

Jennifer Rickette & Yoshika Green  
Chapel Trail Elementary School  
19595 Taft Street  
Pembroke Pines, FL 33029  
754-323-5000

[jennifer.rickette@browardschools.com](mailto:jennifer.rickette@browardschools.com)  
[yoshika.green@gmail.com](mailto:yoshika.green@gmail.com)

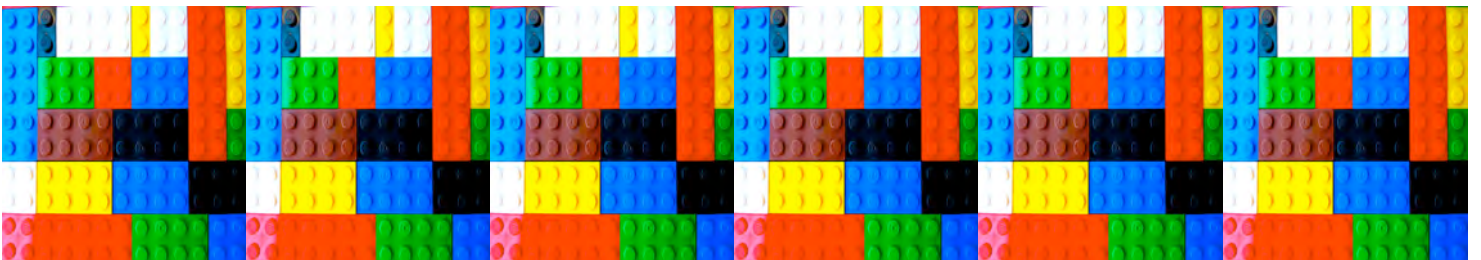
# Let's Go LEGO!

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The Broward Education Foundation  
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754-321-2032

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# GOALS AND OBJECTIVES

The goals and objectives for the Let's Go LEGO program are aligned with Common Core Standards for all students from elementary to the middle school level. The students will be able to:



Conduct research and a learning investigation

Construct an innovative and functional creation with LEGOs

Integrate learning and application as they explore STEM careers

Demonstrate an understanding of skills that are utilized in this project, in the subject areas of math, science, reading, writing and communication.

The objective of this project is to teach students how to engage in research and inquiry, then how to apply what they've learned, so that they can share what they've innovatively constructed. In the end the students will have a full circle learning experience, as they focus on STEM careers and their future through real world connections.

All objectives will be measured through observations, work evaluation and assessment test performance. A measurable increase will be gathered from standardized test scores, in the following areas: reference and research in reading, math computation skills, science applications and writing to explain.

# **COURSE OUTLINE**

## **WHAT IS Let's Go LEGO?**

“Let's GO LEGO!” is an interactive learning experience where students will explore and become LEGO innovators. Students will create a showcase to display their functional LEGO creations, and present them via podcast, after they have engaged in action research to build their knowledge. To culminate this exciting event, LEGO inventors will venture into “Let's Go” journey, as they explore the STEM careers that they mirrored in the creating of their LEGO project.

## **HOW DOES THIS PROJECT GET STARTED?**

There is planning that must take place before “Let's Go LEGO” can begin. Please utilize the resources in this packet to help you in the preparation stage of this project. Also keep in mind that the students will need to draw from prior knowledge in order for them to make content area connections during the project's implementation.

## **WHAT DO THE STUDENTS DO?**

“Let's GO LEGO!” is a three part, multiple class project. This project is where students will learn about innovation and build functional creations by using LEGO pieces. The students will then explore STEM careers as they set life goals. First, the students will attend hands-on learning workshops to build background knowledge, and to learn the necessary skills of a LEGO innovator. These workshops will correlate with the Common Core Standards, with emphasis on college and career readiness, and reading print rich material in the research workshop. All workshops span across multiple subject areas, such as reading, writing, math and science.

After the students have engaged in research and the building of knowledge through the learning workshops, they will work within a small group as they collaborate to build a functional LEGO creation. The students will each be given a task to complete that will allow them to enhance attributes of their character and learning experience. The building process, as well as the entire project will be fully documented, and presented at the “LEGO Innovators Showcase.” Students will set up their displays so that parents, fellow classmates, and community members will be able to view and listen to the

podcast presentations. Awards and honors will be given to all participants. A special recognition award will also be given to a grand prize winner.

As a project extension and culminating event, STEM careers in the fields of science, technology, engineering and mathematics will be explored. STEM career presenters will share with the students and connect the LEGO innovator work to their skill base. Students will create a goals and aspirations journal for a STEM career that they will consider in the future, as an adult. Students will also be given the opportunity to apply for extracurricular programs that will allow them to stay on this learning path from this point to college, and beyond.

### **WHAT ARE THE ACADEMIC CONNECTIONS?**

This wonderful project not only builds upon various STEM skills that are taught, but it can also be used to reinforce skills in any content area. Students of all ages can practice building, constructing and creating with LEGOS as they interactively explore skills such as following directions, measurement and innovation through the use of the hands-on experience with LEGOS. Through this project the students are connecting to the college and career readiness goals as outlined in the Common Core State Standards.

To enrich the science and math curriculum simultaneously the students could invent a LEGOS robot or electronic gadget. In language arts, the students can make sentences by connecting LEGO pieces that have words attached to them. In math, the students can use LEGO pieces as manipulatives to add, subtract and multiply. In social studies, the students can learn about the history of LEGOS as they research the company and the product's inventor. These are just a few ways that this project can connect to various content areas.

### **HOW CAN THE "LET'S GO LEGO!" BE ADAPTED FOR SPECIAL NEEDS AND HIGH ACHIEVING STUDENTS?**

If you have a student with special needs, the project can be modified so that the student can participate with assistance. To challenge the high achieving students, this project can be adapted by making the hands-on LEGOS invention piece a more challenging pursuit by requiring that these students create a more elaborate LEGOS project, such as a robot or an electrical gadget. Any teacher can adapt this project by plugging in the specific skills and learning goals that meet the needs of the students in their class.



