LearningBlade®

STEM / CS/ CTE Career Awareness Resources

STEM Career Exploration

Joshua Sneideman - VP
Jennifer Gregory – State Manager

In strategic partnership with

eDynamicLearning

CAREER & ELECTIVE COURSES

Multiple Statewide Efforts

LearningBlade®
STEM / CS/ CTE Career Awareness Resources

Tennessee
National Rural Education Association

Arkansas
Arkansas Department of Education, & The Arkansas Public School Resource Center

Missouri
Missouri Department of Elementary & Secondary Education (DESI)

Alabama
Department of Education Office of Career & Technical Education & Alabama Works

Ohio
Ohio STEM Learning Network
Proudly Managed by Battelle

South Carolina
South Carolina Department of Education, Office of Career & Technical Education

Louisiana
Louisiana Office of the Governor

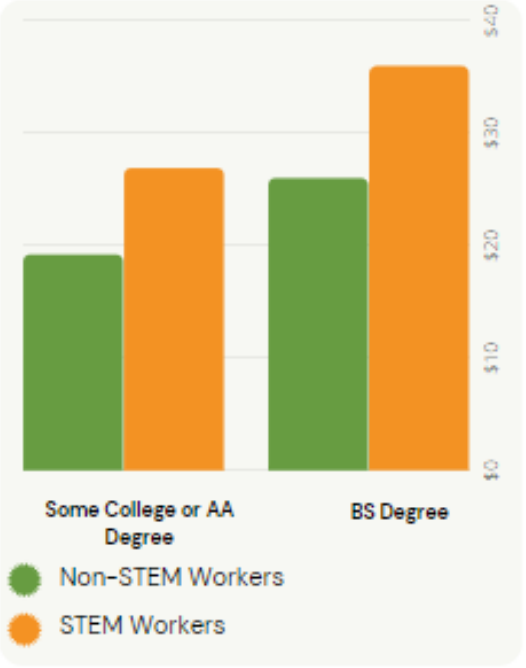
Idaho
Idaho STEM Action Center

Oklahoma
Oklahoma Office of Management and Enterprise Services

Florida
Florida Association of School Superintendents (FADSS)

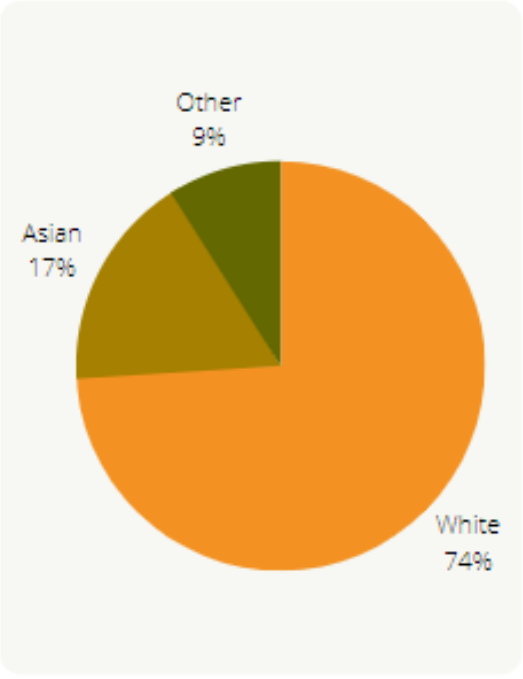
www.learningblade.com/states

Demand for STEM, computer science, career tech workers is growing, but participation by students is lacking.

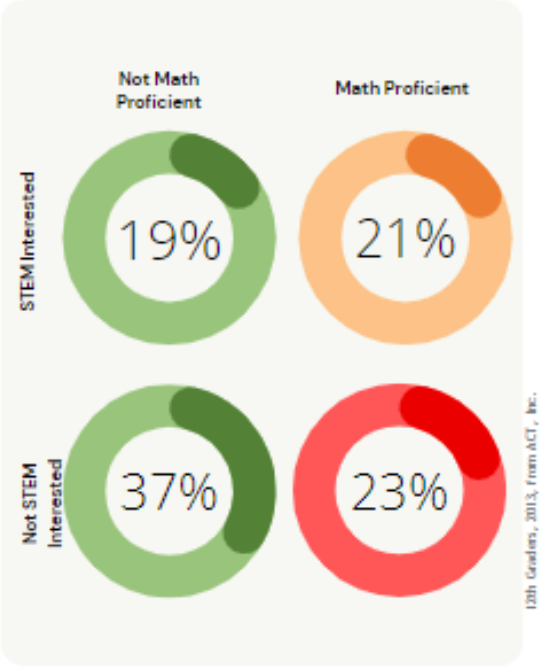


STEM Jobs pay more at all levels

Women are underrepresented in STEM



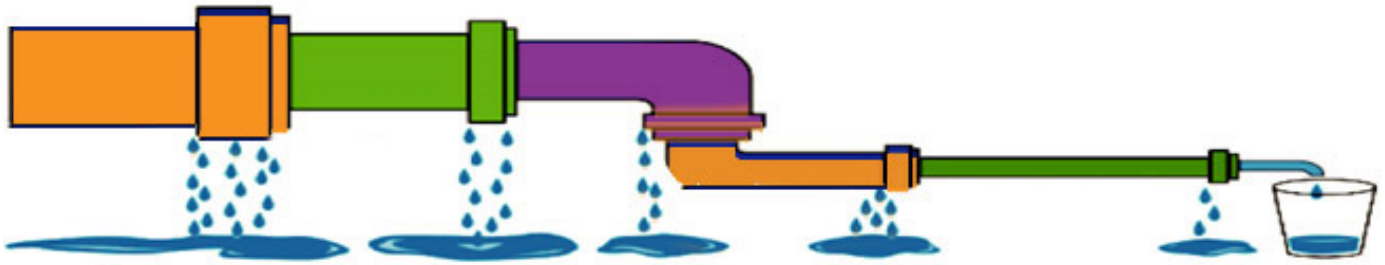
Minorities are underrepresented in STEM



23% of Students are prepared for STEM, but are not interested

Students need exposure to High-Demand careers as early as middle school.

