Orange Public Schools

Office of Curriculum & Instruction
2019-2020 Mathematics Curriculum Guide

PLTW Gateway
Design and Modeling

Curriculum Framework

September 9, 2019 – June 25, 2020

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Meaning
***Essential Questions**: Students will keep considering…* • EQ1.1 How is a design process used to effectively develop a design solution that solves a problem or addresses a design opportunity? • EQ1.2 Why is communication of design ideas with teams and with stakeholders important throughout the design process? • EQ1.3 How are sketches used to document and communicate design ideas with accuracy? • EQ1.4 What role do team norms play in making a collaborative team more successful? • EQ1.5 Why are accurate measurement, precise dimensioning, and thorough documenting necessary for both mechanical dissection and creative problem solving?

Meaning	*Acquisition*	
Domains/Understandings *Domains are key understandings and long-term takeaways that go beyond factual knowledge into broader and more conceptual comprehensions.* *Domains are areas of expertise that an employer in a specific field may seek.* ***"I will be able to address real-world challenges because I understand…"***	*Transfers/Learning Objectives* *Objectives articulate what skills students need to be able to do. (The learning objectives will become targets of assessment.)* *Objectives are functions that directly relate to the workplace or in an applied academic setting.* ***"In the workplace or academic setting, I will need to know and be able to…"***	*Knowledge and Skills* *Knowledge and skills include the essential facts and basic concepts that a student should know and be able to recall in order to perform the competency.* *Knowledge and skill statements are foundational to the performance of a skill.* ***"After I learn the information, I will be able to use my knowledge and skills to…"***
D1.1: Mindset Ethics, analytical thinking, creativity, persistence, iteration, and the positive role of failure are important mindsets and habits of action. They are developed over time in problem solving processes, inquiry, and computational thinking.	LO1.1A: Describe and/or analyze moments within a problem solving process where persistence, iteration, and the positive aspect of failure played an important role in gaining understanding about a problem or unexpected observation.	KS1.1A1: Understand that problem solving and experimentation are cyclical, meaning steps are repeated as many times as needed.
D1.2: Problem Solving Process and/or Design Process	LO1.2A: Apply an iterative process to solve a problem	KS1.2A1: Recall that the goal of any design process is to create solutions and opportunities for people and society,

Many disciplines, including engineering, computer science, and biomedical science, use an iterative problem solving process or engineering design process.	or create an opportunity that can be justified.	while justifying the cost and effort involved. KS1.2A3: Recognize that all solution attempts should be realistic and based on identified design requirements, which include specifications, constraints, desired features, and testable parameters. KS1.2A6: Create multiple solution options and evaluate those options with tools such as a decision matrix to justify a data-driven path forward.
	LO1.2B: Analyze and describe design functionality by observation of an artifact.	KS1.2B1: Describe reverse engineering as a process that allows designers to gain understanding about the functionality of an artifact, component, assembly, or system. KS1.2B2: Deconstruct an artifact to gain understanding about its functionality. KS1.2B3: Recognize that designers must be unbiased in reflecting and presenting their design process. The process only has validity through stakeholder and peer review. KS1.2B5: Illustrate how the context in which an artifact is used determines the correctness, usability, functionality, and suitability of the artifact.
D2.1: Modeling Designing and creating models are essential to the engineering design and problem solving processes. Models are used to represent an artifact or a system to better understand its attributes and/or behavior. Models can be physical, mathematical, computer-generated, and/or simulated.	LO2.1D: Create a physical model or prototype.	KS2.1D1: Construct a prototype based on design documentation. KS2.1D2: Conduct prototype testing to identify design flaws or additional needs. KS2.1D3: Analyze and interpret testing data collected and make modifications to optimize the design or process.
D2.2: Measurement and Estimation A common measurement system is essential to design accuracy for sketches, models, and prototypes. Measuring and dimensioning objects using appropriate tools are critical to effectively communicate and collaborate on design solutions.	LO2.2A: Measure and present values appropriate to standards of accuracy and precision.	KS2.2A1: Identify the proper tool to use to measure and dimension with accuracy and precision. KS2.2A2: Identify the appropriate equation for area and volume problems. KS2.2A3: Measure objects to create accurate design sketches.

