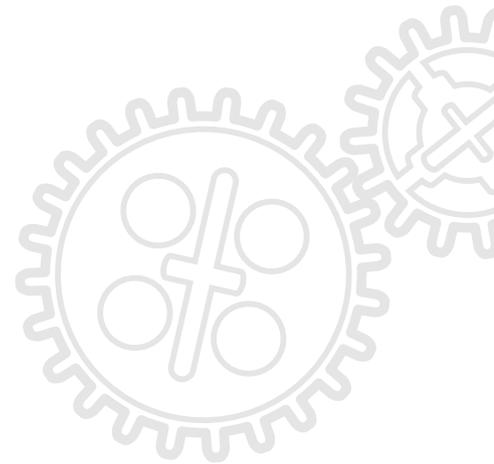
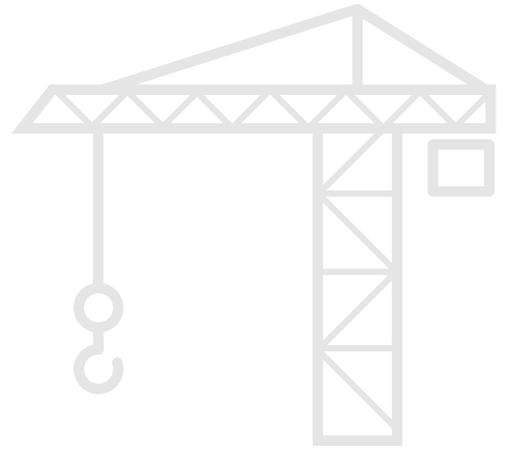


Simple & Powered Machines

MAKER Activities – Middle School



Classroom Management Tips

Resources

- LEGO® Education Simple and Powered Machines (9686)
- Lesson plan for each project
- Student worksheet for each project
- Inspirational images for each project
- Modeling materials already available in your class

How much time do you need?

Each lesson is designed to take 90 minutes. If you work in shorter class periods, you can break this down into two 45 minute sessions.

Preparation

It is important to establish student groups. Groups of two work well. Ensure that each student has a copy of the MAKER worksheet for recording their design process. They will also need the LEGO Education Simple and Powered Machines set (one set for every two students is recommended).

Prior Learning

Before beginning these MAKER activities, it is recommended that students complete the principle models activities from the booklets supplied with each brick set.

However, if you prefer a more open-ended, explorative method, you can start out with this activity and allow students to find help on their own by referring to the principle models booklets.

The LEGO Education MAKER (Design) Process

Defining the Problem

It is important that students define a real problem to solve from the start. The connect images are provided to help students to think about designing solutions for the needs of others, and not just for themselves. At this stage of the process, it is important that you not show examples of a final or sample solution.

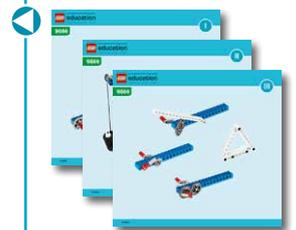
Brainstorm

Brainstorming is an active part of making. Some students will find it easier to explore their thoughts through hands-on experimentation with the LEGO bricks, and others will prefer to make sketches and notes. Group work is essential, but it is important to allow time for students to work alone before sharing their ideas with their group.

Define the Design Criteria

Discussing and finding an agreement about the best solution to build can involve a lot of negotiation, and may require different techniques depending on the students' skills. For example:

- Some students draw well.
- Others may build part of a model and then describe what they mean.
- Other students may be good at describing a strategy.



Encourage an ethos where students can share anything, no matter how abstract it might sound. Be active during this phase and ensure that the ideas the students choose are achievable.

It is important that the students set clear design criteria. Once the solution to the problem has been made, the students will return to these criteria, which will then form the basis for testing how well the solution works.

Go MAKE

Students must make one of their group's ideas using the LEGO® set, and can use other materials if needed. If they are finding it hard to build their idea, encourage them to break problems down into smaller parts. Explain that they do not have to come up with the whole solution from the start. Remind students that this process is iterative and they must test, analyze, and revise their idea as they go.

Using this MAKER process does not mean you are following an inflexible set of steps. Instead, think of it as a set of practices.

For example, brainstorming may be prominent at the beginning of the process. However, students may also need to brainstorm ideas when they are trying to figure out ways to improve their idea, or when they have a bad test result and they must change some features of their design.

Review and Revise Your Solution

To help students develop their critical thinking and communication skills, you may wish to have students from one group observe and critique another group's solution. Peer review and formative feedback helps both the students giving, and the students receiving the feedback to improve their work.

Communicate Your Solution

The student worksheet is helpful for basic documentation of the project. Students can also refer to it when presenting their work in front of the class. You may also wish to use the project as a portfolio for performance evaluations or for student self-evaluation.

Assessment

Where can I find the assessment materials?

Assessment materials are provided for the first three projects. You will find them at the end of each student worksheet.

What learning goals are assessed?

Students use the student worksheet assessment rubric to evaluate their design work according to the learning goals. Each rubric includes four levels: Bronze, Silver, Gold, and Platinum. The intention of the rubric is to help students reflect on what they have done well in relation to the learning goals and what they could have done better. Each rubric can be linked to engineering-related learning goals from the Next Generation Science Standards (NGSS).

Design criteria example:

The design must...
The design should...
The design could...



Share It

We encourage you to share your students' brilliant projects on the appropriate social media platforms using the hashtag **#LEGOMAKER**.

Students can also share their own projects if they are over 13 years old and if it complies with the rules of your school / MAKER space.

The MAKER Projects

Start your MAKER journey with the following three activities:

- Make a Digital accessory
- Make a Wearable
- Make a Repeated Pattern

Once you have completed these three projects, try out one of your own using the same MAKER design process. You can find inspiration, and ideas from the Simple & Powered Machines Curriculum Pack.

A generic Student Worksheet, and self - assessment rubric for students to record their design process is included at the end of these materials.

