

Pine Hill Public Schools Curriculum

Content Area:		Electives	
Course Title/ Grade Level:		Robotics	
Unit 1:	Safety and Classroom Procedures	Duration:	1 Week
Unit 2:	Intro to Robotics	Duration:	3 Weeks
Unit 3:	Mechanic Systems/Robot Components	Duration:	3 Weeks
Unit 4:	Electronics- Review/New	Duration:	2-3 Weeks
Unit 5:	Robot Systems	Duration:	4 Weeks
Unit 6:	Programming/Intro to Autonomous Robotics and Sensing Devices	Duration:	5-6 Weeks
Unit 7:	Robotics Projects	Duration:	8-10 Weeks
Unit 8:	Robotics Capstone Autonomous Project	Duration:	5-6 Weeks
BOE Approval Date:		August 26, 2014	

Pine Hill Public Schools Robotics Curriculum							
Unit Title: Safety and Classroom Procedures						Unit #: 1	
Course or Grade Level: Robotics				Length of Time: 1 week			
Pacing		September					
Essential Questions		<ul style="list-style-type: none"> • What are the safety and classroom procedures? • Review start and end of class with storage and clean up procedures to insure a productive learning environment. 					
Content		<ul style="list-style-type: none"> • Safety when using robots • Tool storage, robot storage, keeping weekly journal • Set up Edmodo account for literacy skill inclusion • Introduce technical writing 					
Skills		<ul style="list-style-type: none"> • Understand difference between technical writing and classroom writing • Understand/implement the use of documentation and the importance of documentation • Explain proper class work procedures including gathering materials and tools, in class procedures, and clean up processes. • Prepare safe work environments in the classroom. • Clean up and store tools and materials at the end of each day. 					
Assessments		<ul style="list-style-type: none"> • Including both formative and summative assessments. • Must include information about benchmark assessments. • Demonstration of learning • Edmodo as a weekly writing tool/assignment. Set up technical writing journal. • Rubric- assess students on both individual and group basis as they apply 					
Interventions / differentiated instruction		<ul style="list-style-type: none"> • Include any strategies or activities aimed at assisting students above or beyond the mainstream level of the lesson • Include strategies aimed at assisting English Language Learners • Using graphic organizers when presenting new information to the students 					
Inter-disciplinary Connections		<ul style="list-style-type: none"> • Include information regarding cross-curricular learning experiences • Include technology integrations • Physics, CAD simulation, Mathematical concepts 					
Lesson resources / Activities		<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Internet simulation programs, smartphone/tablet applications 					
2009 NJCCCS							
Standard:		9.4 Career/Tech Ed.					
Strand(s):		O. STEM, B. Architect/Construction					
Content Statement(s): Communication Skills, Communication Skills, Communication Skills, Safety Health Evaluation				CPI # / CPI(s): 9.4.12.0.6, 9.4.12.0.15, 9.4.12.0.11, 9.4.12.0.45			
				Math Knowledge, Organize Information, Oral, Visual, Written Material, Safety Practice Procedure			
<u>21st Century Themes</u>							
X	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21st Century Skills</u>							

X	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

Pine Hill Public Schools Robotics Curriculum	
Unit Title: Intro to Robotics	Unit #: 2
Course or Grade Level: Robotics	Length of Time: 3 weeks
Pacing	weekly
Essential Questions	<ul style="list-style-type: none"> • What are some systems you use every day that contain items such as microprocessors and sensing abilities? • What problems do robotic systems solve to extend human capabilities? • What are advantages and disadvantages of using robots?
Content	<ul style="list-style-type: none"> • Impacts and benefits of robots • Positive expected, negative expected outcomes • Positive unexpected, negative unexpected outcomes • System feedback loop, Input-Process-Output-Feedback • Open and closed loop systems • Review engineering design process- Identify, Research, Brainstorm, Pick best solution, Plan, Test, Evaluate and identify improvements
Skills	<ul style="list-style-type: none"> • Identify reasons robots are used is for tasks too dangerous for humans • Describe situations where robots are better served to accomplish a task than humans and also the reverse • Create a flow chart of an open and closed loop system using graphic organizers • Possibly use CAD program to design parts used by robots • Create/design a control system using basic electronic components
Assessments	<ul style="list-style-type: none"> • Documentation of the design process using Edmodo and technical writing journal • Sketches either by hand or computer • Summaries of work discussed on a weekly basis • Flow chart and designs possibly posted to Edmodo or on the bulletin board in the hallway • Rubric- assess students on both individual and group basis as they apply
Interventions / differentiated instruction	<ul style="list-style-type: none"> • Include any strategies or activities aimed at assisting students above or beyond the mainstream level of the lesson • Include strategies aimed at assisting English Language Learners • Using graphic organizers when presenting new information to the students • Peer to peer instruction within and between groups and individuals • Cooperative Learning
Inter-disciplinary Connections	<ul style="list-style-type: none"> • Include information regarding cross-curricular learning experiences • Include technology integrations • Teacher led instruction and guidance to individual • English- technical journal writing and Edmodo communications
Lesson resources / Activities	<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Internet simulation programs, smartphone/tablet applications • Tools and materials for the construction/manufacturing of a technological product
2009 NJCCCS	
Standard:	8.2 Technology Education, 9.4 Career/Tech Ed.
Strand(s): 8.2-A. Nature of Technology, B. Design, C. Technological Citizenship, Ethics, and Society, F. Resources for a Technological World. 9.4- O. STEM,	
Content Statement(s): Technology Products, Design Process, Knowledge and Understanding, Technological Resources, Academic Foundation, Problem Solving/Critical Thinking, Information Technology, Technical Skills	CPI # / CPI(s): 8.2.12.B.3, 8.2.12.A.1, 8.2.12.C.1, 8.2.12.F.1, 9.4.12.O.(1).1, 9.4.12.O.(1).7, 9.4.12.O.(1).8, 9.4.12.O.(1).12
	Analyze Technologies of Career Path, Design Technology