D2.3: Spatial Visualization Sketching allows designers to quickly communicate ideas with accurate dimensions and details. Using technology, two-dimensional sketches can be represented in a three-dimensional solid model. Solid models allow designers to view multiple aspects and perspectives of a design.	LO2.3A: Translate and interoperate between 2D and 3D design representations.	KS2.3A1: Differentiate between two-dimensional and three-dimensional models including the strengths and limitations of each. KS2.3A2: Interpret multiview drawings, specifications, dimensions, and annotations.
	LO2.3B: Sketch and/or interpret perspective, isometric, and multiview drawings with adequate attention to standards and critical annotations.	KS2.3B1: Recognize perspective, thumbnail, isometric, and multiview sketches. KS2.3B2: Recognize that isometric drawings of an object are used to provide information that a perspective drawing may not be able to show. KS2.3B3: Summarize the reasoning for using sketching as a communication tool. KS2.3B4: Apply dimensions on a multiview sketch following the guidelines of dimensioning. KS2.3B5: Create a rapid, accurate sketch to communicate ideas.
D3.1 Collaboration Effective problem solving, experimentation, and/or design are most often conducted within teams.	LO3.1A: Collaborate effectively on a diverse and multi-disciplinary team.	KS3.1A2: Identify and value the contributions of each team member. KS3.1A3: Illustrate successful collaboration through effective communication and constructive feedback. KS3.1A4: Apply team norms to encourage productivity and define how a team will function and measure its success. KS3.1A5: Identify and evaluate positive and negative behaviors that impact the team's effectiveness. KS3.1A6: Recognize individual strengths when defining roles and responsibilities.
D3.2: Communication Communication can often be categorized as technical communication or professional communication.	LO3.2A: Communicate effectively for specific purposes and settings.	KS3.2A2: Distinguish technical communication artifacts that capture a process, including but not limited to engineering notebooks, laboratory journals, technical presentations, sketches, technical drawings, design briefs, design reviews, laboratory reports, and code. KS3.2A3: Demonstrate best practices that are widely accepted by professionals when they communicate such as how to present visual media, oral presentations, and

		professional correspondence. KS3.2A4: Communicate to meet the needs of the audience and be appropriate to the situation. KS3.2A5: Demonstrate proper elements of written and electronic communication (spelling, grammar and formatting) at all times when communicating with a team or stakeholder in a process. KS3.2A6: Use accurate terminology when communicating about systems and processes.
	LO3.2B: Document a process according to professional standards.	KS3.2B1: Present data and information through a variety of accepted means such as: graphs, charts, images, video, schematics, code, 3D models, and simulations.
D3.4 Career Awareness It is important to prepare a flexible education plan that matches your interests, knowing that you can change or modify that plan as you discover more about career opportunities.	LO3.4B: Describe the role, connections between disciplines, and impact of engineering, biomedical science, and computer science on society.	KS3.2B1: Present data and information through a variety of accepted means such as: graphs, charts, images, video, schematics, code, 3D models, and simulations. KS3.4B2: Recognize that engineering, biomedical science, and computer science fields impact various career paths, industries, and our society.

Meaning
***Essential Questions**: Students will keep considering…* • EQ2.1 How is a design process used to effectively develop a design solution that solves a problem or addresses a design opportunity? • EQ2.2 Why would a designer choose to communicate a solid object design with two-dimensional sketches rather than a three-dimensional model. • EQ2.3 How has the evolution of rapid prototyping tools impacted design fabrication? • EQ2.4 How is design testing data used to improve design solutions? • EQ2.5 How does using a CAD application benefit an engineer? • EQ2.6 Why is it important for an engineer to be aware of the criteria and the constraints when designing a project? • EQ2.7 How does documentation play a critical role in each step of the design process? • EQ2.8 How can mathematical modeling help designers understand a design? • EQ2.9 How can computational thinking be applied when developing an engineering solution? • EQ2.10 What is the role of statistical analysis in the design process?

