



September 27, 2012
Open Hardware Summit, Eyebeam, NYC

Jonah Brucker-Cohen, Katherine Moriwaki,
Louisa Campbell, Joe Saavedra, Liza Stark, Liz Taylor

School of Art, Media and Technology
Parsons, the New School for Design, New York, NY



PARSONS THE NEW SCHOOL FOR DESIGN

SCRAPYARD CHALLENGE Jr.



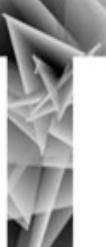
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MFA



SCRAPYARD CHALLENGE Jr.

Adapting an Art and Design Workshop to
Support STEM to STEAM Learning Experiences



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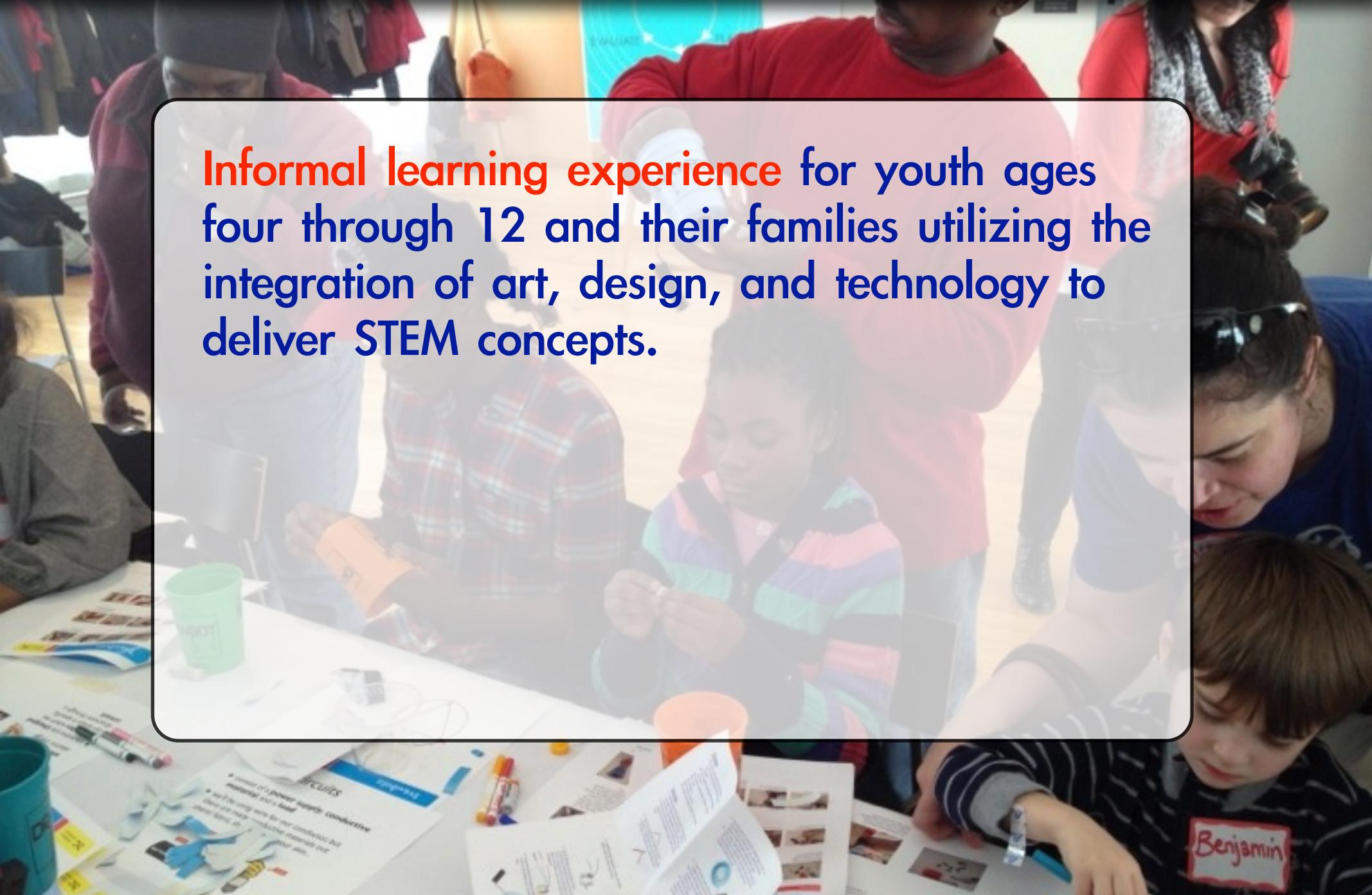
SCRAPYARD CHALLENGE Jr. OVERVIEW



SCRAPYARD CHALLENGE Jr. OVERVIEW

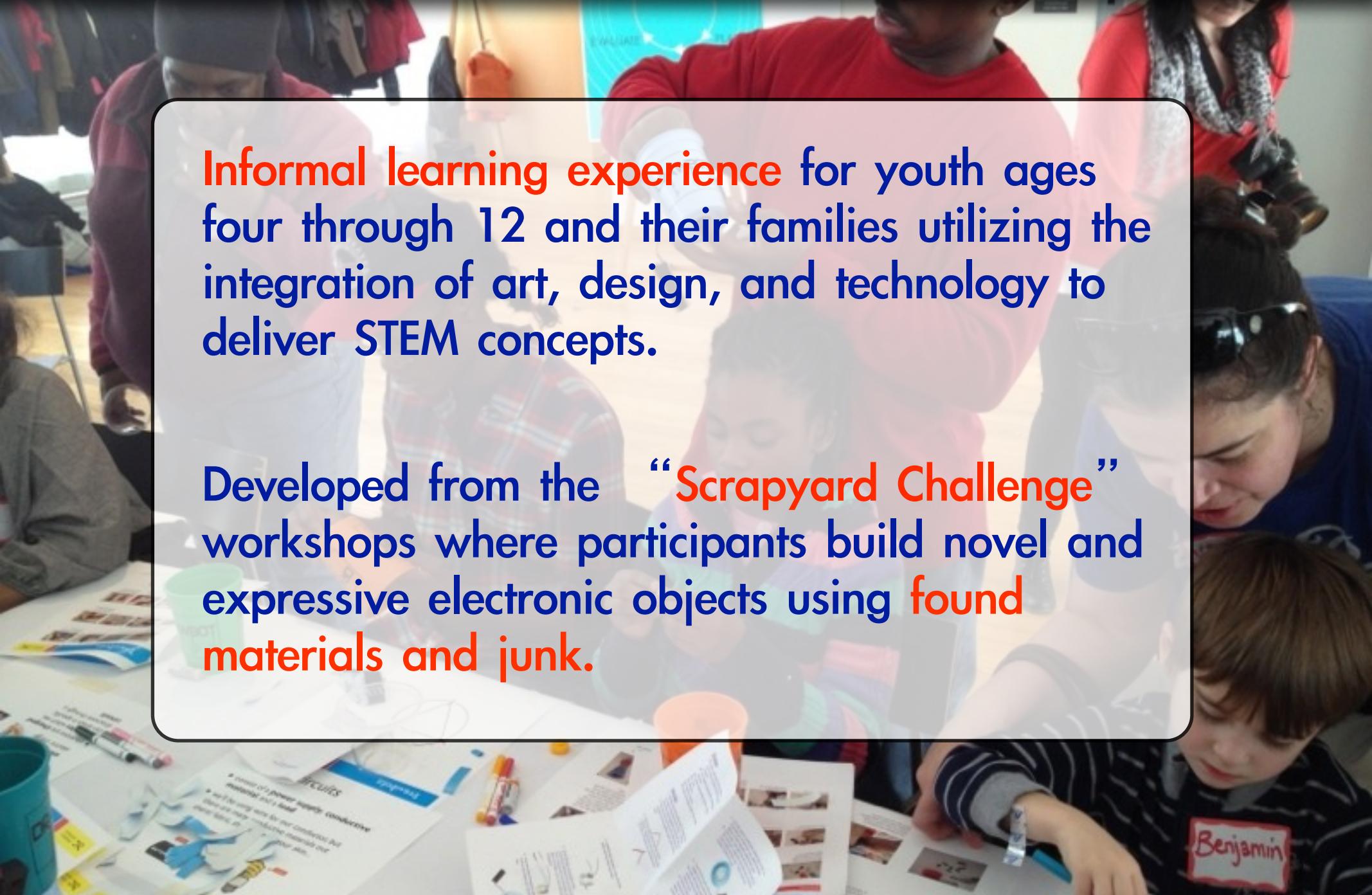


SCRAPYARD CHALLENGE Jr. OVERVIEW

A photograph showing a group of children and adults gathered around a table, engaged in a hands-on activity. On the table, there are various materials and tools, including a green cup, a blue container, and some papers. A child in the foreground is wearing a name tag that says "Benjamin".

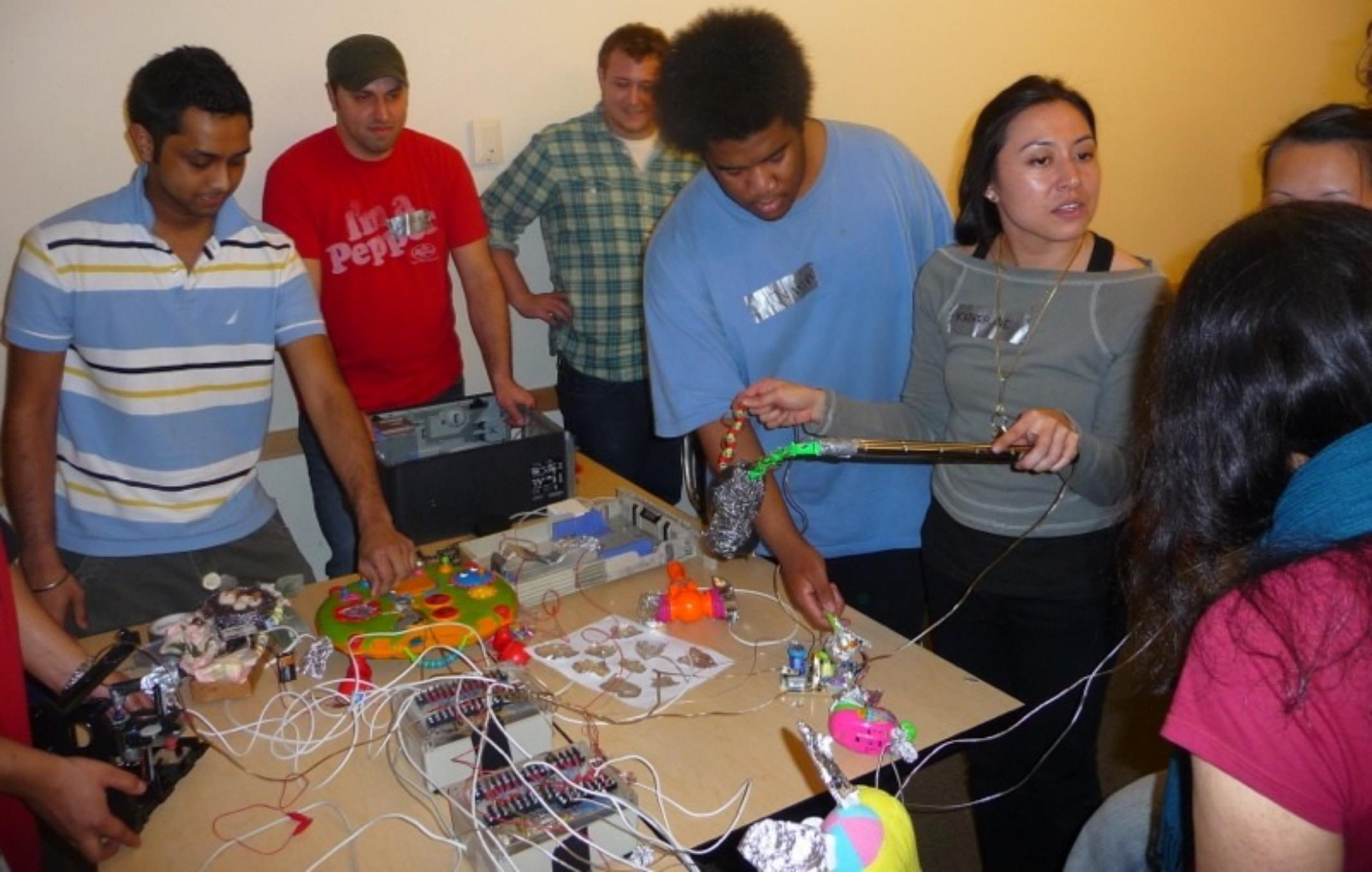
Informal learning experience for youth ages four through 12 and their families utilizing the integration of art, design, and technology to deliver STEM concepts.

SCRAPYARD CHALLENGE Jr. OVERVIEW

A photograph showing several children and adults gathered around a table, focused on building electronic projects. One child in the foreground is wearing a name tag that says "Benjamin". Various tools, materials, and electronic components are visible on the table.

Informal learning experience for youth ages four through 12 and their families utilizing the integration of art, design, and technology to deliver STEM concepts.

Developed from the “Scrapyard Challenge” workshops where participants build novel and expressive electronic objects using found materials and junk.



A photograph showing a group of six people (three men and three women) gathered around a table, working on various electronic projects. The table is covered with components like breadboards, resistors, capacitors, and wires. One man in a red shirt is holding a green circular component, while another man in a blue shirt is focused on a small robot-like device. A woman in an orange shirt is looking towards the camera. The background is a plain yellow wall.

BACKGROUND: SCRAPYARD CHALLENGE WORKSHOPS

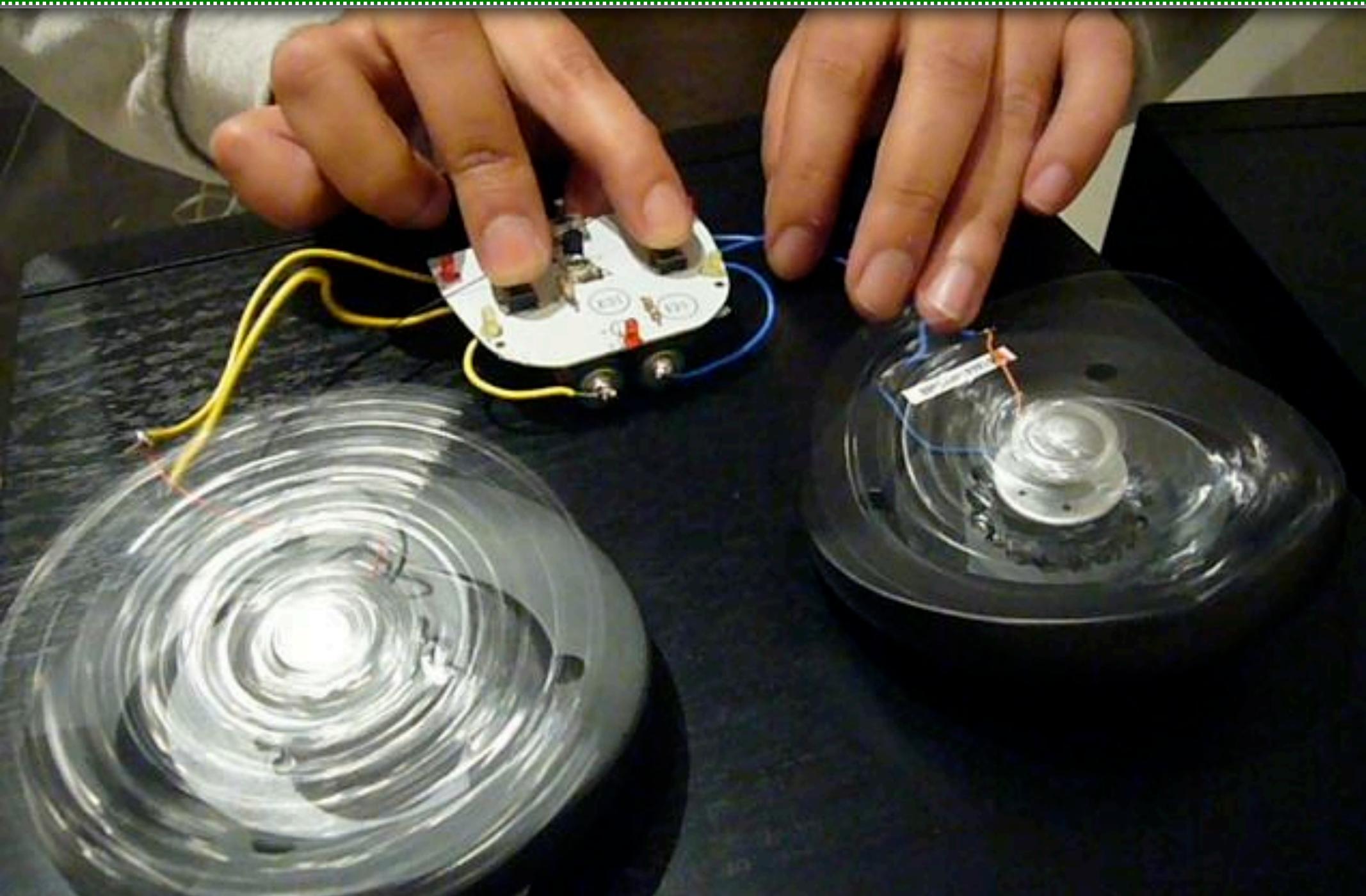
BACKGROUND: SCRAPYARD CHALLENGE

Since 2003, the Scarpayard Challenge workshops have been held 55 times in 14 countries across the 5 continents of Europe, South America, North America, Asia, and Australia.