Product, Analyze Impact of Technology Product, Application of Resources, Math Standards, Problem Solving Projects, Use Communication Technology, Model Technical Competence

21st Century Themes

X	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

X	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

Pine Hill Public Schools Robotics Curriculum							
Unit Title: Mechanic Systems/Robot Components						Unit #: 3	
Course or Grade Level: Robotics				Length of Time: 3 weeks			
Pacing		weekly					
Essential Questions		<ul style="list-style-type: none"> • How do robots move in the three dimensional world? • Why is it so difficult for humans to create robotic entities that mimic human movement? • What materials and mechanical devices have technologists used to develop robotics with the control of more degrees of freedom? • What do the components of our robotic system do? 					
Content		<ul style="list-style-type: none"> • Identify all of the components of the robot system and what each component does • Understand/visualize how robots move in 3dimensional space as compared to on screen simulations or drawings • Make the hardware components connect to create basic movement of robot 					
Skills		<ul style="list-style-type: none"> • Build a basic movement with the robot • Create a flow chart or graphic organizer to show the steps needed to create the intended movement • Choose the particular robotic component to accomplish the task 					
Assessments		<ul style="list-style-type: none"> • Sketch/drawing of components of robotic arm • Construct other structures to show mechanical movement • Documentation on weekly work in Edmodo or technical writing journal • Rubric- assess students on both individual and group basis as they apply 					
Interventions / differentiated instruction		<ul style="list-style-type: none"> • Include any strategies or activities aimed at assisting students above or beyond the mainstream level of the lesson • Include strategies aimed at assisting English Language Learners • Using graphic organizers when presenting new information to the students • Have students present questions via Edmodo or email to teacher • Peer to peer instruction within and between groups and individuals 					
Inter-disciplinary Connections		<ul style="list-style-type: none"> • Math- gear ratio, mechanical advantage and movement • Include technology integrations • English- technical journal writing and Edmodo communications 					
Lesson resources / Activities		<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Robot and components • Hand and power tools, wood, plastic, etc. • Web-based electronic simulations, applications 					
2009 NJCCCS							
Standard:		8.2- Technology Education, 9.4- Career/Tech Ed.					
Strand(s):		A. Nature of Technology, C. Technological Citizenship, Ethics, and Society, F. Resources for a Technological World, O. STEM					
Content Statement(s): Technology Products, Knowledge and Understanding, Technological Resources, Academic Foundation, Problem Solving and Critical Thinking				CPI # / CPI(s): 8.2.12.A.1, 8.2.12.C.3, 8.2.12.F.3, 9.4.12.0.(1)1, 9.4.12.O.(1)7			
				Design Technology Product, Positive/Negative Impacts in Design, Use Technology Resources, Math Standards, Problem Solving Projects			
<u>21st Century Themes</u>							
X	Global Awareness		Financial, Economic, Business, and Entrepreneurial		Civic Literacy		Health Literacy

			Literacy				
<u>21st Century Skills</u>							
X	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

