outcome based, which provides a description of what students should know and do
- Written at high levels of expectations for students to eliminate potential ceiling effect for student learning
- Aligned to the grade-level CCSSs to provide access to the general curriculum
- Organized by the six major LPF strands (Symbolic Expression; Nature of Numbers & Operations; Measurement; Patterns, Relations, & Functions; Geometry; and Data Analysis, Probability, & Statistics)

In some grades, CCCs were developed that were considered important for student learning but were not aligned to the LPF. CCCs for some prerequisite skills were included in some of the grades, but these CCCs are for instructional purposes and not intended as a target for assessment. At the high school level, where only one AA-AAS will be administered to students but many CCSSs and LPFs are provided, some subsets of LPF Progress Indicators were selected for developing CCCs.

All CCCs will be provided by the curriculum and instruction work group in NCSC. While states may add additional content standards as they deem necessary that is specific to the needs, states and teachers will NOT have to develop any further CCCs. The complete set will be disseminated upon completion and validation. It is anticipated that states who have adopted the Common Core State Standards can use the CCCs as the priorities for students who take AA-AAS and will not need to create other forms of translations or create extensions of the Common Core unless they choose to do so. Teachers will be able to use these, along with the various curriculum resources, to plan instruction.

Uses of the document

There are several potential uses for this document. The first is to demonstrate how the identified core content builds critical big ideas across the grades. The format is intended to show how students can grow within the linked content across the grades and the connections between the related content to help guide sequential and meaningful instructional efforts. The second potential use is to provide clarity and specificity of the content within each grade level. In the process of identifying the CCC within each of the PI, it was evident that some considerations were necessary related to the content. First, it is necessary to disaggregate the content within some of the PI to a finer grain size. As students with significant cognitive disabilities may require instruction on single concepts, PIs that include multiple concepts may need to be separated in the unpacked content. Additionally, identifying core content requires focusing on the critical big ideas within the content and the need for considering meaningful instructional context within the instruction of students who participate in the alternate assessment. The third use for this document is to demonstrate how the CCCs have direct links to the CCSS. The CCSS that are identified as having the closest match are listed beside the corresponding CCC. As these direct links indicate, the CCC are not weakly linked or “watered down” translations, but instead pinpoint the most salient content in the standard. The potential users of this document ranges from assessment designers to teachers. While the document is not intended to be a standalone instructional resource, it is intended to support teachers in their understanding of the content.

References

- Hess, K. (2010, December). *Learning progressions frameworks designed for use with the Common Core State Standards in mathematics K-12*. National Alternate Assessment Center at the University of Kentucky and the National Center for the Improvement of Educational Assessment, Dover, N.H.
- Hess, K. (2008). Developing and using learning progressions as a schema for measuring progress [online]. Retrieved from http://www.nciea.org/publications/CCSSO2_KH08.pdf

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	<p>DPS-1 Gather and interpret data to answer questions related to a particular/single context.</p> <ul style="list-style-type: none"> Formulate questions, gather data, and build representations; Identify and describe variation in data, and describe and compare shapes of distributions and measures of central tendency. 		<p>DPS-1 Design investigations and gather data to answer questions about multiple populations.</p> <ul style="list-style-type: none"> Formulate questions, gather data, and build representations; Compare populations by analyzing distributions in terms of variability and measures of central tendency. 		<p>DPS-1 Design and conduct statistical studies:</p> <ul style="list-style-type: none"> Use appropriate statistical measures for analysis; Develop the concepts of statistical inference and statistical significance, especially in relation to probability principles and sampling distributions.
	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
Data Analysis: Selecting and Posing Questions	K.DPS.1a1 Select a question that can be answered by collecting data	3.DPS.1f1 Develop questions, make a plan for data collection	5.DPS.1a1 Develop questions and make a plan for data collection	7.DPS.1b1 Determine sample size to answer a given question	H.DPS.1a1 Design study using categorical and continuous data, including creating a question, identifying a sample, and making a plan for data collection
	1.DPS.1a2 Select questions that ask about “How many” and represent up to three categories that can be concretely represented	4.DPS.1f2 Develop questions, make a plan for data collection	6.DPS.1a2 Identify statistical questions and make a plan for data collection		
	1.DPS.1a3 Identify 2 categories resulting from a selected question				
	2.DPS.1a5 Select a question about 3 attributes that can be concretely represented				
		3.DPS.1g1 Collect data, put in picture or bar graph		8.DPS.1f1 Given a research question, select the variable of study	H.DPS.1b1 Complete a graph given the data, using dot plots, histograms, or box plots

