BURCH CHARTER SCHOOL OF EXCELLENCE

2020-2021

STEM Curriculum Guide – Grade 5 into Middle School

Approved by the Burch Charter School of Excellence Board of Trustees

August 2020

MISSION STATEMENT OF BURCH CHARTER SCHOOL OF EXCELLENCE:

Burch Charter School of Excellence (BCSE) was founded in September, 2008. Our primal mission is to enable students to reach their intellectual and personal potential. We strive to instill integrity and respect in our students' in partnership with families and the community. We maintain a blended learning environment that enhances positive character traits that ensures our students become productive 21st century world citizens. The Burch Charter School of Excellence, a public school, is committed to providing best practices for educating our students in an environment that enables them to develop into critical thinkers that evolve into digital, life-long learners. Our curriculum emphasizes literacy and mathematics infused with technology.

We believe:

- Our students will be effective communicators, quality producers, self-directed lifelong learners, community contributors, collaborative workers and complex thinkers;
- All students are entitled to opportunities to maximize their talents and abilities;
- Our ethnic and cultural diversity is our strength and prepares students for success in a global society;
- Setting high expectations for students, teachers and administrators ensures that our students successfully meet or exceed the New Jersey Student Learning Standards at all grade levels;
- Parents are essential partners in the education of their children;
- Maintaining a strong partnership with the Irvington community is integral to student success;
- Understanding, implementing and responding to current trends in technology is intrinsic to success in a 21st century world; ●   In ensuring that the district has a well-trained, highly qualified and competent staff; ●   In maintaining a safe and secure learning environment.

The underlying values and principles that drive our mission and vision are our personal responsibility, a strong work ethic, cooperation, respect for others, honesty, integrity and the firm belief that every child can learn.

PACING CHART

Unit	Time Frame
Coding & Computer Concepts	10 classes
Engineering & Design	10 classes
Technology Literacy & Citizenship	12 classes
Robotics, Digital Design & STEM Challenge	13 classes
TOTAL:	**45 classes**

8.1 Educational Technology

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.

8.2 Technology Education, Engineering, Design, and Computational Thinking-Programming

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.

Educational Technology
Indicators: 8.1.8.A.1, 8.1.8.B.1, 8.1.8.C.1, 8.1.8.D.1, 8.1.8.D.3, 8.1.8.D.4, 8.1.8.D.5, 8.2.8.A.5, 8.2.8.B.2, 8.2.8.B.5, 8.2.8.B.7, 8.2.8.C.1, 8.2.8.C.6, 8.2.8.D.3, 8.2.8.E.1, 8.2.8.E.2, 8.2.8.E.4,

- Demonstrate knowledge of a real world problem using digital tool.
- Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).
- Collaborate to develop and publish work that provides perspectives on a global problem for discussions with learners from other countries.
- Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.
- Demonstrate an understanding of fair use and Creative Commons to intellectual property.
- Exhibit leadership for digital citizenship.
- Assess the credibility and accuracy of digital content.
- Understand appropriate uses for social media and the negative consequences of misuse.
- Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.
- Identify the desired and undesired consequences from the use of a product or system.
- Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.
- Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product.
- Explain how different teams/groups can contribute to the overall design of a product.

- Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.
- Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.
- Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
- Demonstrate an understanding of the relationship between hardware and software.
- Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).

21st Century Life and Careers Skills

Indicators: 9.1.8.B.10, 9.1.8.D.5, 9.1.8.E.2, 9.2.8.B.4, 9.2.8.B.7,

- Justify safeguarding personal information when using credit cards, banking electronically, or filing forms.
- Explain the economic principle of supply and demand.
- Identify personal information that should not be disclosed to others and the possible consequences of doing or not doing so.
- Evaluate how traditional and nontraditional careers have evolved regionally, nationally, and globally.
- Evaluate the impact of online activities and social media on employer decisions.

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

Grade: 5-8	**Content:** S.T.E.M	
Domain: Coding & Computer Concepts	**Topic:** Programming, Storage, History	**Time Frame:** 10 classes
New Jersey Student Learning Standards: 8.2.5.E.4 Use appropriate terms in conversation (e.g., algorithm, program, debug, loop, events, procedures, memory, storage, processing, software, coding, procedure, and data). 8.2.8.E.3 Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.		

