

Name:
School:

Kim Wellington
Central Valley High School

Course: Introduction to Technology - CIP 210198
Unit of Instruction: Maglev Car

FOUNDATION COMPONENTS AND COMPETENCIES

Unit of Instruction: Maglev Car

1. Major Course Skills/Units of Study:

Maglev Car Designing and Racing

2. Situation or Problem:

Given teacher information from lecture, word, and powerpoint documents and materials supplied, design, produce working drawings, and produce a maglev car according to stated specifications and using only certain materials.

3. Project Description, Design Brief or Purpose:

The teacher will give information by lecture and powerpoint documentation. The students will demonstrate knowledge and application of the design process by documenting the process on powerpoint using the given check sheet as a page by page guide. (See following check sheet.) After documenting their process and designing a best option drawing, the students will make a design a Maglev Car from given materials that will meet specifications. They will also complete a powerpoint presentation demonstrating their understanding of the physical elements of design, magnetism, and basic electricity and show data to back their evaluation, conclusion, and reflection. This assignment gives the beginning student the essentials in learning the basics in the design process, measuring, basic physics of magnetism and electricity, and computer applications

4. Performance Specifications, Guidelines or Rules:

Complete the powerpoint presentation, product, and present the materials in front of the class. Correct until completed accurately meeting instructor specifications

5. Specific Project Core Competencies:

Standards and Competencies/Components

- Technical Skills – Basic Drafting Concepts, Computer Application – Powerpoint and Excel, Basic Tool Use
- Academic Skills – Measuring, Magnetism, Weight, Electricity and Computing Average Speed.
- Employment-Related Skills – The Design Process, Computer Applications, and Presentation Skills.
- Career Transition Skills – Measuring Skills, Concepts of Basic Physics and Electricity, Computer Application Skills, Presentation Skills.

Transportation Technologies
Outline based on OSPI Model Curriculum Framework

Transportation Competencies

- Standards DW-TT 1: Develop an understanding of The Designed World to select and use transportation technologies.
- DW-TT1.1 Transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communications, health and safety, and agriculture.
 - DW-TT1.2 Intermodalism is the use of different modes of transportation, such as highways, railways, and waterways as part of an interconnected system that can move people and goods easily from one mode to another.
 - DW-TT1.3 Transportation services and methods have led to a population that is regularly on the move.
 - DW-TT1.4 The design of transportation systems depends on many processes and innovative techniques.
 - DW-TT1.5 All Transportation Technology programs need to include appropriate tool skills, health and safety, the manipulation of related materials, and the development of appropriate products (physically, digitally or virtually).
- Standard DW-TT 2: Investigate career opportunities in the transportation industry, explore the impact of transportation on our society and identify a variety of transportation technologies.
- DW-TT2.1 Identify occupations related to the transportation industry.
 - DW-TT2.2 State the differences between past and present methods of transportation technologies.
 - DW-TT2.3 Identify a variety of systems, methods and materials for building transportation technologies.
 - DW-TT2.4 Learn and use safe work habits and techniques
- Standard DW-TT 3: Understand the role/use of energy in transportation.
- DW-TT3.1 Understand and define *transportation* and *power*.
 - DW-TT3.2 Identify sources of energy.
 - DW-TT3.3 Demonstrate an understanding of energy conversion.
 - DW-TT3.4 Demonstrate an understanding of mechanical systems.
 - DW-TT3.5 Demonstrate an understanding of electrical systems.
 - DW-TT3.6 Demonstrate an understanding of fluid power systems.
- Standard DW-TT 4: Investigate the modes of transportation.
- DW-TT4.1 Demonstrate an understanding of transportation in the world of aviation systems.
 - DW-TT4.2 Demonstrate an understanding of transportation in the world of aerospace systems.
 - DW-TT4.3 Demonstrate an understanding of transportation in the world of land systems.
 - DW-TT4.4 Demonstrate an understanding of transportation in the world of marine systems.
 - DW-TT4.5 Demonstrate an understanding of intermodal transportation systems.
- Standard DW-TT 5: Investigate the nature and meaning of *vehicular systems*.
- DW-TT5.1 Demonstrate an understanding of propulsion of a vehicle.
 - DW-TT5.2 Demonstrate an understanding of guidance of a vehicle.
 - DW-TT5.3 Demonstrate an understanding of control of a vehicle.
 - DW-TT5.4 Demonstrate an understanding of suspension of a vehicle.
 - DW-TT5.5 Demonstrate an understanding of structure of a vehicle.
 - DW-TT5.7 Explore transportation technologies of the future.