## Simple Machines Glossary of Terms

**Engineering** - The process of creating solutions to human problems through creativity and the application of math and science knowledge.

**Trade-off** – Plus and minus, positive and negative, the trading of one thing for another, usually perceived to be advantageous or complimentary.

**Optimal** – The best or most favorable.

**Consultant** – A person who gives professional advice.

**Pitch** – A brief presentation/summary of an idea used to convince others that one's solution or idea is best or optimal.

**Engineering** - The process of creating solutions to human problems through creativity and the application of math and science knowledge.

**Machine** - A man-made device, usually driven by a motor or engine, with a system of interrelated parts that work together to perform a task.

**Simple Machine** - Anything that has few parts and makes it easier to do a task.

**Complex Machine** - A combination of two or more simple machines.

**Lever** - A stiff bar that rotates around a fixed point and makes it easier to lift a load or apply a force.

**Pulley** - A wheel with grooved edges for ropes that is used to change the direction of a pull and make it easier to lift a load.

**Wheel** - A disk or circular frame that revolves on an axle.

**Axle** - A pin, pole, or bar on or with which a wheel revolves.

**Wheel-and-Axle** - Two differently sized wheels attached to the same axis that are used to make circular motion easier.

**Screw** - Inclined planes wrapped around a cylinder that are used to raise and lower objects and hold objects together

**Wedge** - Two inclined planes joined back to back to form a sharp edge that are used to change the direction of a force and often result in the splitting of objects.

**Inclined Plane** - A surface slanted upwards that lowers the effort needed to lift a load.

**Gear** - A wheel with teeth around the edge that is used to turn other gears and change the direction, speed, and force of circular motion.

**Lever** - A straight bar that rotates around a fixed point and makes it easier to lift a load or apply a force.

**Rigid** - Not flexible, stiff.

**Pry** - To move, lift, or open with something that acts as a lever.

**Rotate** - To turn or cause to turn around an axis or a center.

**Rotation Point** - The axis or center that a wheel or disk spins.

**Work** - The use of force to move an object a certain distance.

**Force** - A push or a pull.

**Distance** - The space between two points, lines, surfaces, or objects.

**Load** - The object being lifted or moved by a machine.

**Lever Arm** - Part of lever that goes around the rotation point and has a force applied to it.

**Horizontal** - On the same level as the horizon or line of the floor.

**Squeeze** - To press something firmly together from both sides.

**Lever Arm** - Part of lever that goes around the rotation point and has a force applied to it.

**Wheel** - A disk or circular frame that revolves on an axle. **Axle** - A pin, pole, or bar on or with which a wheel revolves.

**Steep** - Having a very sharp slope or incline.

**Gentle** - Having a gradual or mild slope or incline.

**Spring Scale** - A device for weighing that uses a hanging spring to measure the weight of an object.

**Fixed Pulley** - Pulley that always stays in one place

**Moveable Pulley** - Pulley that can move along the rope it connects to.

**Load** - The object being lifted or moved by a machine.

**Spring Scale** - A device for weighing that uses a hanging spring to measure the weight of an object.

**Gear** - A wheel with teeth around the edge that is used to turn other gears and change the direction, speed, and force of circular motion.

**Teeth** - The projections on the rim of a gear that fit between the projections on another gear. **Gear Train** - A set of gears that work together to transmit a force.

**Driver Gear** - The gear in a gear train that provides the power to the other gears (usually gets power from a motor).

**Idler** - A gear or wheel that transmits motion between two other gears without change of direction or speed.

**Follower Gear** - The gear that moves last/outputs power in a gear train.

**Motion** - The process of changing place, movement.

**Circular Motion** - Movement in a round or circle pattern.

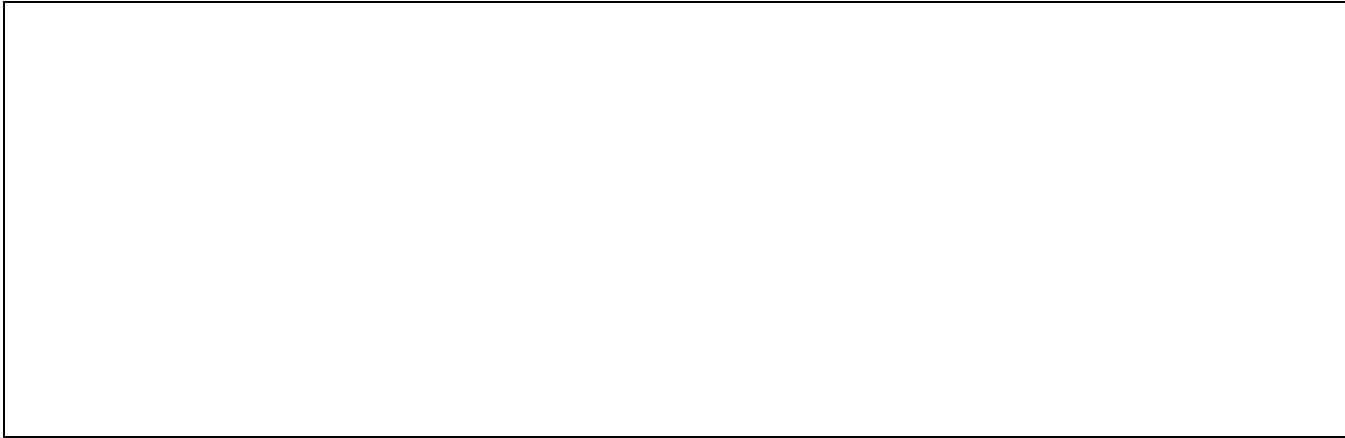
**Direction** - The way in which one may face or travel.

Name:

What machines help people move?

