

Davison Community Schools
ADVISORY CURRICULUM COUNCIL
Phase II, February 29th, 2016

Robotics - DHS

Course Essential Questions:

- What are the different roles that robotics plays in shaping our future?

Phase II Curriculum

Unit 1: Introduction to Engineering

Essential Questions:

- What is engineering and what do engineers do?
- Why is classical mechanics such an important part of engineering?

- How does having constraints placed on a design change the engineering process?

Essential Understanding:

- Engineers are problem solvers.
- Classical mechanics is an integral part of engineering.

Curriculum Standards- DOK noted where applicable with Standards

- 1.J The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.I Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 19.M The Designed World Students will develop an understanding of and be able to select and use 20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

20.K The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none">the subsystems that are needed to assemble and complete the construction of the Clawbot	<ul style="list-style-type: none">demonstrate how classical mechanics is used in the engineering process.correctly produce entries into their engineering notebook.produce a prototype of my design.

Unit 2: Introduction to Robotics

Essential Questions:

- What is the role of robots in society and how can they be used in all aspects of STEM.

Essential Understanding:

- The concepts of how robots have been developed to work in industry, and in research both in autonomous and teleoperated control.
- The relationship between the different subsystems and how they come together to produce a functioning robot that will be able to complete a task.

Curriculum Standards- DOK noted where applicable with Standards

- 1.J The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.M Abilities for a Technological World Students will develop the abilities to apply the design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content
I Know ...

Skills/Processes
I Can ...

- how robots benefit society.
- how the different subsystems work together.
- how the installation of sensors improve the functioning of the robot?

- discuss how robots are used today in industry, research and in education.
- explain what the different basic components of a robot are and how they perform their function.
- correctly produce entries into my engineering notebook.
- assemble the VEX Clawbot using the directions provided in the kit.

Unit 3: Introduction to Engineering

Essential Questions:

- what are the core components of the VEX control system and how does each component function?

Essential Understanding:

- the Cortex Microcontroller, VEXnet Joystick and VEXnet Wireless link are the core components of the VEX control system.

Curriculum Standards- DOK noted where applicable with Standards

- 1.J The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.FF The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.I Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none"> • how the VEX Cortex Microcontroller coordinates the flow of all information and power on the robot. • how the flow of electronic information is 	<ul style="list-style-type: none"> • explain what the specific components that make up the VEXnet System can do and how they are

handled between the system components and the interface.

- that a robot is a very complex system of parts that must work together in order to achieve a desired goal.

used to control the robot.

- set up my microcontroller to function in both autonomous and drive controlled modes.
- correctly produce entries into my engineering notebook.
- use the VEXnet system to successfully control my robot in a classroom challenge.

Unit 4: Introduction to Autodesk Inventor

Essential Questions:

- What are the different ways engineers use Autodesk Inventor?
- What are specific ways they you can use Inventor to help design and build VEX robots.

Essential Understanding:

- Inventor can be used to design and test specs for the VEX robots.

Curriculum Standards- DOK noted where applicable with Standards

2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.

3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.

8.H Design Students will develop an understanding of the attributes of design.

9.L Design Students will develop an understanding of engineering design.

10.J Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in

11.M Abilities for a Technological World Students will develop the abilities to apply the design process.

11.R Abilities for a Technological World Students will develop the abilities to apply the Evaluate final solutions and communicate observation, processes, and results design process.

12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.

13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.

17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.

19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none"> • the math formulas needed to create and animate 3D VEX models. 	<ul style="list-style-type: none"> • create 3D models using Autodesk Inventor • animate 3D models • render 3D models

Unit 5 : The Game

Essential Questions:

- What are the rules of the game?
- What are the effects of applying a cost benefit analysis to the design process?

Essential Understanding:

- The rules of the game are essential to designing your robot.
- There are many potential game strategies that students need to analyze.
- There is an interconnectedness of the game analysis, the design process, and the development of prioritizing based on the cost benefit analysis.

Curriculum Standards- DOK noted where applicable with Standards

- 1.J The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.M Abilities for a Technological World Students will develop the abilities to apply the design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none"> • multiple strategies to use in the game. • how the rules of the game will help in determining the function needs of the robot. 	<ul style="list-style-type: none"> • explain how the process of strategic design works. • demonstrate the use of defining objectives to select game objectives.

- | | |
|--|---|
| | <ul style="list-style-type: none">● list all of the ways to score the most points in the game.● create a cost – benefit analysis to demonstrate the strengths of different tasks.● correctly produce entries into their engineering notebook. |
|--|---|

Unit 6: Object Manipulation

Essential Questions:

- What are the different types and categories of robot manipulators?
- What are some robot manipulators from the real world, and how can the basic principles behind their operation be used to create your own object manipulator for use on your competition robot?
- Why would you choose one type of a manipulator over another type?
- How can your data from your test improve your redesign?

Essential Understanding:

- There are many types of manipulators and it is important to understand the role that each could be used for when designing a robot.

Curriculum Standards- DOK noted where applicable with Standards

2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.

3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.

8.K Design Students will develop an understanding of the attributes of design.