Standard DW-EPT 1: Develop an understanding of The Designed World to select and use energy and power technologies.

DW-EPT1.1 Energy cannot be created nor destroyed; however, it can be converted from one form to another.

DW-EPT1.2 Energy can be grouped into major forms: thermal, radiant, electrical, mechanical, chemical, nuclear, and others.

DW-EPT1.3 It is impossible to build an engine to perform work that does not exhaust thermal energy to the surroundings.

DW-EPT1.4 Energy resources can be renewable or nonrenewable.

DW-EPT1.5 Power systems must have a source of energy, a process, and loads.

All Energy and Power Technology Education programs need to include appropriate tool skills, health and safety, the manipulation of related materials, and the development of appropriate products (physically, digitally or virtually).

Standard DW-EPT 2: Investigate career opportunities in the energy industry, explore the impact of energy on our society, and identify a variety of energy technologies.

DW-EPT2.1 Identify occupations related to the energy industry.

DW-EPT2.2 State the differences between past and present methods of energy technologies.

DW-EPT2.3 Identify a variety of systems, methods and materials for building energy technologies.

Standard DW-EPT 3: Identify and understand conversion and converters.

DW-EPT3.1 Identify and explain energy conversion using mechanical converters

DW-EPT3.2 Identify and explain energy conversion using thermal converters

DW-EPT3.3 Identify and explain energy conversion using chemical converters

DW-EPT3.4 Identify and explain energy conversion using solar converters

Standard DW-EPT 4: Identify and understand energy and power transmission.

DW-EPT4.1 Identify and explain mechanical transmission of energy and power.

DW-EPT4.2 Identify and explain fluid transmission of energy and power.

DW-EPT4.3 Identify and explain electrical transmission of energy and power.

Standard DW-EPT 5: Identify and understand energy resources.

DW-EPT5.1 Understand renewable and nonrenewable energy resources.

DW-EPT5.2 Demonstrate energy conservation practice.

Standards & Competencies: Exploratory = pre-industry content standard
C = CORE Standards 1-7 (The Nature of Technology, Technology & Society)
 Students will develop an understanding of The Nature of Technology. This includes acquiring knowledge of:

Standard 1: the characteristics and scope of technology.
 In order to comprehend the scope of technology, students should learn that:

C1.3 Inventions and innovations in a specific area are generally driven by research to achieve a specific objective.

Standard 2: the core concepts of technology.
 In order to recognize the core concepts of technology, students should learn that:

C2.1 Systems thinking involves input, process, output and feedback and applies logic and creativity with appropriate compromises in complex real-life problems.

C2.2 Technological systems interact with other systems including social, environmental, and scientific. Outputs - expected desirable, expected undesirable, unexpected desirable, unexpected undesirable

C2.3 Systems feedback is the process we use to measure and adjust a system based on the output. The stability of

a technological system is influenced by all of the components in the system.

C2.4 Tradeoffs result from competing values such as availability, cost, desirability, and waste within a system.

C2.5 Requirements involve the identification of the criteria and constraints of a product or system. The system design is driven by the requirements.

C2.6 Constraints impact the design process.

C2.7 New technology creates new processes.

C2.8 Quality control is a planned process to ensure that a product, service, or system meets established criteria and is embedded in the feedback loop.

C2.9 Management is the process of planning, organizing, and controlling work.

C2.10 Complex systems have many layers of control and feedback loops to provide information.

Standard 3: the relationships among technologies and the connections between technology and other fields of study.

In order to appreciate the relationships among technologies, as well as other fields of study, students should learn that:

C3.1 Technology transfer occurs when a new user applies an existing innovation developed for one purpose in a different function; all technical systems are interrelated.

C3.2 Technological innovation often results when ideas, knowledge, or skills are shared within a technology, among technologies, or across other fields.

C3.3 Technological ideas are sometimes protected through the patent process.

C3.4 Technological progress promotes the understanding and relevance of science, mathematics, reading, writing and oral communications.