**Pine Hill Public Schools
Robotics Curriculum**

Unit Title: Electronics- Review/New		Unit #: 4
Course or Grade Level: Robotics		Length of Time: 2-3 weeks
Pacing	weekly	
Essential Questions	<ul style="list-style-type: none"> • What are some of the electronic components in a robot? • What is a circuit, how is it built, and what do circuits accomplish? • Explain the process of troubleshooting electronic circuits and how to do this. 	
Content	<ul style="list-style-type: none"> • Review electronic components including but not limited to resistors, capacitors, switches, etc. • Understand how a circuit flows • Be able to read a schematic diagram and locate all of the components to build the circuit 	
Skills	<ul style="list-style-type: none"> • Practice using Mr. Circuit in building both a closed and open loop circuit • Identify the components of DC circuits and how they are used on building robots • Locate a short in a circuit to show how to troubleshoot an electric problem • Identify the input, process, and output of a 555 timer ic chip • Use resistors to control the amount of electrons through a circuit 	
Assessments	<ul style="list-style-type: none"> • Build a complete circuit • Website based circuit building • Design/draw a schematic diagram of a circuit • Documentation on weekly work in Edmodo or technical writing journal • Rubric- assess students on both individual and group basis as they apply 	
Interventions / differentiated instruction	<ul style="list-style-type: none"> • Include any strategies or activities aimed at assisting students above or beyond the mainstream level of the lesson • Include strategies aimed at assisting English Language Learners • Using graphic organizers when presenting new information to the students • Have students present questions via Edmodo or email to teacher • Peer to peer instruction within and between groups and individuals • Cooperative Learning 	
Inter-disciplinary Connections	<ul style="list-style-type: none"> • Math- determining circuit voltage values, resistor values, etc. • Include technology integrations • English- technical journal writing and Edmodo communications 	
Lesson resources / Activities	<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Mr. Circuit component materials • Web-based electronic simulations, applications 	
2009 NJCCCS		
Standard:	8.2- Technology Education, 9.4- Career/Tech Ed.	
Strand(s): Career Cluster	A. Nature of Technology, B. Design: Critical Thinking, O. STEM , M. Manufacturing	
Content Statement(s): Technology Products, Design Process, Information Technology, Health, Safety & Environmental Assurance	CPI # / CPI(s): 8.2.12.A.1, 8.2.12.B.2, 9.4.12.0.(1)8, 9.4.12.M.(6)7	
	Design Technology Product , Design/Create Prototype, Use Communication Technology, Safe use of Manufacturing Equipment	

21st Century Themes

X	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

X	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy		Life and Career Skills		

Pine Hill Public Schools Robotics Curriculum	
Unit Title: Robot Systems	Unit #: 5
Course or Grade Level: Robotics	Length of Time: 4 weeks
Pacing	weekly
Essential Questions	<ul style="list-style-type: none"> • What are some of the forces robots will encounter in completing tasks? • What is the difference between a tethered system and a remote system? • What forces act upon a robot? • What are the pros and cons of a remotely operated system?
Content	<ul style="list-style-type: none"> • Forces on a remotely operated system • Input-Process-Output-Feedback loop • Tethered versus remote robot • Mechanical systems, lighting systems, sensing systems
Skills	<ul style="list-style-type: none"> • Designing and building an electrical propulsion system • Designing and building a control system using various switch designs • Material design for robot components • Create a structural or mechanical system that can collect/move materials
Assessments	<ul style="list-style-type: none"> • Sketch/drawing of mechanical system • Graphic organizer showing I-P-O-F loop • Documentation on weekly work in Edmodo or technical writing journal • Rubric- assess students on both individual and group basis as they apply
Interventions / differentiated instruction	<ul style="list-style-type: none"> • Include any strategies or activities aimed at assisting students above or beyond the mainstream level of the lesson • Include strategies aimed at assisting English Language Learners • Web-based material such as simulation programs • Using graphic organizers when presenting new information to the students • Have students present questions via Edmodo or email to teacher • Peer to peer instruction within and between groups and individuals
Inter-disciplinary Connections	<ul style="list-style-type: none"> • Math-force calculation, density, structural integrity of materials • Include technology integrations • English- technical journal writing and Edmodo communications • Science- power calculations
Lesson resources / Activities	<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Robot and components • Hand and power tools, wood, plastic, etc. • Web-based electronic simulations, applications
2009 NJCCCS	
Standard:	8.2- Technology Education, 9.4- Career/Tech Ed.
Strand(s):	A. Nature of Technology, B. Design- Critical Thinking, O. STEM
Content Statement(s): Technology Products, Design Process, Design a Prototype, Academic Foundation, Academic Foundation, Problem Solving and Critical Thinking, Academic Foundation, Academic Foundation, Technical Skills	CPI # / CPI(s): 8.2.12.A.1, 8.2.12.B.1, 8.2.12.B.2, 9.4.12.0.(1).1, 9.4.12.0.(1).2, 9.4.12.O.(1).7, 9.4.12.0.(1).3, 9.4.12.0.(1).5, 9.4.12.0.(1).11
	Design Technology Product, Design for Conservation of