No. 1 Reason Students do not Major in STEM is **Lack of Awareness of Careers**



94% Middle School Students Making **Career-Related Decisions**

"Increasing Student Interest in Science, Technology, Engineering, and Math (STEM)" UMass Donahue Institute Research and Evaluation Group, 2011, as retrieved from http:www.mass.edu/forinstitutions/prek16/documents/Student%20Interest%20Summary%20Report.pdf

We introduce students to CS and STEM Careers through “Missions”.

Students

Contextualized Learning for Students, Tailored to their Interests

Learning Blade Missions

Teachers

Reinforcing Academic Standards while Providing Resources that ANY Teacher can use

“Missions” involve a societal challenge that interests students

12

“Missions” that engage all students

Mission	Challenge	Career Clusters
Car Manufacturing	Use modern manufacturing techniques to design and build a new concept car	Advanced Manufacturing
Dolphin Rescue	Help rescue rehabilitate an injured dolphin, including creating an artificial prosthetic tail	Biomedicine, Marine Science
Energy Sources	Evaluate alternative or upgraded energy sources for a city that currently has an old coal-fired power plant	Energy Production, Environment
Entrepreneurship	Set up a new business with a focus on entrepreneurship	Finance, Business
Flu Outbreak	How health and IT professionals can use data warehousing and analysis to predict flu outbreaks using GIS and social media data	Information Technology
Fresh Food	Consider methods to increase production of local foods in a community	Agriculture
Hack Attack	Learn about methods to create and protect website, apps and social media after a school’s website and media are hacked	Computer Science
Haiti Orphanage	Design and build an environmentally-sound orphanage for children left homeless by an earthquake in Haiti	Construction, Sustainability
Heart Surgery	Conduct heart surgery and therapy for a child with a heart defect; evaluate the use of artificial hearts or heart components	Medicine
Lightweight Aircraft	Design a lightweight and easily maintained aircraft for distant missions	Lightweight Metals Manufacturing
Rescue Robots	Explore technology used for robotics design, such as sensors, electrical circuits, industrial design and computers	Electronics, Computer Science
Transportation Congestion	Evaluate new transportation methods for a city that has a traffic congestion problem	Transportation

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Over 400 online lessons tied to academic standards

Hands-On Projects

Mission challenges are project-based lessons using common materials

Design Thinking

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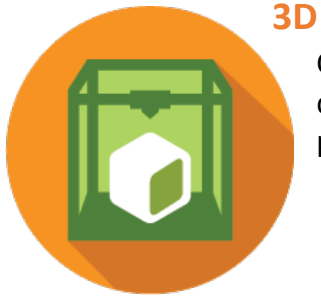
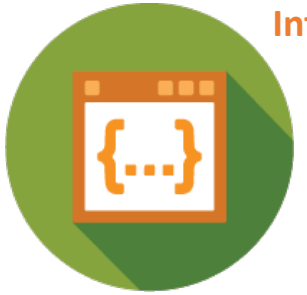
Introduce over 50 careers with real-life people



3D Printing Activities

Create objects that demonstrate science principles



Intro to Coding

20-hour middle school course providing robust coding experiences

Papercraft Figures

Students make origami-type figures of 100 careers and technologies

Car Manufacturing

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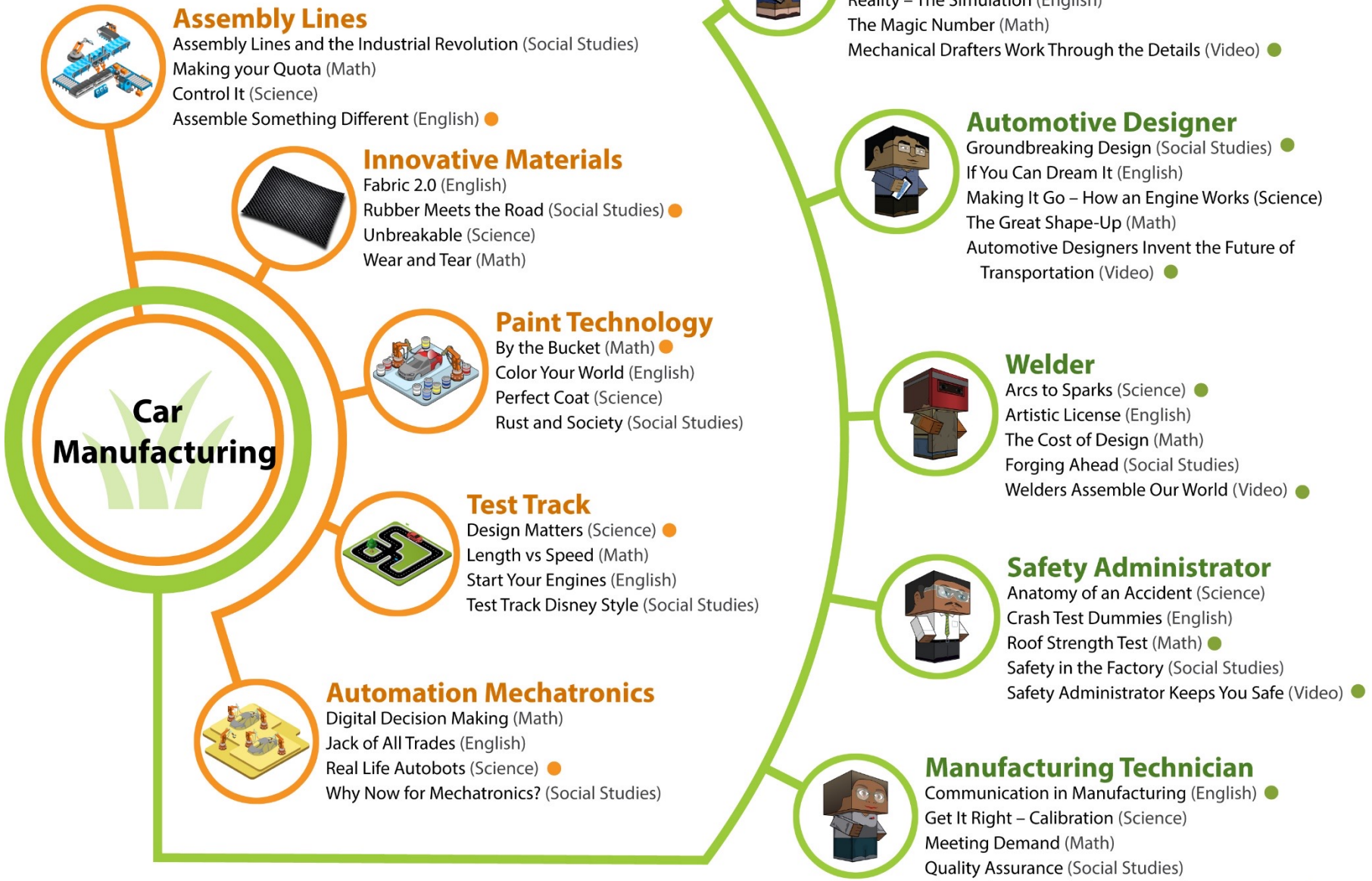