9.I Design Students will develop an understanding of engineering design.

10.L Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

11.M Abilities for a Technological World Students will develop the abilities to apply the design process.

11.N Abilities for a Technological World Students will develop the abilities to apply the design process.

12.P Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.

13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.

17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.

19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none"> • real world examples of manipulators found in my community. 	<ul style="list-style-type: none"> • demonstrate the basic concepts of manipulators

and accumulators.

- design examples of manipulators and accumulators
- describe when to use one type of a manipulator over another.
- analyze data to aid in redesigning..

Unit 7: Speed, Power, Torque & DC Motors

Essential Questions:

- What are the physical principles of speed, power, and torque?
- How do the principles of speed, power, and torque apply to DC motors?
- What is the relationship between adjusting your speed or power have on the other and why would you do so one way or the other?

Essential Understanding:

- the concepts of speed, power, and torque can be used to calculate key details of the design of a mechanical system.
- The engineering process used in the real world for solving problems uses the application of both practical and scientific information which will also follow a methodical process to develop the desired effect.

Curriculum Standards- DOK noted where applicable with Standards

- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.I Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 7.G Technology and Society Students will develop an understanding of the influence of technology on history.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.M Abilities for a Technological World Students will develop the abilities to apply the design process. solutions and communicate observation, processes, and results design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.K Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 16.J The Designed World Students will develop an understanding of and be able to select and use energy and power technologies.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content

Skills/Processes

I Know ...	I Can ...
<ul style="list-style-type: none">• the physical principles of speed, power, and torque.• the components of a DC motor.	<ul style="list-style-type: none">• explain the difference between speed, power and torque.• demonstrate the concept of speed.• demonstrate the concept of power.• demonstrate the concept of torque.

Unit 8: Mechanical Power Transmission

Essential Questions:

- What are the different types of mechanical power transmission?
- How do the principles of gear types and calculating gear ratios apply to the types of motor - arm systems seen on competition robots?
- How do the different types of gears provide an advantage in your arm design?

- How do the mathematical calculations help you to determine what type of gear ratio is needed in your design?

Essential Understanding:

- Mechanical power transmission systems are very important in the design and construction of robots.

Curriculum Standards- DOK noted where applicable with Standards

- 1.K The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.I Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 7.G Technology and Society Students will develop an understanding of the influence of technology on history.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.R Abilities for a Technological World Students will develop the abilities to apply the Evaluate final solutions and communicate observation, processes, and results design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 16.J The Designed World Students will develop an understanding of and be able to select and use energy and power technologies.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.

20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none">• different types of mechanical power transmissions.• mathematical concepts in terms of how a transmission functions.• the advantages the different types of gears provide in an arm design.• the different mathematical calculations used to compute gear ratios.	<ul style="list-style-type: none">• demonstrate how mechanical power transmission systems are very important in the design and construction of competition robots.• vary the gear ratio (and the mechanical advantage) in a system, which gives them the versatility necessary to accomplish whatever work needs to be done.• determine gear inputs & outputs by calculating the difference between them, and determine their gear ratio accordingly.

Unit 9: Drivetrain Design

Essential Questions:

- How do the physical principles of friction and traction impact the drivetrain design?
- How can you use friction to your advantage when you create your robot drivetrain?

- How can you use geometry to help select the most efficient drivetrain for your robot?

Essential Understanding:

- The major physics concepts of friction and traction along with the geometry involved in the different types of drivetrains are critical to consider in the design phase of robotics.

Curriculum Standards- DOK noted where applicable with Standards

- 1.K The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 7.G Technology and Society Students will develop an understanding of the influence of technology on history.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.M Abilities for a Technological World Students will develop the abilities to apply the design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 16.J The Designed World Students will develop an understanding of and be able to select and use energy and power technologies.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none"> ● the difference between static and kinetic friction. ● different types of drivetrains and their benefits and drawbacks in context. ● the basic principles of friction and traction. ● know examples of friction and traction found at school, in my neighborhood and in industry. 	<ul style="list-style-type: none"> ● identify examples of Friction, Traction, Static Friction, Coefficient of Friction, and Normal Force. ● demonstrate how applied force and friction are related. ● distinguish between static and kinetic friction. ● calculate wheel speed. ● demonstrate how to calculate a gear reduction. ● compare and contrast the different types of drivetrains, along with their benefits and drawbacks. ● sketch different types of drivetrains.

Unit 10: Lifting Mechanisms

Essential Questions:

- What are the different types of lifting mechanisms and how they does each work.
- Explain how the degrees of freedom will allow you to design a robot that is able to transfer motion as it manipulates game objects.
- Explain how a linkage system allows a robot to score on a high goal in a game situation.
- Explain how passive assistance can provide your robot with a mechanical advantage.

Essential Understanding:

- Lifting systems vary in types and purpose and using the correct one is crucial to have a well functioning robot.
- Linkage systems allow for the robot to reach far past what a stationary arm would be able to.