INITIAL DESIGN: Brainstorm one idea for machines that will move your LEGO person UP and OVER

Sketch of Idea:



Written explanation of your Idea: \_\_\_\_\_

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PITCH: Come up with a pitch to convince airport staff that your idea for a people mover is the best one. Write at least two sentences to make your pitch.

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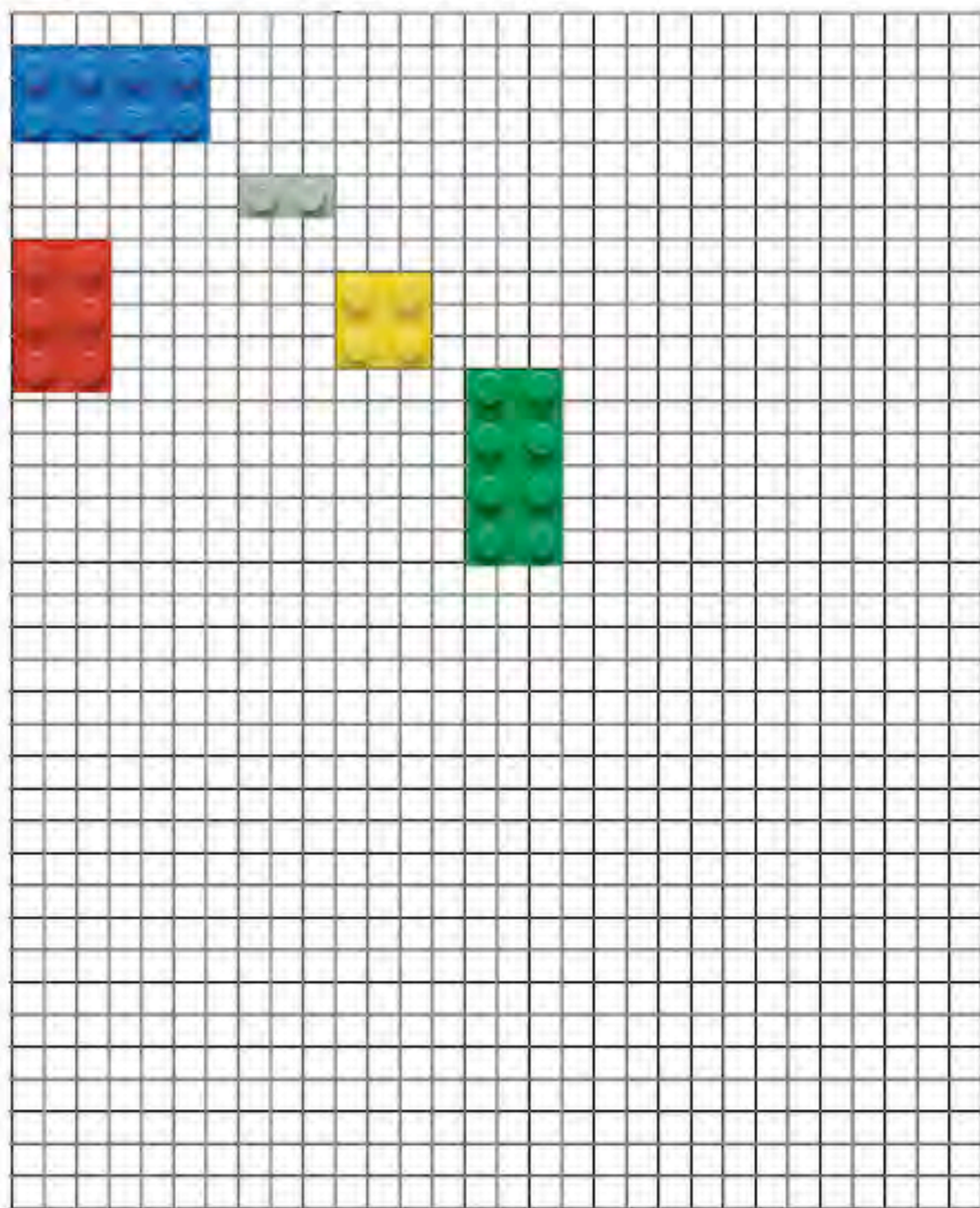


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Every LEGO brick tells a story. Build yours.