Assembly Lines

Assembly Lines and the Industrial Revolution (Social Studies)
Making your Quota (Math)
Control It (Science)
Assemble Something Different (English) ●

Innovative Materials

Fabric 2.0 (English)
Rubber Meets the Road (Social Studies) ●
Unbreakable (Science)
Wear and Tear (Math)

Paint Technology

By the Bucket (Math) ●
Color Your World (English)
Perfect Coat (Science)
Rust and Society (Social Studies)

Test Track

Design Matters (Science) ●
Length vs Speed (Math)
Start Your Engines (English)
Test Track Disney Style (Social Studies)

Automation Mechatronics

Digital Decision Making (Math)
Jack of All Trades (English)
Real Life Autobots (Science) ●
Why Now for Mechatronics? (Social Studies)

Mechanical Drafter

Aerodynamics in Action (Science) ●
From the Page to the Track (Social Studies)
Reality – The Simulation (English)
The Magic Number (Math)
Mechanical Drafters Work Through the Details (Video) ●

Automotive Designer

Groundbreaking Design (Social Studies) ●
If You Can Dream It (English)
Making It Go – How an Engine Works (Science)
The Great Shape-Up (Math)
Automotive Designers Invent the Future of Transportation (Video) ●

Welder

Arcs to Sparks (Science) ●
Artistic License (English)
The Cost of Design (Math)
Forging Ahead (Social Studies)
Welders Assemble Our World (Video) ●

Safety Administrator

Anatomy of an Accident (Science)
Crash Test Dummies (English)
Roof Strength Test (Math) ●
Safety in the Factory (Social Studies)
Safety Administrator Keeps You Safe (Video) ●