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	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
				8.DPS.1f2 Identify two variables to study in a given research question	
				7.DPS.1g1 Graph continuous data using line graphs, histograms, or dot plots	
	1.DPS.1a4 Analyze data by sorting into categories; answer questions about the total number of data points and how many in each category	3.DPS.1g2 Organize measurement data into a line plot	5.DPS.1c1 Collect and graph data: bar graph, line plots, picture graph (e.g., average height among 3 classrooms, # of boys and girls)	8.DPS.1g2 Graph data using line graphs, histograms, or box plots	
	2.DPS.1a6 Identify up to 3 categories resulting from a selected question	4.DPS.1g3 Collect data, organize in graph (e.g. picture graph, line plot, bar graph)			

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	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
	2.DPS.1a7 Analyze data by sorting into categories established by each question		6.DPS.1c2 Collect and graph data: bar graph, line plots, dot plots, histograms	8.DPS.1h1 Graph bivariate data using scatter plots and identify possible associations between the variables	
	2.DPS.1a8 Interpret the number of points in each category				
	1.DPS.1c1 Using a picture graph, represent each object/person counted on the graph (1:1 correspondence) for 2 or more categories				
	2.DPS.1c2 Organize data by representing categorical data on a picture graph or bar graph				
	2.DPS.1c3 Organize data by representing continuous data on a line plot				

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	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
Data Analysis: Analyzing and Interpreting	1.DPS.1d1 Interpret a picture graph to answer questions about how many in each category	3.DPS.1i1 Select the appropriate statement that describes the data representations based on a given graph (picture, bar, line plots)	5.DPS.1d1 Select an appropriate statement about the range of the data for a given graph (bar graph, line plot) (i.e. range of data) up to 10 points	8.DPS.1f1 Formulate a research question to study	H.DPS.1c1 Use descriptive stats (range, median, mode, outliers/gaps) to describe a data set
				8.DPS.1f2 Identify two variables to study in a given a research question	H.DPS.1c2 Compare means, median, and range of 2 sets of data
				8.DPS.1f3 Construct a two-way table summarizing data on two categorical variables collected from the same subjects; identify possible association between the two variables	H.DPS.1c3 Determine what inferences can be made from statistics
				7.DPS.1i1 Solve for the median of a given data set	

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
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	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
	2.DPS.1d2 Identify the value of each category represented on picture graph and bar graph or each point on a line plot	4.DPS.1i1 Select the appropriate statement that describes the data representations based on a given graph (picture, bar, line plots)	6.DPS.1d2 Solve for mean of a given data set	7.DPS.1i2 Identify the range (high/low), median (middle), mean, or mode of a given data set	H.DPS.1d1 Represent data on a scatter plot to describe and predict
		4.DPS.1j1 Select an appropriate statement that describes the most frequent or the least frequent data point using a line plot, picture graph, or bar graph		8.DPS.1i3 Using box plots and scatter plots, identify data points that appear to be outliers	H.DPS.1d2 Select an appropriate statement that describes the relationship between variables
				8.DPS.1i4 Identify outliers, range, mean, median, and mode	H.DPS.1d3 Make or select an appropriate statement(s) about findings

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
	<p>DPS-1 Gather and interpret data to answer questions related to a particular/single context.</p> <ul style="list-style-type: none"> Formulate questions, gather data, and build representations; Identify and describe variation in data, and describe and compare shapes of distributions and measures of central tendency. 		<p>DPS-1 Design investigations and gather data to answer questions about multiple populations.</p> <ul style="list-style-type: none"> Formulate questions, gather data, and build representations; Compare populations by analyzing distributions in terms of variability and measures of central tendency. 		<p>DPS-1 Design and conduct statistical studies:</p> <ul style="list-style-type: none"> Use appropriate statistical measures for analysis; Develop the concepts of statistical inference and statistical significance, especially in relation to probability principles and sampling distributions.
	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
	1.DPS.1e1 Compare the values of the 2 categories of data in terms of more or less	3.DPS.1k1 Apply results of data to a real word situation	6.DPS.1d3 Select statement that matches mean, mode, and spread of data for 1 measure of center for a given data set	7.DPS.1j1 Make or select a statement to compare the distribution of 2 data sets	H.DPS.1d4 Apply the results of the data to a real world situation
		4.DPS.1k2 Apply results of data to a real word situation	6.DPS.1d4 Find the range of a given data set		
			6.DPS.1d5 Explain or identify what the mean represents in a set of data		
			6.DPS.1d6 Explain or identify what the mode represents in a set of data		
	2.DPS.1e2 Compare the information shown in a bar graph or picture graph with up to 4 categories. Solve simple comparisons of how many more or how		6.DPS.1d7 Explain or identify what the median represents in a set of data	8.DPS.1j2 Make or select an appropriate statement based upon two unequal data sets using measure of central tendency and shape	