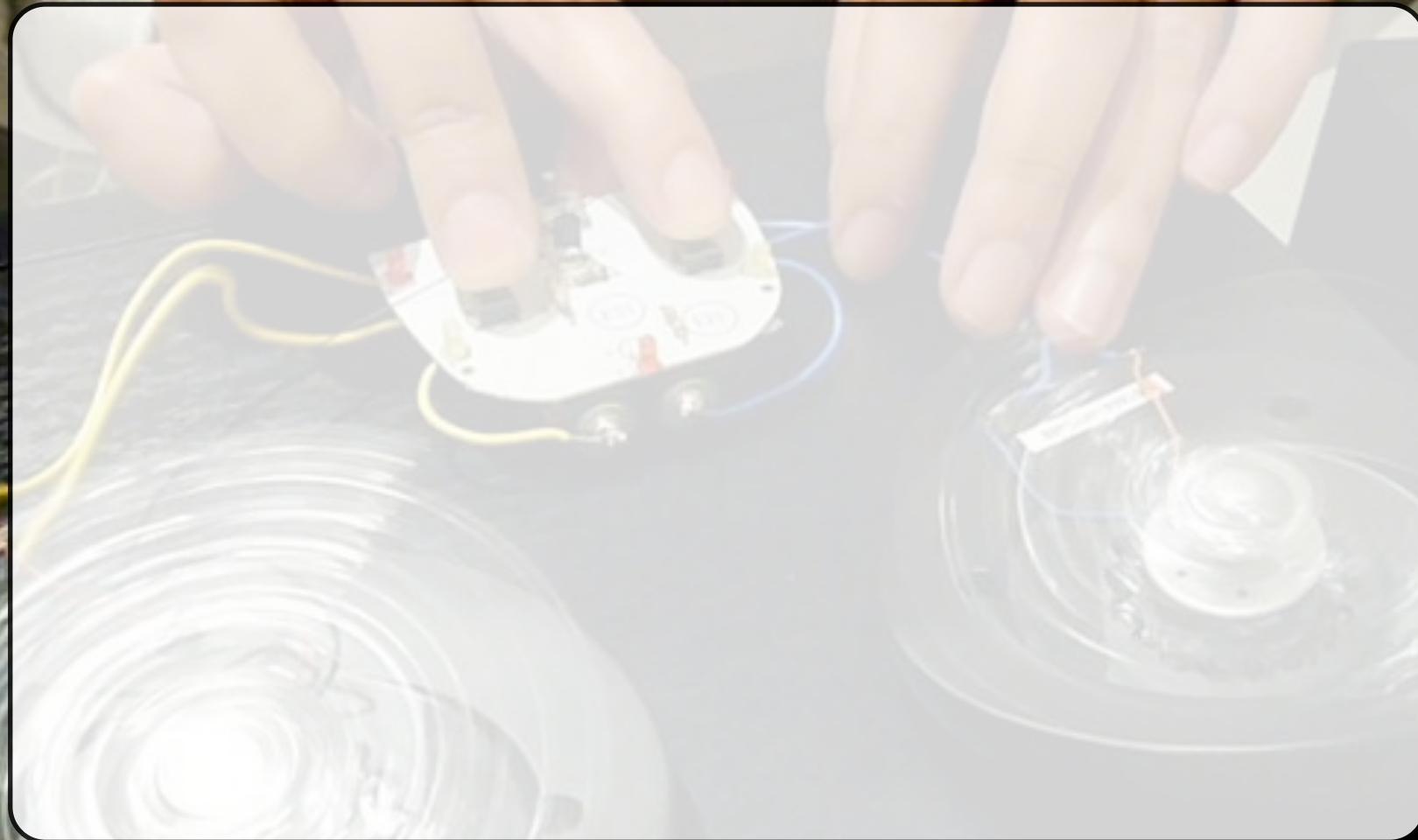


2008

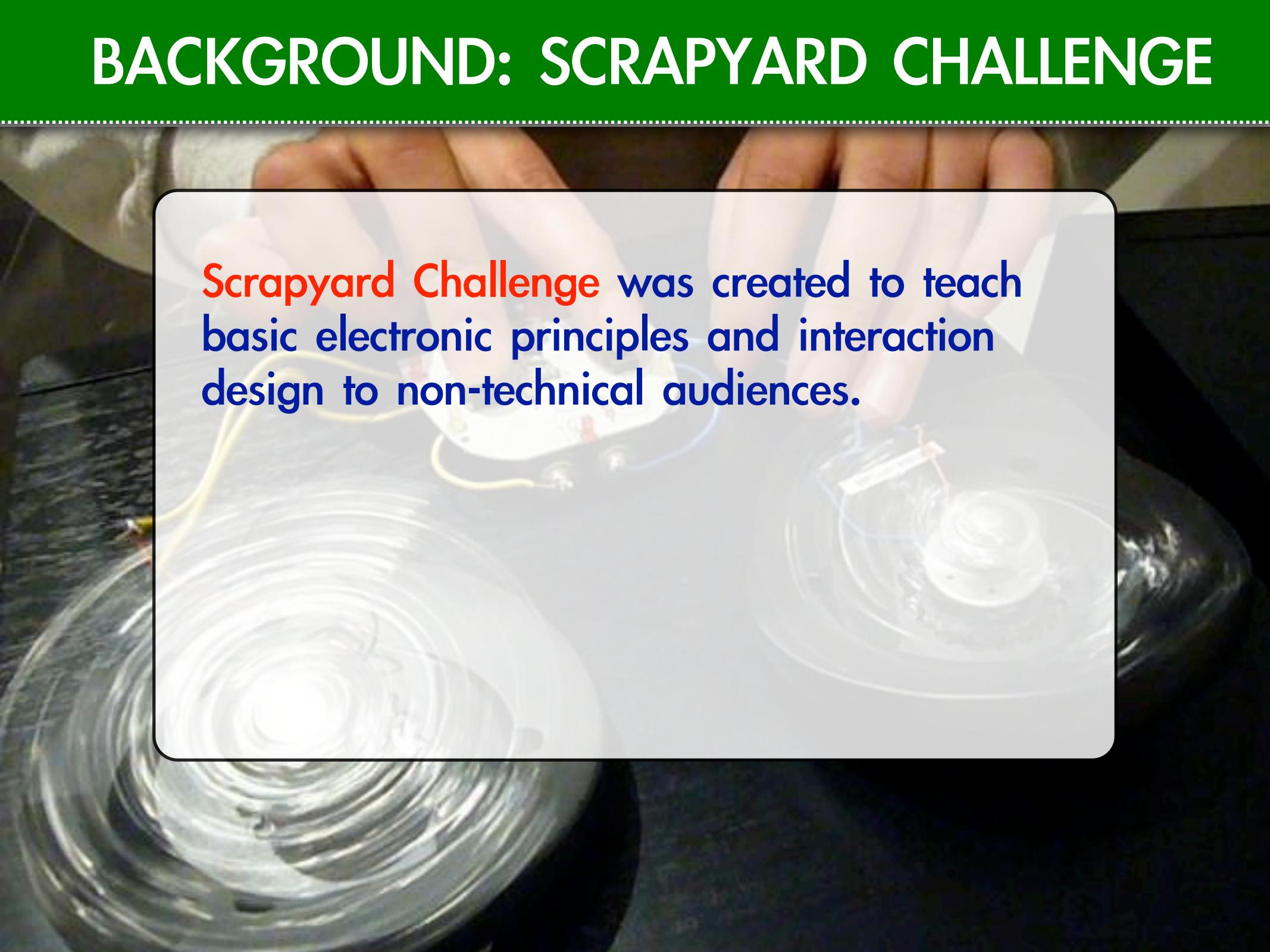
BACKGROUND: SCRAPYARD CHALLENGE



BACKGROUND: SCRAPYARD CHALLENGE

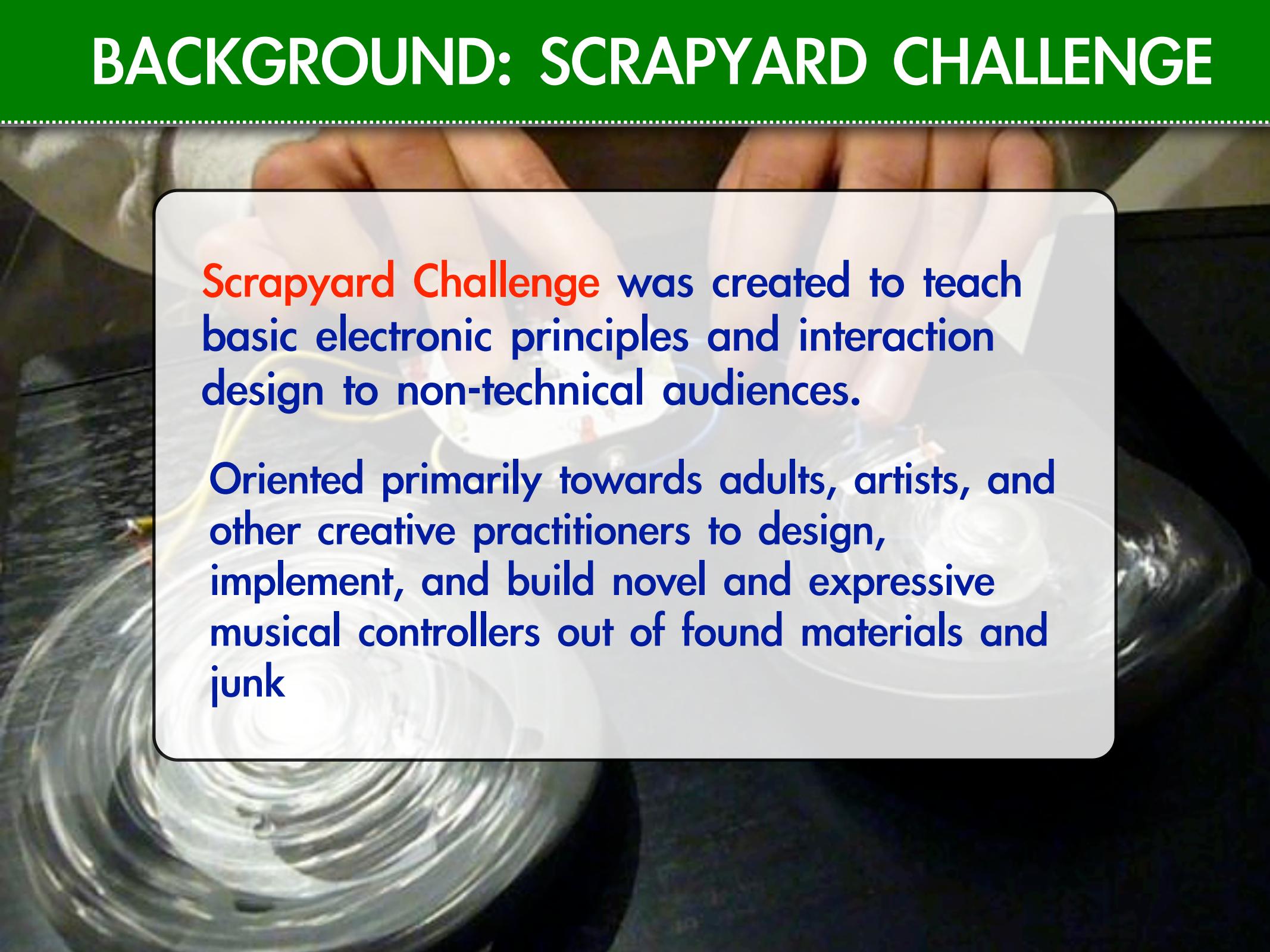


BACKGROUND: SCRAPYARD CHALLENGE



Scrapyard Challenge was created to teach basic electronic principles and interaction design to non-technical audiences.

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Scrapyard Challenge was created to teach basic electronic principles and interaction design to non-technical audiences.

Oriented primarily towards adults, artists, and other creative practitioners to design, implement, and build novel and expressive musical controllers out of found materials and junk

SCRAPYARD CHALLENGE: MOTIVATION



Typical Workshop Table
Amsterdam, 2006

SCRAPYARD CHALLENGE: MOTIVATION

DEMOCRATIZATION OF
TECHNOLOGY



Typical Workshop Table
Amsterdam, 2006

SCRAPYARD CHALLENGE: MOTIVATION

DEMOCRATIZATION OF
TECHNOLOGY



SCRAPYARD CHALLENGE: MOTIVATION

DEMOCRATIZATION OF
TECHNOLOGY

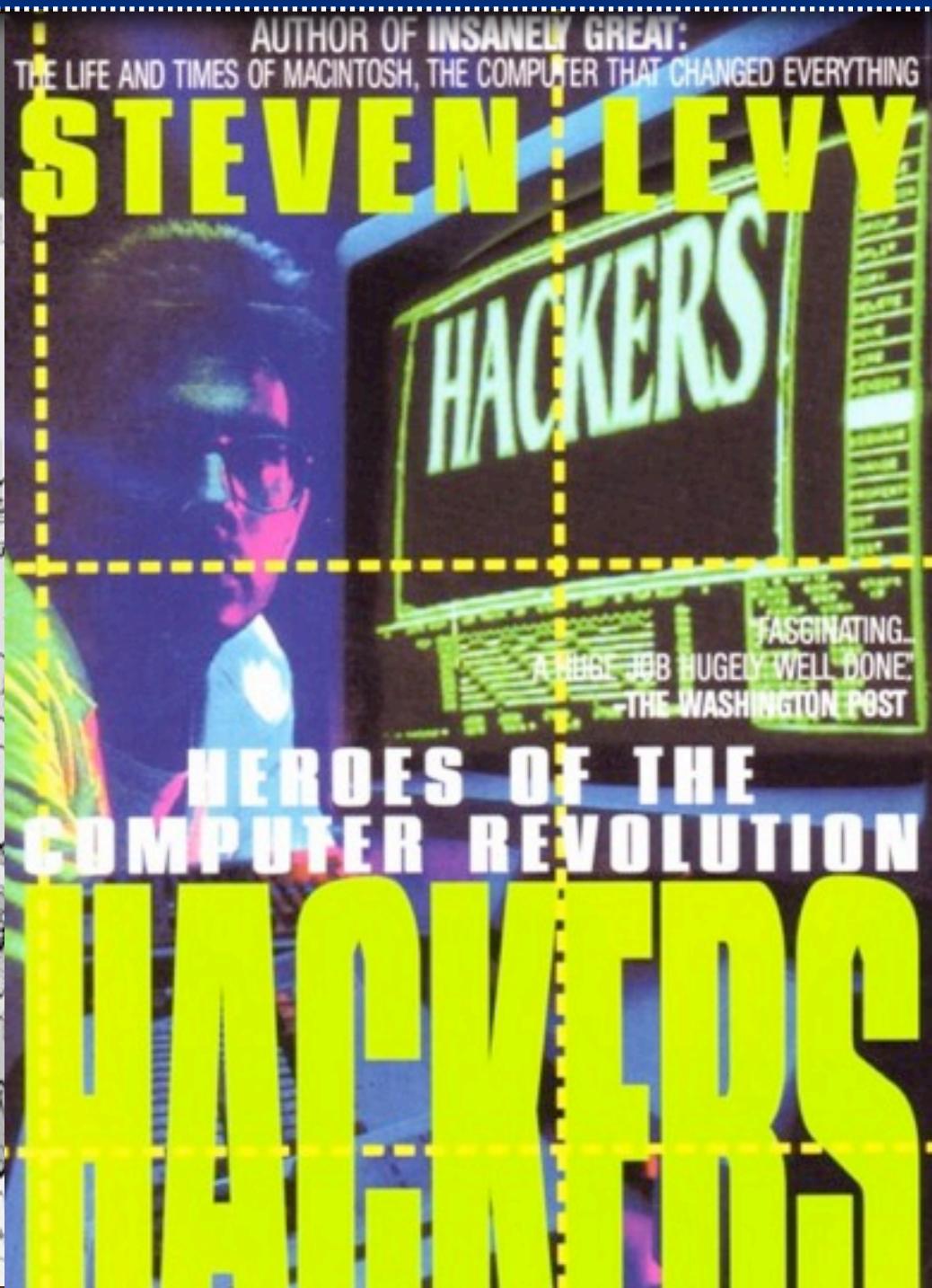
DO IT YOURSELF: DIY



SCRAPYARD CHALLENGE: MOTIVATION

DEMOCRATIZATION OF
TECHNOLOGY

DO IT YOURSELF: DIY
HACKING



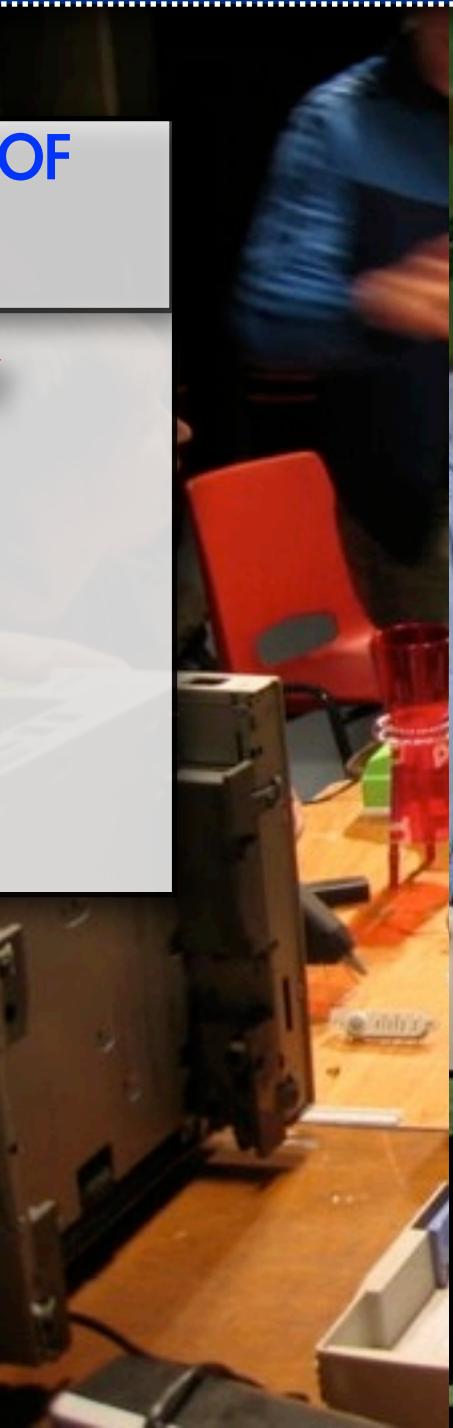
SCRAPYARD CHALLENGE: MOTIVATION

DEMOCRATIZATION OF
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DO IT YOURSELF: DIY