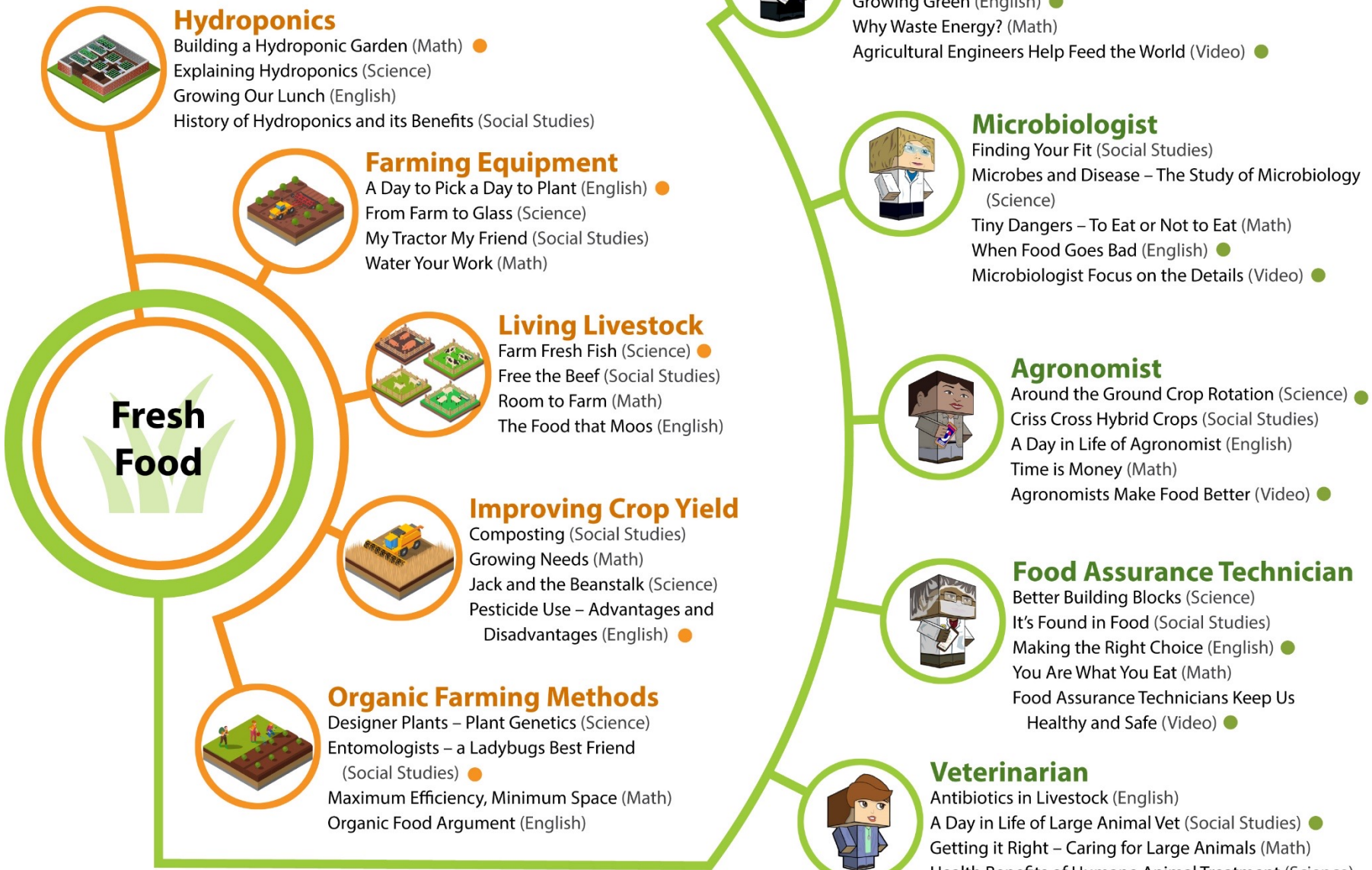
Manufacturing Technician

Communication in Manufacturing (English) ●
Get It Right – Calibration (Science)
Meeting Demand (Math)
Quality Assurance (Social Studies)
Learn About a Manufacturing Technician (Video) ●

● ● Express missions only include these lessons.

Fresh Food

Consider methods to increase production of local foods in a community.



Hydroponics

Building a Hydroponic Garden (Math) ●
Explaining Hydroponics (Science)
Growing Our Lunch (English)
History of Hydroponics and its Benefits (Social Studies)

Farming Equipment

A Day to Pick a Day to Plant (English) ●
From Farm to Glass (Science)
My Tractor My Friend (Social Studies)
Water Your Work (Math)

Living Livestock

Farm Fresh Fish (Science) ●
Free the Beef (Social Studies)
Room to Farm (Math)
The Food that Moos (English)

Improving Crop Yield

Composting (Social Studies)
Growing Needs (Math)
Jack and the Beanstalk (Science)
Pesticide Use – Advantages and Disadvantages (English) ●

Organic Farming Methods

Designer Plants – Plant Genetics (Science)
Entomologists – a Ladybugs Best Friend (Social Studies) ●
Maximum Efficiency, Minimum Space (Math)
Organic Food Argument (English)

Agricultural Engineer

By the Light of the Moon (Social Studies)
Grinding the Grain (Science)
Growing Green (English) ●
Why Waste Energy? (Math)
Agricultural Engineers Help Feed the World (Video) ●

Microbiologist

Finding Your Fit (Social Studies)
Microbes and Disease – The Study of Microbiology (Science)
Tiny Dangers – To Eat or Not to Eat (Math)
When Food Goes Bad (English) ●
Microbiologist Focus on the Details (Video) ●

Agronomist

Around the Ground Crop Rotation (Science) ●
Criss Cross Hybrid Crops (Social Studies)
A Day in Life of Agronomist (English)
Time is Money (Math)
Agronomists Make Food Better (Video) ●

Food Assurance Technician

Better Building Blocks (Science)
It's Found in Food (Social Studies)
Making the Right Choice (English) ●
You Are What You Eat (Math)
Food Assurance Technicians Keep Us Healthy and Safe (Video) ●

Veterinarian

Antibiotics in Livestock (English)
A Day in Life of Large Animal Vet (Social Studies) ●
Getting it Right – Caring for Large Animals (Math)
Health Benefits of Humane Animal Treatment (Science)
Veterinarians Care for Our Animal Friends (Video) ●

● ● Express missions only include these lessons.

Hack Attack

See how web development, apps and social media experts restore a school's website and media after being hacked.

Cloud Computing

How Big is Big? (Math)
It's Not Just a Nimbus (English)
The History of Cloud Computing (Social Studies)
Protecting the Cloud (Science) ●

Cybersecurity

Are You A Target? (Social Studies)
Breaking the Language (English)
The Business of Security (Science)
The Math of Security (Math) ●

Mobile Applications

Design Your App (Science)
DIY App (Math)
Hot Spots Are Not (English)
Misdirection (Social Studies) ●

Social Media

Check Yourself (Science)
Driving The Traffic (Math) ●
To the Ends of the Earth (English)
Who is Watching You? (Social Studies)

Robot Development Kit

Controlling Your World (Social Studies)
If You Build It (English) ●
Sensory Overload (Math)
Simple and Compound Machines (Science)

Information Security Analyst

Don't Open The Door (Science)
If I Were a Hacker (English) ●
It Could Happen To You (Social Studies)
Spreading the Bugs (Math)
Information Security Analysts Secure Our Future (Video) ●

Software Engineer

Pushing the Limit (Science)
The Journey of 1000 Miles Begins with a Line of Code (Math) ●
The Language of Code (English)
The Power of Possibilities (Social Studies)
Software Engineers Make the Future Possible (Video) ●

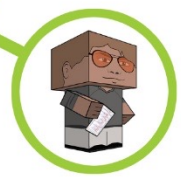
Web Developer

Oh Sweet Phi! (Math) ●
The First Website (Social Studies)
The Story of a Site (English)
The Three Second Rule (Science)
Web Developers Build Our Digital Experiences (Video) ●

UI-UX Designer

Creating a Visual Interface (Science) ●
Getting The Message Write (English)
Sizing Up the Competition (Math)
Translating our Meaning (Social Studies)
UI/UX Designers Create Digital Experiences (Video) ●