Meaning	*Acquisition*	
Domains/Understandings *Domains are key understandings and long-term takeaways that go beyond factual knowledge into broader and more conceptual comprehensions.* *Domains are areas of expertise that an employer in a specific field may seek.* *"I will be able to address real-world challenges because I understand…"*	*Transfers/Learning Objectives* *Objectives articulate what skills students need to be able to do. (The learning objectives will become targets of assessment.)* *Objectives are functions that directly relate to the workplace or in an applied academic setting.* *"In the workplace or academic setting, I will need to know and be able to…"*	*Knowledge and Skills* *Knowledge and skills include the essential facts and basic concepts that a student should know and be able to recall in order to perform the competency.* *Knowledge and skill statements are foundational to the performance of a skill.* *"After I learn the information, I will be able to use my knowledge and skills to…"*
D1.1: Mindset Ethics, analytical thinking, creativity, persistence, iteration, and the positive role of failure are important mindsets and habits of action. They are developed over time in problem solving processes, inquiry, and computational thinking.	LO1.1A: Describe and/or analyze moments within a problem solving process where persistence, iteration, and the positive aspect of failure played an important role in gaining understanding about a problem or unexpected observation.	KS1.1A1: Understand that problem solving and experimentation are cyclical, meaning steps are repeated as many times as needed. KS1.1A2: Recognize that identifying complex problems, defining them clearly, and proposing solutions can be difficult and requires persistence and iteration. KS1.1A3: Describe how failure can produce positive outcomes by improving understanding.

	LO1.1C: Analyze problems or artifacts when developing solutions.	KS1.1C1: Demonstrate analytical thinking when evaluating a proposed solution, locating and correcting errors, explaining how something functions, gaining understanding through experimentation, and/or justifying the appropriateness of a solution, model, or artifact.
	LO1.1E: Recognize that models are used to make predictions and/or learn about a phenomenon, situation, or design.	KS1.1E1: Identify various models that may be used, which include but are not limited to physical models (prototypes), mathematical models, simulations, schematics, code, and 3D and 2D representations. KS1.1E2: Compare and contrast the various types of models used when designing a solution.
D1.2: Problem Solving Process and/or Design Process Many disciplines, including engineering, computer science, and biomedical science, use an iterative problem solving process or engineering design process.	LO1.2A: Apply an iterative process to solve a problem or create an opportunity that can be justified.	KS1.2A3: Recognize that all solution attempts should be realistic and based on identified design requirements, which include specifications, constraints, desired features, and testable parameters.
D1.3: Computational Thinking Computational thinking is used to solve problems or create solutions based on an identified need or an opportunity. Common concepts of computational thinking include: the use of algorithms, abstraction, problem decomposition, and data analysis and processing. Computational thinking can support solving problems across many disciplines including math, science, humanities, engineering, and computer science.	LO1.3A: Apply computational thinking to solve problems.	KS1.3A1: Recognize that computational thinking can be applied in all domains. KS1.3A3: Apply logical reasoning by organizing the steps of an algorithm into the correct sequence. KS1.3A4: Understand that different algorithms can be used to solve the same problem.
D2.1: Modeling Designing and creating models are essential to the engineering design and problem solving processes. Models are used to represent an artifact or a system to better understand its attributes and/or behavior. Models can be physical, mathematical, computer-generated, and/or simulated.	LO2.1A: Apply a mathematical model to represent an authentic situation.	KS2.1A1: Recognize that mathematical equations can be used to create models through tables, charts, and simulations.
	LO2.1C: Construct a computer-generated solid model.	KS2.1C1: Develop solid models using two-dimensional geometric shapes and three-dimensional geometric primitives. KS2.1C2: Construct new solid models using geometric primitives with additive and subtractive methods. KS2.1C3: Apply geometric and dimensional constraints to

		solid model designs.
	LO2.1D: Create a physical model or prototype.	KS2.1D1: Construct a prototype based on design documentation. KS2.1D2: Conduct prototype testing to identify design flaws or additional needs. KS2.1D3: Analyze and interpret testing data collected and make modifications to optimize the design or process.
D2.2: Measurement and Estimation A common measurement system is essential to design accuracy for sketches, models, and prototypes. Measuring and dimensioning objects using appropriate tools are critical to effectively communicate and collaborate on design solutions.	LO2.2A: Measure and present values appropriate to standards of accuracy and precision.	KS2.2A1: Identify the proper tool to use to measure and dimension with accuracy and precision. KS2.2A2: Identify the appropriate equation for area and volume problems.
D2.3: Spatial Visualization Sketching allows designers to quickly communicate ideas with accurate dimensions and details. Using technology, two-dimensional sketches can be represented in a three-dimensional solid model. Solid models allow designers to view multiple aspects and perspectives of a design.	LO2.3A: Translate and interoperate between 2D and 3D design representations.	KS2.3A1: Differentiate between two-dimensional and three-dimensional models including the strengths and limitations of each. KS2.3A2: Interpret multiview drawings, specifications, dimensions, and annotations.
	LO2.3B: Sketch and/or interpret perspective, isometric, and multiview drawings with adequate attention to standards and critical annotations.	KS2.3B3: Summarize the reasoning for using sketching as a communication tool. KS2.3B4: Apply dimensions on a multiview sketch following the guidelines of dimensioning. KS2.3B5: Create a rapid, accurate sketch to communicate ideas.
D2.4 Tools and Technology There are a variety of tools and technology used during the different stages of an engineering design or problem-solving process. They include, but are not limited to, measuring tools, drawing tools, software applications including computer-aided design (CAD), computer algebra system (CAS) applications, modeling and simulation, data representation, and online resources.	LO2.4A: Select and apply tools and technology appropriately to develop solutions, create artifacts, and/or conduct investigations into engineering, biomedical science, and computational problems/needs.	KS2.4A1: Recognize the existence of various tools and technology that can be used when developing solutions or artifacts or conducting experiments. KS2.4A2: Select the appropriate tools and technology based on the needs of the project and the team.