Resources, Math Standards, Geometry, Algebra & Trigonometry, Problem Solving Projects, Convert Measurement, Physical Properties of Materials, Design Process

21st Century Themes

X	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

X	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

**Pine Hill Public Schools
Robotics Curriculum**

Unit Title:	Programming, Intro to Autonomous Robotics and Sensing Devices	Unit #:	6
Course or Grade Level:	Robotics	Length of Time:	5-6 weeks
Pacing	weekly		
Essential Questions	<ul style="list-style-type: none"> • How can computer programming make it easier to control electronic devices? • How can LEDs be alternately flashing with transistors and capacitors vs. using a microcontroller? • How do you program a robot to make it complete a task? 		
Content	<ul style="list-style-type: none"> • Software of robotic systems • Firmware and programming language (Robotc for example) • Commands- wait, until, loops, counters, digital inputs, motors, etc. 		
Skills	<ul style="list-style-type: none"> • Program a microcontroller to turn indicator lights on and off • Program a microcontroller to control outputs such as lights, DC motor, and Servo Motors • Program a microcontroller so that outputs react to sensing devices such as lights and touch • Design and create an autonomous robotic program that makes/allows the robotic hardware to sense environment, perform tasks, and create movement 		
Assessments	<ul style="list-style-type: none"> • Documentation on weekly work in Edmodo or technical writing journal • Performance of their robotic programs to perform the task and reflect to improve the design • Writing code that will make the robot complete a task specified in the code • Various robot tasks that are programmed to complete a task • Rubric- assess students on both individual and group basis as they apply 		
Interventions / differentiated instruction	<ul style="list-style-type: none"> • Written/spoken programming via email or in writing • Include strategies aimed at assisting English Language Learners • Using graphic organizers when presenting new information to the students • Have students present questions via Edmodo or email to teacher • Peer to peer instruction within and between groups and individuals • Cooperative Learning 		
Inter-disciplinary Connections	<ul style="list-style-type: none"> • Math- path where the robot moves or creates movement • Include technology integrations • English- technical journal writing and Edmodo communications • Computer Science- Using table, smart phone or computer to write and test the code 		
Lesson resources / Activities	<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Robot and components • Web-based electronic simulations, applications • Computers, tablets, smart phones, etc. 		
2009 NJCCCS			
Standard:	8.2- Technology Education, 9.4- Career/Tech Ed.		
Strand(s):	A. Nature of Technology, B. Design: Critical Thinking, O. STEM , M. Manufacturing		
Content Statement(s): Technology Products, Design Process, Information Technology, Health, Safety & Environmental Assurance	CPI # / CPI(s):8.2.12.A.1, 8.2.12.B.2, 9.4.12.0.(1).8, 9.4.12.M.(6).7		
	Design Technology Product , Design/Create Prototype, Use Communication Technology, Safe Use of Manufacturing Equipment		

21st Century Themes

X	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

X	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

Pine Hill Public Schools Robotics Curriculum	
Unit Title: Robotics Projects	Unit #: 7
Course or Grade Level: Robotics	Length of Time: 8-10 weeks
Pacing	weekly
Essential Questions	<ul style="list-style-type: none"> • Why are there so many different types of robots in the world? • Can a robot complete many different tasks with simple programming? • How does troubleshooting a robot system compare to real world scenarios in problem solving?
Content	<ul style="list-style-type: none"> • Software of robotic systems • Using components of robotic system in various ways • Programming code to perform simple and more complex tasks
Skills	<ul style="list-style-type: none"> • Build several robots starting with basic designs • Move through difficulty level to include line sensing, mechanical movement, and technical tasks such as sorting objects
Assessments	<ul style="list-style-type: none"> • Documentation on weekly work in Edmodo or technical writing journal • Performance of their robotic programs to perform the task • Writing code that will make the robot complete a task specified in the code • Various robot tasks that are programmed to complete a task • Increasing difficulty and troubleshooting problems, documenting all details • Rubric- assess students on both individual and group basis as they apply
Interventions / differentiated instruction	<ul style="list-style-type: none"> • Written/spoken programming via email or in writing • Include strategies aimed at assisting English Language Learners • Using graphic organizers when presenting new information to the students • Have students present questions via Edmodo or email to teacher • Peer to peer instruction within and between groups and individuals • Cooperative Learning
Inter-disciplinary Connections	<ul style="list-style-type: none"> • Math- distance, power, and directional calculations • Include technology integrations • English- technical journal writing and Edmodo communications • Computer Science- Using table, smart phone or computer to write and test the code
Lesson resources / Activities	<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Robot and components • Web-based electronic simulations, applications • Computers, tablets, smart phones, etc.
2009 NJCCCS	
Standard:	8.2- Technology Education, 9.4- Career/Tech Ed.
Strand(s):	A. Nature of Technology, B. Design: Critical Thinking, E. Engineering and Design, O. STEM , M. Manufacturing
Content Statement(s): Technology Products, Design & Create a Prototype, Communication and Collaboration, Information Technology, Health, Safety & Environmental Assurance	CPI # / CPI(s): 8.2.12.A.1, 8.2.12.B.2, 8.2.12.E.1, 9.4.12.O.(1).8, 9.4.12.O.(1).12, 9.4.12.M.(6).7
	Design Technology Product , Design/Create Prototype, Design and Development Process, Use Communication Technology, Safe Use of Manufacturing Equipment