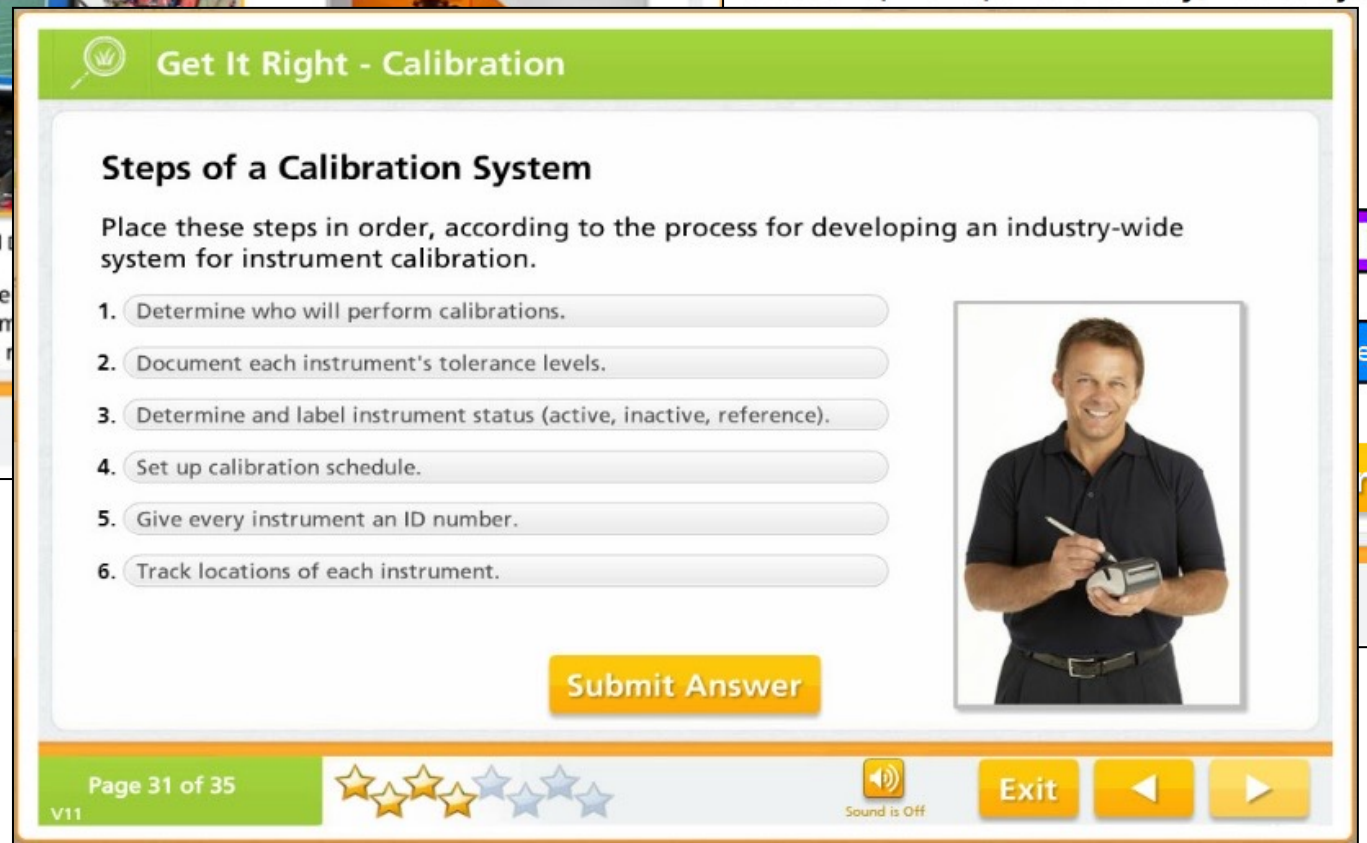
Data Scientist

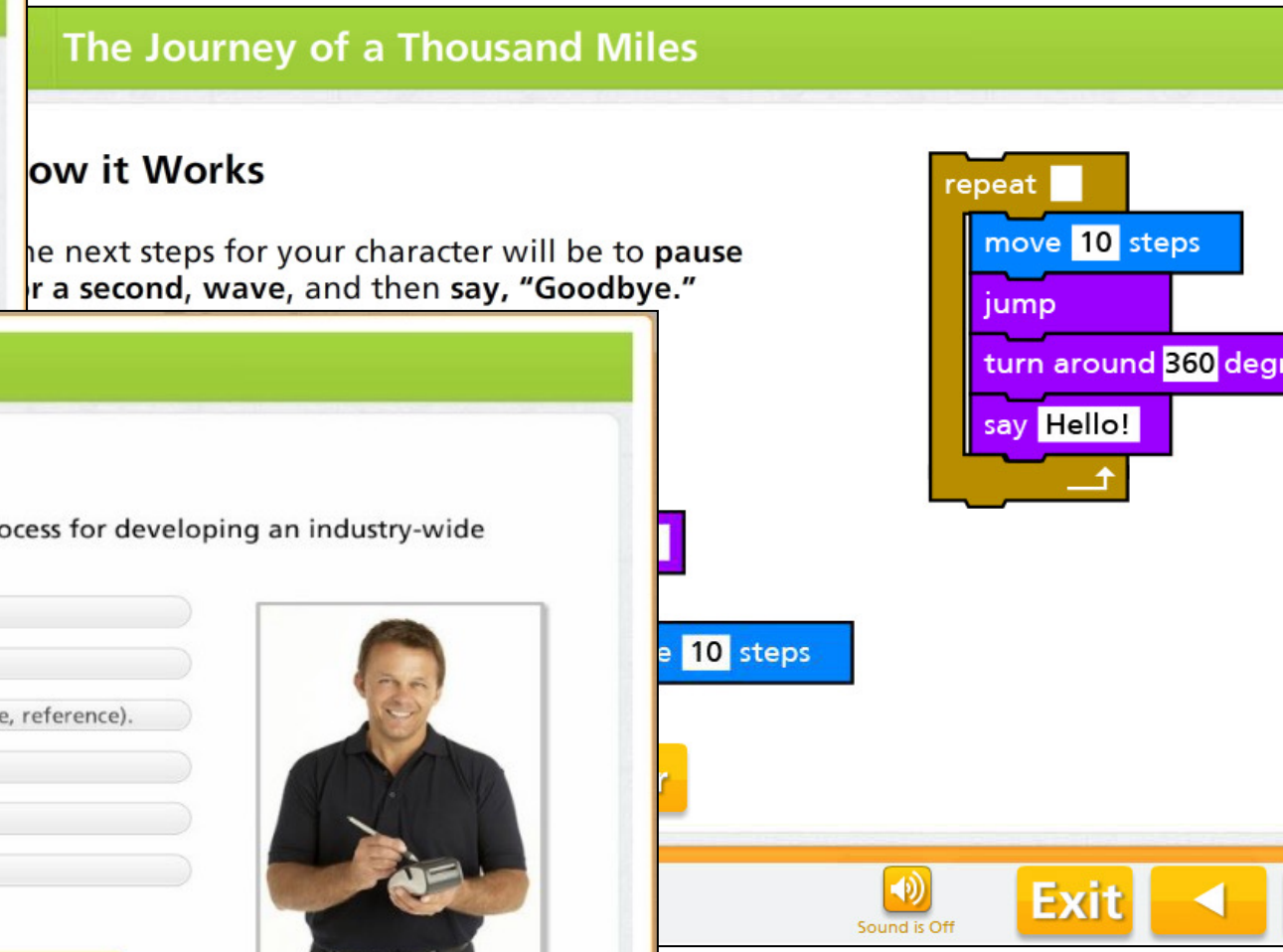


AI vs IQ (English)
Female Firsts in Computer Engineering (Social Studies) ●
It's All in the Stats (Math)
Mining For More Then Gold (Science)
Data Scientists are Statisticians (Video) ●

● ● Express missions only include these lessons.

LB interactive lessons introduce careers while reviewing academics.





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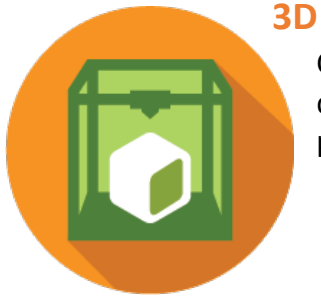

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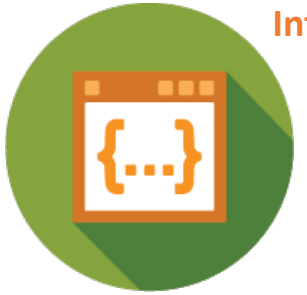

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Students make origami-type figures of 100 careers and technologies

Mission Challenges include experiments, projects and presentations.

Mission Challenges

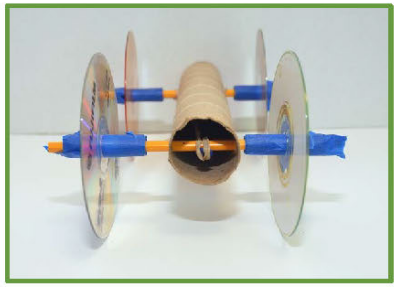
Each lesson includes:

- Writing prompt
- Presentation prompt
- Manipulatives using common household or classroom materials

LearningBlade

CAR MANUFACTURING MISSION CHALLENGE

Design a Rubber Band Car



Objective

To construct a rubber band-powered car using common household items

Description

Students will design and construct a rubber-band-propelled car. The cars will be measured on various criteria.

Materials

Almost any common household items can be used as materials. The design of the rubber band car may be dictated by the availability of materials. Students' cars may function radically different from one another.

- Basics tools like a ruler, a hole punch, thumb tacks, tape, or glue
- 2 unsharpened pencils or some other long, round objects suitable for axels
- 2 rubber bands (these will be the power source)
- Cardboard, paper towel tubes, craft sticks, or some other materials suitable for a car frame/ body
- paper clip
- CDs, small plastic lids, cardboard cut into circles, or some other materials suitable for wheels

LearningBlade

CAR MANUFACTURING MISSION CHALLENGE

Evaluating a Racecourse

Objective