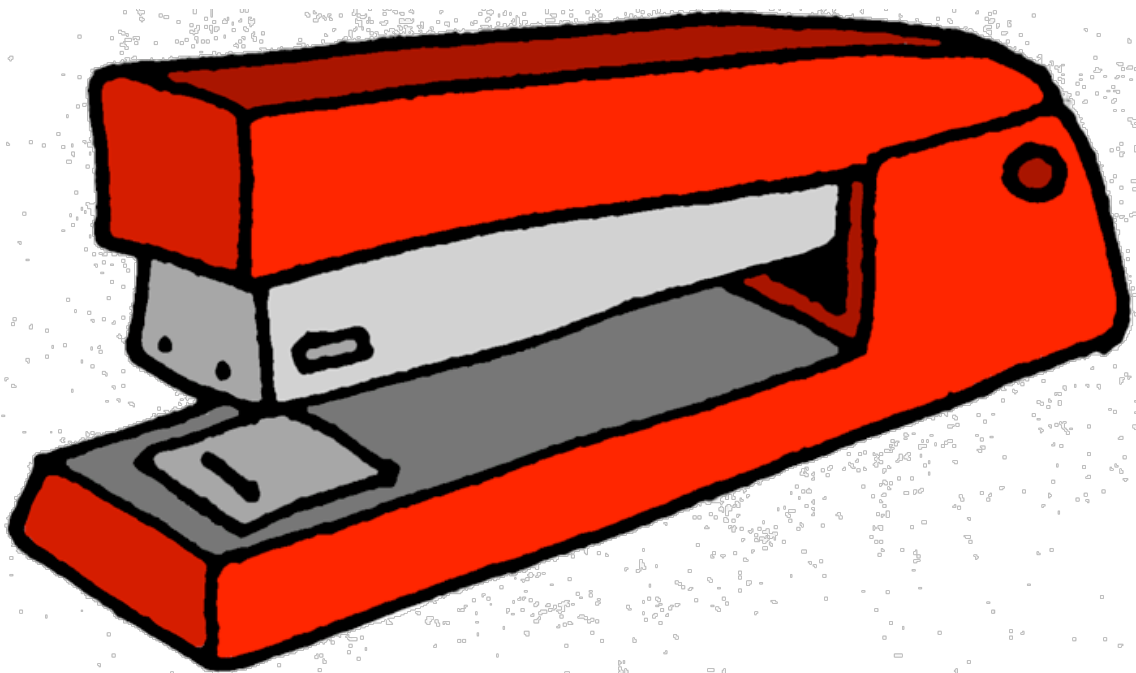


# Area / Perimeter



# Levers

A lever is a simple machine that is made up of a board or bar that rests on an object.



# Wheels and Axles

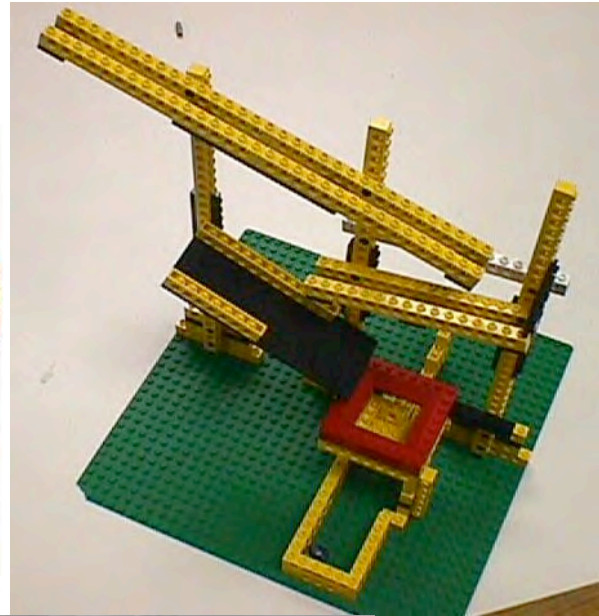
A wheel and axle has 2 parts to it. The wheel and the axle! The axle is a rod that goes through the wheel. This lets the wheel turn.





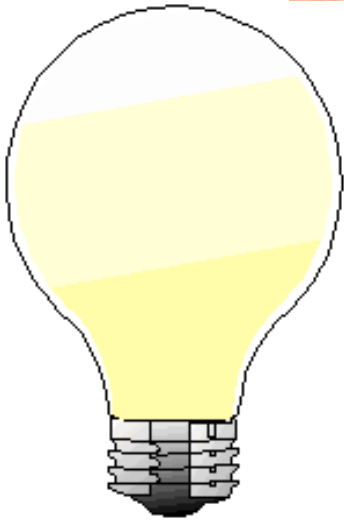
# Inclined Plane

An inclined plane is a flat, sloping surface.



# Screw

A screw is a simple machine made up of another simple machine. It is an inclined plane wrapped around a cylinder.



# Wedge

A wedge is a simple machine made up of two inclined planes put together. These 2 planes meet and form a sharp edge.

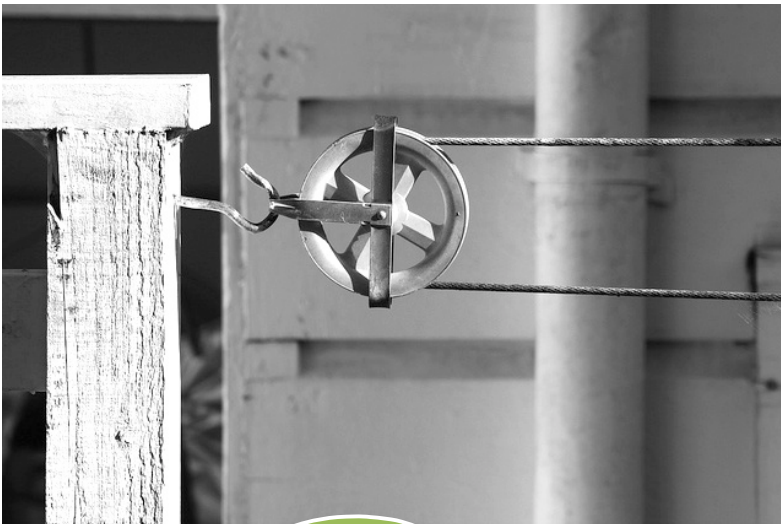


# Pulley

A Pulley is a simple machine made up of a wheel and a rope. The rope fits into the wheel and one end of the rope is attached to the load



When you pull on one side of the pulley, the wheel turns and the load moves.



# Gears

A gear is a rotating machine part having cut teeth, or cogs, which mesh with another toothed part in order to transmit rotation.



# Lesson Plan

**GRADES:**

2-5

**TIME:**

Approximately 10 weeks

## **OBJECTIVES:**

Through this project students will learn:

- how to conduct research and a learning investigation
- to construct an innovative and functional creation with LEGOs
- to integrate learning and application as they explore STEM careers
- to demonstrate an understanding of skills that are utilized in this project, in the subject areas of math, science, reading, writing, and communication.
- 

## **PRIOR KNOWLEDGE:**

The students will need to know the basic research/ reference skills and how to work collaboratively with their peers.

## **MATERIALS:**

LEGO building blocks, display base board, LEGO Trade books, awards, podcast recorder

## **PROCEDURES:**

1. Plan for LEGO Workshops.
2. Introduce the program to the students, and host the student workshops.
3. Students will build their innovations while collaborating with others.
4. The Innovator's Showcase takes place where students feature their creations. The creations will be evaluated, and awards will be presented.
5. Explore STEM careers as a culminating activity. Possibly, the students can attend a STEM-related field trip.