Standard 8: the attributes of design.

In order to recognize the attributes of design, students should learn that:

DP8.1 Design problems are seldom presented in a clearly defined form; the best results are often based on the clarity of the design problem.

DP8.2 The design needs to be continually checked and critiqued, and the ideas of the design must be redefined and improved; the best results are often achieved when the process is non-linear.

DP8.3 Requirements of a design, such as criteria, constraints, and efficiency, sometimes compete with each other.

Standard 9: the design process

In order to comprehend engineering design, students should learn that:

DP9.1 Established design principles are used to evaluate existing designs, to collect data, and to guide the design process; Design principles are often rules of thumb rather than absolutes.

DP9.2 The design process is influenced by personal characteristics, such as creativity, teamwork, resourcefulness, and the ability to visualize and think abstractly.

DP9.3 A prototype is a working model used to test a design concept by making actual observations and necessary adjustments.

DP9.4 The design process takes into account a number of factors, including safety, reliability, economic considerations, manufacturability, maintenance and repairs, and human factors engineering; the design process can't be complete without a prototype or virtual model.

Standard 10: the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.

In order to comprehend other problem-solving approaches, students should learn that:

DP10.1 Research and development is an integral part of the design process.

- DP10.2 Technological problems must be researched before they can be solved.
- DP10.3 Not every problem can be solved using technology.
- DP10.4 Many technological problems require a multidisciplinary approach.

Students will develop Abilities for a Technological World. This includes becoming able to:

Standard 11: apply the design process.

As a part of learning how to apply design processes, students should be able to:

- DP11.1 Identify the design problem to solve and decide whether or not to address it; differentiate between problems and solutions.
- DP11.2 Identify criteria and constraints and determine how these will affect the design process.
- DP11.3 Refine a design by using prototypes and modeling to ensure quality, efficiency, and productivity of the final product.
- DP11.4 Evaluate the design solution using conceptual, physical and mathematical models at various intervals of the design process in order to check for proper design and to note where areas of improvements are needed.
- DP11.5 Develop and produce a product or system using a design process.
- DP11.6 Evaluate final solutions and communicate observations, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.

Standard 12: use and maintain technological products and systems.

As part of learning how to use and maintain technological products and systems, students should be able to:

- DP12.1 Document process and procedures and communicate them to different audiences using appropriate oral and written techniques; technical communications is critical to maintaining and operating a system.
- DP12.2 Diagnose a system that is malfunctioning and use tools, materials, machines, and knowledge to repair it.
- DP12.3 Troubleshoot, analyze, and maintain systems to ensure safe and proper function and precision.
- DP12.4 Operate systems so that they function in the way they were designed; management and quality control are necessary for the system to operate the way it was designed.
- DP12.5 Use computers and calculators to access, retrieve, organize, process, maintain, interpret, and evaluate data and information in order to communicate.

Standard 13: assess the impact of products and systems.

As a part of learning how to assess the impact of products and systems, students should learn to:

- DP13.1 Ongoing development depends on evaluating a product or system effectiveness based the design criteria.
- DP13.2 Synthesize data, analyze trends, and draw conclusions regarding the effect of technology on the individual, society, and the environment.
- DP13.3 Use assessment techniques, such as trend analysis and experimentation to make decisions about the future development of technology.
- DP13.4 Design forecasting techniques to evaluate the results of altering natural systems.

6. Assessments

Written Assessment

Students will present their powerpoint presentation completing the check sheet with 100% accuracy. Students will fix document until completed and the presentation will meet industrial and teacher standard