HACKING

POPULAR CULTURE



SCRAPYARD CHALLENGE: MOTIVATION

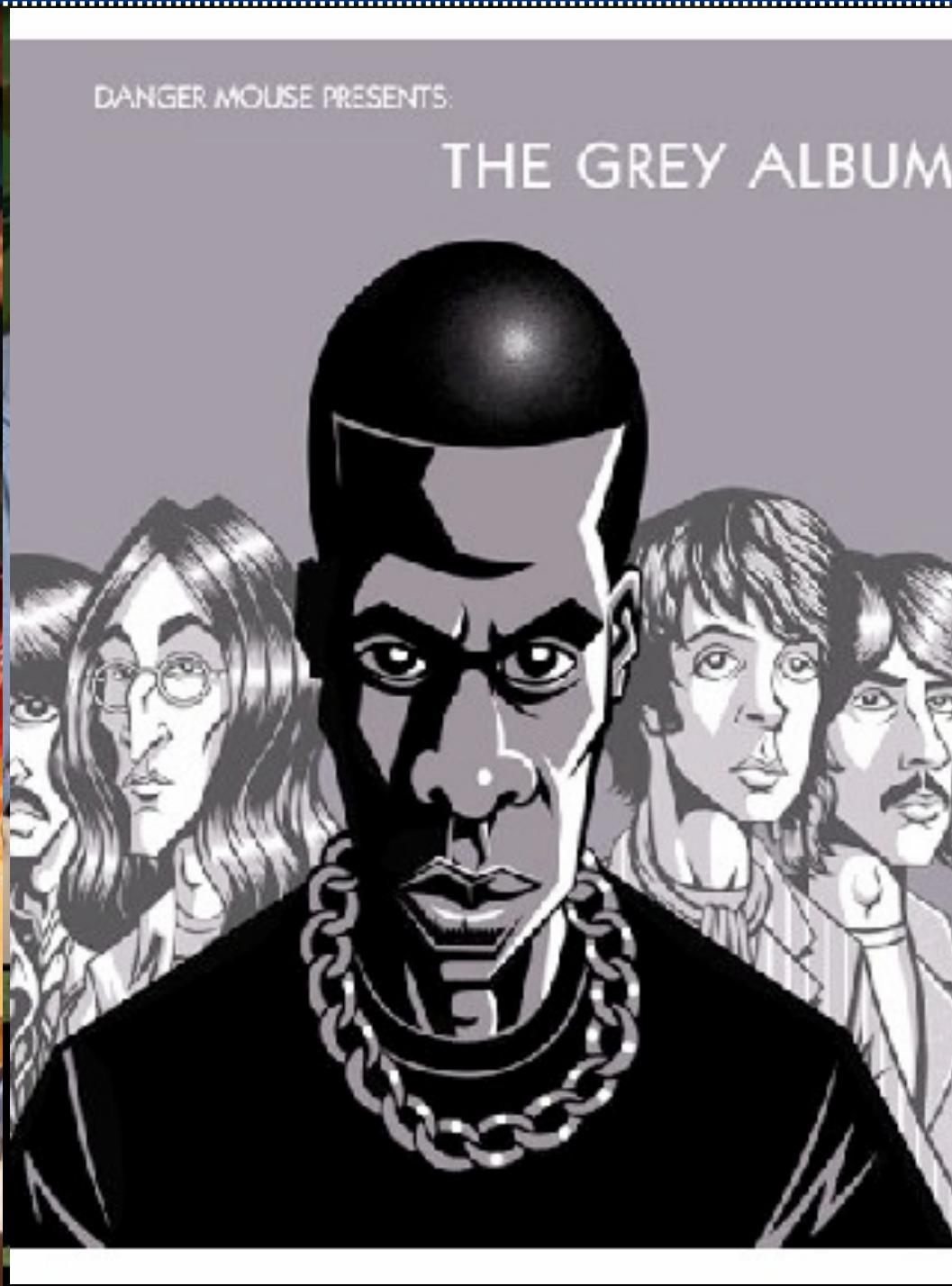
DEMOCRATIZATION OF
TECHNOLOGY

DO IT YOURSELF: DIY

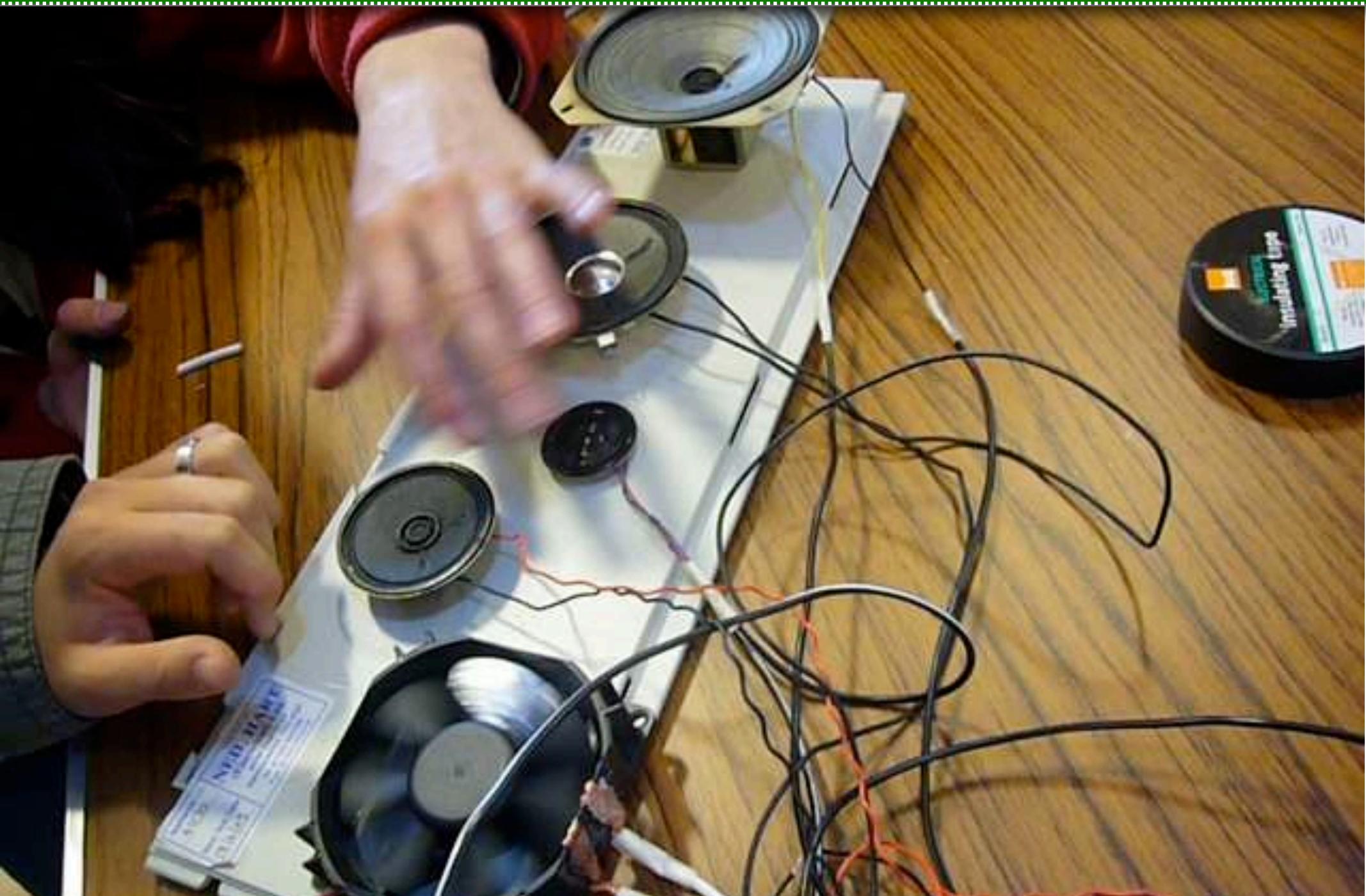
HACKING

POPULAR CULTURE

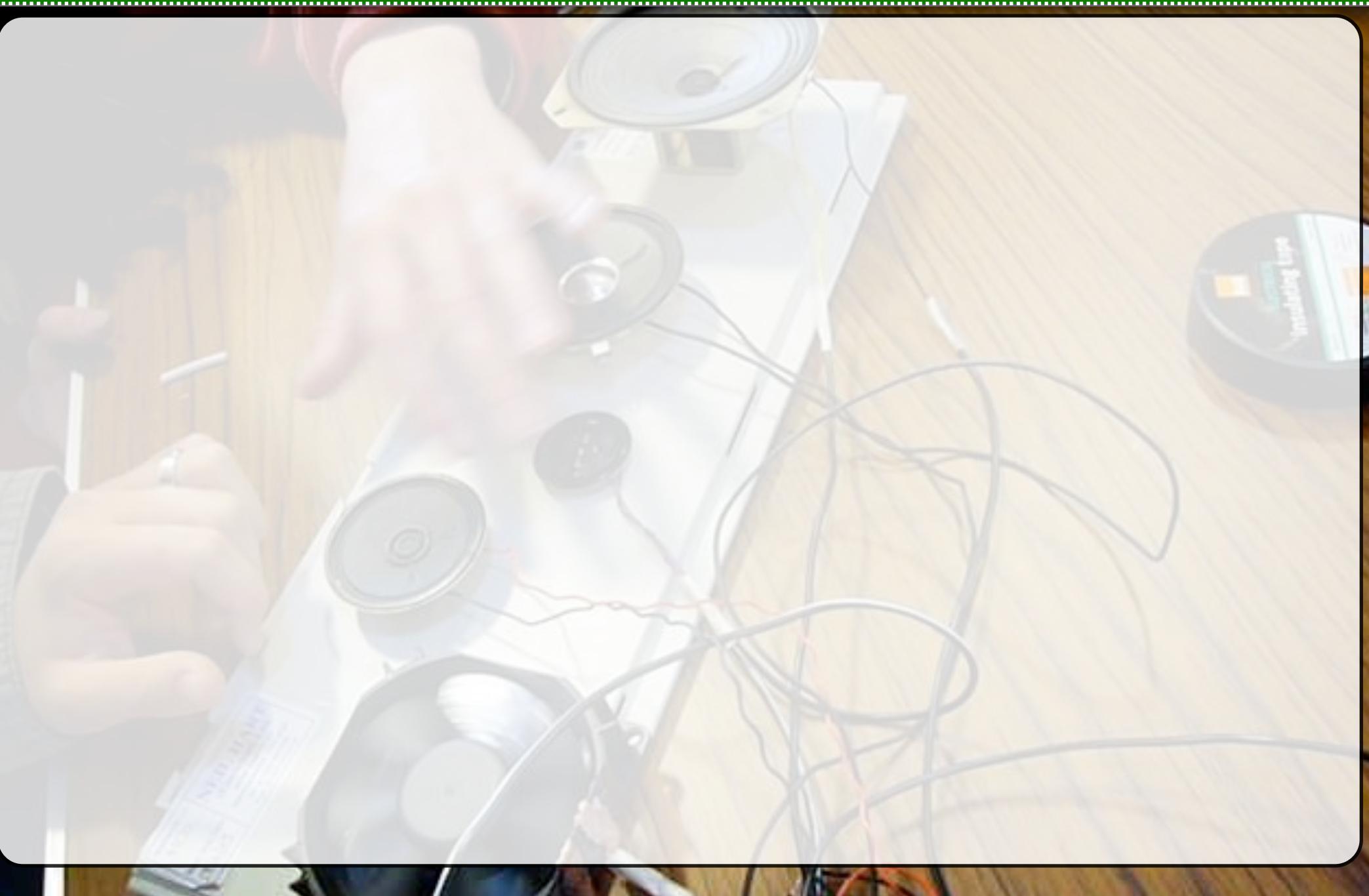
REMIX CULTURE



BACKGROUND: SCRAPYARD CHALLENGE



BACKGROUND: SCRAPYARD CHALLENGE



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

urgency,



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

urgency, improvisation,



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

urgency, improvisation, shared experience



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

urgency, improvisation, shared experience

UNPREDICTABLE MATERIALS



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

urgency, improvisation, shared experience

UNPREDICTABLE MATERIALS

cheap sources!



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

urgency, improvisation, shared experience

UNPREDICTABLE MATERIALS

cheap sources! discarded electronics



BACKGROUND: SCRAPYARD CHALLENGE

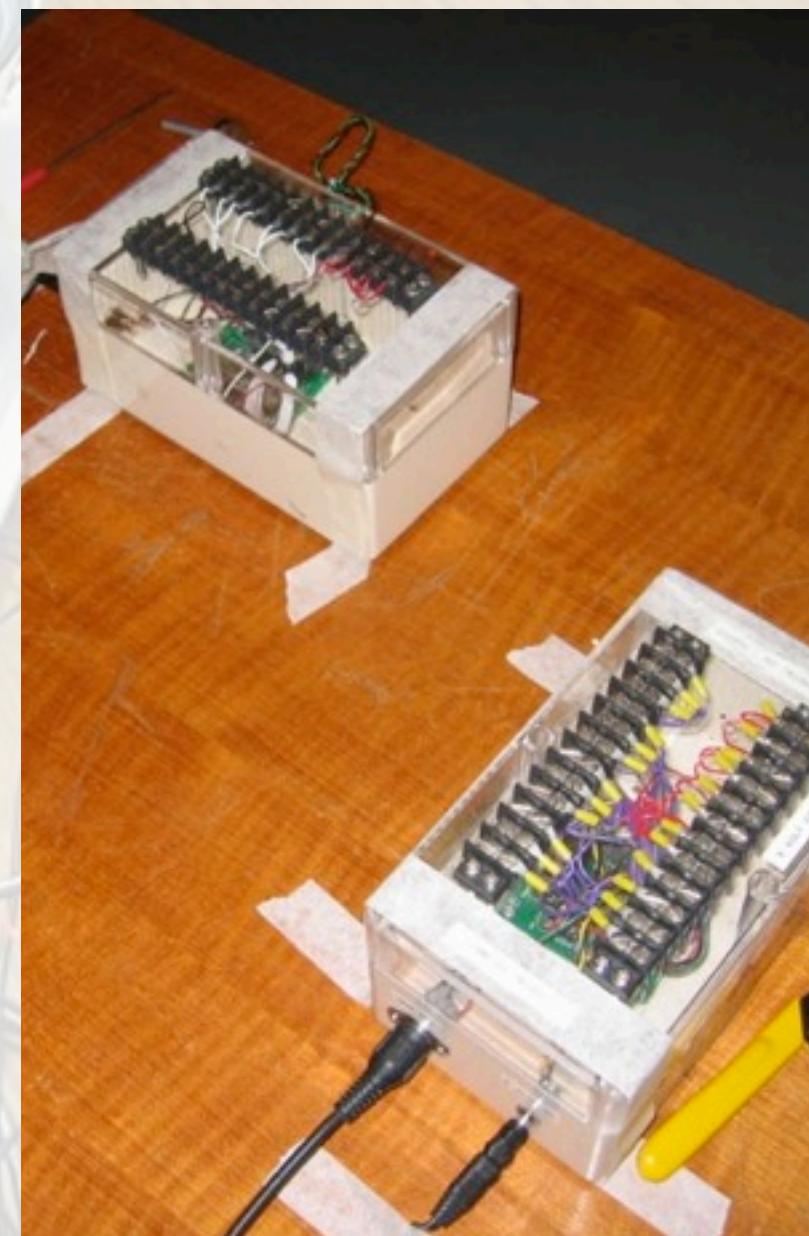
LIMITED TIME FRAME

urgency, improvisation, shared experience

UNPREDICTABLE MATERIALS

cheap sources! discarded electronics

SIMPLE INPUT/OUTPUT



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

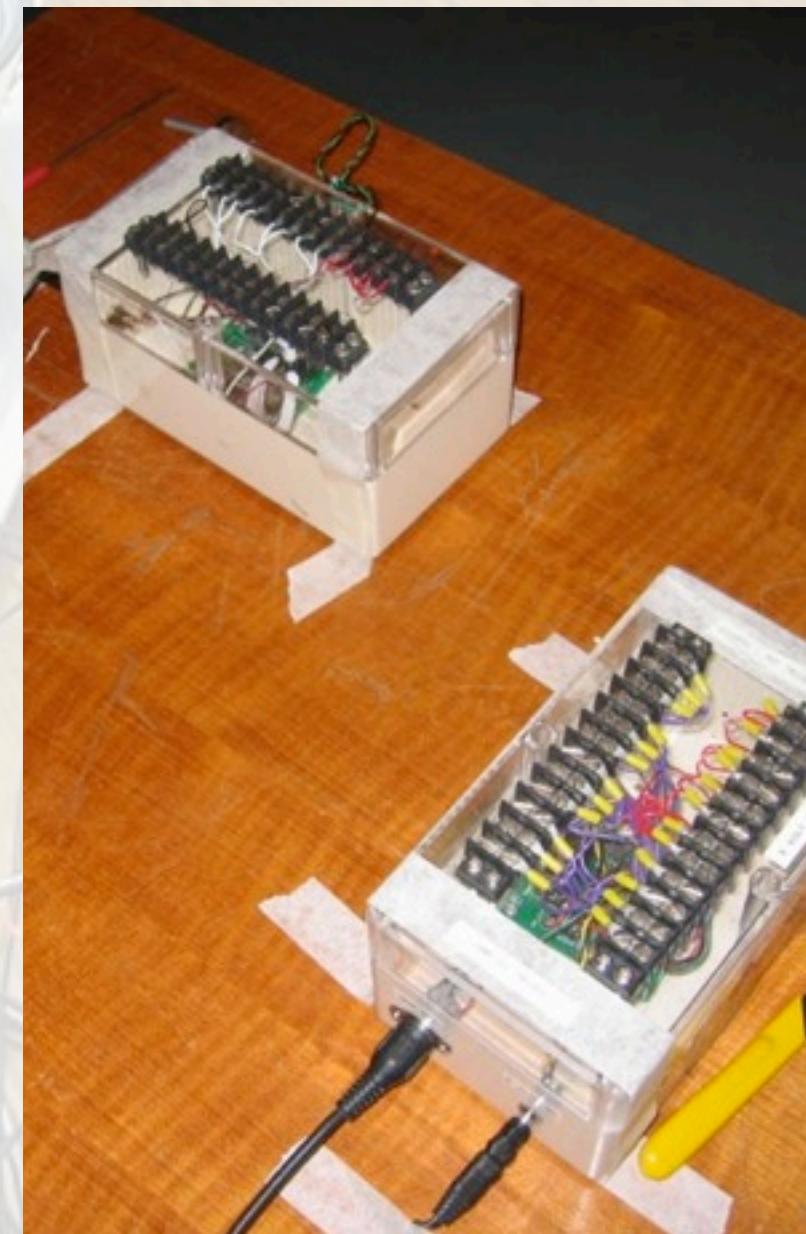
urgency, improvisation, shared experience

UNPREDICTABLE MATERIALS

cheap sources! discarded electronics

SIMPLE INPUT/OUTPUT

microcontrollers & MIDI,



BACKGROUND: SCRAPYARD CHALLENGE

LIMITED TIME FRAME

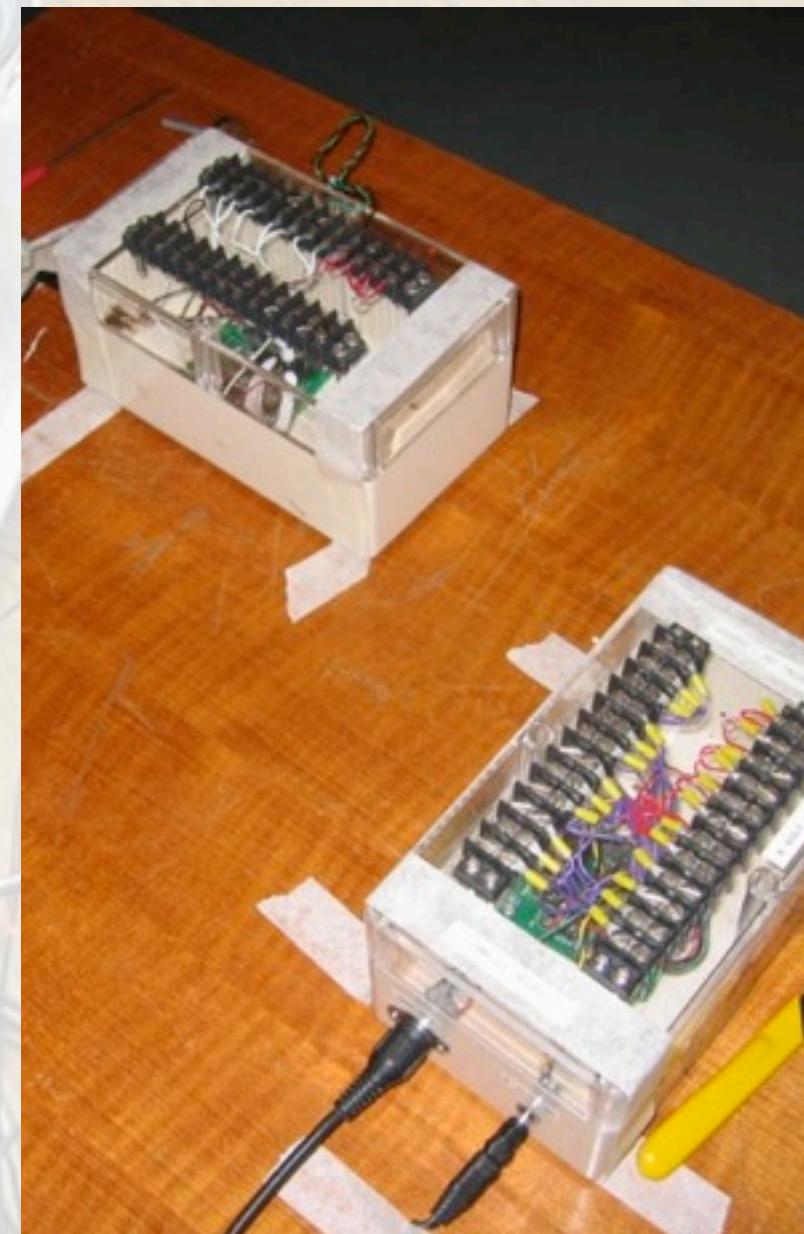
urgency, improvisation, shared experience

UNPREDICTABLE MATERIALS

cheap sources! discarded electronics

SIMPLE INPUT/OUTPUT

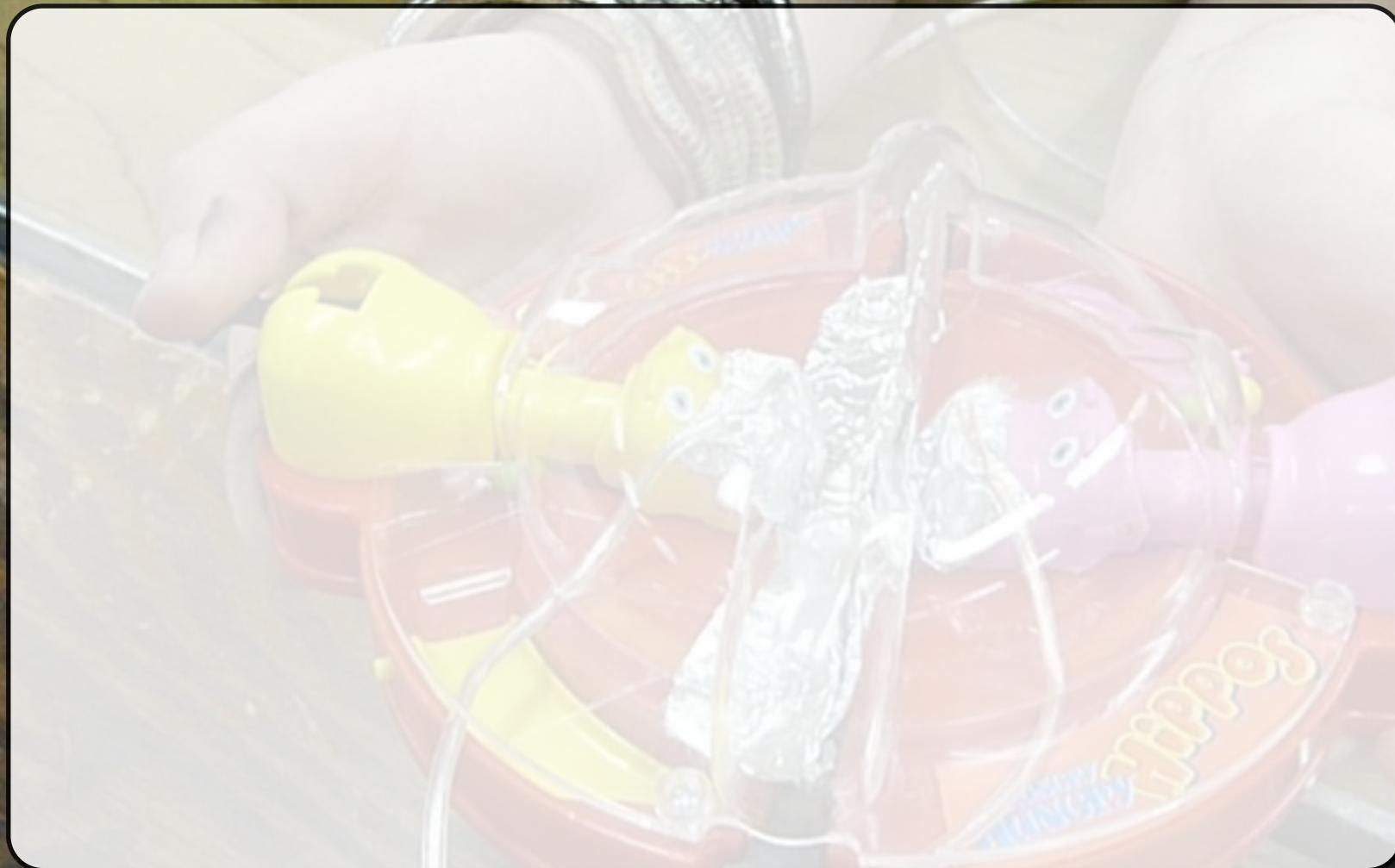
microcontrollers & MIDI, “musical guests”