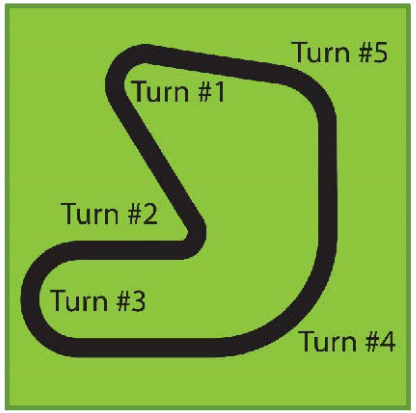
To understand the equations for uniform circular motion, and how they apply to real world scenarios

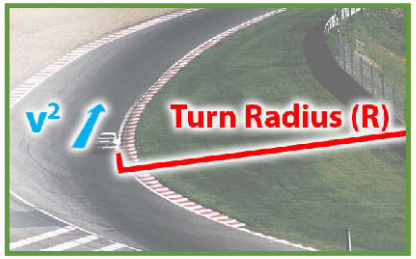
Description

Students will imagine they are designing a new racetrack, and calculate the curvature of a turn given the projected speed and friction force of a car's tires.

How to Begin

The uniform circular motion equations help us understand how object behave when going around turns. The first equation we'll use is: $\mathbf{a = v^2 / R}$. This will tell us the acceleration of an object as it moves around a circle.
The second equation is: $\mathbf{F = m \cdot a}$. This tells us the force acting on an object as it moves through the curve.
Students will imagine they are helping design a new race track. You will evaluate several turns on the track. Use the uniform circular motion equations above to answer the questions about the turns.





Turn #1 – How Much Force?

Turn #1 is a turn around a corner with a radius of 25 meters. If a 900-kg car moving at 10 m/s drives through this turn, what is the acceleration and the force acting upon the car?
The first step is to determine the circular acceleration of the car as it goes around the turn.
We use the equation: $\mathbf{a = v^2 / R}$, and use the information give to solve for the acceleration.

$$a = v^2 / R$$

Mission Challenge Videos

Learning Blade offers video tutorials for teachers for each of the 17 mission challenges!

Videos range from 2-12 minutes

- Rubber Band Challenge
- Earthquake Simulator
- Aluminum Foil Boat
- App Wireframing
- Lever Experiment
- Dolphin Tail Prototype
- Gathering Soil Profiles
- Floor Plan Design
- Recording Pulse Rates
- Design a New Product
- Stethoscope Construction
- Wind Turbine
- Plan a Light Rail Line
- Traffic Collision Forces
- Outbreak Simulation Game
- Construct a Robot Hand
- Farmer's Market Game

3D Printing lessons let students design objects and then do experiments.