Essential Questions	Enduring Understandings
- How are computers programmed? - How is coding translated into a user experience? - How are computers used in the past versus present? - In what ways have computers revolutionized society? How does accessibility to technology create inequities in the global market? - How can I modify a coded program to enhance the user's experience?	- Any function is possible with the correct coding abilities. - There are multiple coding languages. - Coding represents a text language, both unplugged & digital. - The history and difference in storage amounts. - Cloud-based storage is physically stored on external servers. - The language of coding & mathematics are closely related.
Skills	Student Learning Objectives
Students will be able to: - View the code from any chosen website. - Write an interactive app in Javascript. - Write an original program using Block Coding. - Compare standard storage amounts from the past to the present. - Utilize mathematical functions, such as inequalities and variables, within an original computer program. - Acknowledge the importance of a mentor when desiring for a career involving computer science.	**Students will know how to:** - Use coding to execute a desired function - Identify the hardware involved in cloud-based storage - Comprehend how the history of computers led to its present day application. - Write a program with specific inputs and outputs. - Effectively utilize social media to problem solve when coding.

Vocabulary	Resources	Assessment/Project
Computer Science STEM Scratch: sprite, stage Coding Languages: HTML, CSS, JavaScript, Block, Python Coding: algorithm, binary, bit, byte, code, command, data, bug/debug, drag/drop, loop, if-statement, input/output, pixel, program/programming, variable, The Enigma Project	Chromebooks, Desktops, iPads, Mobile Devices Guest Speakers (Present & via Skype) Class Notes Google Classroom Teacher website Research Tools: Google Scholar, Youtube Coding Resources: Scratch.MIT.Edu, PlayCodeMonkey.com, Codeacademy.org, KhanAcademy.com, BitsBox.com, Code.org	Complete unplugged coding activity from Code.org Write & share an interactive Javascript App using BitsBox Write a program using Block coding in Scratch Write a blog post on the history of computers
Colossus Networks Servers		

Differentiated Instruction		Interdisciplinary Connections
AT RISK STUDENTS	**Enrichment, Gifted and Talented**	This curriculum is aligned with the NJSLS, but is also informed by the ISTE standards, particularly **Empowered Learners:**
RTI: Reteach/peer teaching activities Repeat, clarify, or reword directions Short manageable tasks Small group instruction Give students increased wait time Provide modified materials, as needed	Students will have opportunities to learn & write code in advanced languages, such as JavaScript, Python, HTML, and CSS. Provide advanced independent study options that promote cross-curricular activities.	**ISTE 1a:** Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. **ISTE 7d:** Students explore local and global issues and use collaborative technologies to work with others to investigate solutions. Since all topics and units are to be made with student input, all content is related to topics related to science, technology, engineering, and mathematics, social studies, and art. In addition, This unit encompasses digital literacy skills which support all content
		areas that utilize technology.

Differentiated Instruction: Special Education	Differentiated Instruction: 504
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. - Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). - Provide student with a model of what is expected by sharing exemplary pieces of work. - Give all instructions both in writing and verbally. - Allow student to provide oral responses rather than written ones. - Modifications in classroom and homework assignments (shortened assignments to compensate for amount of time it takes to complete, extended time to complete assignments, reduced amount of written work, breaking down assignments and long-term projects into segments with separate due dates for completion of each segment, allowing student to dictate or tape record responses, allowing student to use computer for written work, oral reports or hands-on projects to demonstrate learning of material)	- Preferential seating away from distractions - Extended time for testing - Modification of test format and delivery (oral exams, use of a calculator, chunking or breaking down tests into smaller sections to complete, providing breaks between sections, quiet place to complete tests, multiple choice or fill in the blank test format instead of essay) - Assistance with note taking (providing student with a copy of class notes, peer assistance with note taking, and give page numbers to locate answers to questions) - Providing clear and simple directions for homework and class assignments (repeating directions, posting homework assignments on board, supplementing verbal instructions with visual/written instructions) - Organizational assistance - Extra set of books for student to keep at home - Two copies of a worksheet, one as draft and other as final copy