D3.1 Collaboration Effective problem solving, experimentation, and/or design are most often conducted within teams.	LO3.1A: Collaborate effectively on a diverse and multi-disciplinary team.	KS3.1A1: Describe how diverse perspectives in collaboration typically produce the best results in a process. KS3.1A4: Apply team norms to encourage productivity and define how a team will function and measure its success.
D3.2: Communication Communication can often be categorized as technical communication or professional communication.	LO3.2A: Communicate effectively for specific purposes and settings.	KS3.2A3: Demonstrate best practices that are widely accepted by professionals when they communicate such as how to present visual media, oral presentations, and professional correspondence.
	LO3.2C: Construct and communicate informed decisions supported by evidence.	KS3.2C2: Use current and accurate research and testing documentation.

Meaning
***Essential Questions**: Students will keep considering…* • EQ3.1 Why is it important to engage stakeholders during the design process? • EQ3.2 Why are teams of people more successful than an individual when solving problems? • EQ3.3 Why is brainstorming, research, and testing important when creating, modifying, or improving a design solution?

Meaning	*Acquisition*	
Domains/Understandings *Domains are key understandings and long-term takeaways that go beyond factual knowledge into broader and more conceptual comprehensions.* *Domains are areas of expertise that an employer in a specific field may seek.* *"I will be able to address real-world challenges because I understand…"*	*Transfers/Learning Objectives* *Objectives articulate what skills students need to be able to do. (The learning objectives will become targets of assessment.)* *Objectives are functions that directly relate to the workplace or in an applied academic setting.* *"In the workplace or academic setting, I will need to know and be able to…"*	*Knowledge and Skills* *Knowledge and skills include the essential facts and basic concepts that a student should know and be able to recall in order to perform the competency.* *Knowledge and skill statements are foundational to the performance of a skill.* *"After I learn the information, I will be able to use my knowledge and skills to…"*
D1.1: Mindset Ethics, analytical thinking, creativity, persistence, iteration, and the positive role of failure are important mindsets and habits of action. They are developed over time in problem solving processes, inquiry, and computational thinking.	LO1.1A: Describe and/or analyze moments within a problem solving process where persistence, iteration, and the positive aspect of failure played an important role in gaining understanding about a problem or unexpected observation.	KS1.1A1: Understand that problem solving and experimentation are cyclical, meaning steps are repeated as many times as needed. KS1.1A2: Recognize that identifying complex problems, defining them clearly, and proposing solutions can be difficult and requires persistence and iteration. KS1.1A3: Describe how failure can produce positive outcomes by improving understanding.

	LO1.1B: Demonstrate creativity and courage to take risks in proposing designs.	KS1.1B2: Generate ideas or build upon other ideas to innovate. KS1.1B3: Develop solutions employing non-traditional techniques; novel combinations of artifacts, tools, techniques; and exploration of personal curiosities throughout a creative process.
	LO1.1C: Analyze problems or artifacts when developing solutions.	KS1.1C1: Demonstrate analytical thinking when evaluating a proposed solution, locating and correcting errors, explaining how something functions, gaining understanding through experimentation, and/or justifying the appropriateness of a solution, model, or artifact.
	LO1.1E: Recognize that models are used to make predictions and/or learn about a phenomenon, situation, or design.	KS1.1E1: Identify various models that may be used, which include but are not limited to physical models (prototypes), mathematical models, simulations, schematics, code, and 3D and 2D representations. KS1.1E2: Compare and contrast the various types of models used when designing a solution.
	LO1.1F: Identify ethical considerations that must be considered when creating solutions or opportunities.	KS1.1F1: Recognize that ethical considerations include but are not limited to safety, impact on future generations (sustainability), and recognizing the work of others (intellectual property). KS1.1F2: Explain how universal design considers the broadest possible spectrum of human ability in the design of products, environments and information systems.