Curriculum Standards- DOK noted where applicable with Standards

- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 7.G Technology and Society Students will develop an understanding of the influence of technology on history.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.I Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.M Abilities for a Technological World Students will develop the abilities to apply the design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 16.J The Designed World Students will develop an understanding of and be able to select and use energy and power technologies.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none">• what the terms degrees of freedom, shock load, joint loading, joint speed, elevators, linkages, and passive assistance are.• the major physics concept of degrees of freedom• the math components necessary to calculate the approach of a rotating joint• places where the three different degrees of freedom are found in my community.	<ul style="list-style-type: none">• differentiate the three degrees of freedom that are presented in the beginning of the unit.• demonstrate the correct use of the calculations needed to choose a gear reduction• distinguish between the use of a linkage system and a multi-state elevator in manipulator design.• explain how passive assistance can improve a robot design.• can make sketches or use Autodesk Inventor to create some simple designs to illustrate the different types of lifting mechanisms.• can find examples of linkage systems in common objects, tools and construction.

Unit 11: Systems Integration

Essential Questions:

- What are the techniques that are used in engineering that allow for the successful integration of systems into a cohesive finished product?
- How does the process of system engineering allow for the development of a well- integrated structure?
- How does the integration of system engineering early in the design process provide benefits to the overall design?

Essential Understanding:

- Integration is an integral part of the initial design process.
- A major component of the design process includes the successful integration of all structural systems within the finished product.

Curriculum Standards- DOK noted where applicable with Standards

- 1.J The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.FF The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.I Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 7.G Technology and Society Students will develop an understanding of the influence of technology on history.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.M Abilities for a Technological World Students will develop the abilities to apply the design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 16.J The Designed World Students will develop an understanding of and be able to select and use energy and power technologies.
- 17.Q The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.L The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 20.N The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none">• techniques that are used in engineering that allow for the successful integration of systems into a cohesive finished product.• the structural components of a finished robot.	<ul style="list-style-type: none">• demonstrate how system integration works.• demonstrate how to use the six tips of integration in my design.• explain how the successful integration of all structural systems is a major component of the design process

Unit 12: Testing and Iteration Process

Essential Questions:

- How does the testing process provide you concrete information to make your decisions?
- How does the iterative process improve the quality of your design?
- How do you prioritize which subsystems to work on first?
- Why is making a prototype so important in the design process?

Essential Understanding:

- Testing, iteration and continuous improvement are extremely important in the design process of a robot.
- The iterative process is fundamental in engineering.

Curriculum Standards- DOK noted where applicable with Standards

- 2.W The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.G The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 4.I Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 5.H Technology and Society Students will develop an understanding of the cultural, social, economic, and political effects of technology
- 7.O Technology and Society Students will develop an understanding of the influence of technology on history.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.Q Abilities for a Technological World Students will develop the abilities to apply the design process.
- 11.R Abilities for a Technological World Students will develop the abilities to apply the Evaluate final solutions and communicate observation, processes, and results design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.J Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 16.J The Designed World Students will develop an understanding of and be able to select and use energy and power technologies.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.
- 19.R The Designed World Students will develop an understanding of and be able to select and use manufacturing technologies.
- 20.J The Designed World Students will develop an understanding of and be able to select and use construction technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none">• what the process of iteration is and how it is used in engineering.• the testing process and can use it to answer the guiding questions.	<ul style="list-style-type: none">• demonstrate the role that testing plays in the design process.• demonstrate how the information collected in the testing process is used in the different iterations of their robot design.• demonstrate a systematic process to prioritize the improvements dictated from the data collected from their testing.• use the information collected in my testing to prioritize the changes that need to be made to my robots.

Unit 13: Design your own part

Essential Questions:

- What other custom parts could be designed for the Clawbot?
- How many different methods of Rapid Prototyping are there?

Essential Understanding:

- The ability to design custom parts will aid designing a robot that specifically addressed the problem at hand.

Curriculum Standards- DOK noted where applicable with Standards

- 1.J The Nature of Technology Students will develop an understanding of the characteristics and scope of technology.
- 2.X The Nature of Technology Students will develop an understanding of the core concepts of technology.
- 3.J The Nature of Technology Students will develop an understanding of the relationships among technologies and the connections between technology and other fields of study.
- 8.H Design Students will develop an understanding of the attributes of design.
- 9.L Design Students will develop an understanding of engineering design.
- 10.I Design Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- 11.R Abilities for a Technological World Students will develop the abilities to apply the Evaluate final solutions and communicate observation, processes, and results design process.
- 12.L Abilities for a Technological World Students will develop the abilities to use and maintain technological products and systems.
- 13.M Abilities for a Technological World Students will develop the abilities to assess the impact of products and systems.
- 17.L The Designed World Students will develop an understanding of and be able to select and use information and communication technologies.

LEARNING TARGETS

Knowledge/Content I Know ...	Skills/Processes I Can ...
<ul style="list-style-type: none"> • the different types of rapid prototyping. • the basic commands of the Inventor software. 	<ul style="list-style-type: none"> • create custom 3D models using Autodesk Inventor • animate 3D models • render 3D models • use Autodesk Inventor to design and model my

own custom part for addition onto my robot.

- utilize rapid prototyping to create a part and implement it onto a robot before testing its efficiency.