<u>21st Century Themes</u>							
X	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
<u>21st Century Skills</u>							
X	Creativity and Innovation	X	Critical Thinking and Problem Solving	X	Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		

**Pine Hill Public Schools
Robotics Curriculum**

Unit Title: Robotics Capstone Autonomous Project		Unit #: 8
Course or Grade Level: Robotics		Length of Time: 5-6 weeks
Pacing	weekly	
Essential Questions	<ul style="list-style-type: none"> • What is the meaning of Open Source Systems? • How does Open Source help an engineer be more innovative? • How do Ethics play a role in the development of new technologies in robotics and other systems? 	
Content	<ul style="list-style-type: none"> • Control systems • Sensors, Computer programming • Mechanical systems, electrical systems • Applying the engineering design • Process 	
Skills	<ul style="list-style-type: none"> • Design a robotic system that extends human capabilities • Research global issues and problems to identify problems that can be solved with robots • Apply science and math principles to engineer the robotic system • Evaluate the positive and negative impacts of the designed robotics system 	
Assessments	<ul style="list-style-type: none"> • Documentation on weekly work in Edmodo or technical writing journal • Performance of their robotic programs to perform the task • The innovative robotic system that is designed/created and suggestions for improvements • Rubric- assess students on both individual and group basis as they apply • Final project - guided by questions of global issue and how to solve it 	
Interventions / differentiated instruction	<ul style="list-style-type: none"> • Written/spoken programming via email or in writing • Include strategies aimed at assisting English Language Learners • Using graphic organizers when presenting new information to the students • Have students present questions via Edmodo or email to teacher • Peer to peer instruction within and between groups and individuals • Cooperative Learning 	
Inter-disciplinary Connections	<ul style="list-style-type: none"> • Math- distance, power, and directional calculations • Include technology integrations • English- technical journal writing and Edmodo communications • Computer Science- Using table, smart phone or computer to write and test the code 	
Lesson resources / Activities	<ul style="list-style-type: none"> • Ex: websites, supplemental learning tools, etc. • Edmodo account • Robot and components • Web-based electronic simulations, applications • Computers, tablets, smart phones, etc. 	
2009 NJCCCS		
Standard:	8.2- Technology Education, 9.4- Career/Tech Ed.	
Strand(s):	8.2-A. Nature of Technology, B. Design: Critical Thinking, C. Technological Citizenship, Ethics, and Society, E. Engineering and Design, O. STEM	
Content Statement(s): Technology Products, Design & Create a Prototype, Communication and Collaboration, Evaluate Positive & Negative Impacts, Design Product to Address a Global Issue, Academic Foundation, Problem Solving Critical Thinking, Academic Foundation	CPI # / CPI(s): 8.2.12.A.1, 8.2.12.B.2, 8.2.12.B.3, 8.2.12.C.3, 8.2.12.E.1, 9.4.12.O.(1).1, 9.4.12.O.(1).7, 9.4.12.O.(2).1	

Design Technology Product , Design/Create Prototype, Analyze Risks, Trade-Offs, Suggest Modifications to Address Negative Impacts, Design Impact on Cultural Perspectives, Math Standards, Problem Solving Projects, Real World Problem Solving

21st Century Themes

	Global Awareness		Financial, Economic, Business, and Entrepreneurial Literacy		Civic Literacy		Health Literacy
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21st Century Skills

X	Creativity and Innovation	X	Critical Thinking and Problem Solving		Communication and Collaboration		Information Literacy
	Media Literacy		ICT Literacy	X	Life and Career Skills		