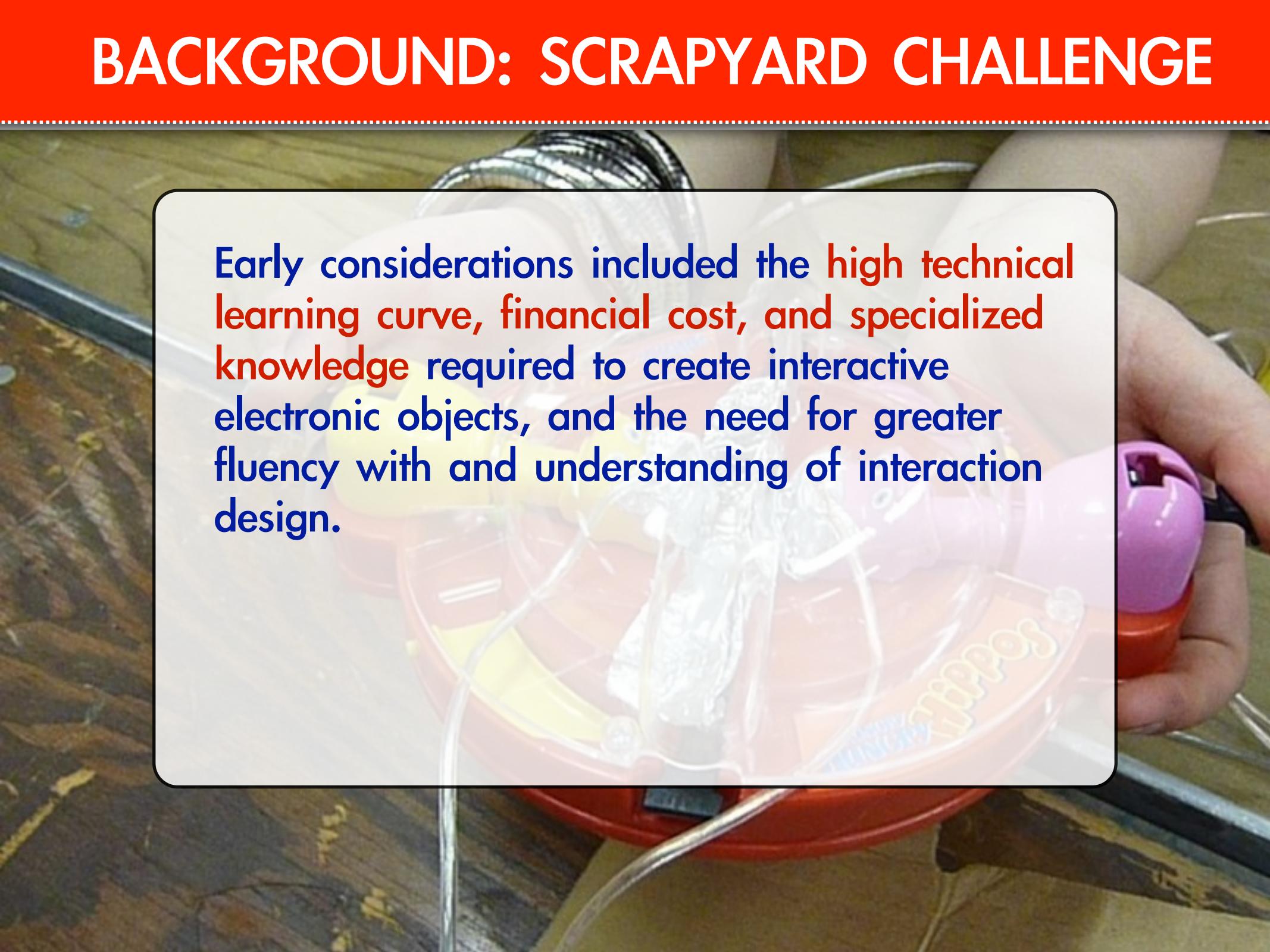
BACKGROUND: SCRAPYARD CHALLENGE



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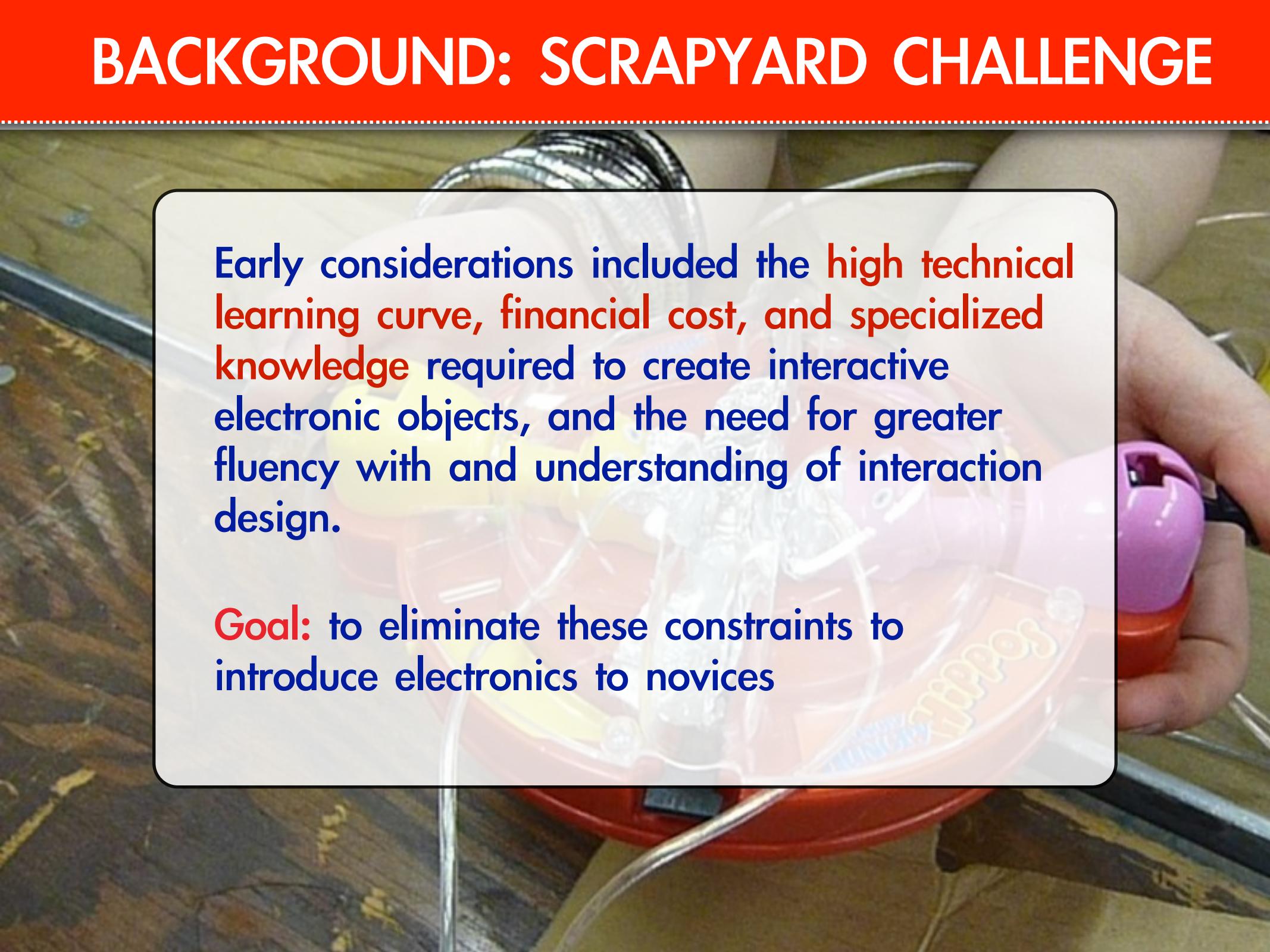


BACKGROUND: SCRAPYARD CHALLENGE



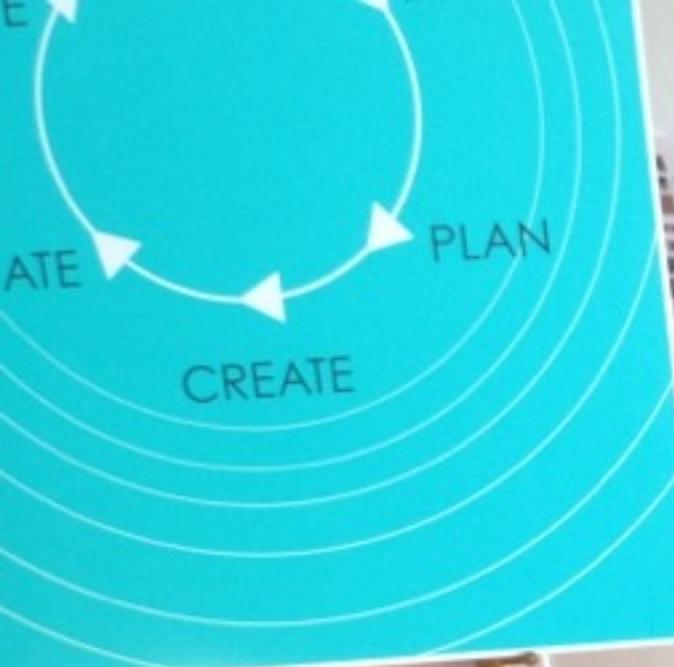
Early considerations included the high technical learning curve, financial cost, and specialized knowledge required to create interactive electronic objects, and the need for greater fluency with and understanding of interaction design.

BACKGROUND: SCRAPYARD CHALLENGE



Early considerations included the high technical learning curve, financial cost, and specialized knowledge required to create interactive electronic objects, and the need for greater fluency with and understanding of interaction design.

Goal: to eliminate these constraints to introduce electronics to novices





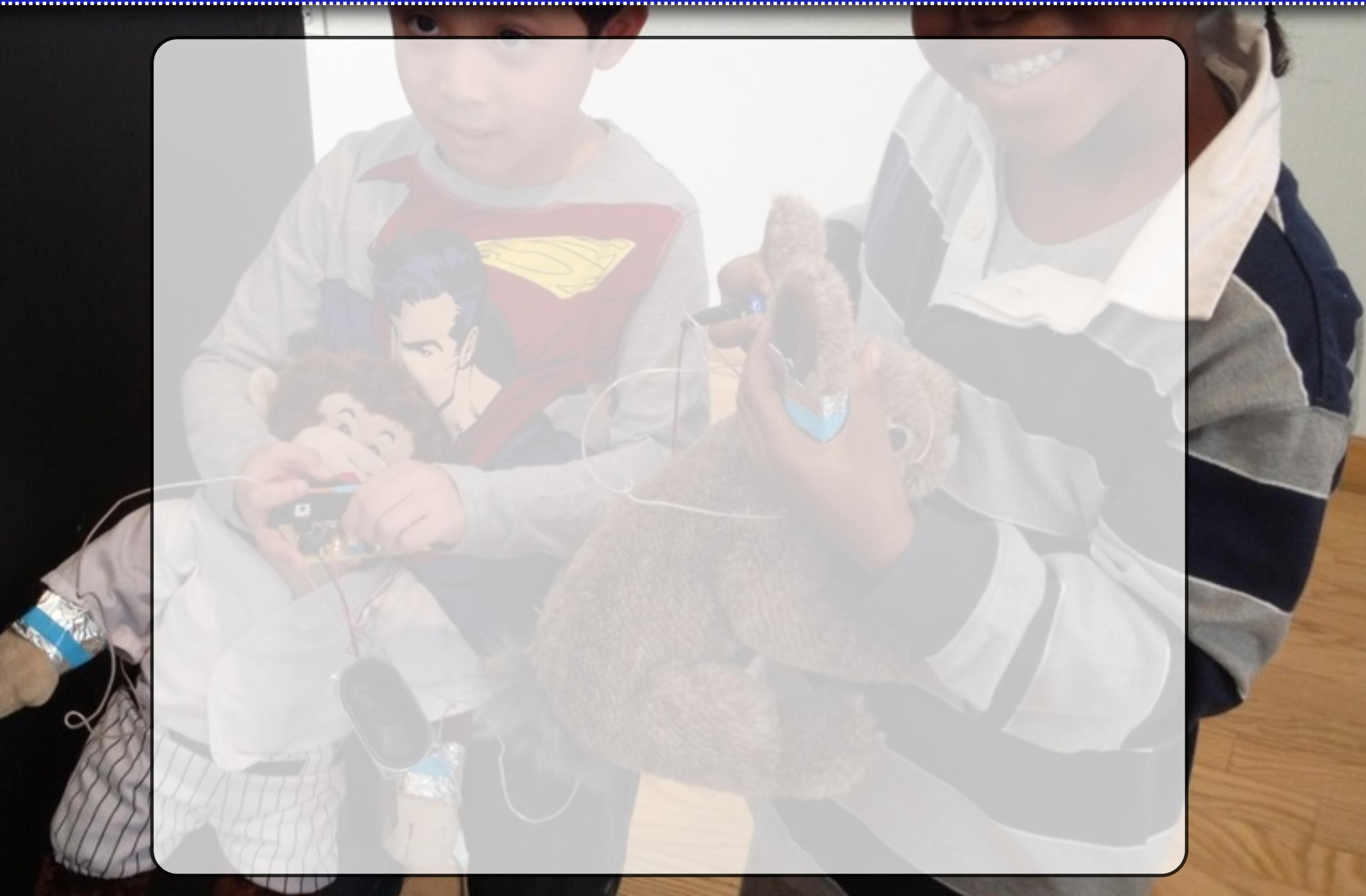
SCRAPYARD CHALLENGE Jr. !



SCRAPYARD CHALLENGE Jr. INTRODUCTION

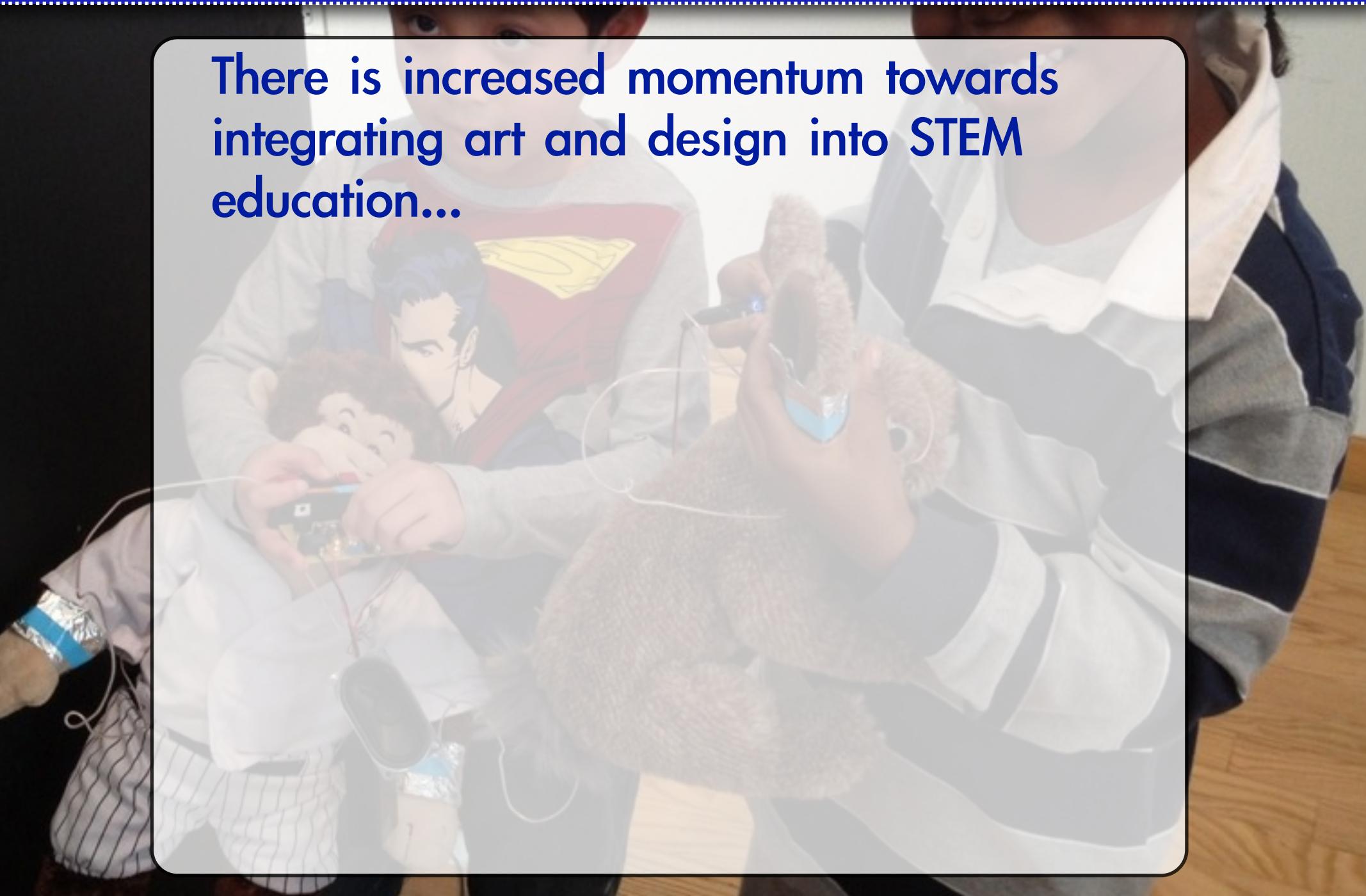


SCRAPYARD CHALLENGE Jr. INTRODUCTION

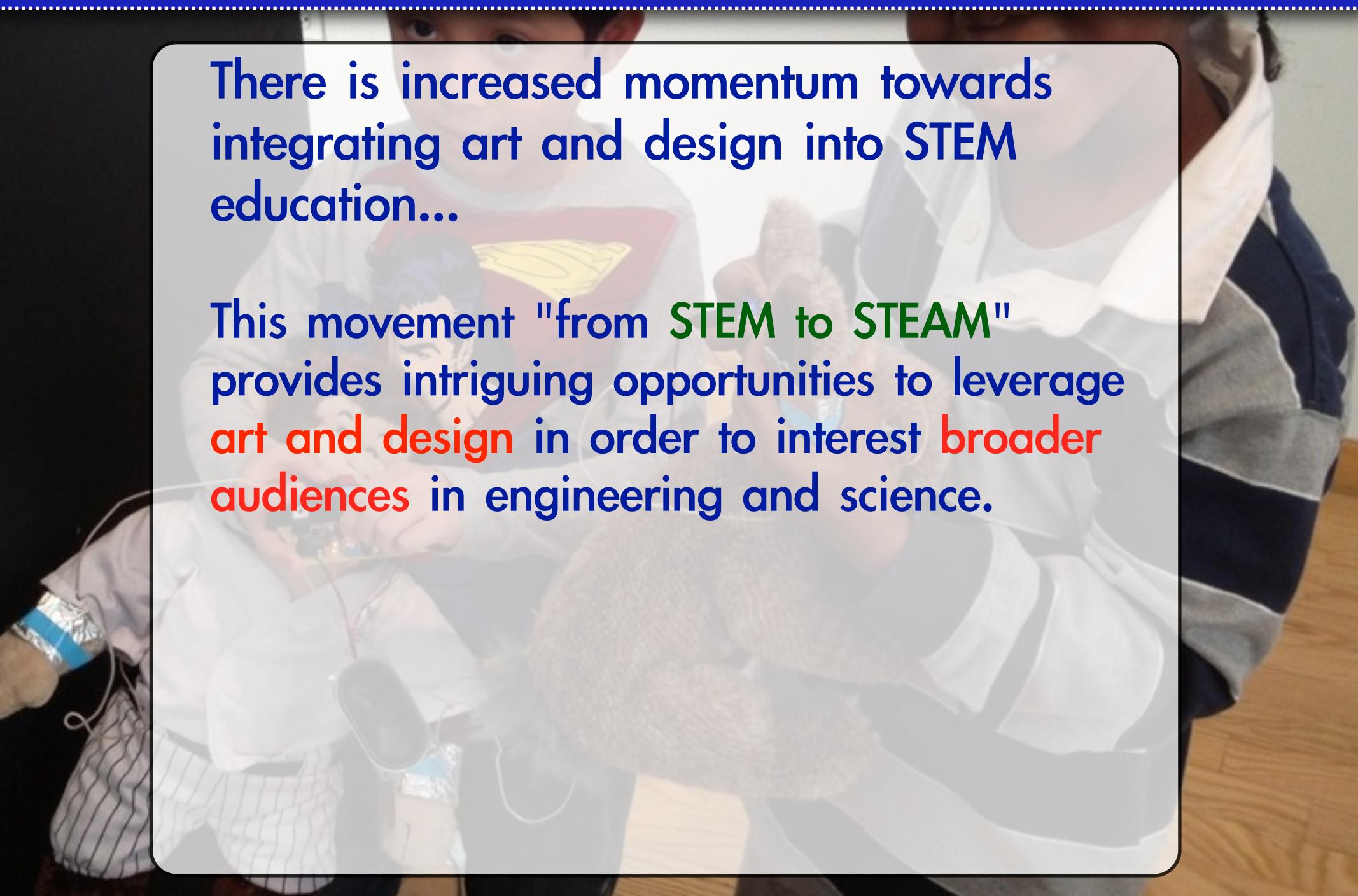


SCRAPYARD CHALLENGE Jr. INTRODUCTION

There is increased momentum towards integrating art and design into STEM education...