# **EVALUATION & STUDENT ASSESSMENT**

The students will be evaluated on their LEGO projects, podcast presentations, related reading, writing, and mat assignments, as well as their collaborative group participation. An assessment guideline and rubric will be provided and explained to students so that expectations and goals are clearly defined. Project success will be based on the LEG

project quality, functionality, and student learning gains. Formal and informal assessments and evaluations will indicate project and student success. Standardized reading, math, and science scores, in regards to the project objectives will increase, due to the authentic learning experience that this project will provide. Collaborative interactions and problem solving strategies will be strengthened among students and their peers by the end of this project. This goal will be evaluated through observation and a decrease in bullying and social dispute reports to administration.



## RESOURCE LIST

### PURCHASING MATERIALS

\*These items can be purchased wherever you choose. I recommend that you shop at the following stores: Scholastic.com, Amazon, Best Buy, Wal-Mart, Kmart, Target, Toys R Us, and LEGO.COM.

Item Description	Quantity	Vendor	Cost	Total Cost
LEGO Ideas Book	5	Scholastic	\$25.00	\$125.00
LEGO Book	5	Scholastic		
The LEGO Technic Idea Book	5	Amazon	\$15.00	\$75.00
Awards and Certificates	1 per student	Ace Educational Supplies	\$52.00 (for 800 students)	\$52.00
Student LEGO display base plate board	100	LEGO	\$5.00	\$500.00
Podcast recorder	1	Best Buy	\$100.00	\$100.00
LEGO magazines	1 per student	LEGO	Free	Free
Getting Started with LEGO Robotics: A Guide for K-12 Educators	5	Amazon	\$13.00	\$65.00
Showcasing STEM Careers (curriculum)	5	Amazon	\$10.00	\$50.00
LEGO Gift Card for Grand Prize Winner	1	LEGO	\$50.00	\$50.00
Engineer, Mathematician, Inventor, and Scientist Student Reading Books	10	Amazon	\$10.00	\$100.00

# BIBLIOGRAPHY

## IMAGES

Microsoft Office Word Clip Art. CD-ROM. Microsoft. 2003.

Print Shop Clip Art. CD-ROM. Print Shop. 1999.

Copyright Tommy Students at Chapel Trail Elementary. Digital Photography. 2012

## **GOALS, OBJECTIVES & LESSON PLANS**

Common Core State Standards. 1 October 2012. Common Core State Standards Initiative.  
<<http://www.corestandards.org/>>

## **ONLINE RESOURCES/WEBSITES**

Additional worksheets, center ideas, and teacher resources. 2012. Tufts University.  
<http://www.legoengineering.com/>

## **SUPPLEMENTAL READ ALOUD BOOKS**

The LEGO Technic Idea Book: Simple Machines. Yoshihito Isogawa, No Starch Press, 2010.

LEGO Ideas Book. Daniel Lipkowitz, Dorling Kindersley Publishing, 2011.



# **SEQUENCE OF EVENTS**

1. Plan and setup.
2. Introduce the program to the students, and host the student workshops.
3. Students will build their innovations while collaborating with others.

4. The Innovator's Showcase takes place where students feature their creations. The creations will be evaluated and awards will be presented.
5. Explore STEM careers as a culminating activity. Possibly, the students can attend a STEM-related field trip.



# PROJECT PROCEDURES & CHECKLIST

## PLAN AND SETUP

**Shop:** The first thing to do is to have lots of fun shopping! You will want to purchase everything that you need (see the materials and resource list).

**Make photocopies:** There are many resources that are attached to this packet that you will need. Choose the materials you will want to pull from your resources in this packet, and make photocopies of them prior to the start of this project.

**Invite participants:** It adds a nice touch to cordially invite the students, administrators and volunteering parents via a formal invitation (see attached). The invitation will explain the Innovator's Showcase and the program. This will set the stage for anticipation and excitement.

**Build a strong team:** Recruit parents, teachers and members of the community to be on the advisory and task team for this project. You'll need them to be your support mentally and physically, as you work together in the planning and execution stages of this project.

**Thank you notes:** This is a great project, and the volunteers that will assist you are a part of making it great. You will want to thank your volunteers for doing a great job in helping out.

**Once you have set everything up, your project is ready to begin, and it will be a success!**

## **PROJECT INTRODUCTION & INNOVATION BUILDING**

**The project introduction and ground rules:** The students will be so excited about this project. You will explain this project to the students. It's recommended that an exciting reveal of this project's introduction be assembly or celebration style in order to build excitement among the students. You will also want to set some rules such as, how to work together in collaboration, and how to meet all of the requirements for their innovation creating. The attached resources will support the innovation building and introduction process.



## STUDENTS BUILD INNOVATIONS

**LEGO Creations:** The students will work collaboratively in class and at home in building their LEGO innovations. The guidelines for their building can be found in the resource section of this packet. The teachers and parents will be the guiding advisors as the students work on building a unique creation. The creation can be electronically powered or manually functional.

## INNOVATOR'S SHOWCASE

**Presenting LEGO Creations:** The students will present their LEGO innovations and their research at the Innovator's Showcase. The creations will be evaluated by judges based on the criteria noted in the resources section of this packet. The students will be awarded prizes and honors based on their evaluations. Parents, fellow students, teachers and members of the community will be invited to attend this celebratory event that will showcase the student's accomplishments.

## EXPLORE STEM CAREERS/EXTENSION ACTIVITIES

**Review and Explore:** Once the showcase is over, the students will learn more about STEM careers as they review what they've learned, and how it correlates to the fields of science, technology, engineering and mathematics. In order to support the Common Core State Standards for college and career readiness you may also choose to plan a STEM career field trip for the students as a culminating activity that extends learning in a hands-on way.



