



An Affiliate of Young Audiences  
Arts for Learning

*Arts Partners seeks to ignite the full creative potential of all young people  
by integrating the arts into the early childhood through high school curriculum.*

## **The Three-Legged Stool: Blending the Lines between Engineering and Art**

**Program:** The Three-Legged Stool: Blending the Lines between Engineering and Art is an Arts Partners program originally developed in 2010 as a 7-session residency with underwriting grants from MetLife and Spirit AeroSystems. Redesigned in 2011 with additional funding from Spirit AeroSystems for STEM program development, and scaled down in length and cost to make it more accessible to more schools.

**Program Structure:** 1 Residency comprised of 3 - 50 minute Workshops + 1 Culminating Event (optional) in the form of an Art Show

**Audience:** Elementary School – 4<sup>th</sup> and 5<sup>th</sup> Grades

**Curriculum Connections:** Science, Technology, Language Arts, Careers / Life Skills

**Authentic Arts Experience:** Visual Art / Design Arts / Kinetics in Art (turntable art)

**Authentic Curriculum Experience:** Hands-on experience with mechanics (pre-cut foam shapes) and electricity (motor and battery); introduction to and exploration of the power of physical properties and variables; introduction to testing and prototypes; introduction to science and technology vocabulary; comprehension of language arts vocabulary and form (wall tags and artist statements)

**21<sup>st</sup> Century Learning Skills:** Communication, Collaboration, Critical Thinking, Creativity

**Teaching Artists:** Art Meets Science is the collaborative partnership of engineer / sculptor Tom McGuire and visual artist / kinetic sculptor Lee Shiney.

**Classroom Teacher Responsibilities:** Be present during all Workshops; lead students in follow-up assignments; coordinate the culminating Art Show; complete the Arts Partners assessment

**Main Ideas:** The Three-Legged Stool: Blending the Lines between Engineering and Art uses the metaphor of a three-legged stool to walk students through the construction of a robotic "tripod" for creating art.

**Goals of the Residency:** We will engineer. We will design. We will make art. We will have an art show. WE WILL HAVE FUN!

**Summary of Student Outcomes:** Participating students will **experience** real life applications of technology and art. Using critical thinking skills, they will construct robots and **create** works of art that implement and extend knowledge of science, math, social studies, and language arts. Among the numerous probable outcomes, the students will **understand** kinetic art; the difference between potential and kinetic energy; the difference between evidence and logical conclusions; concept of color theory. They will communicate through design and the written word. They will work collaboratively to gather data and make predictions. They will **connect** the value of daydreaming and creativity to success in life.

## Workshop # 1: Introduction (Mr. McGuire and Mr. Shiney)

*Defining the basic principles: Simplicity, Organization, and Procedure. Project management. Discussion of Art Show. Hands-on introduction to mechanics, electricity and kinetics.*

Mr. Shiney & Mr. McGuire introduce themselves via a video of their works.

Mr. Shiney & Mr. McGuire discuss the basic principles of the 3-Legged Stool Residency, including aspects of project management and protective equipment.

The daily routine is defined as:

### WORK

3-2-1

3 = Cleanup

2 = Replay & Write

1 = Fast Forward

### DONE

Students are led in a discussion about metaphors.

Students discover how a three-legged stool is a metaphor for simplicity and a firm foundation for getting things accomplished.

Introduction to Engineering: What is it? Students view a video showing real-world applications of electricity, mechanics, and kinetics in art.

Related vocabulary is introduced.

Introduction to Electricity: Self exploration and discovery with complete simple circuits, direct drive, and vibration.

Introduction to Mechanics: Students begin building robots with foam elements.

## Workshop # 2: Robot Development & Testing (Mr. McGuire and Mr. Shiney)

*Elements of mechanics, electricity and kinetic art are brought together. More vocabulary is introduced. Color Theory & Color Wheel are discussed. Collaboration enters.*

Students continue robot construction by experimenting with variables that affect movement:

1. Controlling directional movement
2. Shifting center of gravity
3. Adjusting motor angles
4. Adjusting feet location and height
5. Adding colored art markers

Students create a drawing device / machine.

Mr. Shiney discusses the color wheel.

Students and machines start drawing.

Students have a collaborative, informal discussion of variables that affect the drawing:

1. Placement of markers
2. How many markers
3. Color theory - color of the markers
4. Combining the machines

Mr. McGuire emphasizes testing and prototyping.

Students collaborate to compare and contrast their machines and their artwork. They gather evidence and make logical conclusions about their machines and their artwork.

### CLASSROOM FOLLOW-UP:

Classroom Teacher leads students in a practice session to allow experimentation with the defined variables.

Classroom Teacher(s) will lead students in a review of vocabulary, terminology, and concepts:

Angles, Art, Artist Statement, Batteries, Branding, Cause & Effect, Circles and Spirals, Circuit, Color, Color Theory, Color Wheel, Compare & Contrast, Control, Design, Direct Drive, Direction, Documentation, Electricity, Energy, Engineering, Evidence, Expression, Failure, Friction, Gravity, Inertia, Kinetic, Kinetic Art, Logical Conclusions, Machine, Mechanics, Metaphors, Motion, Motor, Movement, Observe, Organization, Outcomes, Perforated, Planning, Potential Energy, Predict, Procedures, Project Management, Robot, Rotation, Scientific Principles, Simplicity, Stability, Technology, Testing & Prototypes, Tripod, Variables, Vibration, Wall Tags

### Workshop # 3: Artist Statements & Art Show Preparation (Mr. McGuire and Mr. Shiney)

Mr. McGuire and Mr. Shiney discuss guidelines and show examples of artist statements and wall tags. Mr. McGuire and Mr. Shiney demonstrate how and why to mount artwork, and they review the residency. Further discussion includes:

1. The purpose of an art show and how to make professional presentations
2. The purpose of documenting an event
3. Aspects of working full time as an artist
4. Aspects of working full time as an engineer
5. The value of daydreaming
6. Discovering the hidden potential in boring work

Students continue drawing with the goal of finishing their artwork during the class period.

**CLASSROOM FOLLOW-UP:** With the guidance of the Classroom Teacher(s), students will complete their artist statements and wall tags as discussed in Workshop #3. Students will also mount their artwork, artist statements, and wall tags.

## Culminating Event: Art Show (Mr. McGuire and Mr. Shiney)

*The culminating event demonstrates the students' understanding of kinetic art, their understanding of color theory, and their understanding of engineering through their construction of electric machines that draw art. Students will keep their machines for further creating and experimenting.*

The student work is premiered at an event that replicates an art show. Hands-on engineering activities and visual arts activities during the Residency have allowed the students to be successful engineers and artists, with each activity enhancing the other! Applaud students for a job well done!!!

**CLASSROOM FOLLOW-UP:** Classroom teacher(s) will lead students in writing assignments that document the process. Student writings will:

1. Be an explanation of what they learned
2. Be an expression of what they liked
3. Be a reflection on the process of engineering and creating art
4. Connect the process to other events and activities in their lives

Classroom Teacher will complete the Arts Partners survey / assessment.

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