	(K-4) Elementary School Learning Targets		(5-8) Middle School Learning Targets		(9-12) High School Learning Targets
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	Grades K-2	Grades 3-4	Grades 5-6	Grades 7-8	HS
	many less				
			5.DPS.1e1 Use measures of central tendency to interpret data including overall patterns in the data	7.DPS.1k1 Analyze graphs to determine or select appropriate comparative inferences about two samples or populations	
			6.DPS.1e2 Use measures of central tendency to interpret data including overall patterns in the data	8.DPS.1k2 Analyze displays of bivariate data to develop or select appropriate claims about those data	

Progress Indicator: E.DPS.1a posing questions of interest that can be answered by counting or collecting data (e.g., concrete comparisons about students, classroom materials, science topics) with teacher guidance		
Core Content Connectors: K	CCSS Domain/Cluster	Common Core State Standard
K.DPS.1a1 Select a question that is answered by collected data	Counting and Cardinality K CC Count to tell the number of objects.	K.CC.5 Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

Progress Indicator: E.DPS.1a posing questions of interest that can be answered by counting or collecting data (e.g., concrete comparisons about students, classroom materials, science topics) with teacher guidance		
Core Content Connectors: 1	CCSS Domain/Cluster	Common Core State Standard
1.DPS.1a2 Select questions that ask about “How many” and represent up to three categories that can be concretely represented	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
1.DPS.1a3 Identify 2 categories resulting from a selected question	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
1.DPS.1a4 Analyze data by sorting into 2 categories; answer questions about the total number of data points and how many in each category	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
Progress Indicator: E.DPS.1c collecting and organizing/representing data (e.g., picture graphs, tally charts, bar graphs)		
Core Content Connectors: 1	CCSS Domain/Cluster	Common Core State Standard
1.DPS.1c1 Using a picture graph, represent each object/person counted on the graph (1:1 correspondence) for 2 or more categories	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Progress Indicator: E.DPS.1d recognizing that data can take on different values		
Core Content Connectors: 1	CCSS Domain/Cluster	Common Core State Standard
1.DPS.1d1 Interpret a picture graph to answer questions about how many in each category	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
Progress Indicator: E.DPS.1e describing and comparing data and beginning to identify what the data do or do not show (e.g., bar graphs, line plots, picture graphs)		
Core Content Connectors: 1	CCSS Domain/Cluster	Common Core State Standard
1.DPS.1e1 Compare the values of the 2 categories of data in terms of more or less	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

Progress Indicator: E.DPS.1a posing questions of interest that can be answered by counting or collecting data (e.g., concrete comparisons about students, classroom materials, science topics) with teacher guidance		
Core Content Connectors: 2	CCSS Domain/Cluster	Common Core State Standard
2.DPS.1a5 Select a question about 3 attributes that can be concretely represented	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
2.DPS.1a6 Identify up to 3 categories resulting from a selected question	Measurement and Data 1 MD Represent and interpret data.	1.MD.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.
2.DPS.1a7 Analyze data by sorting into categories established by each question	Measurement and Data 2 MD Represent and interpret data.	2.MD.10 Draw a picture graph and a bar graph to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems using information presented in a bar graph.
2.DPS.1a8 Interpret the number of points in each category		No CCSS linked

Progress Indicator: E.DPS.1c collecting and organizing/representing data (e.g., picture graphs, tally charts, bar graphs)		
Core Content Connectors: 2	CCSS Domain/Cluster	Common Core State Standard
2.DPS.1c2 Organize data by representing categorical data on a pictorial graph or bar graph	Measurement and Data 2 MD Represent and interpret data.	2.MD.10 Draw a picture graph and a bar graph to represent a data set with up to four categories. Solve simple put together, take-apart, and compare problems using information presented in a bar graph.
2.DPS.1c3 Organize data by representing continuous data on a line plot	Measurement and Data 2 MD Represent and interpret data.	2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

Progress Indicator: E.DPS.1d recognizing that data can take on different values		
Core Content Connectors: 2	CCSS Domain/Cluster	Common Core State Standard
2.DPS.1d2 Identify the value of each category represented on picture graph and bar graph or each point on a line plot	Measurement and Data 2 MD Represent and interpret data.	2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take apart, and compare problems using information presented in a bar graph.