**PICTURES**





Calling All Friends & Family  
You're Invited To Our

## **LEGO Innovator's Showcase!**



**Who:** \_\_\_\_\_, your innovative student's work will be featured!

**When:**

**Where:**

**Can't wait to see you soon!**

\* All parents who would like to volunteer please let your child's teacher know, thank you.

# Welcome to our LEGO Innovator's Showcase!

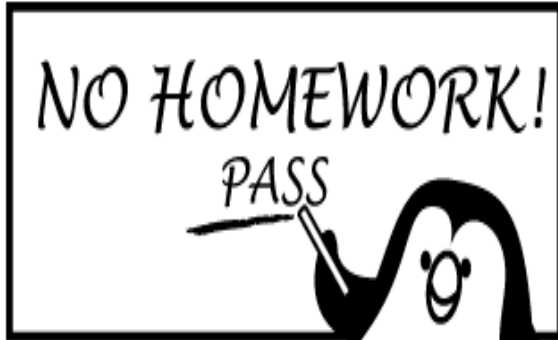


# *PARTNERING GUIDELINES*



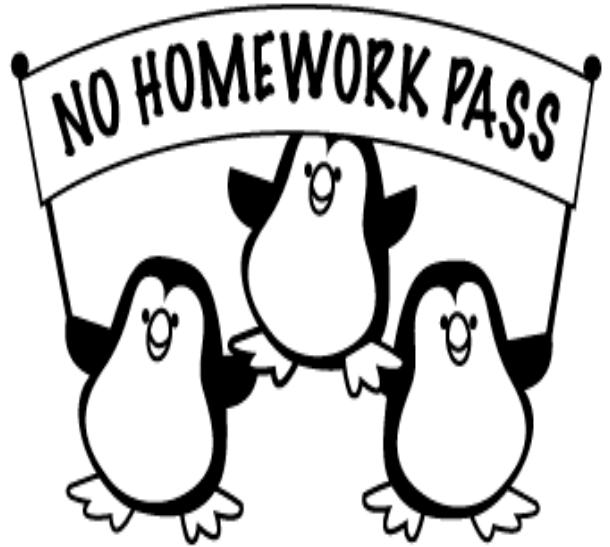
1. You must choose your partner. If you need help with finding a partner, ask your teacher.
2. You are to decide together on one or two LEGO creations that you will present.
3. You are to research your idea and two STEM careers. Then include all of your research in the final report assessment.
4. You are to share all responsibilities (for example, you are both builders, reporters, writers, researchers, etc...).
5. You are to keep your ideas and work to yourselves and your parents (let your final product and ideas be a surprise to your classmates).
6. If your featured creation wins an honor at our showcase, then you both will be recognized and awarded LEGO gifts.

*HAPPY WORKING TOGETHER!*



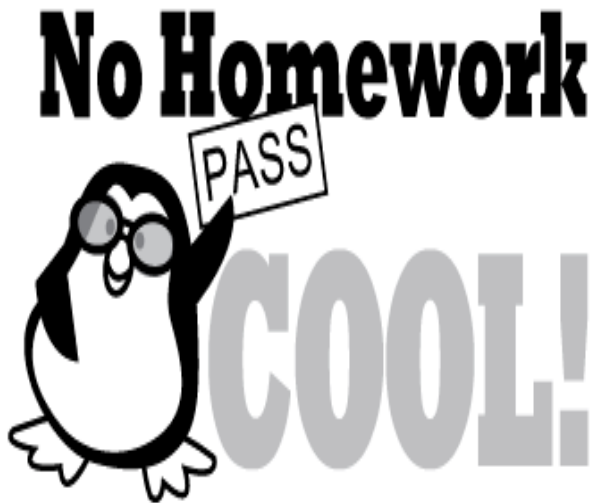
For: Students who are working on their "COOL" Let's Go LEGO Project!

Date: \_\_\_\_\_



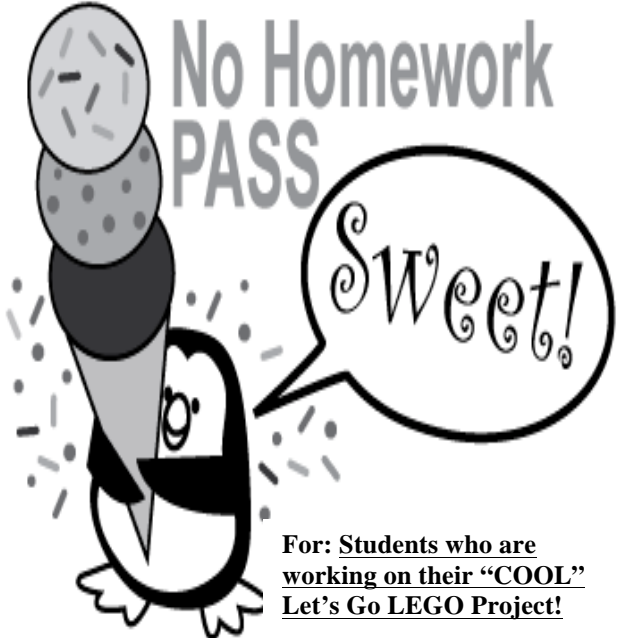
For: Students who are working on their "COOL" Let's Go LEGO Project!

Date: \_\_\_\_\_



For: Students who are working on their "COOL" Let's Go LEGO Project!

Date: \_\_\_\_\_



For: Students who are working on their "COOL" Let's Go LEGO Project!



You're Going Places with  
"Let's Go LEGO!" Great Job!  
This ticket is good for one  
entry to win a LEGOS® build-  
a-robot gift!

Name:

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Grade:

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You're Going Places with  
"Let's Go LEGO!" Great Job!  
This ticket is good for one  
entry to win a LEGOS® build-  
a-robot gift!

Name:

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Grade:

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You're Going Places with "Let's  
Go LEGO!" Great Job! This ticket  
is good for one entry to win a  
LEGOS® build-a-robot gift!