D1.2: Problem Solving Process and/or Design Process Many disciplines, including engineering, computer science, and biomedical science, use an iterative problem solving process or engineering design process.	LO1.2A: Apply an iterative process to solve a problem or create an opportunity that can be justified.	KS1.2A1: Recall that the goal of any design process is to create solutions and opportunities for people and society, while justifying the cost and effort involved. KS1.2A2: Identify a problem and justify the pursuit of a solution to the problem. KS1.2A3: Recognize that all solution attempts should be realistic and based on identified design requirements, which include specifications, constraints, desired features, and testable parameters. KS1.2A4: Define the problem or opportunity identified through research and stakeholder engagement prior to any solution attempt. This includes examining prior solution attempts. KS1.2A5: Evaluate, define, and/or prioritize realistic design requirements including specifications, constraints, desired features, and testable parameters. KS1.2A6: Create multiple solution options and evaluate those options with tools such as a decision matrix to justify a data-driven path forward. KS1.2A7: Create and execute an iterative testing plan to provide evidence that a solution meets the design requirements.
	LO1.2B: Analyze and describe design functionality by observation of an artifact.	KS1.2B3: Recognize that designers must be unbiased in reflecting and presenting their design process. The process only has validity through stakeholder and peer review. KS1.2B4: Evaluate the validity of a testing plan and conclusions drawn from a process. KS1.2B5: Illustrate how the context in which an artifact is used determines the correctness, usability, functionality, and suitability of the artifact.
	LO1.3B: Organize, process, and analyze data to understand a real-world situation.	KS1.3B3: Collect and process data to facilitate the creation of knowledge. KS1.3B4: Interpret data to gain insight on a problem and draw conclusions.

	LO2.1C: Construct a computer-generated solid model.	KS2.1C1: Develop solid models using two-dimensional geometric shapes and three-dimensional geometric primitives. KS2.1C2: Construct new solid models using geometric primitives with additive and subtractive methods. KS2.1C3: Apply geometric and dimensional constraints to solid model designs.
	LO2.1D: Create a physical model or prototype.	KS2.1D1: Construct a prototype based on design documentation. KS2.1D2: Conduct prototype testing to identify design flaws or additional needs. KS2.1D3: Analyze and interpret testing data collected and make modifications to optimize the design or process.
D2.2: Measurement and Estimation A common measurement system is essential to design accuracy for sketches, models, and prototypes. Measuring and dimensioning objects using appropriate tools are critical to effectively communicate and collaborate on design solutions.	LO2.2A: Measure and present values appropriate to standards of accuracy and precision.	KS2.2A1: Identify the proper tool to use to measure and dimension with accuracy and precision. KS2.2A3: Measure objects to create accurate design sketches.
D2.3: Spatial Visualization Sketching allows designers to quickly communicate ideas with accurate dimensions and details. Using technology, two-dimensional sketches can be represented in a three-dimensional solid model. Solid models allow designers to view multiple aspects and perspectives of a design.	LO2.3A: Translate and interoperate between 2D and 3D design representations.	KS2.3A1: Differentiate between two-dimensional and three-dimensional models including the strengths and limitations of each. KS2.3A2: Interpret multiview drawings, specifications, dimensions, and annotations.

	LO2.3B: Sketch and/or interpret perspective, isometric, and multiview drawings with adequate attention to standards and critical annotations.	KS2.3B1: Recognize perspective, thumbnail, isometric, and multiview sketches. KS2.3B2: Recognize that isometric drawings of an object are used to provide information that a perspective drawing may not be able to show. KS2.3B4: Apply dimensions on a multiview sketch following the guidelines of dimensioning. KS2.3B5: Create a rapid, accurate sketch to communicate ideas.
D2.4: Tools and Technology There are a variety of tools and technology used during the different stages of an engineering design or problem-solving process. They include, but are not limited to, measuring tools, drawing tools, software applications including computer-aided design (CAD), computer algebra system (CAS) applications, modeling and simulation, data representation, and online resources.	LO2.4A: Select and apply tools and technology appropriately to develop solutions, create artifacts, and/or conduct investigations into engineering, biomedical science, and computational problems/needs.	KS2.4A2: Select the appropriate tools and technology based on the needs of the project and the team.

