

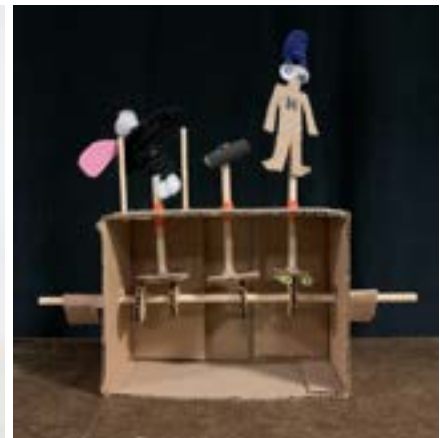
Automata with Cardboard Boxes

Shared by: MIT K-12 Maker Lab Team

Specialized tools and materials used:	Experience level required:
Craft materials	Beginner
Cardboard mechanism parts can be made in bulk on laser cutter instead of cutting out by hand	Beginner/Intermediate

Grade Level and Subject (of this example): Science, 4th Grade

Topic/Content Standards (for this example): Engineering design ([4.3-5-ETS1-3](#), [4.3-5-ETS1-5](#))

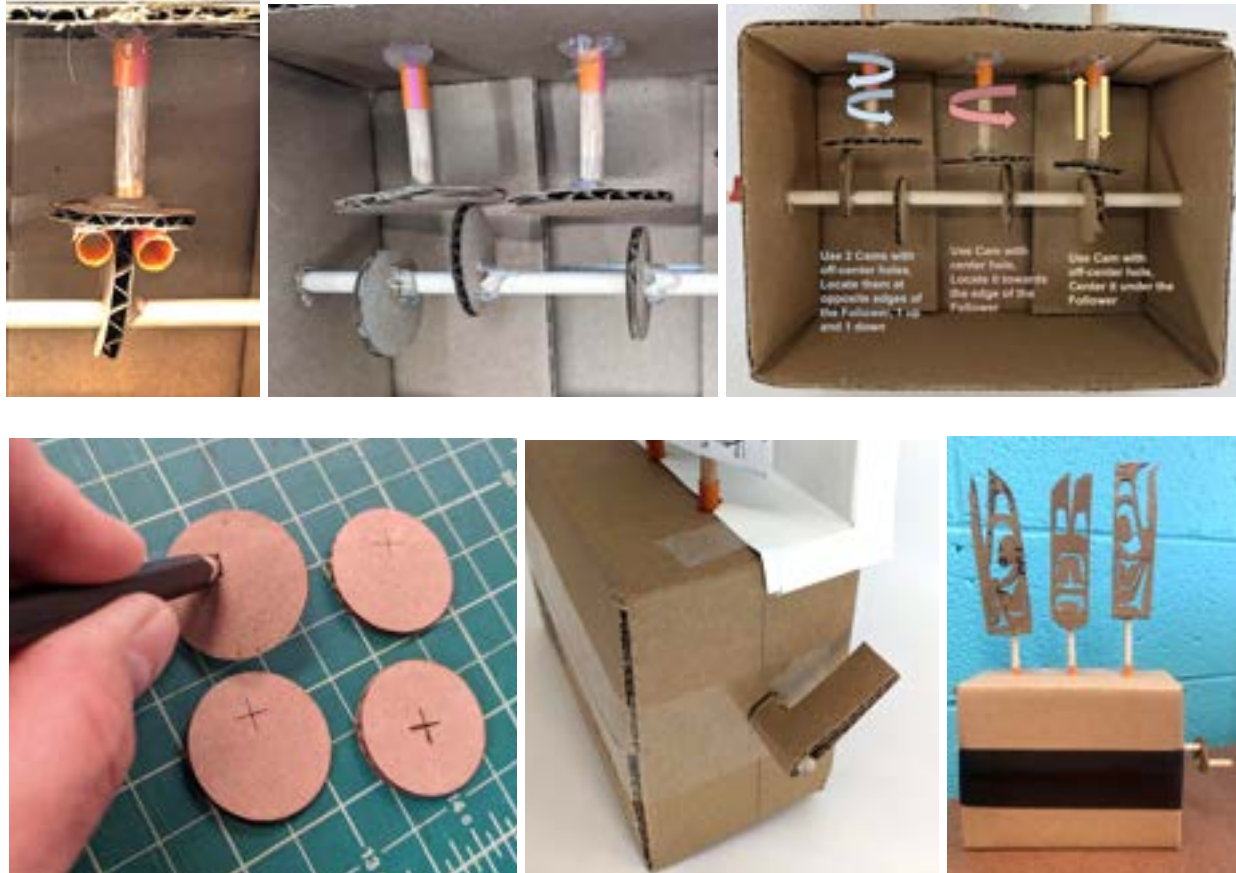


Summary of Project:

Students design and create machines with moving objects or characters that symbolize abstract concepts and represent dynamic situations. The examples shown above were created by students both as an introduction to mechanical functions and engineering design, and as a vessel for self expression. These machines, called automata or cam toys, use hand-powered mechanisms to create cyclical motions that animate a scene. Cams are rotating shapes that push on or rub against mechanical elements to create other motions. One rotating drive shaft can power many cams, and each cam can create a different motion in its associated mechanical element.

This version of the classic toy is constructed from easy-to-find materials: a small cardboard box, 1/4" wood dowels, plastic straws, and cardboard. Students begin by coming up with ways that their topic can be expressed. What characters or objects represent the topic, and what simple interactions or motions can convey the meaning?

Working individually or in pairs, they create the box, the mechanisms, and the graphics or models. (Find a full tutorial from K12MakerLab here [Automata project Tutorial slides](#)). Leave enough time for tinkering, tweaking, and embellishing!



Suggested resources

- K12 Maker Lab [Automata project tutorial slides](#) with step by step instructions
- Mechanical cam toys [Instructable](#)

Possible Content explorations [example MA Content Standards]

- **History and Social Science:** Cause and effect of social movements and events, such as the expansion of the United States over time and its regions today [\[4.T4\]](#)
- **STEM:** Ecosystems: Interactions, Energy, and Dynamics [\[5-LS2.1\]](#)