ELL Differentiated Instruction which include Listening, Speaking, Reading, and Writng		
Entering	**Beginning**	**Developing**
☐ Provide students with one-step oral commands/instructions Allow ☐ pictorial or graphic representation of the language of the content areas ☐ Ask students to supply missing words in short sentences Teacher-Student Modeling ☐ Think/Read aloud ☐ Choral Reading ☐ Chunking ☐ Verbal clues ☐ Highlight text ☐ Buddy Partner Reading ☐ Ask yes and no questions (i.e. is this a question, does this?) ☐ Help students to learn the classroom routines and school routines. Use a student buddy, if possible someone with the same language. ☐	• Provide students with multi-step oral commands/instructions • Use cloze strategy with pre-taught vocabulary • Provide bilingual dictionaries and glossaries • Use written models in writing instructions (writing samples) • Provide sentence starters, graphic organizers, and outlines for assigned writing topics. • Demonstrate/model the activity for the students. • Ask students to categorize cooking utensils. ☐ Label objects and cooking tools around the kitchen and classroom space. • Post all safety procedures and include picture representations for safety procedures. • Post all sanitary procedures and include picture representations. • Use a student buddy, if possible someone with the same language.	☐ Provide students the opportunity to retell/rephrase ideas from speech ☐ general and some specific language of the content areas; ☐ Multiple meanings of words in context (Tier 2 Academic Vocabulary) ☐ Provide instruction for frequently used affixes and root words ☐ Use English dictionaries and glossaries ☐ Expanded sentences in oral interaction or written paragraphs ☐ Use a student buddy, if possible someone with the same language. ☐ Develop and use non-verbal cues, such as holding up a hand to say, "stop." ☐ Ask questions with 1-3 word answers

Expanding	Bridging
• Assist students with self-editing (syntax and word usage) • Provide explicit instruction on function words (however, moreover, • and in contrast) • Peer tutoring • Use English dictionaries and glossaries • Provide opportunities for students to defend a point of view	• Provide students with target words for the unit • Provide students with metacognitive for problem-solving (tell me how you know it)the technical language of the content areas; • Support students in using a variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays, or reports; • Oral or written language approaching comparability to that of English proficient peers when presented with grade level material

Grade: 5-8	Content: S.T.E.M	
Domain: Engineering & Design	Topic: Design Process, Circuitry, 3D Design/Printing	Time Frame: 10 classes

New Jersey Student Learning Standards:

8.2.8.C.7: Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.

8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

8.2.8.C.2 Explain the need for optimization in a design process.

8.2.5.C.7 Work with peers to redesign an existing product for a different purpose.

Essential Questions	Enduring Understandings
□ How can digital technologies be utilized to innovate, create, teach/inform, share, and reflect? □ How can 3D design enable to the creation of useful prototypes? □ How can the Design and Computational Thinking processes encourage the creation of meaningful and innovative prototypes? □ Under what circumstances does the human factor remain necessary in the engineering design process?	● There are societal benefits to 3D printed technologies. ● Engineering and innovation work collaboratively and benefit society. ● Electricity is conducted via circuits and utilizes insulative and conductive materials. ● There are pros and cons of single-user computer systems and network systems.
Skills	**Student Learning Objectives**

Students will be able to:	Students will know how to:
- Comprehend complete circuits that are grounded. - Apply design and redesign in the engineering process in order to reach a desired goal. - Evaluate several designs and coherently defend their choice in an organized and factual manner. - Identify the relationship between engineering and physical science.	- Utilize the Design Thinking Process methodology as a solutionbased approach to solving problems. - Determine a design solution from a list of team generated possibilities, defend the chosen design and draft a reflection after the chosen design is tested. - Brainstorm techniques to develop design ideas and creative solutions.

Vocabulary	Resources	Assessment/Project
Computer Science, STEM IP Address Servers Design Thinking Empathize Define Ideate Prototype Test Circuit/Circuitry Grounded Conductive/Insulation Alligator Clips	Chromebooks, Desktops, iPads, Mobile Devices Guest Speakers (Present & via Skype) Class Notes Google Classroom Teacher website Makey Makey CIrcuitry Kits with various conductive materials Research Tools: Google Scholar, Youtube	Blog reflection for game design project Students embed prototype on digital portfolio Makey Makey teamwork setup/execution

Differentiated Instruction		Interdisciplinary Connections
RTI/ELL	**Enrichment, Gifted and Talented**	This curriculum is aligned with the NJSLS, but is also informed by the ISTE standards, particularly **Empowered Learners:**
RTI: Reteach/peer teaching activities Repeat, clarify, or reword directions Short manageable tasks Small group instruction Give students increased wait time Provide modified materials, as needed	Combine coding + Makey Makey useage Provide advanced independent study options that promote cross-curricular activities.	**ISTE 1a:** Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. **ISTE 7d:** Students explore local and global issues and use collaborative technologies to work with others to investigate solutions. Since all topics and units are to be made with student input, all content is related to topics related to science, technology, engineering, and mathematics, social studies, and art. In addition, This unit encompasses digital literacy skills which support all content areas that utilize technology.