D3.1: Collaboration Effective problem solving, experimentation, and/or design are most often conducted within teams.	LO3.1A: Collaborate effectively on a diverse and multi-disciplinary team.	KS3.1A1: Describe how diverse perspectives in collaboration typically produce the best results in a process. KS3.1A2: Identify and value the contributions of each team member. KS3.1A3: Illustrate successful collaboration through effective communication and constructive feedback. KS3.1A4: Apply team norms to encourage productivity and define how a team will function and measure its success. KS3.1A5: Identify and evaluate positive and negative behaviors that impact the team's effectiveness. KS3.1A6: Recognize individual strengths when defining roles and responsibilities.

D3.2: Communication Communication can often be categorized as technical communication or professional communication.		KS3.2A2: Distinguish technical communication artifacts that capture a process, including but not limited to engineering notebooks, laboratory journals, technical presentations, sketches, technical drawings, design briefs, design reviews, laboratory reports, and code. KS3.2A3: Demonstrate best practices that are widely accepted by professionals when they communicate such as how to present visual media, oral presentations, and professional correspondence. KS3.2A4: Communicate to meet the needs of the audience and be appropriate to the situation. KS3.2A5: Demonstrate proper elements of written and electronic communication (spelling, grammar and formatting) at all times when communicating with a team or stakeholder in a process. KS3.2A6: Use accurate terminology when communicating about systems and processes.
	LO3.2B: Document a process according to professional standards.	KS3.2B1: Present data and information through a variety of accepted means such as: graphs, charts, images, video, schematics, code, 3D models, and simulations.
	LO3.2C: Construct and communicate informed decisions supported by evidence.	KS3.2C1: Recognize that the validity of sources will provide credibility to one's arguments.
		KS3.2C2: Use current and accurate research and testing documentation.

D3.3: Project Management The discipline of carefully projecting or planning, organizing, motivating and controlling resources to achieve specific goals and meet specific success criteria.	LO3.3A: Demonstrate the ability to manage multiple resources throughout a project.	KS3.3A1: Identify resources managed in a project to include time, capital, energy, information, materials, people, tools, and machines. KS3.3A2: Create and execute a plan to manage and use resources.
	LO3.3B: Justify decisions and provide rationales when making tradeoffs between resources.	KS3.3B1: Recognize that processes involve tradeoffs when weighing the need against effort and resources available. KS3.3B2: Demonstrate sound judgement when making decisions regarding resources and their potential tradeoffs.

<table>
<tr><th colspan="2">Modifications</th></tr>
<tr><th>Special Education/504:</th><th>English Language Learners:</th></tr>
<tr><td>Adhere to all modifications and health concerns stated in each IEP.
Give students a MENU of options, allowing them to choose assignments from different levels based on difficulty.
Accommodate Instructional Strategies: use of post-its, reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), handouts, definition list with visuals, extended time
Allow extra time to complete assignments or tests
Allow students to demonstrate understanding of a problem by drawing a functional model of the answer and then explaining the reasoning orally and/or writing.
Provide breaks between tasks, use positive reinforcement, use proximity
Work in a small group
Use large print books, Braille, or digital texts
Strategies for Students with 504 Plans</td><td>Simplify written and verbal instructions
Use manipulatives to promote conceptual understanding and enhance vocabulary usage
Allow for alternate forms of responses- drawing or speaking instead of writing to demonstrate knowledge when you are not specifically assessing writing
Allow the use of an online dictionary to look up the definition and hear the pronunciation of unknown words
Provide graphic representations, gestures, drawings, equations, and pictures during all segments of instruction
Utilize program translations tools such as Snap and Read (if available)
Utilize graphic organizers which are concrete, pictorial ways of constructing knowledge and organizing information
Use sentence frames and questioning strategies so that students will explain their thinking/ process of how to solve real life problems.
Reword questions in simpler language
Provide class notes ahead of time to allow students to preview material and increase comprehension
Provide extended time</td></tr>
<tr><th>Gifted and Talented:</th><th>Students at Risk for Failure:</th></tr>
<tr><td>Organize and offer flexible small group learning opportunities / activities.
Utilize elevated contextual complexity
Inquiry based or open ended assignments, performance tasks and projects
Allow more time to study concepts with greater depth
Provide options, alternatives and choices to differentiate and broaden the curriculum.
Promote the synthesis of concepts and making real world connections</td><td>Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum
Modify Instructional Strategies; extended time, reading aloud text, graphic organizers, flexible grouping, one-on-one instruction, class website (Google Classroom), inclusion of more visuals and manipulatives, Utilize Scaffolded Questioning, Field Trips, Google Expeditions, Peer Support, Modified Assignments, Chunking of Information, Peer Buddies
Assure constant parental/ guardian contact throughout the year with successes/ challenges</td></tr>
</table>