Name:

---

Grade:

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Dear Parents,

Your child will be a participant in an exciting new, grant funded project called "Let's Go LEGO!"

"Let's GO LEGO!" is a three part, multiple class project for students in grades 2-5. "Let's Go LEGO!" is where students will learn about innovation and build functional creations by using LEGO® pieces. The students will then explore STEM careers as they set life goals. First, the students will attend hands-on learning workshops to build background knowledge, and to learn the necessary skills of a LEGO innovator. These workshops will correlate with the Common Core Standards, with emphasis on reading print rich material, college and career readiness, and research. All workshops span across multiple subject areas, such as reading, writing, math and science.

After the students have engaged in research and the building of knowledge through the learning workshops, they will work within a small group as they collaborate to build a functional LEGO® creation. The students will each be given a task to complete that will allow them to enhance attributes of their character and learning experience. The building process, as well as the entire project will be fully documented, and presented at the "LEGO® Innovators Showcase." Students will set up their displays so that parents, fellow classmates and community members will be able to view and listen to their podcast presentations. Awards and honors will be given to all participants. A special recognition award will also be given to a grand prize winner.

As a project extension and culminating event, STEM careers in the fields of science, technology, engineering and mathematics will be explored. STEM career presenters will share with the students, and connect the LEGO® innovator work to their skill base. Students will create a goals and aspirations journal for a STEM career that they will consider in the future, as an adult. Students will also be given the opportunity to apply for extracurricular programs that will allow them to stay on this learning path from this point to college, and beyond.

Through this project students will learn:

- how to conduct research and a learning investigation, individually and collaboratively.
- to construct an innovative and functional creation with LEGOs
- to integrate learning and application as they explore careers in Science, Technology, Engineering and Mathematics
- to demonstrate an understanding of skills.

The students will be evaluated on their LEGO® projects, podcast presentations, related reading, writing, and math assignments, as well as their collaborative group participation. An assessment guideline and rubric will be provided and explained to students so that expectations and goals are clearly defined. Project success will be based on the LEGO® project quality, functionality, and student learning gains.

If you have any questions, please see your child's teacher. Please sign and return the bottom portion of the letter. Thank you.

-----  
I have read and understand the "Let's Go LEGO!" Project and Guidelines that \_\_\_\_\_ (my child) will be required to complete.

\_\_\_\_\_  
Parent Signature

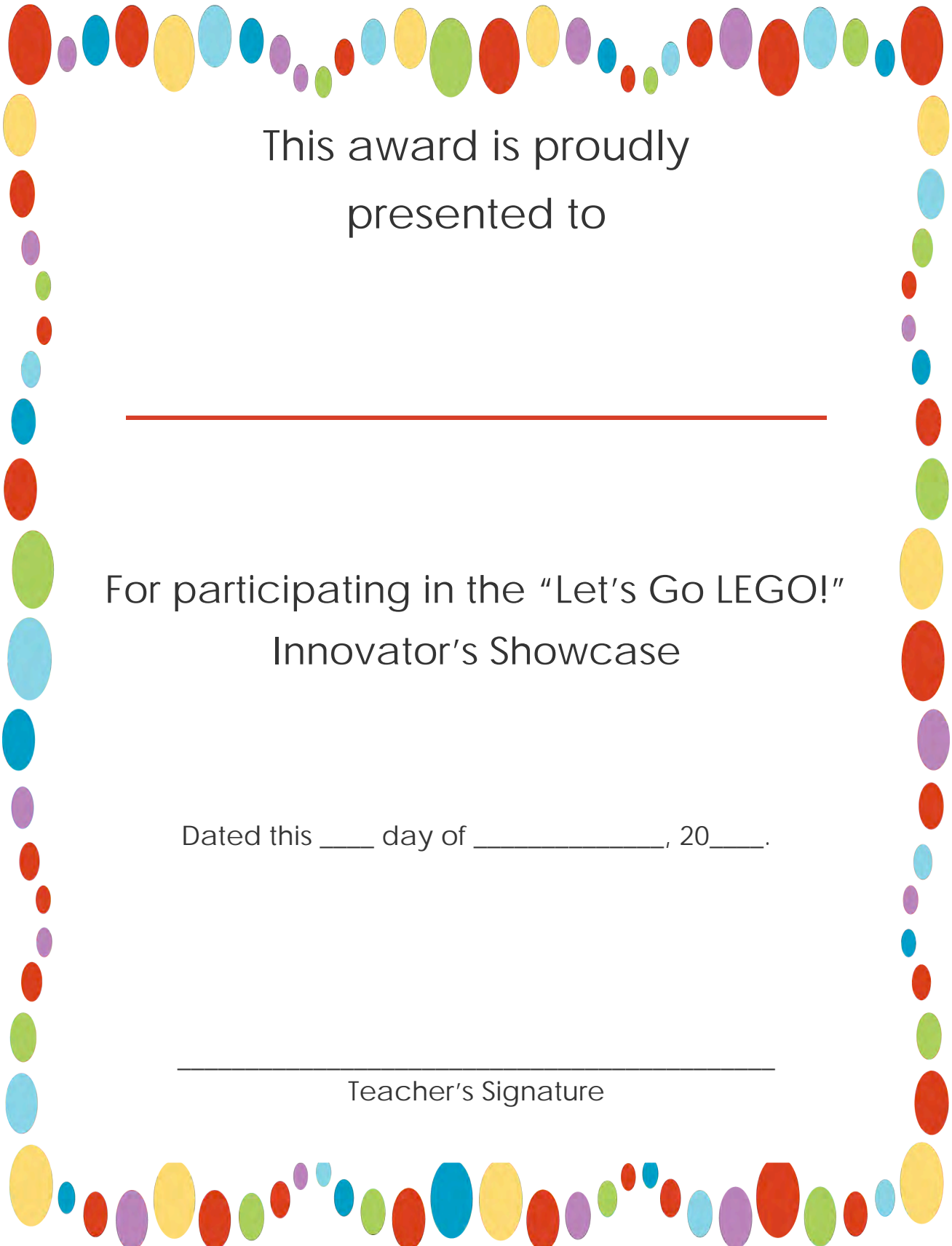
\_\_\_\_\_  
Date

# Assessment Guidelines



**Students, you will be assessed on the following:**

- **Your project planning and research**
- **STEM career exploration**
- **Your innovator's showcase creation**
- **Your individual and partnering participation**
- **The STEM connection and innovation quiz**



This award is proudly  
presented to

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For participating in the "Let's Go LEGO!"  
Innovator's Showcase

Dated this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_.