Differentiated Instruction: Special Education	Differentiated Instruction: 504
- Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. - Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). - Provide student with a model of what is expected by sharing exemplary pieces of work. - Give all instructions both in writing and verbally. - Allow student to provide oral responses rather than written ones. - Modifications in classroom and homework assignments (shortened assignments to compensate for amount of time it takes to complete, extended time to complete assignments, reduced amount of written work, breaking down assignments and long-term projects into segments with separate due dates for completion of each segment, allowing student to dictate or tape record responses, allowing student to use computer for written work, oral reports or hands-on projects to demonstrate learning of material)	- Preferential seating away from distractions - Extended time for testing - Modification of test format and delivery (oral exams, use of a calculator, chunking or breaking down tests into smaller sections to complete, providing breaks between sections, quiet place to complete tests, multiple choice or fill in the blank test format instead of essay) - Assistance with note taking (providing student with a copy of class notes, peer assistance with note taking, and give page numbers to locate answers to questions) - Providing clear and simple directions for homework and class assignments (repeating directions, posting homework assignments on board, supplementing verbal instructions with visual/written instructions) - Organizational assistance - Extra set of books for student to keep at home - Two copies of a worksheet, one as draft and other as final copy

ELL Differentiated Instruction which include Listening, Speaking, Reading, and Writing		
Entering	**Beginning**	**Developing**
• Provide students with one-step oral commands/instructions • Allow pictorial or graphic representation of the language of the content areas • Ask students to supply missing words in short sentences • Teacher-Student Modeling • Think/Read aloud • Choral Reading • Chunking • Verbal clues • Highlight text • Buddy Partner Reading • Ask yes and no questions (i.e. is this a question, does this?) • Help students to learn the classroom routines and school routines. • Use a student buddy, if possible someone with the same language.	• Provide students with multi-step oral commands/instructions • Use cloze strategy with pre-taught vocabulary • Provide bilingual dictionaries and glossaries • Use written models in writing instructions (writing samples) • Provide sentence starters, graphic organizers, and outlines for assigned writing topics. • Demonstrate/model the activity for the students. • Ask students to categorize cooking utensils. ☐ Label objects and cooking tools around the kitchen and classroom space. • Post all safety procedures and include picture representations for safety procedures. • Post all sanitary procedures and include picture representations. • Use a student buddy, if possible someone with the same language.	• Provide students the opportunity to retell/rephrase ideas from speech • general and some specific language of the content areas; • Multiple meanings of words in context (Tier 2 Academic Vocabulary) • Provide instruction for frequently used affixes and root words • Use English dictionaries and glossaries • Expanded sentences in oral interaction or written paragraphs • Use a student buddy, if possible someone with the same language. • Develop and use non-verbal cues, such as holding up a hand to say, "stop." • Ask questions with 1-3 word answers

Expanding	Bridging
• Assist students with self-editing (syntax and word usage) • Provide explicit instruction on function words (however, moreover, • and in contrast) • Peer tutoring • Use English dictionaries and glossaries • Provide opportunities for students to defend a point of view	• Provide students with target words for the unit • Provide students with metacognitive for problem-solving (tell me how you know it)the technical language of the content areas; • Support students in using a variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays, or reports; • Oral or written language approaching comparability to that of English
	proficient peers when presented with grade level material

Grade: 5-8	Content: S.T.E.M	
Domain: Technology Literacy & Citizenship	Topic: Digital Citizenship, Hardware, Keyboarding	Time Frame: 12 classes

New Jersey Student Learning Standards:

8.1.8.D.1: Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.

8.1.8.D.3: Demonstrate an understanding of fair use and Creative Commons to intellectual property.

8.1.8.D.4: Assess the credibility and accuracy of digital content.

8.1.8.D.5: Understand appropriate uses for social media and the negative consequences of misuse.

8.2.8.E.2 Demonstrate an understanding of the relationship between hardware and software.