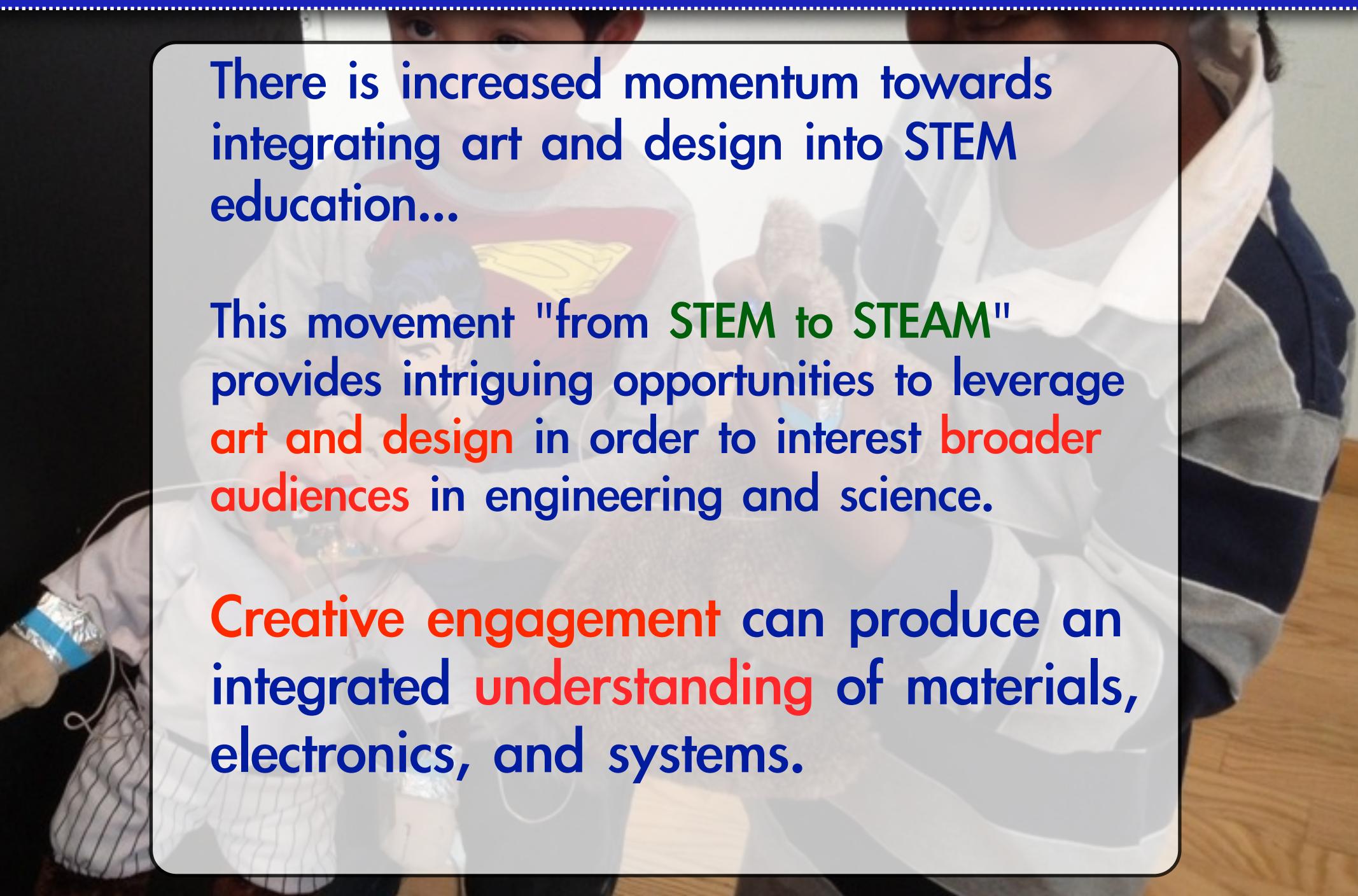
SCRAPYARD CHALLENGE Jr. INTRODUCTION

A photograph showing several students in a workshop setting. In the foreground, a student wearing a white t-shirt with a yellow and red graphic is focused on their work. Behind them, other students are visible, one wearing a blue and white striped shirt. They appear to be working on a large-scale project, possibly a cardboard model of a robot or mechanical device.

There is increased momentum towards integrating art and design into STEM education...

This movement "from STEM to STEAM" provides intriguing opportunities to leverage art and design in order to interest broader audiences in engineering and science.

SCRAPYARD CHALLENGE Jr. INTRODUCTION

A photograph showing several students in a workshop or classroom setting. In the foreground, a student wearing a white t-shirt with a yellow and red graphic is focused on a task. Behind them, other students are visible, some wearing blue and white striped shirts. The environment looks like a creative workshop with various materials and tools.

There is increased momentum towards integrating art and design into STEM education...

This movement "from STEM to STEAM" provides intriguing opportunities to leverage art and design in order to interest broader audiences in engineering and science.

Creative engagement can produce an integrated understanding of materials, electronics, and systems.

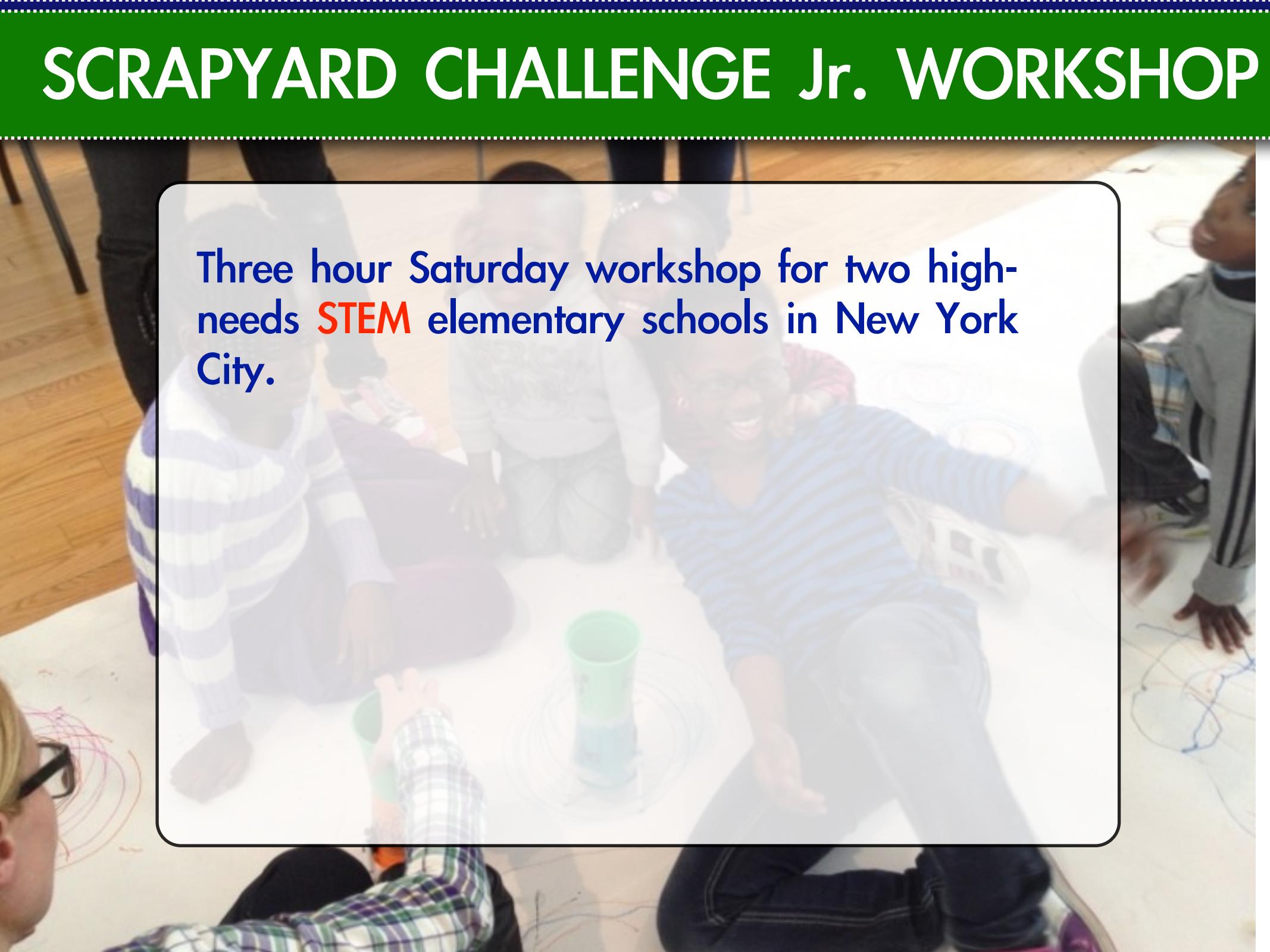
SCRAPYARD CHALLENGE Jr. WORKSHOP



SCRAPYARD CHALLENGE Jr. WORKSHOP

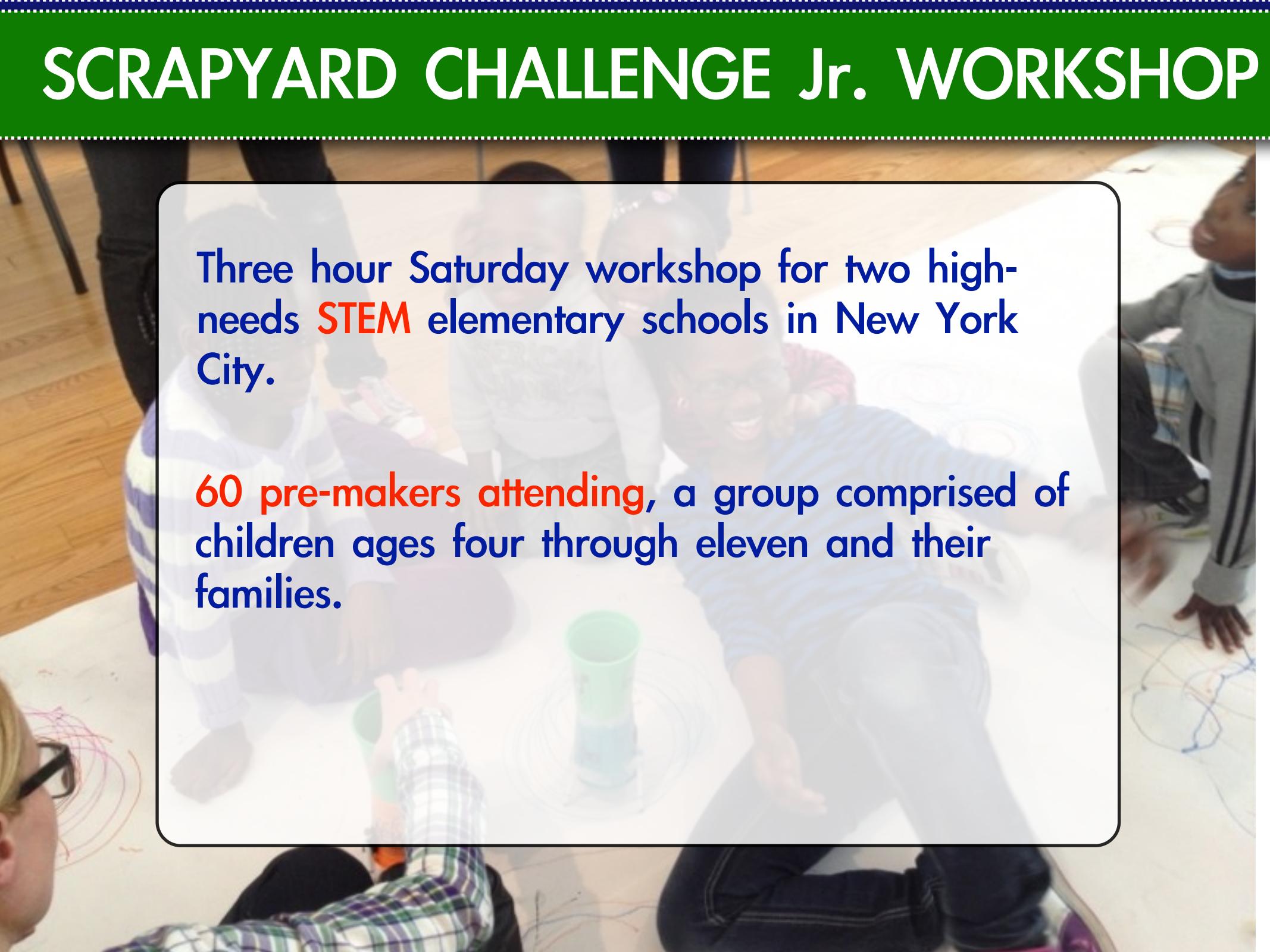


SCRAPYARD CHALLENGE Jr. WORKSHOP

A photograph showing a group of children sitting around a large white table in a workshop setting. They appear to be engaged in a hands-on activity, possibly related to the Scarpard Challenge Jr. Workshop mentioned in the text. The children are dressed in casual clothing, and the room has a warm, wooden floor.

Three hour Saturday workshop for two high-needs **STEM** elementary schools in New York City.

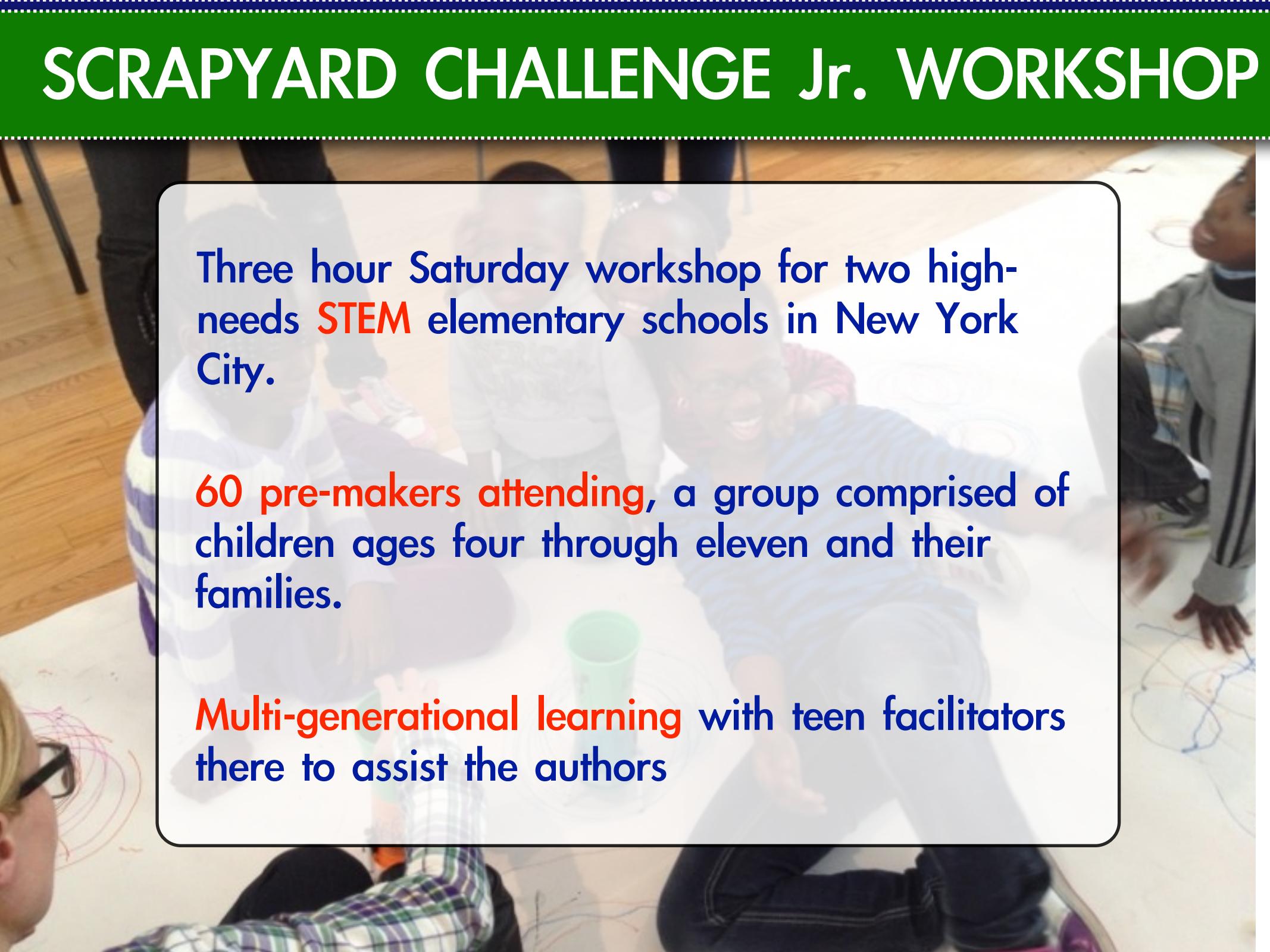
SCRAPYARD CHALLENGE Jr. WORKSHOP



Three hour Saturday workshop for two high-needs **STEM** elementary schools in New York City.

60 pre-makers attending, a group comprised of children ages four through eleven and their families.

SCRAPYARD CHALLENGE Jr. WORKSHOP

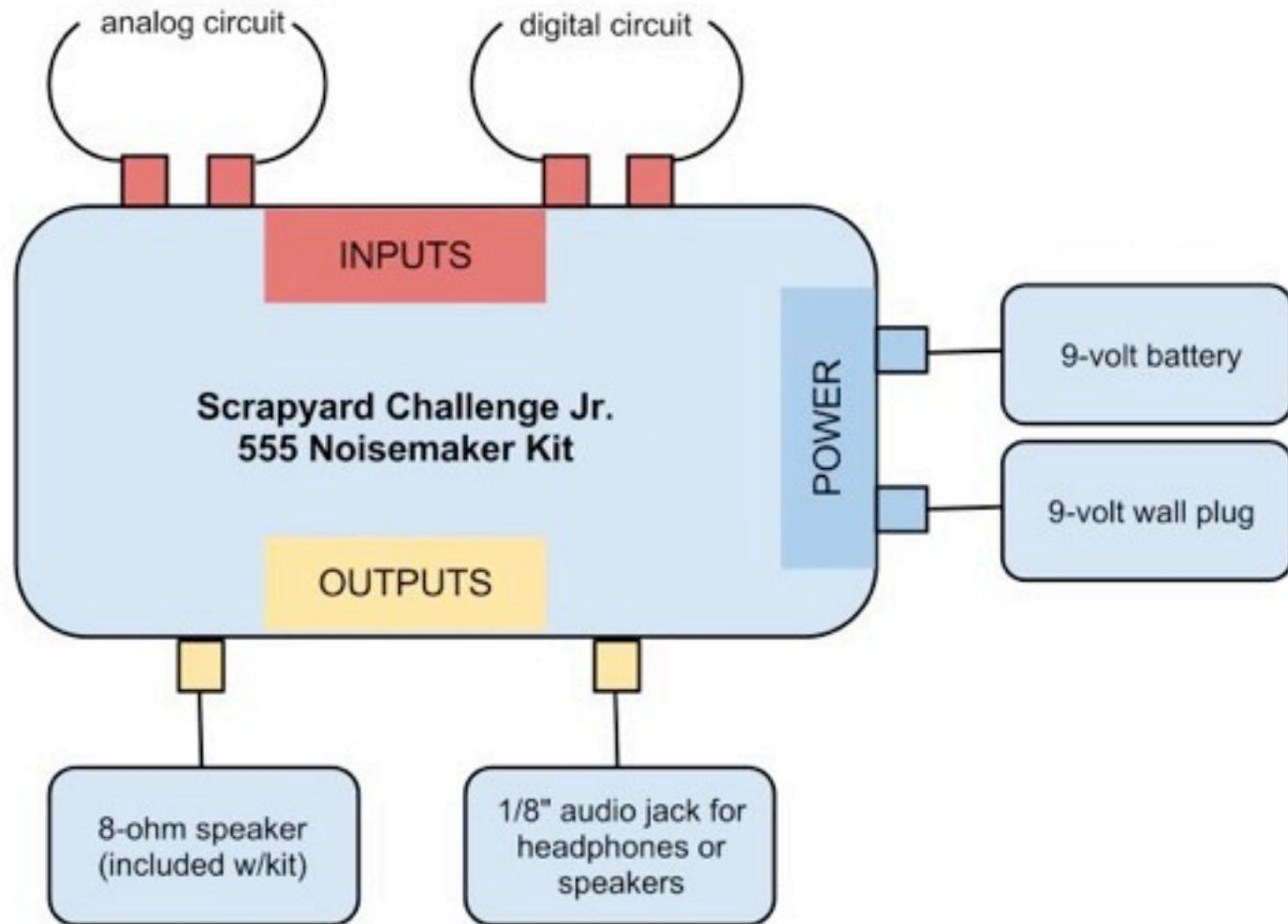
A photograph showing a group of people, including children and adults, gathered around a table covered with white paper. They appear to be engaged in a craft or workshop activity, with various materials and tools visible on the table.

Three hour Saturday workshop for two high-needs **STEM** elementary schools in New York City.

60 pre-makers attending, a group comprised of children ages four through eleven and their families.