3D Printing projects

Each lesson includes:

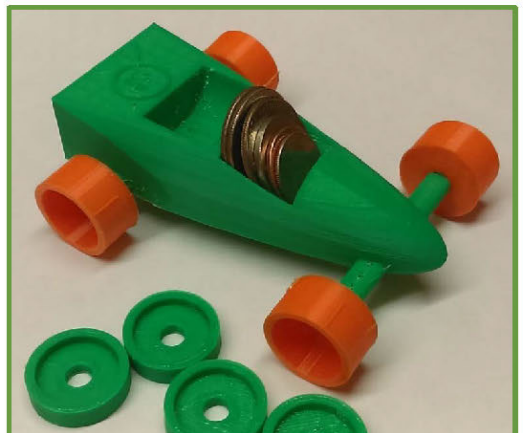
- Downloadable 3D design models
- Ability to modify the model online
- Instructions for activities that use the object after printing to illustrate science concepts

MAKER QUEST

LearningBlade® - MAKER QUESTS
Model Car Prototyping

QUEST OBJECTIVES

To practice 3D printing and testing procedures used in automotive design prototyping



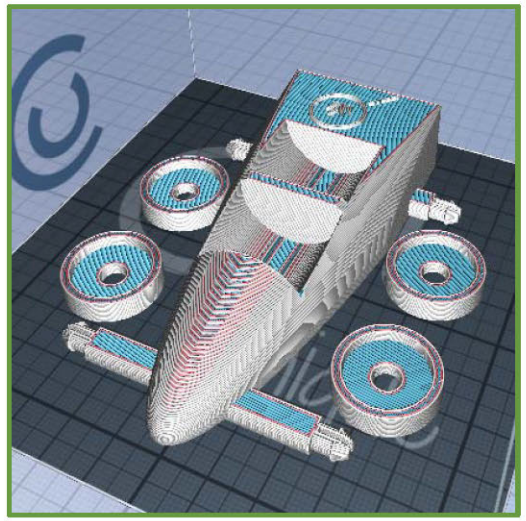
QUEST SITUATION

Have you ever wondered how automobiles are created? Taking a new automobile from concept to reality involves a long series of steps. At each step, automotive engineers and designers must test and evaluate their work to make sure the automobile will perform the way it's designed. A major tool is this evaluation is Prototyping.

Prototyping involves making a digital or physical model of a product, so that it can studied before the product goes into production. Most Prototypes are not the same size as the final version of the product. Instead, smaller, scaled-down

QUEST PROCEDURE

Read to students, or have them read, the Quest Situation section before beginning. Review the Materials list and make sure students have access to the required materials.



Download the 3D Prototype Files

Digital files for this Maker Quest have been prepared, and may be downloaded at: http://www.thingiverse.com/thing:1954693. Students should identify the files for this Quest and download those files to their computer hard drive.

Prototype Scaling

Once the files are downloaded, students should import them into the 3D slicing software and set the prototype scale. The 3D prototype model is designed as an approximately 1:15 scale model of a 4000mm long, full-sized car. Depending on the size of the 3D printer, students may need to adjust the scale of the model. Any adjustment to the model's scale will need to be recorded and accounted for during testing.

Prototype Assembly

Once the printing is complete, students will need to carefully remove the pieces from the printing surface and separate and loose filament and printed flashing from them. The finishing nails should be pushed through the center of the wheels, into the holes in the side of the car. The plastic studs should be inserted into the two holes in the front and back of the model. The washers can be placed on these studs to adjust the weight of the car for testing.

Testing the Prototype

Setup the board as a ramp, placing one end of the board on a smooth floor, and several books under the other end. For the first experiment, create a ramp that's at least 4 inches

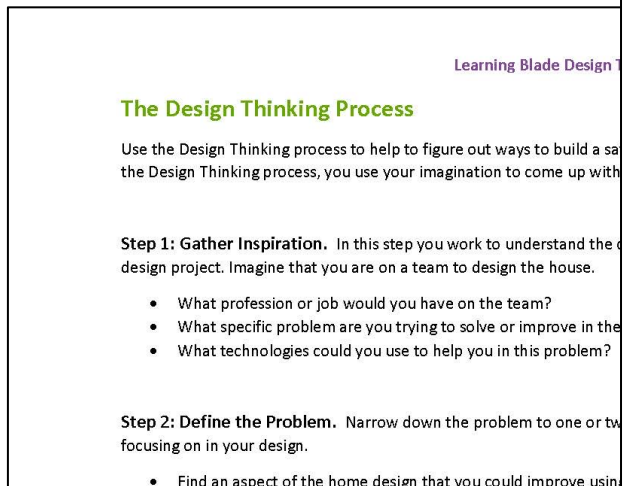
Design Thinking lessons let students create a solution to the Mission.

Design Thinking

New Design Thinking lessons encourage students to explore their own solutions to the problems related to each the mission, and to present their ideas in front of other students.

Each lesson includes:

- Background research information
- Suggestions for problem statements
- Five-step design thinking process guides
- Standards alignment
- Teacher rubric