Essential Questions	Enduring Understandings
☐ Why is digital citizenship necessary to use digital media responsibly and ethically? ☐ How is keyboarding beneficial to a career as a student? ☐ How does intellectual property compare to tangible property? ☐ What actions contribute to one's digital footprint? How has innovation with technology contributed to cultural understandings?	**Students will understand that:** ● Digital citizenship is required in order to use digital media and a responsible and ethical learner. ● Digital media can be used to inform/teach. ● Video and animated video can be used to engage and reach those we want to teach/inform. ● A monitor uses pixels for digital display.
Skills	**Student Learning Objectives**
Students will be able to: ● Solve complex problems and think critically. ● Conduct research with reasoning & evidence. ● Be creative & innovative. ● Communicate & collaborate effectively. ● Be an independent, self-directed learner. ● Demonstrate global competency. ● Type with proper finger placement with speed & accuracy.	**Students will know how to:** ● Learn about important precepts of digital citizenship by playing Interland (Be Internet Awesome) games. ● Share their learning with their classmates. ● Teach their classmates using mixed video media. ● Type with speed & accuracy. ● Utilize keyboard shortcuts to increase computer efficiency. ● Acknowledge key digital behaviors to ensure a positive digital footprint.

Vocabulary	Resources	Assessment/Project
Computer Science STEM Cyberbullying Digital Footprint Digital Citizen Copyright Creative Commons Fair use Firewall Hacker Identity theft Intellectual property Malware Netiquette Open source Phishing Plagiarism Sexting Spyware Virus Home-placement Keyboarding	Chromebooks, Desktops, iPads, Mobile Devices Guest Speakers (Present & via Skype) Class Notes Google Classroom Teacher website Research Tools: Google Scholar, Youtube BeInternetAwesome.withGoogle.com TypingPal.com, Typing.com, Nitrotype	Interland Gameplay Student private + class notes (GoodNotes/Google Keep/Padlet) Student Flipgrid reflection Digital citizenship video project Growth in typing assessment in speed & accuracy

Differentiated Instruction		Interdisciplinary Connections
AT RISK STUDENTS	**Enrichment, Gifted and Talented**	This curriculum is aligned with the NJSLS, but is also informed by the ISTE standards, particularly **Empowered Learners:**
RTI: Reteach/peer teaching activities Repeat, clarify, or reword directions Short manageable tasks Small group instruction Give students increased wait time Provide modified materials, as needed	Gifted: Enable students to research topics instead of playing the game; additional resources provided Provide advanced independent study options that promote cross-curricular activities.	**ISTE 1a:** Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. **ISTE 7d:** Students explore local and global issues and use collaborative technologies to work with others to investigate solutions. Since all topics and units are to be made with student input, all content is related to topics related to science, technology, engineering, and mathematics, social studies, and art. In addition, This unit encompasses digital literacy skills which support all content areas that utilize technology.

Differentiated Instruction: Special Education	Differentiated Instruction: 504
☐ Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. ☐ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ☐ Provide student with a model of what is expected by sharing	• Preferential seating away from distractions • Extended time for testing • Modification of test format and delivery (oral exams, use of a calculator, chunking or breaking down tests into smaller sections to complete, providing breaks between sections, quiet place to complete tests, multiple choice or fill in the blank test format instead of essay)
exemplary pieces of work. Give all instructions both in writing and verbally. Allow student to provide oral responses rather than written ones. ☐ Modifications in classroom and homework assignments (shortened assignments to compensate for amount of time it takes to complete, extended time to complete assignments, reduced amount of written ☐ work, breaking down assignments and long-term projects into ☐ segments with separate due dates for completion of each segment, allowing student to dictate or tape record responses, allowing student to use computer for written work, oral reports or hands-on projects to demonstrate learning of material)	• Assistance with note taking (providing student with a copy of class notes, peer assistance with note taking, and give page numbers to locate answers to questions) • Providing clear and simple directions for homework and class assignments (repeating directions, posting homework assignments on board, supplementing verbal instructions with visual/written instructions) • Organizational assistance • Extra set of books for student to keep at home • Two copies of a worksheet, one as draft and other as final copy