Progress Indicator: E.DPS.1e describing and comparing data and beginning to identify what the data do or do not show (e.g., bar graphs, line plots, picture graphs)		
Core Content Connectors: 2	CCSS Domain/Cluster	Common Core State Standard
2.DPS.1e2 Compare the information shown in a bar graph or picture graph with up to 4 categories. Solve simple comparisons of how many more or how many less	Measurement and Data 2 MD Represent and interpret data.	2.MD.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take apart, and compare problems using information presented in a bar graph.

Progress Indicator: E.DPS.1f formulating questions and designing investigations (defining measures and variables)		
Core Content Connectors: 3	CCSS Domain/Cluster	Common Core State Standard
3.DPS.1f1 Develop questions, make a plan for data collection		No CCSS linked

Progress Indicator: E.DPS.1g collecting data and representing data (e.g., bar graphs, frequency tables, line plots)		
Core Content Connectors: 3	CCSS Domain/Cluster	Common Core State Standard
3.DPS.1g1 Collect data, organize into picture or bar graph	Measurement and Data 3 MD Represent and interpret data.	3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i>
3.DPS.1g2 Organize measurement data into a line plot	Measurement and Data 3 MD Represent and interpret data.	3. MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units-whole numbers, halves, or quarters.
Progress Indicator: E.DPS.1i describing data shapes and what the data representations do and do not show (bar graphs, picture graphs, frequency tables, line plots, circle graphs) including the attributes used		
Core Content Connectors: 3	CCSS Domain/Cluster	Common Core State Standard
3.DPS.1i1 Select the appropriate statement that describes the data representations based on a given graph (picture, bar, line plots)	Measurement and Data 3 MD Represent and interpret data.	3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i>
Progress Indicator: E.DPS.1k using data to make and support claims and interpretations (e.g., making comparisons among individuals, between individuals and the group, and among groups)		
Core Content Connectors: 3	CCSS Domain/Cluster	Common Core State Standard
3.DPS.1k1 Apply results of data to a real world situation		No CCSS linked

Progress Indicator: E.DPS.1f formulating questions and designing investigations (defining measures and variables)		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.DPS.1f2 Develop questions, make a plan for data collection		No CCSS linked

Progress Indicator: E.DPS.1g collecting data and representing data (e.g., bar graphs, frequency tables, line plots)		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.DPS.1g3 Collect data, organize in graph (e.g., picture graph, line plot, bar graph)	Measurement and Data 3 MD Represent and interpret data. 4 MD Represent and interpret data.	3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i> 4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit. Solve problems involving addition and subtraction of fractions by using information presented in line plots. <i>For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.</i>
Progress Indicator: E.DPS.1i describing data shapes and what the data representations do and do not show (bar graphs, picture graphs, frequency tables, line plots, circle graphs) including the attributes used		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.DPS.1i1 Select the appropriate statement that describes the data representations based on a given graph (picture, bar, line plots)	Measurement and Data 3 MD Represent and interpret data.	3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i>
Progress Indicator: E.DPS.1j identifying clumps, gaps, trends, or central tendency (mode, median) in the data		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.DPS.1j1 Select an appropriate statement that describes the most frequent or the least frequent data point using a line plot, picture graph, or bar graph	Measurement and Data 3 MD Represent and interpret data.	3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i> 3. MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units-whole numbers, halves, or

		quarters.
Progress Indicator: E.DPS.1k using data to make and support claims and interpretations (e.g., making comparisons among individuals, between individuals and the group, and among groups)		
Core Content Connectors: 4	CCSS Domain/Cluster	Common Core State Standard
4.DPS.1k2 Apply results of data to a real world situation	Measurement and Data 3 MD Represent and interpret data.	3. MD.4 Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units-whole numbers, halves, or quarters.