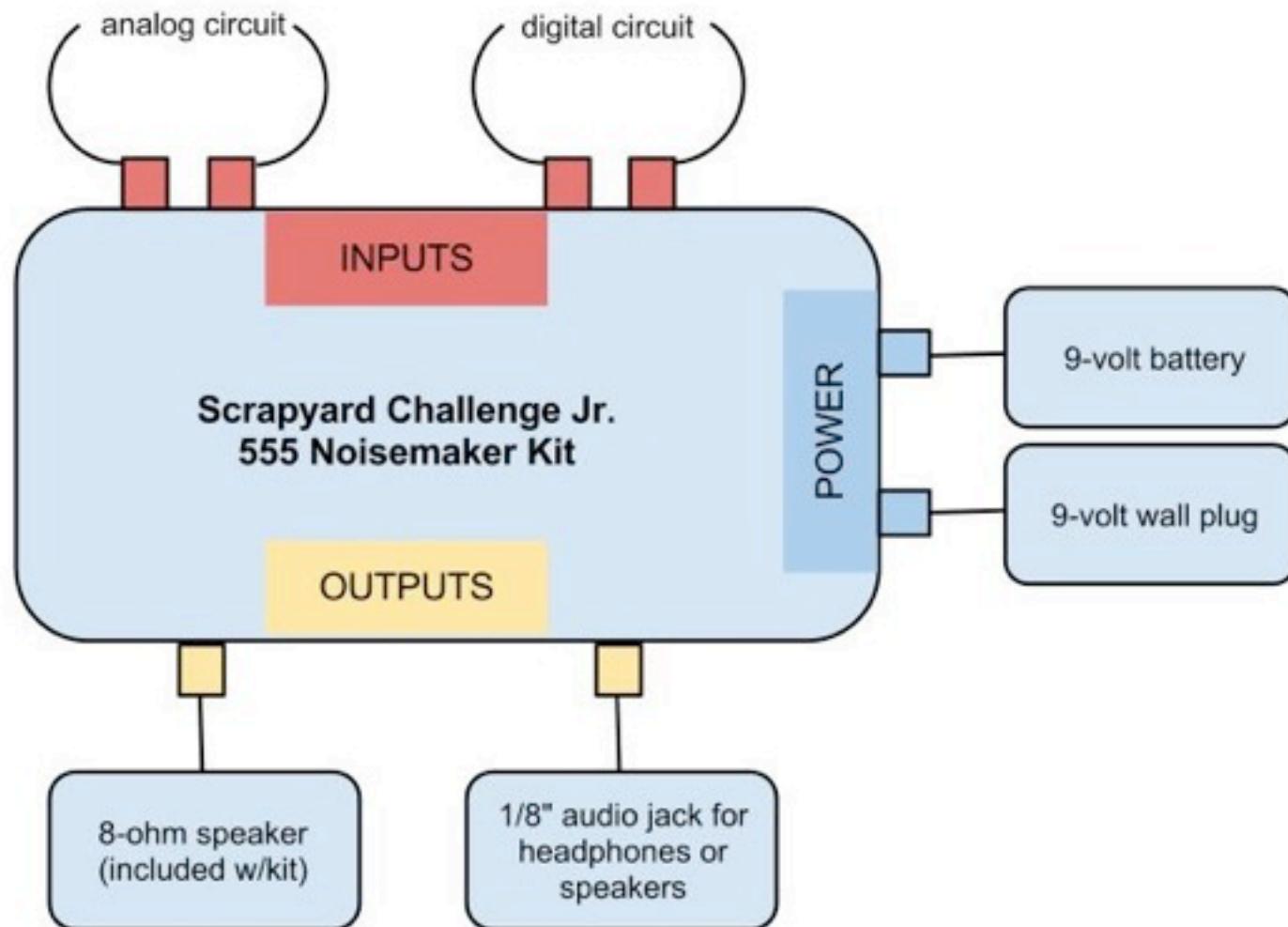
Multi-generational learning with teen facilitators there to assist the authors

SCRAPYARD CHALLENGE Jr. BOARDS



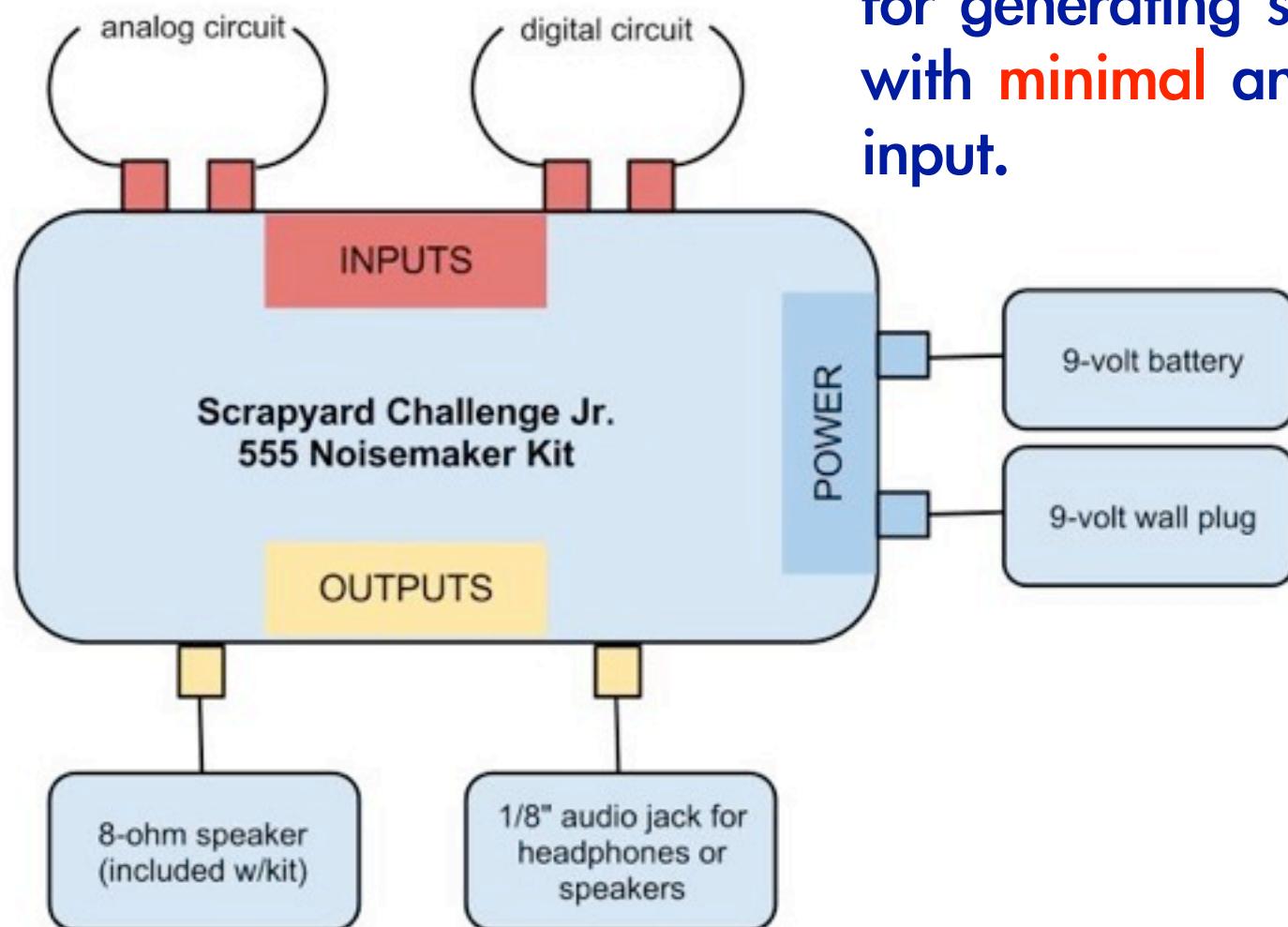
SCRAPYARD CHALLENGE Jr. BOARDS

NoiseMaker Board



SCRAPYARD CHALLENGE Jr. BOARDS

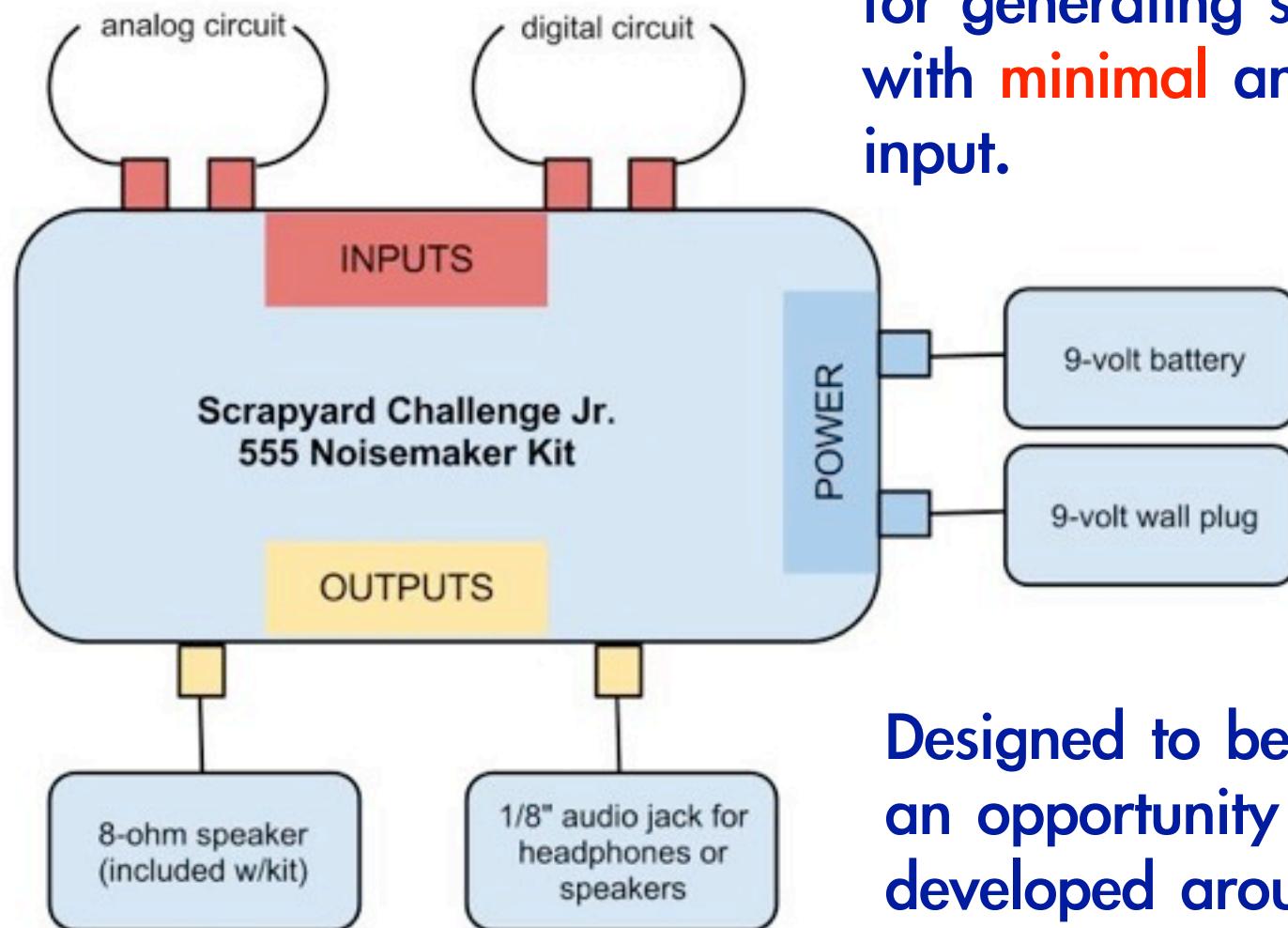
NoiseMaker Board



Kit designed as a simple tool
for generating sonic output
with **minimal** and **modular**
input.

SCRAPYARD CHALLENGE Jr. BOARDS

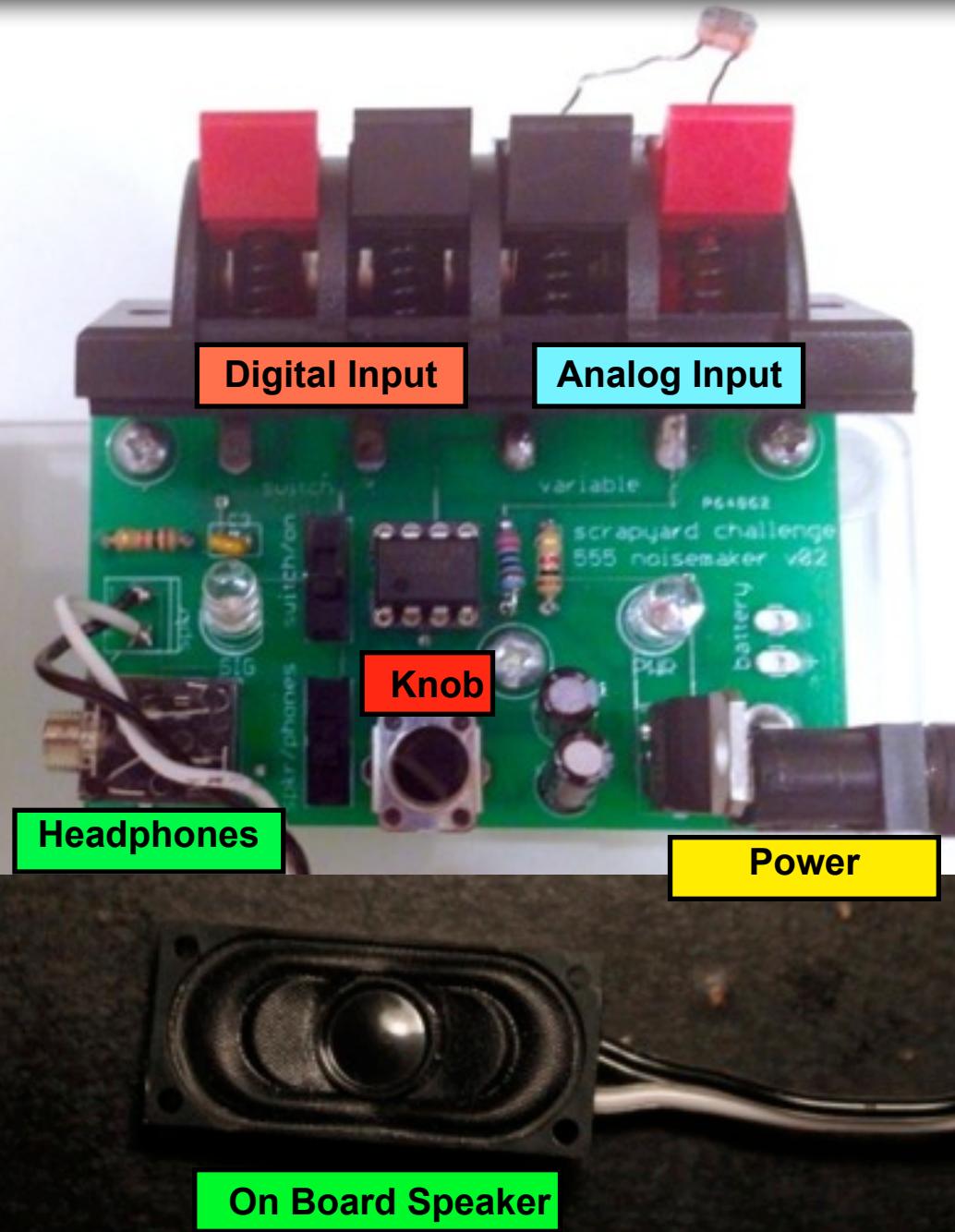
NoiseMaker Board



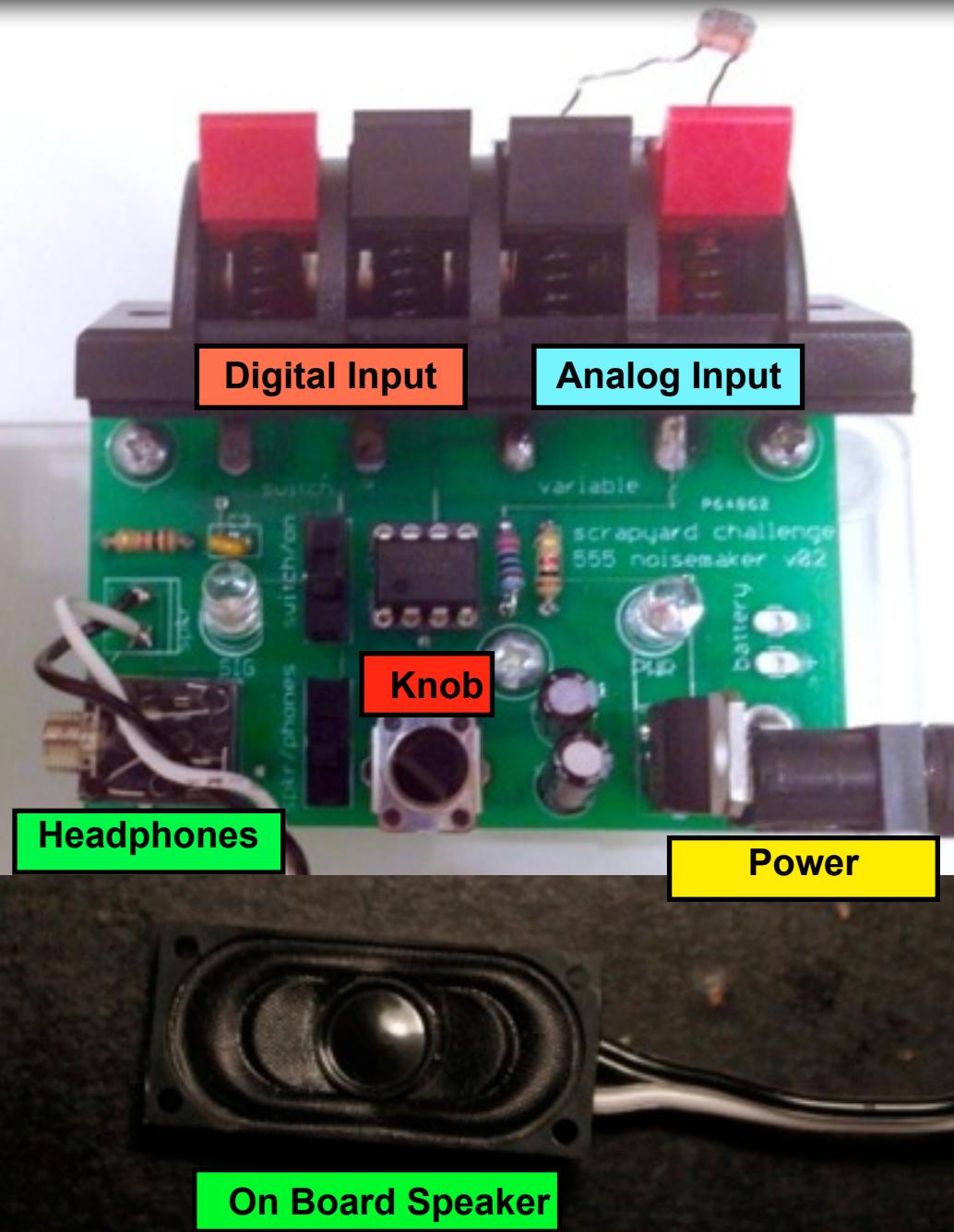
Kit designed as a simple tool for generating sonic output with **minimal** and **modular** input.