ELL Differentiated Instruction which include Listening, Speaking, Reading, and Writing		
Entering	**Beginning**	**Developing**
- Provide students with one-step oral commands/instructions Allow - pictorial or graphic representation of the language of the content areas - Ask students to supply missing words in short sentences Teacher-Student Modeling - Think/Read aloud - Choral Reading - Chunking - Verbal clues - Highlight text - Buddy Partner Reading - Ask yes and no questions (i.e. is this	- Provide students with multi-step oral commands/instructions - Use cloze strategy with pre-taught vocabulary - Provide bilingual dictionaries and glossaries - Use written models in writing instructions (writing samples) - Provide sentence starters, graphic organizers, and outlines for assigned writing topics. - Demonstrate/model the activity for the students. - Ask students to categorize cooking utensils. Label objects and cooking tools around the kitchen and classroom space. - Post all safety procedures and include picture representations for safety procedures.	- Provide students the opportunity to retell/rephrase ideas from speech general and some specific language of the content areas; - Multiple meanings of words in context (Tier 2 Academic Vocabulary) - Provide instruction for frequently used affixes and root words - Use English dictionaries and glossaries - Expanded sentences in oral interaction or written paragraphs - Use a student buddy, if possible someone with the same language. - Develop and use non-verbal cues, such as holding up a hand to say, "stop."
- a question, does this?) - Help students to learn the classroom routines and school routines. - Use a student buddy, if possible someone with the same language.	- Post all sanitary procedures and include picture representations. - Use a student buddy, if possible someone with the same language.	Ask questions with 1-3 word answers

Expanding	Bridging
• Assist students with self-editing (syntax and word usage) • Provide explicit instruction on function words (however, moreover, • and in contrast) • Peer tutoring • Use English dictionaries and glossaries • Provide opportunities for students to defend a point of view	• Provide students with target words for the unit • Provide students with metacognitive for problem-solving (tell me how you know it)the technical language of the content areas; • Support students in using a variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays, or reports; • Oral or written language approaching comparability to that of English proficient peers when presented with grade level material

Grade: 5-8	Content: S.T.E.M	
Domain: Robotics, Digital Design & STEM Challenge	Topic: Robotics (Sphero, Ozobots), Media	Time Frame: 13 classes

New Jersey Student Learning Standards:

8.2.8.C.7: Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.

8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

8.2.8.C.2 Explain the need for optimization in a design process.

8.2.5.C.7 Work with peers to redesign an existing product for a different purpose.

Essential Questions	Enduring Understandings
⬜ How can digital technologies enable the collection and curation of information using different types of digital resources (text, video, audio, social media)? How can digital media be used to inform or teach? In what ways can humans and machines interact to accomplish goals that neither could achieve separately? How can devices such as robots be brought to serve the needs of humans? ⬜ How can graphics/graphic design be useful to us? How can video and animated video design be useful to us? ⬜	⬜ Graphics and other visuals can be used to engage and reach those we want to teach/inform. ⬜ The benefits of utilizing robots over human work, such as they are work more accurately, have increased sensitivity to finer inputs, execute functions tirelessly and without error, and can excel in environments not safe for human labor. ⬜ There is a link with intended audiences between understood media and media that is aesthetically pleasing.

Skills	Student Learning Objectives
Students will be able to: • Thinking critically to solve open-ended tasks. • Work collaboratively and effectively navigate the problem solving process. • Navigate the Design Thinking Process to problem solve. • Program a robot to move in a desired motion, in terms of angular movement in degrees, forward/background movement, and velocity. • Debug/retest a written program when given a task with robots. • Creatively design an alternative purpose for materials.	**Students will know how to:** • Engage in the innovation and creation process. • Comprehend how digital technologies enable the collection and curation of information using different digital resources. • Assess a given task, effectively brain & plan possible solutions, execute a chosen solution, then evaluate its effectiveness at the conclusion.

Vocabulary	Resources	Assessment/Project
Computer Science STEM Robot/Robotics Algorithm Axes CAD (computer aided design) Kinematics Orientation Speed Velocity Momentum Physics VR (Virtual Reality) AR (Augmented Reality)	Chromebooks, Desktops, iPads, Mobile Devices Guest Speakers (Present & via Skype) Class Notes Google Classroom Teacher website Research Tools: Google Scholar, Youtube Creation Tools: CoSpaces.io, Aurasma, SpheroEDU, Ozoblockly.com, TynkerCAD	3D Design Tasks Sphero Maze Challenge Ozobot Task Challenge Virtual Reality Creation & Exploration Augmented Reality Creation & Presentation