Production Assessment	Students will work in teams of two to produce a product that successfully powers down the track. The car will be timed for evaluation and comparison to other cars.
7. Supplies/Materials and Community Resources:	Small electric motor, magnets, propellers, two power supplies, maglev track, cardboard, paperclips, wood.
8. Other Assessment Correlations	Students must use or pass the safety tests of any tools needed to complete the project such as Powerpoint & Excel Computer programs, Band Saw and Drill presses, Portable Drills, Roto-tools, and Sanders.
<i>Math GLEs included in unit</i>	<p>Math GLEs</p> <p>1.1.6 Apply strategies to compute fluently with rational numbers in all forms including whole number exponents. 1.2.1 Analyze how changes in one or two dimensions of an object affect perimeter, area, surface area, and volume. 1.2.6 Understand and apply strategies to obtain reasonable measurements at an appropriate level of precision. 1.3.1 Understand the relationship among characteristics of one-dimensional, two-dimensional, and three-dimensional figures. 1.3.2 Apply understanding of geometric properties and relationships. 1.3.3 Apply understanding of geometric properties and location of points to figures. 1.4.3 Apply appropriate methods and technology to collect data or evaluate methods used by others for a given research questions. 1.4.6 Apply understanding of statistics to make, analyze, or evaluate a statistical argument. 1.5.2 Analyze a pattern, table, graph, or model involving repeated addition (linear) or repeated multiplication (exponential) model to write an equation or rule.</p> <p>2.1.1 Analyze a situation to define a problem. 2.2.1 Apply strategies, concepts, and procedures to devise a plan to solve the problem.</p> <p>3.1.1. Synthesize information from multiple sources in order to answer questions. 3.2.2 Analyze information to draw conclusions and support them using inductive and deductive reasoning. 3.3.2 Analyze thinking and mathematical ideas using models, known facts, patterns, relationships, counter examples, or proportional reasoning.</p> <p>5.1.1 Apply multiple mathematical concepts and procedures in a given problem or situation. 5.2.1 Analyze mathematical patterns and ideas to extend mathematical thinking and modeling in other disciplines. 5.3.2 Understand the mathematical knowledge and training requirements for occupational/career areas of interest.</p>
<i>Reading GLEs included in unit</i>	<p>Reading GLEs</p> <p>1.2.2 Apply strategies to comprehend words and ideas. 1.3.2 Understand and apply <u>content/academic vocabulary</u> critical to the meaning of the text, including vocabularies relevant to different contexts, cultures, and communities</p> <p>2.1.4 Apply <u>comprehension monitoring strategies</u> for informational and technical materials, complex narratives, and expositions: use <u>prior knowledge</u>. 2.1.5 Apply <u>comprehension monitoring strategies</u> for informational and technical materials, complex narratives, and expositions: synthesize ideas from selections to make <u>predictions</u> and <u>inferences</u> 2.1.6 Apply <u>comprehension monitoring strategies</u> for informational and technical materials, complex narratives, and expositions: monitor for meaning, create mental images, and generate and answer questions.</p>

	<p>2.1.7 Apply <u>comprehension monitoring strategies</u> for informational and technical materials, complex narratives, and expositions: determine importance and <u>summarize</u> the text.</p> <p>2.2.2 Apply understanding of complex <u>organizational features</u> of printed text and <u>electronic sources</u>.</p> <p>2.3.2 Evaluate informational materials, including <u>electronic sources</u>, for effectiveness.</p> <p>2.3.4 Synthesize information from a variety of sources.</p> <p>3.1.1 Analyze web-based and other resource materials (including <u>primary sources</u> and <u>secondary sources</u>) for relevance in answering research questions.</p> <p>3.3.1 Apply appropriate reading strategies for interpreting <u>technical</u> and <u>non-technical documents</u> used in job-related settings.</p>
<p><i>Science GLEs included in unit</i></p>	<p>Science GLEs</p> <p>1.1.1 Understand the atomic nature of matter, how it relates to physical and chemical properties and serves as the basis for the structure and use of the periodic table.</p> <p>1.1.2 Apply an understanding of direction, speed, and acceleration when describing the linear motion of objects.</p> <p>1.1.4 Analyze the forms of energy in a system, subsystems, or parts of a system.</p> <p>1.2.1 Analyze how systems function, including the inputs, outputs, transfers, transformations, and feedback of a system and its subsystems.</p> <p>1.2.3 Understand the structure of atoms, how atoms bond to form molecules, and that molecules form solutions.</p> <p>1.3.2 Analyze the effects of balanced and unbalanced forces on the motion of an object.</p> <p>1.3.3 Analyze the factors that affect physical, chemical, and nuclear changes and understand that matter and energy are conserved.</p> <p>2.1.1 Understand how to generate and evaluate questions that can be answered through scientific investigations.</p> <p>2.1.2 Understand how to plan and conduct systematic and complex scientific investigations.</p> <p>2.1.3 Synthesize a revised scientific explanation using evidence, data, and inferential logic.</p> <p>2.1.4 Analyze how physical, conceptual, and mathematical models represent and are used to investigate objects, events, systems, and processes.</p> <p>2.1.5 Apply understanding of how to report complex scientific investigations and explanations of objects, events, systems, and processes and how to evaluate scientific reports.</p> <p>2.2.1 Analyze why curiosity, honesty, cooperation, openness, and skepticism are important to scientific explanations and investigations.</p> <p>2.2.2 Analyze scientific theories for logic, consistency, historical and current evidence, limitations, and capacity to be investigated and modified.</p> <p>2.2.3 Evaluate inconsistent or unexpected results from scientific investigations using scientific explanations.</p> <p>2.2.4 Analyze scientific investigations for validity of method and reliability of results.</p> <p>2.2.5 Understand how scientific knowledge evolves.</p> <p>3.1.2 Evaluate the scientific design process used to develop and implement solutions to problems or challenges.</p> <p>3.1.3 Evaluate consequences, constraints, and applications of solutions to a problem or challenge.</p> <p>3.2.3 Analyze the scientific, mathematical, and technological knowledge, training, and experience needed for occupational/career areas of interest.</p>
<p><i>Arts EALRs and Frameworks included in unit</i></p>	<p>Art GLEs</p>