Learning Blade Design T

The Design Thinking Process

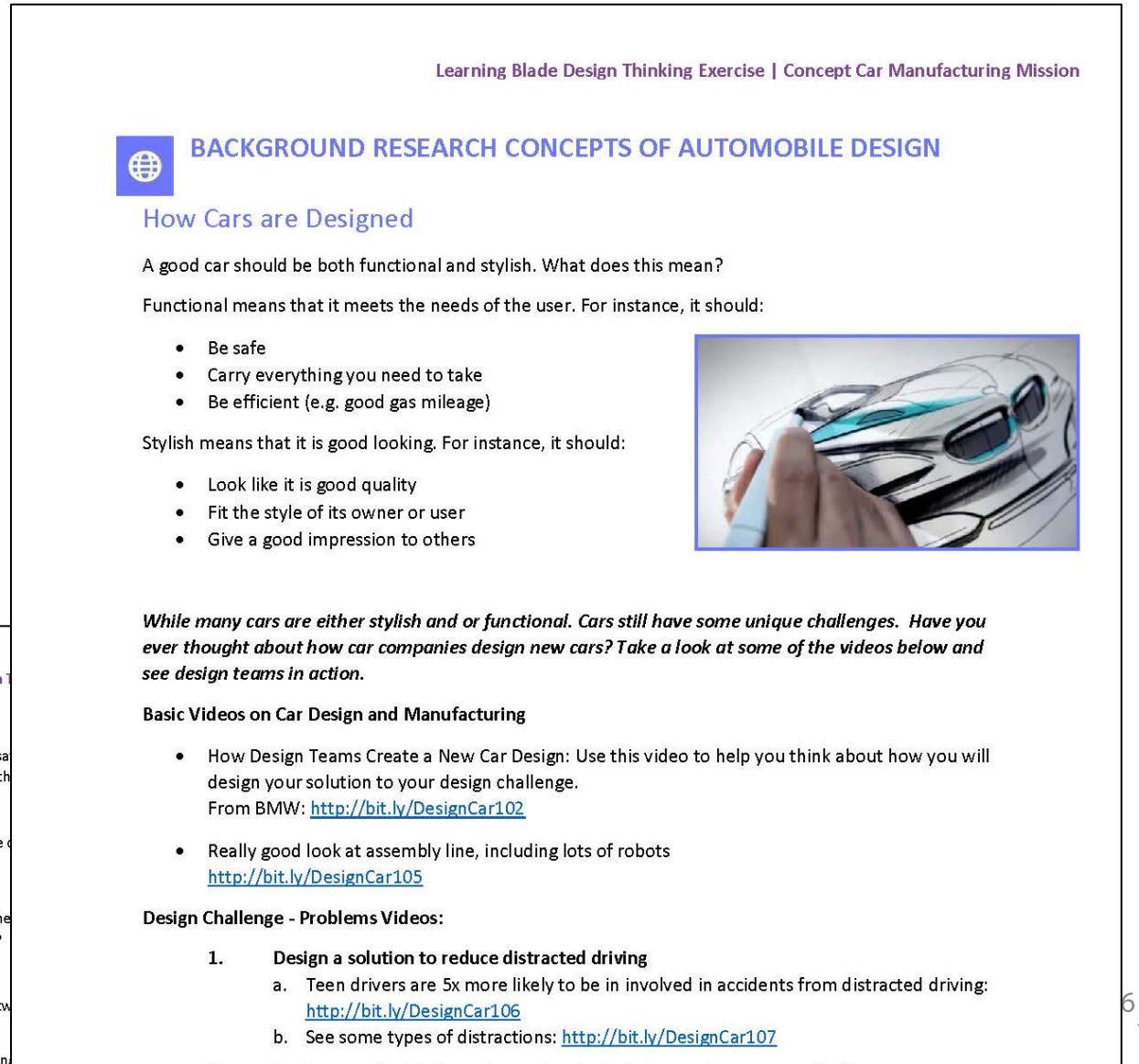
Use the Design Thinking process to help to figure out ways to build a sa
the Design Thinking process, you use your imagination to come up with

Step 1: Gather Inspiration. In this step you work to understand the
design project. Imagine that you are on a team to design the house.

- What profession or job would you have on the team?
- What specific problem are you trying to solve or improve in the
- What technologies could you use to help you in this problem?

Step 2: Define the Problem. Narrow down the problem to one or tw
focusing on in your design.

- Find an aspect of the home design that you could improve usin



Learning Blade Design Thinking Exercise | Concept Car Manufacturing Mission

BACKGROUND RESEARCH CONCEPTS OF AUTOMOBILE DESIGN

How Cars are Designed

A good car should be both functional and stylish. What does this mean?

Functional means that it meets the needs of the user. For instance, it should:

- Be safe
- Carry everything you need to take
- Be efficient (e.g. good gas mileage)

Stylish means that it is good looking. For instance, it should:

- Look like it is good quality
- Fit the style of its owner or user
- Give a good impression to others

While many cars are either stylish and or functional. Cars still have some unique challenges. Have you ever thought about how car companies design new cars? Take a look at some of the videos below and see design teams in action.

Basic Videos on Car Design and Manufacturing

- How Design Teams Create a New Car Design: Use this video to help you think about how you will design your solution to your design challenge.
  From BMW: http://bit.ly/DesignCar102
- Really good look at assembly line, including lots of robots
  http://bit.ly/DesignCar105

Design Challenge - Problems Videos:

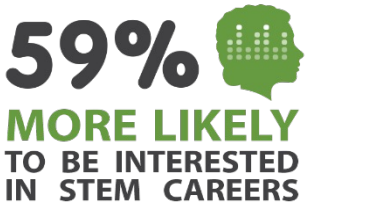
1. **Design a solution to reduce distracted driving**
   a. Teen drivers are 5x more likely to be in involved in accidents from distracted driving: http://bit.ly/DesignCar106
   b. See some types of distractions: http://bit.ly/DesignCar107

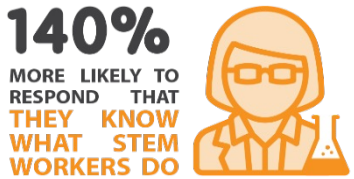
Our results have been independently validated.

BATTELLE

Student Survey Results Validated by Battelle:

- **55% Increase** in students who strongly agree that they are interested in a career in Computer Sci.
- **Doubling** the # of students interested in becoming an engineer and/or scientist
- **79% Increase** in students recognizing "*Math is helpful when solving interesting problems.*"
- **69% Increase** in students recognizing "*What I learn in school will be useful later in life.*"
- **56% Increase** in students interested in **taking advanced math classes** in high school.





Results from Student Surveys

Independent Ed.D. Research Results: Katherine Kendall, 2017. All items p<.001, N=276

Learning Blade users were more likely to intend to pursue STEM careers:

- **59% more likely** to be interested in a STEM career
- **84% more likely** to want a job that designs or builds things
- **140% more likely** to respond that they knew what STEM workers do
- **70% more likely** to be willing to like to talk about science with others

Selected as "Accomplished" in STEMworks database by WestEd by meeting rigorous design principles and evaluation by independent reviewers

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