Differentiated Instruction		Interdisciplinary Connections
AT RISK STUDENTS	**Enrichment, Gifted and Talented**	This curriculum is aligned with the NJSLS, but is also informed by the ISTE standards, particularly **Empowered Learners:**
ELL: Google Translate, Google Dictionary, Assign students cooperative groups with English speaking peer leaders, Assign students a bilingual class buddy, Provide translated materials RTI: Reteach/peer teaching activities Repeat, clarify, or reword directions Short manageable tasks Small group instruction Give students increased wait time Provide modified materials, as needed	Students are assigned open-ended tasks, which require a combination of resources introduced in the class in order to solve. Provide advanced independent study options that promote cross-curricular activities.	**ISTE 1a:** Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them and reflect on the learning process itself to improve learning outcomes. **ISTE 7d:** Students explore local and global issues and use collaborative technologies to work with others to investigate solutions. Since all topics and units are to be made with student input, all content is related to topics related to science, technology, engineering, and mathematics, social studies, and art. In addition, This unit encompasses digital literacy skills which support all content areas that utilize technology.

Differentiated Instruction: Special Education	Differentiated Instruction: 504
☐ Structure lessons around questions that are authentic, relate to students' interests, social/family background and knowledge of their community. ☐ Provide students with multiple choices for how they can represent their understandings (e.g. multisensory techniques-auditory/visual aids; pictures, illustrations, graphs, charts, data tables, multimedia, modeling). ☐ Provide student with a model of what is expected by sharing exemplary pieces of work. ☐ Give all instructions both in writing and verbally. ☐ Allow student to provide oral responses rather than written ones. ☐ Modifications in classroom and homework assignments (shortened assignments to compensate for amount of time it takes to complete, extended time to complete assignments, reduced amount of written work, breaking down assignments and long-term projects into segments with separate due dates for completion of each segment, allowing student to dictate or tape record responses, allowing student to use computer for written work, oral reports or hands-on projects to demonstrate learning of material)	• Preferential seating away from distractions • Extended time for testing • Modification of test format and delivery (oral exams, use of a calculator, chunking or breaking down tests into smaller sections to complete, providing breaks between sections, quiet place to complete tests, multiple choice or fill in the blank test format instead of essay) • Assistance with note taking (providing student with a copy of class notes, peer assistance with note taking, and give page numbers to locate answers to questions) • Providing clear and simple directions for homework and class assignments (repeating directions, posting homework assignments on board, supplementing verbal instructions with visual/written instructions) • Organizational assistance • Extra set of books for student to keep at home • Two copies of a worksheet, one as draft and other as final copy

ELL Differentiated Instruction which include Listening, Speaking, Reading, and Writing		
Entering	**Beginning**	**Developing**
• Provide students with one-step oral commands/instructions • Allow pictorial or graphic representation of the language of the content areas • Ask students to supply missing words in short sentences • Teacher-Student Modeling • Think/Read aloud • Choral Reading • Chunking • Verbal clues • Highlight text • Buddy Partner Reading • Ask yes and no questions (i.e. is this a question, does this?) • Help students to learn the classroom routines and school routines. • Use a student buddy, if possible someone with the same language.	• Provide students with multi-step oral commands/instructions • Use cloze strategy with pre-taught vocabulary • Provide bilingual dictionaries and glossaries • Use written models in writing instructions (writing samples) • Provide sentence starters, graphic organizers, and outlines for assigned writing topics. • Demonstrate/model the activity for the students. • Ask students to categorize cooking utensils. ☐ Label objects and cooking tools around the kitchen and classroom space. • Post all safety procedures and include picture representations for safety procedures. • Post all sanitary procedures and include picture representations. • Use a student buddy, if possible someone with the same language.	• Provide students the opportunity to retell/rephrase ideas from speech • general and some specific language of the content areas; • Multiple meanings of words in context (Tier 2 Academic Vocabulary) • Provide instruction for frequently used affixes and root words • Use English dictionaries and glossaries • Expanded sentences in oral interaction or written paragraphs • Use a student buddy, if possible someone with the same language. • Develop and use non-verbal cues, such as holding up a hand to say, "stop." • Ask questions with 1-3 word answers

Expanding	Bridging
• Assist students with self-editing (syntax and word usage) • Provide explicit instruction on function words (however, moreover, • and in contrast) • Peer tutoring • Use English dictionaries and glossaries • Provide opportunities for students to defend a point of view	• Provide students with target words for the unit • Provide students with metacognitive for problem-solving (tell me how you know it)the technical language of the content areas; • Support students in using a variety of sentence lengths of varying linguistic complexity in extended oral or written discourse, including stories, essays, or reports; • Oral or written language approaching comparability to that of English
	proficient peers when presented with grade level material