<p><i>Writing GLEs included in unit</i></p>	<p>Writing GLEs</p> <p>1.1.1 Analyzes and selects effective strategies for generating ideas and planning writing 1.2.1 Analyzes task and composes multiple drafts when appropriate 1.3.1 Revises text, including changes in words, sentences, paragraphs, and ideas 1.4.1 Edits for conventions (see 3.3) 1.5.1 Publishes in formats that are appropriate for specific audiences and purposes 1.6.1 Applies understanding of the recursive nature of writing process 1.6.2 Uses collaborative skills to adapt writing process 1.6.3 Uses knowledge of time constraints to adjust writing process</p> <p>2.4.1 Produces documents used in a career setting</p> <p>3.2.3 Uses a variety of sentences consistent with audience, purpose, and form 3.3.2 Spells accurately in final draft 3.3.3 Applies capitalization rules 3.3.4 Applies punctuation rules 3.3.5 Applies usage rules 3.3.6 Uses complete sentences in writing 3.3.7 Applies paragraph conventions 3.3.8 Applies conventional forms for citations</p>
<p><i>Communication GLEs in unit</i></p>	<p>Communication GLEs</p> <p>1.1.1 Applies a variety of listening strategies to accommodate the listening situation. 1.2.1 Synthesizes a response to and evaluates effectiveness of, visual and auditory information.</p> <p>2.1.1 Uses language and other communication strategies that adapt to the needs of the situation and setting. 2.2.2 Applies skills to contribute responsibly in a group setting. 2.3.1 Analyzes the influence of cultural principles, beliefs, and world views on intercultural communication.</p> <p>3.1.1 Applies skills to plan for effective oral communication and presentation. 3.3.1 Applies skills and strategies for the delivery of effective oral communication and presentations.</p> <p>4.1.1 Applies own or established criteria to analyze strengths and weaknesses of one's own communication. 4.1.2 Analyzes and evaluates strengths and weaknesses of others' formal and informal communication using own or established criteria. 4.2.1 Applies strategies for setting grade level appropriate goals and evaluates improvement in communication.</p>
<p><i>Leadership & Employability Skills</i></p>	<p>Leadership GLEs</p>