Designed to be **low-cost**, creating an opportunity for curriculum to be developed around **basic fabrication skills** including soldering, circuit design, and enclosure prototyping

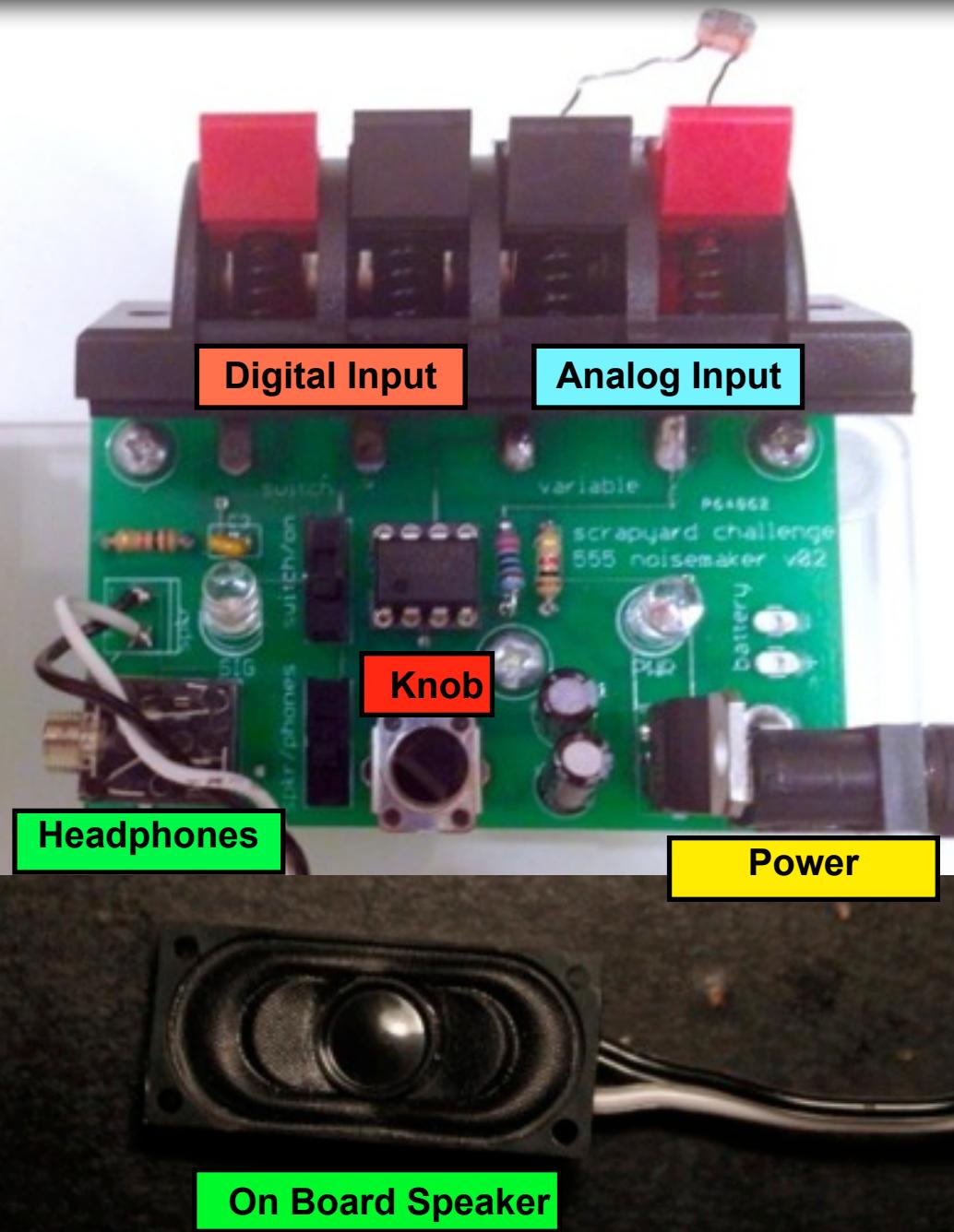
SCRAPYARD CHALLENGE Jr. BOARDS



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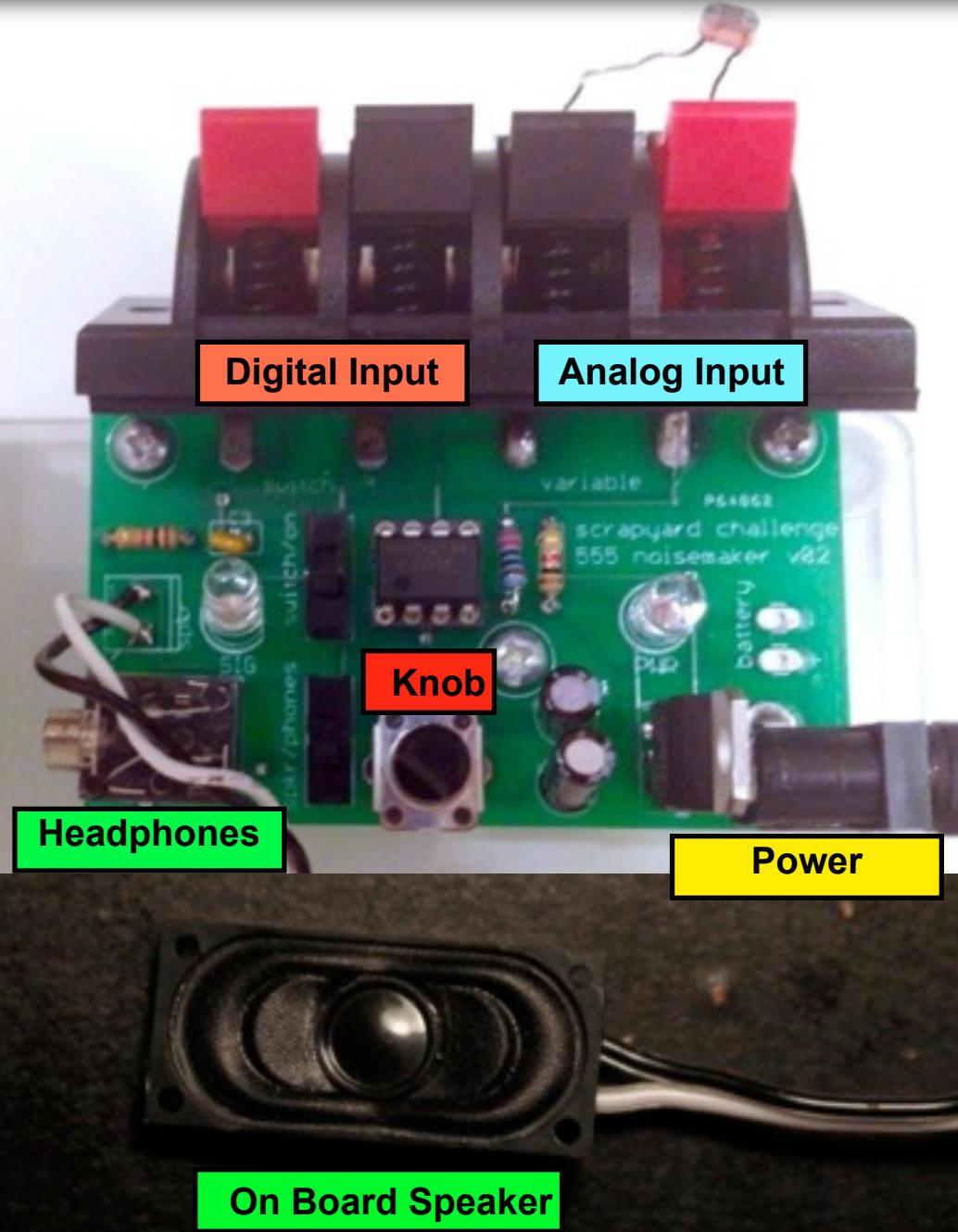


SCRAPYARD CHALLENGE Jr. BOARDS



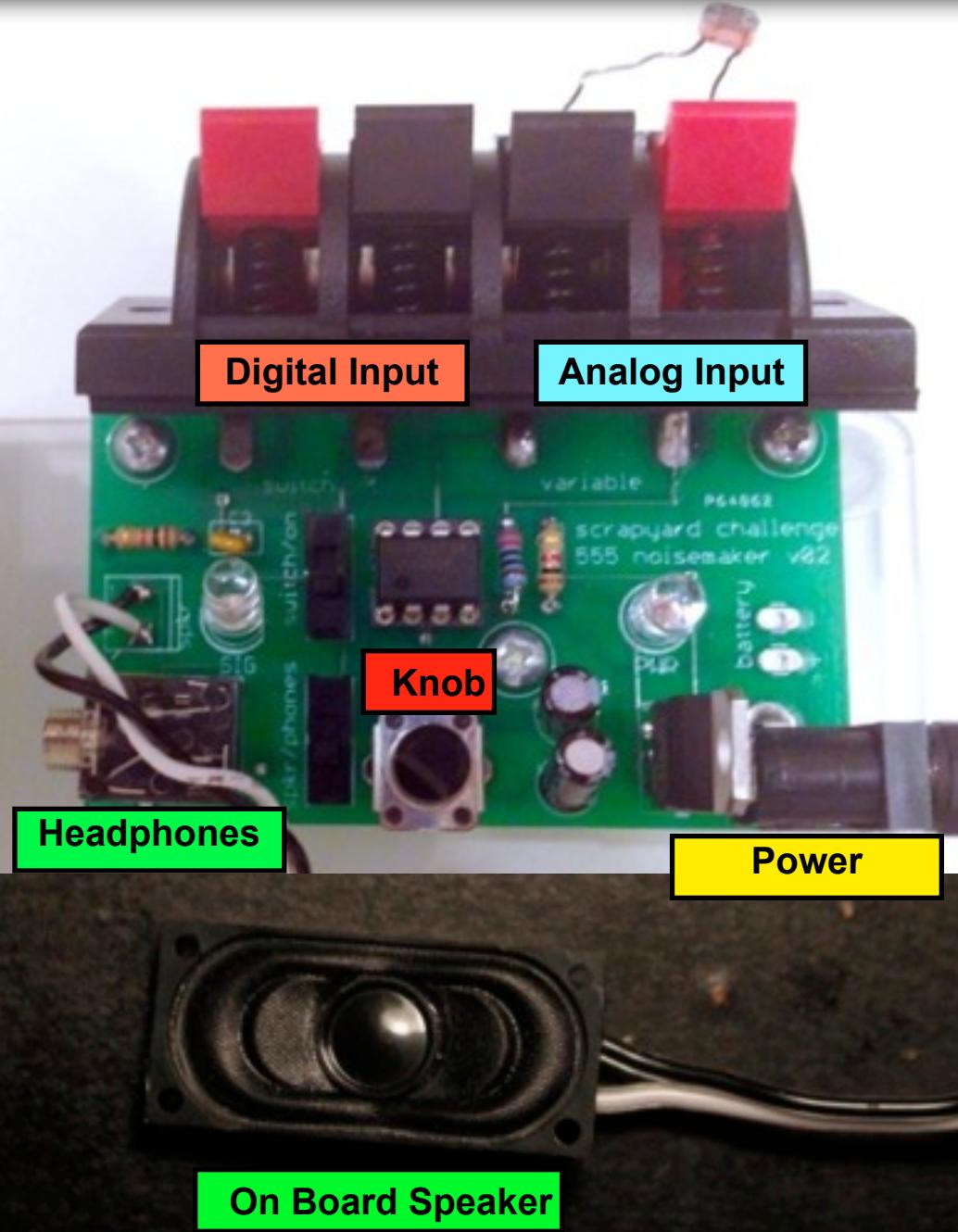
NoiseMaker Board Version 2.0

SCRAPYARD CHALLENGE Jr. BOARDS



NoiseMaker Board Version 2.0
Modified feature set
specifically designed for
young children and their
families

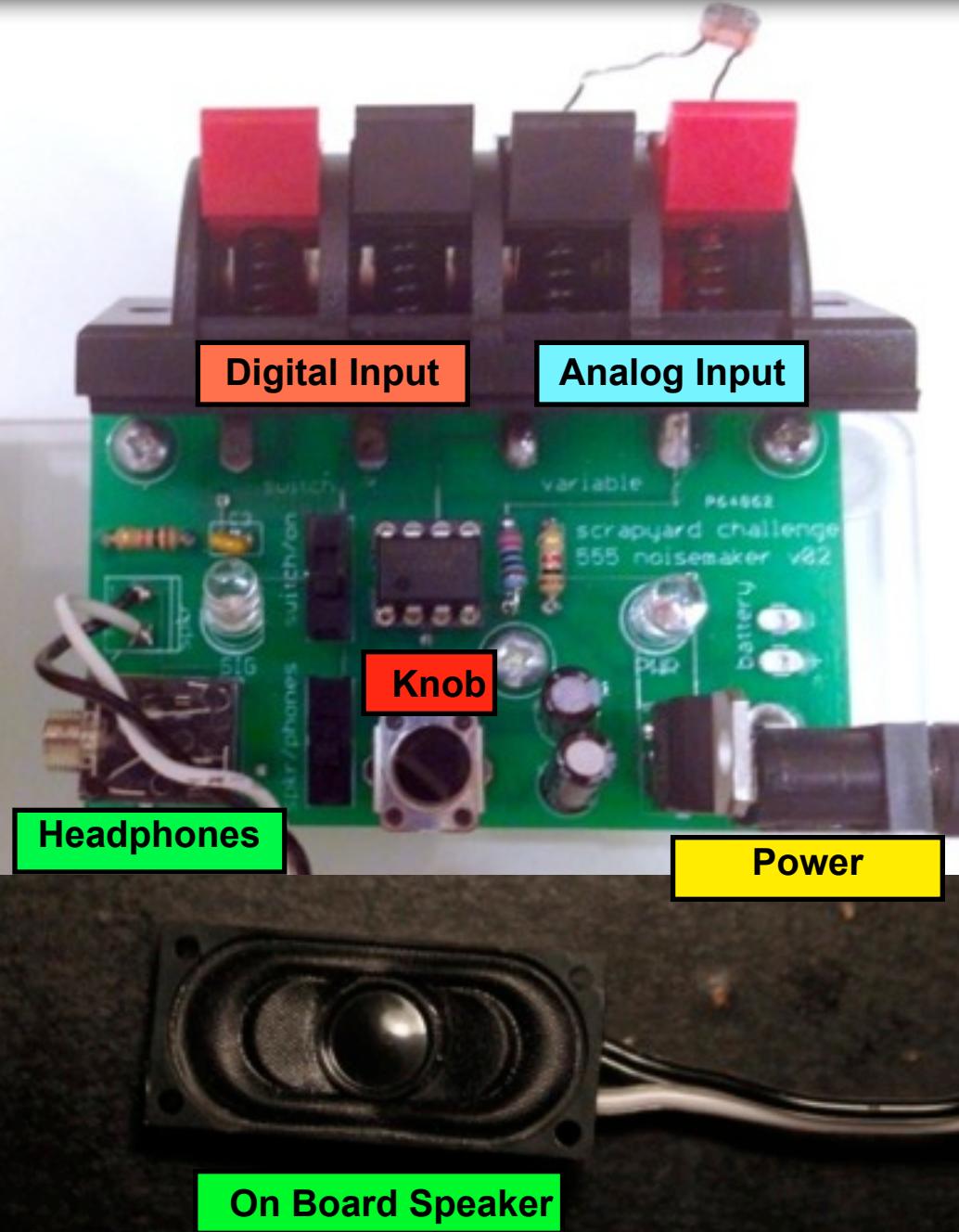
SCRAPYARD CHALLENGE Jr. BOARDS



NoiseMaker Board Version 2.0
Modified feature set
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families

- 1 Digital Input, 1 Analog

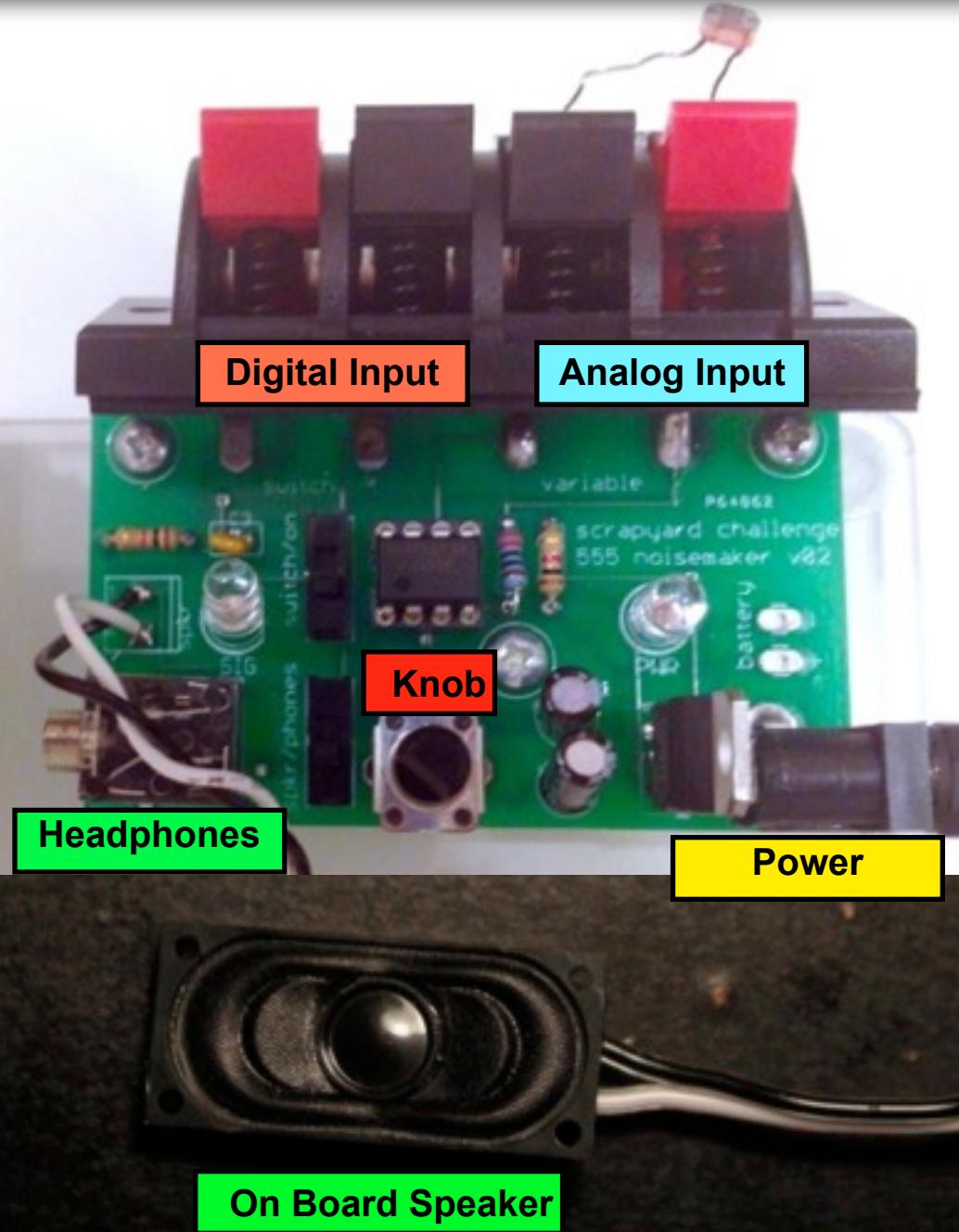
SCRAPYARD CHALLENGE Jr. BOARDS



NoiseMaker Board Version 2.0
Modified feature set
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young children and their
families

- 1 Digital Input, 1 Analog
- Variable tones with knob

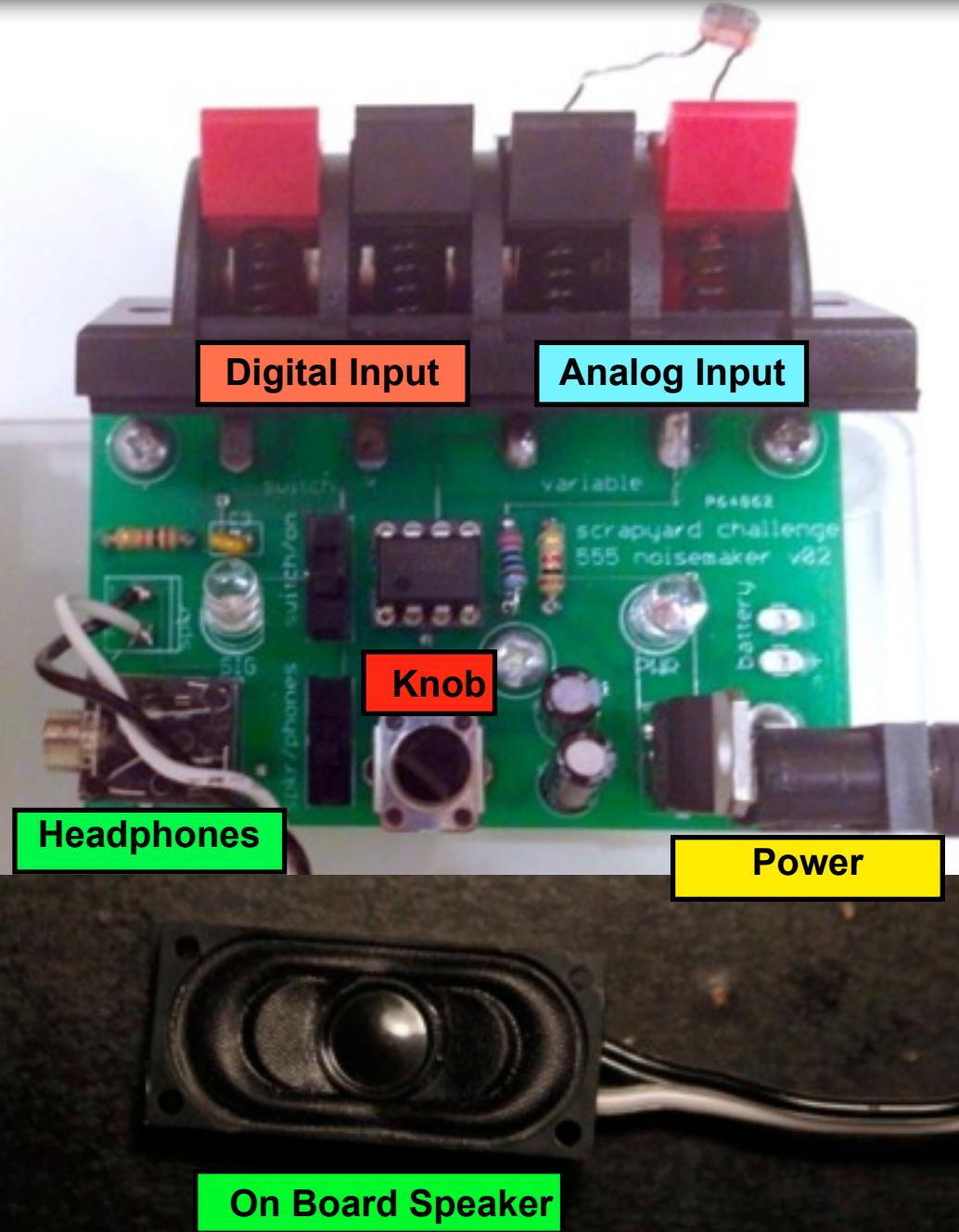
SCRAPYARD CHALLENGE Jr. BOARDS



NoiseMaker Board Version 2.0
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- 1 Digital Input, 1 Analog
- Variable tones with knob
- On board speaker