• Provide students with enrichment practice that are imbedded in the curriculum o allowing students to design problems to be addressed by the class o allowing students to modify the lesson by introducing a related phenomena o allow for interest-based extension activities • Utilize an enhanced set of introductory activities (e.g. phenomena, organizers, concept maps etc) • Provide whole group enrichment explorations. • Teach cognitive and methodological skills • Allow for the use of stations • Organize integrated problem-solving simulations.	• Provide academic contracts to students and guardians • Create an interactive notebook with samples, key vocabulary words, student goals/ objectives. • Always plan to address students at risk in the designing of learning tasks, instructions, and directions. • Try to anticipate where the needs will be and then address them prior to lessons. • Teacher should allow for preferential seating • Include Visual Cues/Modeling • Allow for technology Integration, especially Assistive Technology

21st Century Life and Career Skills:

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century workplace.

As such, they should be taught and reinforced in all career exploration and preparation programs, with increasingly higher levels of complexity and expectation as a student advances through a program of study.

https://www.state.nj.us/education/cccs/2014/career/9.pdf

- **CRP1**. Act as a responsible and contributing citizen and employee.
- **CRP2**. Apply appropriate academic and technical skills.
- **CRP3**. Attend to personal health and financial well-being.
- **CRP4**. Communicate clearly and effectively and with reason.
- **CRP5**. Consider the environmental, social and economic impacts of decisions.
- **CRP6**. Demonstrate creativity and innovation.
- **CRP7**. Employ valid and reliable research strategies.
- **CRP8**. Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP9**. Model integrity, ethical leadership and effective management.
- **CRP10**. Plan education and career paths aligned to personal goals.
- **CRP11**. Use technology to enhance productivity.
- **CRP12**. Work productively in teams while using cultural global competence.

Students are provided with an equitable opportunity to communicate with peers effectively, clearly, and with the use of technical language. They are also encouraged to reason through experiences and exposure to phenomena that promote critical thinking and emphasize the importance of perseverance. Students are exposed to various mediums of technology, such as digital learning, and educational websites.

Technology Standards:

All students will be prepared to meet the challenge of a dynamic global society in which they participate, contribute, achieve, and flourish through universal access to people, information, and ideas.

https://www.state.nj.us/education/cccs/2014/tech/

8.1 Educational Technology:	8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:
All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge. A. **Technology Operations and Concepts:** Students demonstrate a sound understanding of technology concepts, systems and operations. B. **Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology. C. **Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others. D. **Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior. E. **Research and Information Fluency:** Students apply digital tools to gather, evaluate, and use of information. F. **Critical thinking, problem solving, and decision making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment. A. **The Nature of Technology: Creativity and Innovation-** Technology systems impact every aspect of the world in which we live. B. **Technology and Society:** Knowledge and understanding of human, cultural, and societal values are fundamental when designing technological systems and products in the global society. C. **Design:** The design process is a systematic approach to solving problems. D. **Abilities in a Technological World:** The designed world in a product of a design process that provides the means to convert resources into products and systems. E. **Computational Thinking: Programming-** Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Interdisciplinary Connections:

Science:

- MS-ETS1-1 - Engineering Design
  Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-2 - Engineering Design Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- MS-ETS1-3 - Engineering Design
  Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- MS-ETS1-4 - Engineering Design
  Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
- P1 - Science and Engineering Practices
  Asking questions (for science) and defining problems (for engineering)
- P2 - Science and Engineering Practices
  Developing and using models
- P3 - Science and Engineering Practices
  Planning and carrying out investigations
- P4 - Science and Engineering Practices
  Analyzing and interpreting data
- P5 - Science and Engineering Practices
  Using mathematics and computational thinking
- P6 - Science and Engineering Practices
  Constructing explanations (for science) and designing solutions (for engineering)
- P7 - Science and Engineering Practices
  Engaging in argument from evidence
- P8 - Science and Engineering Practices
  Obtaining, evaluating, and communicating information

Interdisciplinary Connections:

English Language Arts:

- 7.RL.4 - Reading Literature

Determine the meaning of words and phrases as they are used in a text, including figurative and connotative meanings; analyze the impact of rhymes and other repetitions of sounds (e.g., alliteration) on a specific verse or stanza of a poem or section of a story or drama.