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Teacher's Signature

# STEM Connection & Innovation Quiz (Formal Assessment)

1. What does the word "*innovation*" mean?
2. Who is original inventor of LEGO®?
3. Where is the national LEGO® competition?
4. What is one career that you learned about in each of the following areas?
  - Science-
  - Technology-
  - Engineering-
  - Mathematics-
5. What STEM skills were used when working to build a LEGO® creation?

# LEGO® LEARNER

**SPECIAL RECOGNITION AWARD**

PRESENTED TO

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For receiving the highest honor in the  
Innovator's Showcase

Given this \_\_\_\_ day of

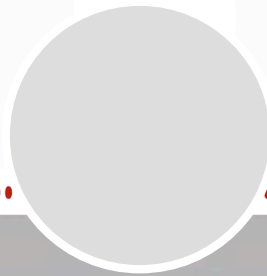
\_\_\_\_\_, 20\_\_\_\_

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Teacher

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Principal



## **Student Learning Workshops Agenda (workshops are held once a week)**

Workshop #1: Researching and Choosing a LEGO® Creation Focus

Workshop #2: Becoming an Innovator & Working with a Partner

Workshop #3: How to build with LEGO®

Workshop #4: How to build a working LEGO® machine

Workshop #5: Testing your LEGO® creation

Workshop #6: STEM Career Exploration (Science)

Workshop #7: STEM Career Exploration (Technology)

Workshop #8: STEM Career Exploration (Engineering)

Workshop #9: STEM Career Exploration (Mathematics)

Workshop #10: Presenting Your Creation at the Showcase



# LEGO® Innovator's Showcase Plan

- **All presenters will label all of their property with the assigned code. Student names should not be visible.**
- **Each display will have the project's name on the project, above the project (on the top of the display, elevated for everyone to see).**
- **Each display is to include the written report, the information board, and the created innovation to showcase.**
- **The projects will be set up in the designated area, by grade level.**
- **All projects are to be set up the day before the showcase.**
- **All electronic creations will be turned off until the showcase event.**
- **Students are responsible to power-up their electronic creations. The power source cannot come from the showcase room.**





# LEGO® Innovator's Brainstorm Sheet



**What do you like to do? List your 3 favorite hobbies?**

**What are your two favorite colors?**

**If you could build or draw something today, what would it be?**

**What are your favorite toys?**

**If you could create a robot, what would it be able to do?**

**Do some research, what LEGO® creations are your favorite?**

# Judges Evaluation Log

Project Code: \_\_\_\_\_

Project Title: \_\_\_\_\_

Table #: \_\_\_\_\_

Section #: \_\_\_\_\_

Place a check next to each area that is mastered, then tally the points and make any comments at the bottom of this sheet.

\_\_\_\_\_ Project Packet/Report shows evidence of reference, research and effort. (50 points)

\_\_\_\_\_ Project packet has STEM career connections (50 points)

Project innovation is: (this section totals 100 points)

\_\_\_\_\_ functional (30 points)

\_\_\_\_\_ creative (30 points)

\_\_\_\_\_ named appropriately and uniquely (20 points)

\_\_\_\_\_ original (20 points)

\_\_\_\_\_ Project innovation includes pictures of student collaboration and creating (this project could be created by kids, with adult assistance) (50 points)

The project board... (this section totals 75 points)

\_\_\_\_\_ is informative (25 points)

\_\_\_\_\_ is creative (25 points)

\_\_\_\_\_ clearly explains the objectives, the project purpose, and the process. (25 points)

Comments: \_\_\_\_\_

Total Points: \_\_\_\_\_

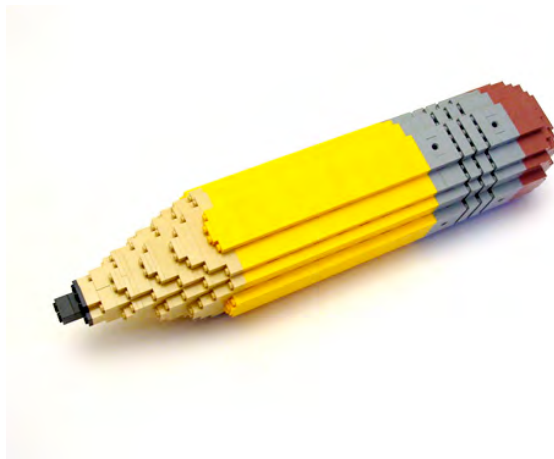
# Project Timeline

**Learning:** via the student workshops (approximately 10 weeks).

**Building:** via student collaborations with a partner, while creating their innovation to showcase (approximately 4 weeks).

**Presenting:** via the LEGO® Innovator's Showcase (approximately 1-2 days/evenings).

**Exploring:** via the STEM Career exploration path, possibly a culminating STEM career fieldtrip (approximately 4 weeks).



# LEGO Fun Facts



If you built a column of 40,000,000,000 LEGO bricks, it would reach the moon!



Laid end to end, the number of LEGO bricks sold in one year would reach more than five times around the world!



The world's children spend 5 billion hours each year playing with LEGO bricks!



On average there are 62 LEGO bricks for every person on earth!



Approximately seven LEGO sets are sold every second!



You can buy LEGO products in 130 different countries!