Progress Indicator: M.DPS.1c using representations (e.g., dot plots, scatter plots, line plots) to display data from investigations to describe the shapes of the data		
Core Content Connectors: 5	CCSS Domain/Cluster	Common Core State Standard
5.DPS.1c1 Collect and graph data: bar graph, line plots, picture graph (e.g., average height among 3 classrooms, # of boys and girls)	Measurement and Data 3 MD Represent and interpret data. 5 MD Represent and interpret data.	3.MD.3 Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 5 pets.</i> 5.MD.2 Make a line plot to display a data set of measurements in fractions of a unit ($\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$). Use operations on fractions for this grade to solve problems involving information presented in line plots. <i>For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.</i>
Progress Indicator: M.DPS.1d identifying the range, three common measures of central tendency (mean, median, and mode) and interpreting the mean as a fair share and a center of balance		
Core Content Connectors: 5	CCSS Domain/Cluster	Common Core State Standard
5.DPS.1d1 Select an appropriate statement about the range of the data for a given graph (bar graph, line plot) (i.e., range of data) up to 10 points	Statistics and Probability 6 SP Develop understanding of statistical variability.	6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Progress Indicator: M.DPS.1e making claims about populations from data distributions, supporting interpretations on the basis of mean, median, or mode, and the shape of the distribution		
Core Content Connectors: 5	CCSS Domain/Cluster	Common Core State Standard
5.DPS.1e1 Use measures of central tendency to interpret data including overall patterns in the data	Statistics and Probability 6 SP Develop understanding of statistical variability.	6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

Progress Indicator: M.DPS.1a formulating questions about groups larger than classroom groups and comparing different populations or samples		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.DPS.1a2 Identify statistical questions and make a plan for data collection	Statistics and Probability 6 SP Develop understanding of statistical variability.	6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. <i>For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages.</i>

Progress Indicator: M.DPS.1c using representations (e.g., dot plots, scatter plots, line plots) to display data from investigations to describe the shapes of the data		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.DPS.1c2 Collect and graph data: bar graph, line plots, dot plots, histograms	Statistics and Probability 6 SP Summarize and describe distributions.	6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

Progress Indicator: M.DPS.1d identifying the range, three common measures of central tendency (mean, median, and mode) and interpreting the mean as a fair share and a center of balance		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.DPS.1d2 Solve for mean of a given data set	Statistics and Probability 6 SP Develop understanding of statistical variability.	6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
6.DPS.1d3 Select statement that matches mean, mode, and spread of data for 1 measure of central	Statistics and Probability 6 SP Summarize and describe distributions.	6.SP.5 Summarize numerical data sets in relation to their context such as by: c) Giving quantitative measures of center (median and/or

tendency for a given data set		mean) and variability as well as describing any overall pattern and striking deviations from the overall pattern with reference to the context in which the data were gathered.
6.DPS.1d4 Find the range of a given data set	Statistics and Probability 6 SP Develop understanding of statistical variability.	6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
6.DPS.1d5 Explain or identify what the mean represents in a set of data	Statistics and Probability 6 SP Develop understanding of statistical variability.	6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
6.DPS.1d6 Explain or identify what the mode represents in a set of data	Statistics and Probability 6 SP Develop understanding of statistical variability.	6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
6.DPS.1d7 Explain or identify what the median represents in a set of data	Statistics and Probability 6 SP Summarize and describe distributions.	6.SP.5 Summarize numerical data sets in relation to their context such as by: c) Giving quantitative measures of center (median and/or mean) and variability as well as describing any overall pattern and striking deviations from the overall pattern with reference to the context in which the data were gathered.
Progress Indicator: M.DPS.1e making claims about populations from data distributions, supporting interpretations on the basis of mean, median, or mode, and the shape of the distribution		
Core Content Connectors: 6	CCSS Domain/Cluster	Common Core State Standard
6.DPS.1e2 Use measures of central tendency to interpret data including overall patterns in the data	Statistics and Probability 6 SP Summarize and describe distributions.	6.SP.5 Summarize numerical data sets in relation to their context such as by: c) Giving quantitative measures of center (median and/or mean) and variability as well as describing any overall pattern and striking deviations from the overall pattern with reference to the context in which the data were gathered.