- 7.RI.4 - Reading Informational

Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.

- 7.W.2 -Writing

Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

- 7.W.2.d -Writing

Use precise language and domain-specific vocabulary to inform about or explain the topic.

- 7.W.3.d -Writing

Use precise words and phrases, relevant descriptive details, and sensory language to capture the action and convey experiences and events.

- 7.SL.1 – Speaking and Listening

Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

- 7.SL.1.b - Speaking and Listening

Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.

- 7.SL.1.c - Speaking and Listening

Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.

- 7.SL.1.d - Speaking and Listening

Acknowledge new information expressed by others and, when warranted, modify their own views.

- 7.SL.6 - Speaking and Listening

Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

- 7.L.2.b - Language

Spell correctly.

- 7.L.3 - Language

Use knowledge of language and its conventions when writing, speaking, reading, or listening.

- 7.L.4.a - Language

Use context (e.g., the overall meaning of a sentence or paragraph; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.

- 7.L.4.c - Language

Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning or its part of speech.

- 7.L.5.b - Language

Use the relationship between particular words (e.g., synonym/antonym, analogy) to better understand each of the words.

- 7.L.6 - Language

Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases; gather vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Interdisciplinary Connections:

Mathematics:

- 6.RP.3 - Ratios and Proportional Relationships
  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.
- 6.RP.3.b - Ratios and Proportional Relationships
  Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?
- 6.RP.3.d - Ratios and Proportional Relationships
  Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
- 6.NS.1 - The Number System
  Interpret and compute quotients of fractions and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9, because3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?
- 6.NS.2 - The Number System
  Fluently divide multi-digit numbers using the standard algorithm.
- 6.NS.3 - The Number System
  Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.6 - The Number System
  Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.

- 6.NS.6.a - The Number System
  Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite.
- 6.NS.6.b - The Number System
  Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
- 6.NS.6.c - The Number System
  Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
- 6.NS.8 - The Number System
- Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.
- 6.G.1 - Geometry
  Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
- 6.G.2 - Geometry
  Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = b h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
- 6.G.3 - Geometry
  Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
- 6.G.4 - Geometry
  Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.
- 6.SP.1 - Statistics and Probability
  Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. 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.
- 6.SP.2 - Statistics and Probability
  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.SP.4 - Statistics and Probability
  Display numerical data in plots on a number line, including dot plots, histograms, and box plots. 6.SP.5 - Statistics and ProbabilitySummarize numerical data sets in relation to their context, such as by: a.Reporting the number of observations.b.Describing the nature of the attribute under investigation, including how itwas measured and its units of measurement. 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. d.Relating the choice of measures of center and variability to the shape of thedata distribution and the context in which the data were gathered.

- 6.SP.5 - Statistics and Probability
  Summarize numerical data sets in relation to their context, such as by:
  a.Reporting the number of observations.
  b.Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
  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.
  d.Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.
- 7.NS.3 - The Number System
  Solve real-world and mathematical problems involving the four operations with rational numbers.
- 7.G.1 - Geometry
  Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- 7.G.2 - Geometry
  Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
- 7.G.3 - Geometry
  Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
- 7.G.4 - Geometry
  Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
- 7.G.6 - Geometry
  Solve real-world and mathematical problems involving area, volume, and surfacearea of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.
- 7.SP.8 - Statistics and Probability
  Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
- 7.SP.8.b - Statistics and Probability
  Represent sample spaces for compound events using methods such as organized lists, tables, and tree diagrams. For an event described in everyday language (for example, “rolling double sixes”), identify the outcomes in the sample spacewhich compose the event.
- 8.G.1 – Geometry
  Verify experimentally the properties of rotations, reflections, and translations:
  a. Lines are taken to lines, and line segments to line segments of the same length.
  b. Angles are taken to angles of the same measure.
  c. Parallel lines are taken to parallel lines.
- 8.G.9 - Geometry
  Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.