	<p>1.1.1 The student will analyze, refine, and apply decision-making skills through classroom, family, community, and business and industry (work-related) experiences.</p> <p>1.1.3 The student will demonstrate oral, interpersonal, written, and electronic communication and presentation skills and understand how to apply those skills.</p> <p>1.1.5 The student will be involved in activities that require applying theory, problem-solving, and using critical and creative thinking skills while understanding outcomes of related decisions.</p> <p>1.2.1 The student will communicate, participate, and advocate effectively in pairs, small groups, teams, and large groups in order to reach common goals.</p> <p>1.2.3 The student will analyze the complex responsibilities of the leader and follower and demonstrate the ability to both lead and follow.</p> <p>1.2.6 The student will use knowledge, build interest, guide and influence decisions, organize efforts, and involve members of a group to assure that a pre-planned group activity is completed.</p> <p>1.2.7 The student will demonstrate the ability to train others to understand the established rules and expectations, rationale, and consequences and to follow those rules and expectations.</p> <p>1.2.8 The student will demonstrate the ability to incorporate and utilize the principles of group dynamics in a variety of settings.</p> <p>1.3.7 The student will participate in the development of a program of work or strategic plan and will work to implement the organization's goals.</p> <p>2.1.1 The student will demonstrate the ability to identify, organize, plan, and allocate resources. This means that the student is able to demonstrate allocating time, money, materials, space, and staff.</p> <p>2.1.4 The student will demonstrate an ability to work with a variety of technologies, identify or solve problems with equipment, including computers and other technologies. This means that the student can select equipment and tools, apply technology to specific tasks, and maintain and troubleshoot equipment.</p>
<p><i>Analytical, Logical & Creative Thinking Skills</i></p>	<p>Thinking Skills GLEs</p> <p>1.1.1 Observe</p> <p>1.1.2 Patterns</p> <p>1.1.3 Sequence</p> <p>1.1.4 Classify</p> <p>1.1.5 Compare/Contrast</p> <p>1.1.6 Predict</p> <p>1.1.7 Cause/Effect</p> <p>1.1.8 Fact/Opinion</p> <p>1.1.9 Main Idea</p> <p>1.1.10 Summary</p> <p>1.1.12 Analysis</p> <p>1.1.13 Finding Evidence</p> <p>1.1.14 Evaluation</p> <p>1.1.17 Conclusion</p>

2.1.2 Reasoning

3.1.1 Problem Solving

3.1.2 Decision Making

3.1.3 Goal Setting

4.1.1 Fluency

4.1.2 Elaboration

4.1.3 Flexibility

4.1.4 Originality

5.1.1 Risking

5.1.2 Inquisitiveness

5.1.3 Attending

5.1.4 Persistence

INTRODUCTION TO TECHNOLOGY PRESENTATION
Maglev Car Evaluation Criteria

NAME _____ PERIOD _____

File Names _____

OK or EXTRA (Text-----Picture)	(Fix This)	Not Complete or Do Over	<u>Assignment Sections</u>
_____	_____	_____	Title Page
_____	_____	_____	Table of Contents (Linked to Chapters in the PPT Presentation.)
DEFINE THE PROBLEM			DEFINE THE PROBLEM
_____	_____	_____	Define the Problem
RESEARCH			RESEARCH
_____	_____	_____	(Do Not Copy Instructor's Versions)
_____	_____	_____	Describe Electron Movement
_____	_____	_____	Describe the Structure of an Atom
_____	_____	_____	Describe how DC Current is Produced
_____	_____	_____	Describe how AC Current is Produced
_____	_____	_____	Describe how Magnetism Works
BRAINSTORM			BRAINSTORM
_____	_____	_____	3 Brainstorm Pictures of the Power-plant Design and the Car and Magnet Placement
BEST OPTION			BEST OPTION
_____	_____	_____	Orthographic Projection (top, front, side with dimensions on Vector Draw)
_____	_____	_____	Best Option Description (Why did you pick it?)
_____	_____	_____	Full Scale Paper Drawing showing how it will be actually constructed including your design on how you are going to connect the wires to the bar.
PROTOTYPE			PROTOTYPE
_____	_____	_____	Excel Cost Sheet
_____	_____	_____	Show the Car (Digital Picture)
EVALUATION			EVALUATION
_____	_____	_____	Your Best Option's Time
_____	_____	_____	Excel Table of all Contestants' Time
_____	_____	_____	Excel Chart Showing Your Time on the Graph
CONCLUSION			CONCLUSION
_____	_____	_____	Show and Explain the Good Points of Your Design
_____	_____	_____	Show and Explain the Design Points that need Improvement
REFLECTION			REFLECTION
_____	_____	_____	Picture of Future Design

Description of Future Design

TOOLS PASSED

TOOLS PASSED (Minimum of 4)

Band Saw or Scroll Saw

Drill Press

Disk, Belt, and Oscillating Sander

Portable Electric Drill

Others: _____

____ **FINAL SCORE** ____
Instructor's Initials

FINAL SCORE -- PASS or FIX