Progress Indicator: M.DPS.1b distinguishing among populations, censuses, and sampling		
Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.DPS.1b1 Determine sample size to answer a given question	Statistics and Probability 7 SP Use random sampling to draw inferences about a population.	7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
Progress Indicator: M.DPS.1g displaying and interpreting univariate data using dot plots, histograms, and circle graphs		
Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.DPS.1g1 Graph continuous data using line graphs, histograms, or dot plots	Statistics and Probability 6 SP Summarize and describe distributions.	6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
Progress Indicator: M.DPS.1i using box plots, interquartile range, mean absolute deviation, range, and the concept of outliers to characterize the distribution (variability) of univariate data		
Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.DPS.1i1 Solve for the median of a given data set	Statistics and Probability 6 SP Summarize and describe distributions.	6.SP.5 Summarize numerical data sets in relations to their context such as by: c) Giving quantitative measures of center (median and/or mean) and variability as well as describing any overall pattern and striking deviations from the overall pattern with reference to the context in which the data were gathered.
7.DPS.1i2 Identify the range (high/low), median (middle), mean, or mode of a given data set	Statistics and Probability 7 SP Draw informal comparative inferences about two populations.	7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about the two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i>
Progress Indicator: M.DPS.1j comparing two unequal distributions of data using number of data points, measures of central tendency, shape, and variability (numerical data), and two-way tables (categorical variables)		
Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.DPS.1j1 Make or select a statement to compare the	Statistics and Probability 7 SP Draw informal comparative	7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring

distribution of 2 data sets	inferences about two populations.	the difference between the centers by expressing it as a multiple of a measure of variability. <i>For example, the mean height of players on the basketball team is 10cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.</i>
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Progress Indicator: M.DPS.1k supporting claims about the results of investigations (e.g., coordinating among the measures of central tendency and variability)

Core Content Connectors: 7	CCSS Domain/Cluster	Common Core State Standard
7.DPS.1k1 Analyze graphs to determine or select appropriate comparative inferences about two samples or populations	<p>Statistics and Probability</p> <p>7 SP Use random sampling to draw inference about a population.</p> <p>7 SP Draw informal comparative inferences about two populations.</p>	<p>7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. <i>For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.</i></p> <p>7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about the two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i></p>

Progress Indicator: M.DPS.1f formulating questions about groups larger than classroom groups, comparing different populations or samples, and involving two variables

Core Content Connectors: 8	CCSS Domain/Cluster	Common Core State Standard
8.DPS.1f1 Formulate a research question to study		No CCSS linked
8.DPS.1f2 Identify two variables to study in a given a research question		No CCSS linked

<p>8.DPS.1f3 Construct a two-way table summarizing data on two categorical variables collected from the same subjects; identify possible association between the two variables</p>	<p>Statistics and Probability 8 SP Investigate patterns of association in bivariate data.</p>	<p>8.SP.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. <i>For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?</i></p>
<p>Progress Indicator: M.DPS.1g displaying and interpreting univariate data using dot plots, histograms, and circle graphs</p>		
<p>Core Content Connectors: 8</p>	<p>CCSS Domain/Cluster</p>	<p>Common Core State Standard</p>
<p>8.DPS.1g2 Graph data using line graphs, histograms, or box plots</p>	<p>Statistics and Probability 8 SP Investigate patterns of association in bivariate data.</p>	<p>8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and non linear association.</p>
<p>Progress Indicator: M.DPS.1h displaying data in scatter plots and investigating the association between the variables</p>		
<p>Core Content Connectors: 8</p>	<p>CCSS Domain/Cluster</p>	<p>Common Core State Standard</p>
<p>8.DPS.1h1 Graph bivariate data using scatter plots and identify possible associations between the variables</p>	<p>Statistics and Probability 8 SP Investigate patterns of association in bivariate data.</p>	<p>8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and non linear association.</p>
<p>Progress Indicator: M.DPS.1i using box plots, interquartile range, mean absolute deviation, range, and the concept of outliers to characterize the distribution (variability) of univariate data</p>		
<p>Core Content Connectors: 8</p>	<p>CCSS Domain/Cluster</p>	<p>Common Core State Standard</p>
<p>8.DPS.1i3 Using box plots and scatter plots, identify data points that appear to be outliers</p>	<p>Statistics and Probability 8 SP Investigate patterns of association in bivariate data.</p>	<p>8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and non linear association.</p>
<p>8.DPS.1i4 Identify outliers, range, mean, median, and mode</p>	<p>Statistics and Probability 6 SP Summarize and describe</p>	<p>6.SP.5 Summarize numerical data sets in relation to their context, such as by:</p>

	distributions.	c) Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
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Progress Indicator: M.DPS.1j comparing two unequal distributions of data using number of data points, measures of central tendency, shape, and variability (numerical data), and two-way tables (categorical variables)		
Core Content Connectors: 8	CCSS Domain/Cluster	Common Core State Standard
8.DPS.1j2 Make or select an appropriate statement based upon two unequal data sets using measure of central tendency and shape	Statistics and Probability 7 SP Draw informal comparative inferences about two populations.	7.SP.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about the two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i>
Progress Indicator: M.DPS.1k supporting claims about the results of investigations (e.g., coordinating among the measures of central tendency and variability)		
Core Content Connectors: 8	CCSS Domain/Cluster	Common Core State Standard
8.DPS.1k2 Analyze displays of bivariate data to develop or select appropriate claims about those data	Statistics and Probability 8 SP Investigate patterns of association in bivariate data.	8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. <i>For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?</i>

Progress Indicator: H.DPS.1a designing and conducting different kinds of studies using categorical and numerical data, explain results, and use data to estimate a population mean or proportion: a. observational studies (e.g., traffic patterns at an intersection near the school); b. sample surveys (a survey of student nutritional habits); c. simple comparative experiments (e.g., comparisons of water and fertilizer treatments in a plant growth experiment)		
Core Content Connectors: 9-12	CCSS Domain/Cluster	Common Core State Standard
H.DPS.1a1 Design study using categorical and continuous data, including creating a question, identifying a sample, and making a	Interpreting Categorical and Quantitative Data S ID Summarize, represent and interpret data on two categorical	S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data. Recognize possible associations and trends in the data.

plan for data collection	and quantitative variables.	
Progress Indicator: H.DPS.1b representing data with plots on the real number line (dot plots, histograms, box plots)		
Core Content Connectors: 9-12	CCSS Domain/Cluster	Common Core State Standard
H.DPS.1b1 Complete a graph given the data, using dot plots, histograms, or box plots	Interpreting Categorical and Quantitative Data S ID Summarize, represent, and interpret data on a single count or measurement variable.	S.ID.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).
Progress Indicator: H.DPS.1c analyzing and summarizing the data resulting from studies using statistical measures appropriate to shape of the data (median, mean) and spread (interquartile range, standard deviation), and using data to support inferences (population parameters, sample size) or explain possible outliers		
Core Content Connectors: 9-12	CCSS Domain/Cluster	Common Core State Standard
H.DPS.1c1 Use descriptive stats; range, median, mode, mean, outliers/gaps to describe the data set	Interpreting Categorical and Quantitative Data S ID Summarize, represent, and interpret data on a single count or measurement variable. S ID Summarize, represent and interpret data on two categorical and quantitative variables.	S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets. S.ID.4 Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data. Recognize possible associations and trends in the data.
H.DPS.1c2 Compare means, median, and range of 2 sets of data	Interpreting Categorical and Quantitative Data S ID Summarize, represent and interpret data on two categorical and quantitative variables.	S.ID.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
H.DPS.1c3 Determine what inferences can be made from statistics	Making Inferences and Justifying Conclusions S IC Understand and evaluate random processes underlying statistical experiments.	S.IC.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Progress Indicator: H.DPS.1d representing and interpreting data (graphs, scatter plots) to explain how variables are related, or to fit a function to the data		
Core Content Connectors: 9-12	CCSS Domain/Cluster	Common Core State Standard
H.DPS.1d1 Represent data on a scatter plot to describe and predict	Interpreting Categorical and Quantitative Data S ID Summarize, represent and interpret data on two categorical and quantitative variables.	S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
H.DPS.1d2 Select an appropriate statement that describes the relationship between variables	Interpreting Categorical and Quantitative Data S ID Summarize, represent and interpret data on two categorical and quantitative variables.	S.ID.6 Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.
H.DPS.1d3 Make or select an appropriate statement(s) about findings	Making Inferences and Justifying Conclusions S IC Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	S.IC.6 Evaluate reports based on data.
H.DPS.1d4 Apply the results of the data to a real world situation	Making Inferences and Justifying Conclusions S IC Make inferences and justify conclusions from sample surveys, experiments, and observational studies.	S.IC.6 Evaluate reports based on data.