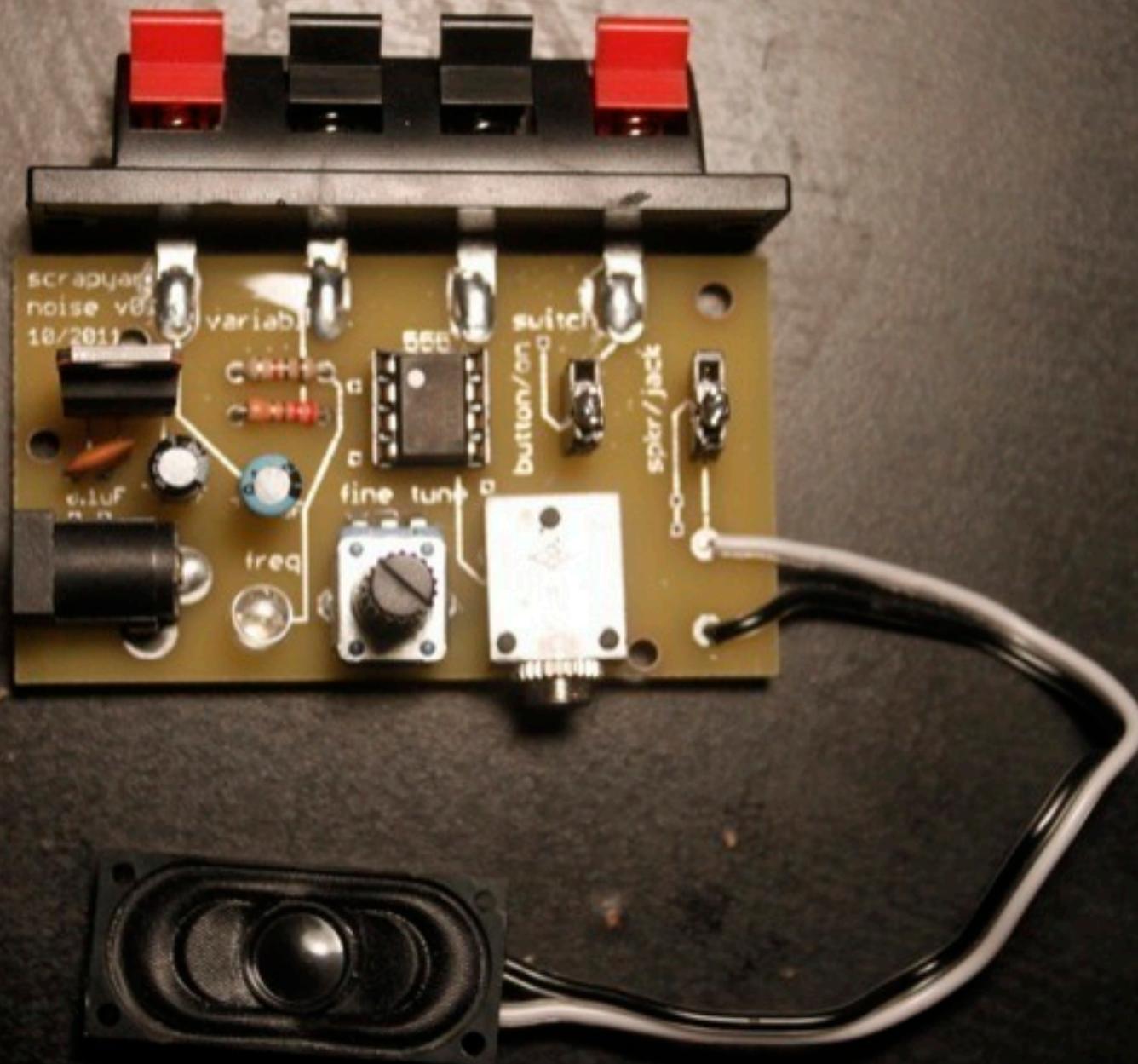
SCRAPYARD CHALLENGE Jr. BOARDS



NoiseMaker Board Version 2.0
Modified feature set
specifically designed for
young children and their
families

- 1 Digital Input, 1 Analog
- Variable tones with knob
- On board speaker
- External amplifier / headphone jack

SCRAPYARD CHALLENGE Jr. WORKSHOP



SCRAPYARD CHALLENGE Jr. WORKSHOP

NOISEMAKER BOARD LEARNING OUTCOMES

SCRAPYARD
noise v1.0
10/2011

scrap
freq

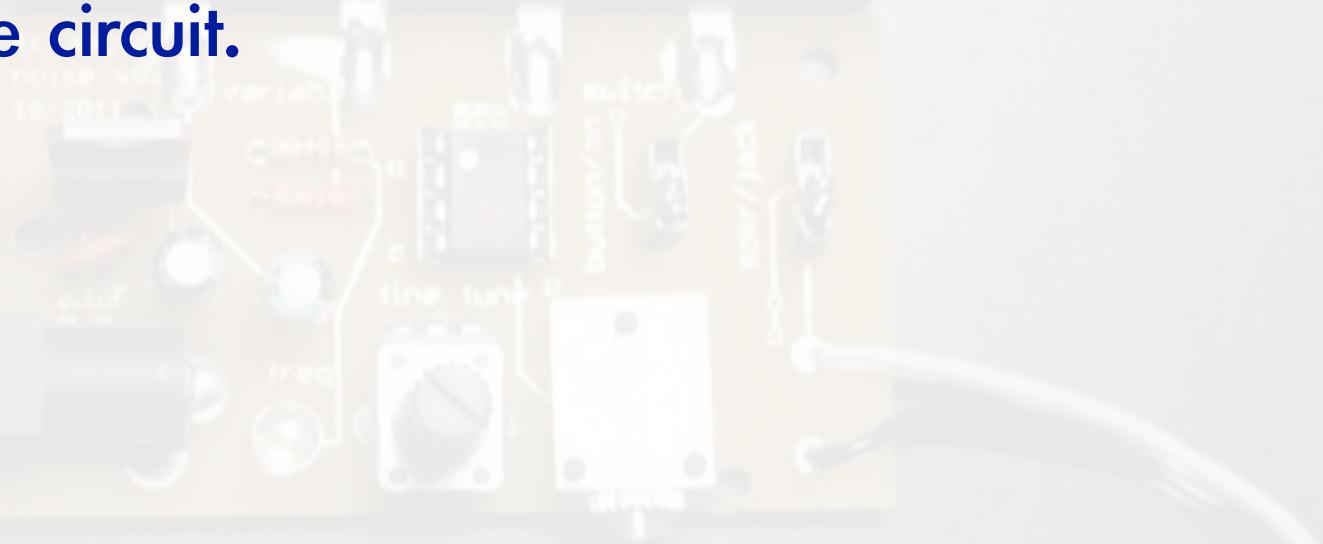
fine tune

scrap

SCRAPYARD CHALLENGE Jr. WORKSHOP

NOISEMAKER BOARD LEARNING OUTCOMES

ANALOG: The analog input demonstrates the concepts of resistance and conductivity within a single circuit.



SCRAPYARD CHALLENGE Jr. WORKSHOP

NOISEMAKER BOARD LEARNING OUTCOMES

ANALOG: The analog input demonstrates the concepts of resistance and conductivity within a single circuit.

The amount of resistance passing through their circle instantly affects the pitch of the sounds heard

SCRAPYARD CHALLENGE Jr. WORKSHOP

NOISEMAKER BOARD LEARNING OUTCOMES

ANALOG: The analog input demonstrates the concepts of resistance and conductivity within a single circuit.

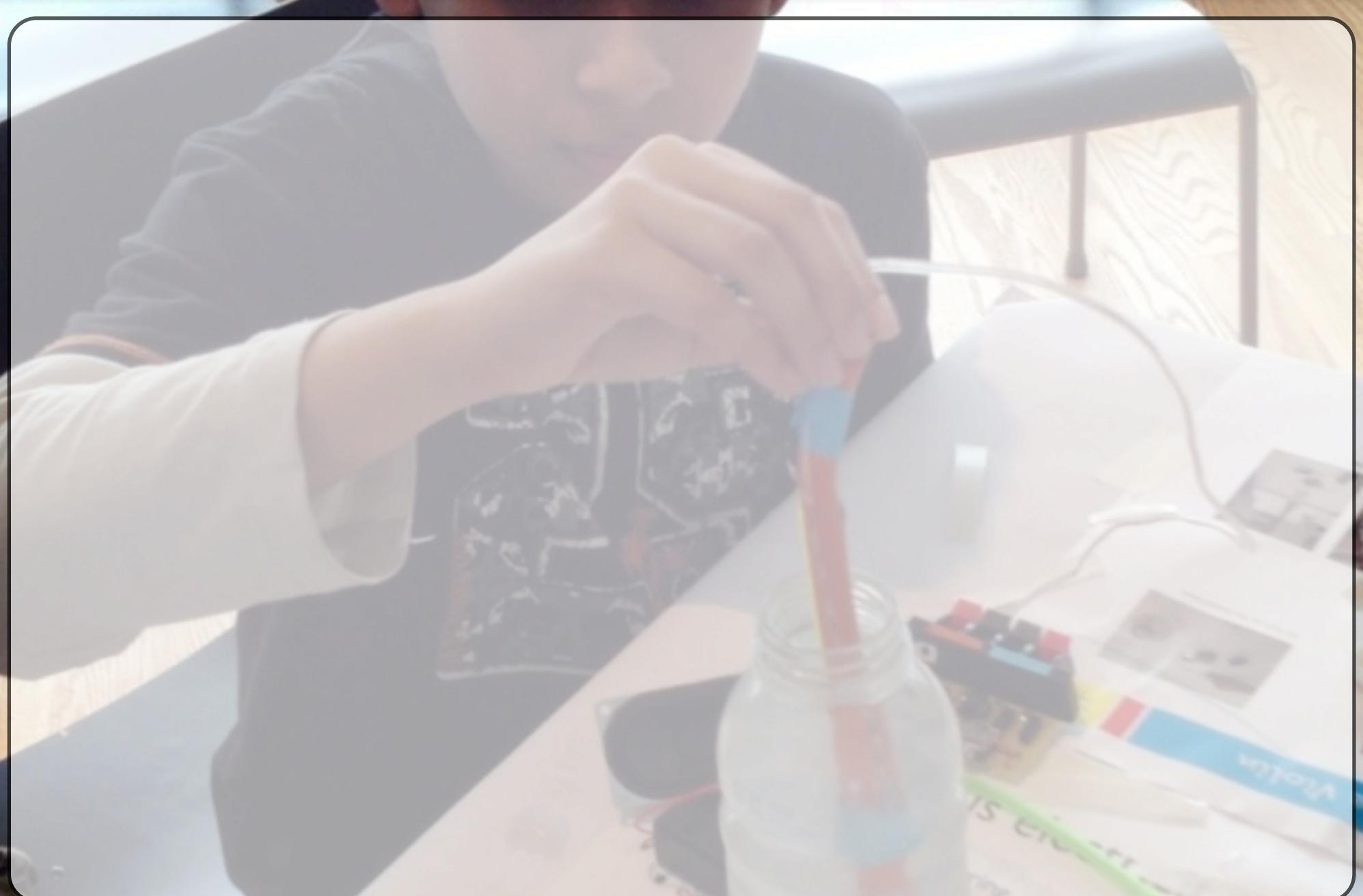
The amount of resistance passing through their circle instantly affects the pitch of the sounds heard

DIGITAL: The digital input illustrates a closed versus open circuit. When a connection is made between the two poles, as simple as clapping two bands of aluminum foil together in the noisy stuffed animal project, sound is emitted.

SCRAPYARD CHALLENGE Jr. ACTIVITIES

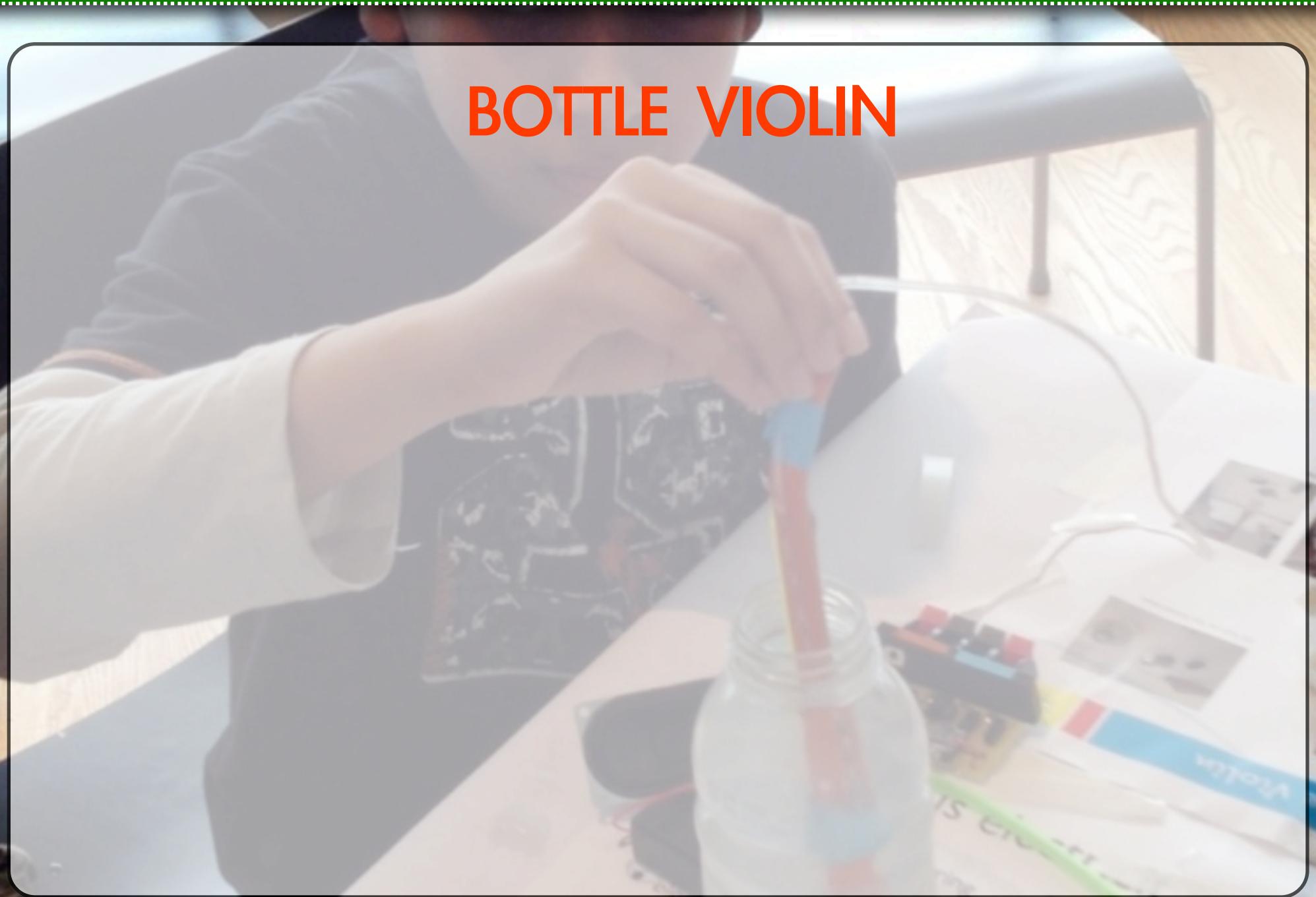


SCRAPYARD CHALLENGE Jr. ACTIVITIES



SCRAPYARD CHALLENGE Jr. ACTIVITIES

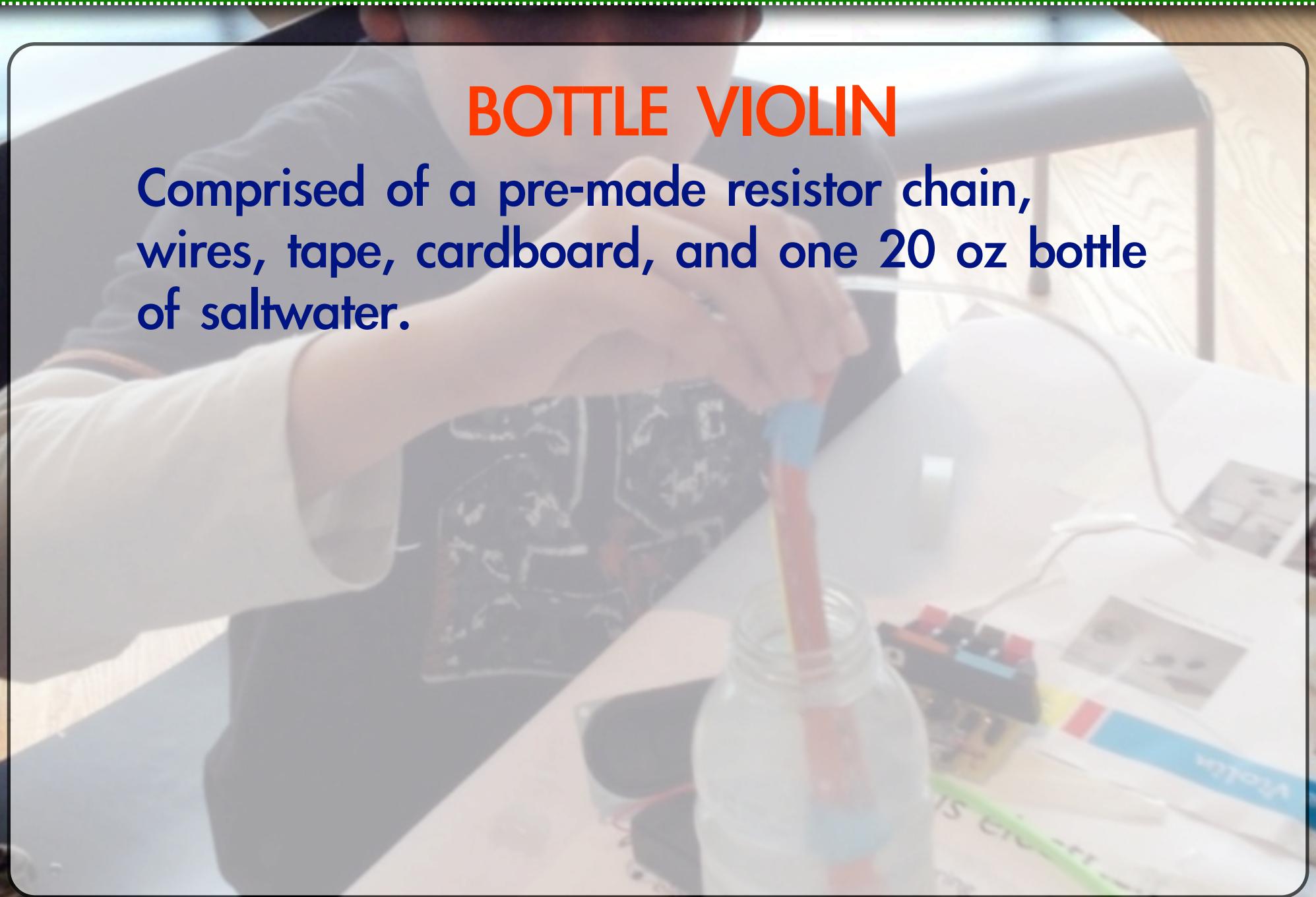
BOTTLE VIOLIN



SCRAPYARD CHALLENGE Jr. ACTIVITIES

BOTTLE VIOLIN

Comprised of a pre-made resistor chain, wires, tape, cardboard, and one 20 oz bottle of saltwater.



SCRAPYARD CHALLENGE Jr. ACTIVITIES

BOTTLE VIOLIN

Comprised of a pre-made resistor chain, wires, tape, cardboard, and one 20 oz bottle of saltwater.

Makers connect the chain to the analog input of the Noisemaker Board and dip the chain into the salt water to create a chain of changing sounds

SCRAPYARD CHALLENGE Jr. ACTIVITIES

BOTTLE VIOLIN

Comprised of a pre-made resistor chain, wires, tape, cardboard, and one 20 oz bottle of saltwater.

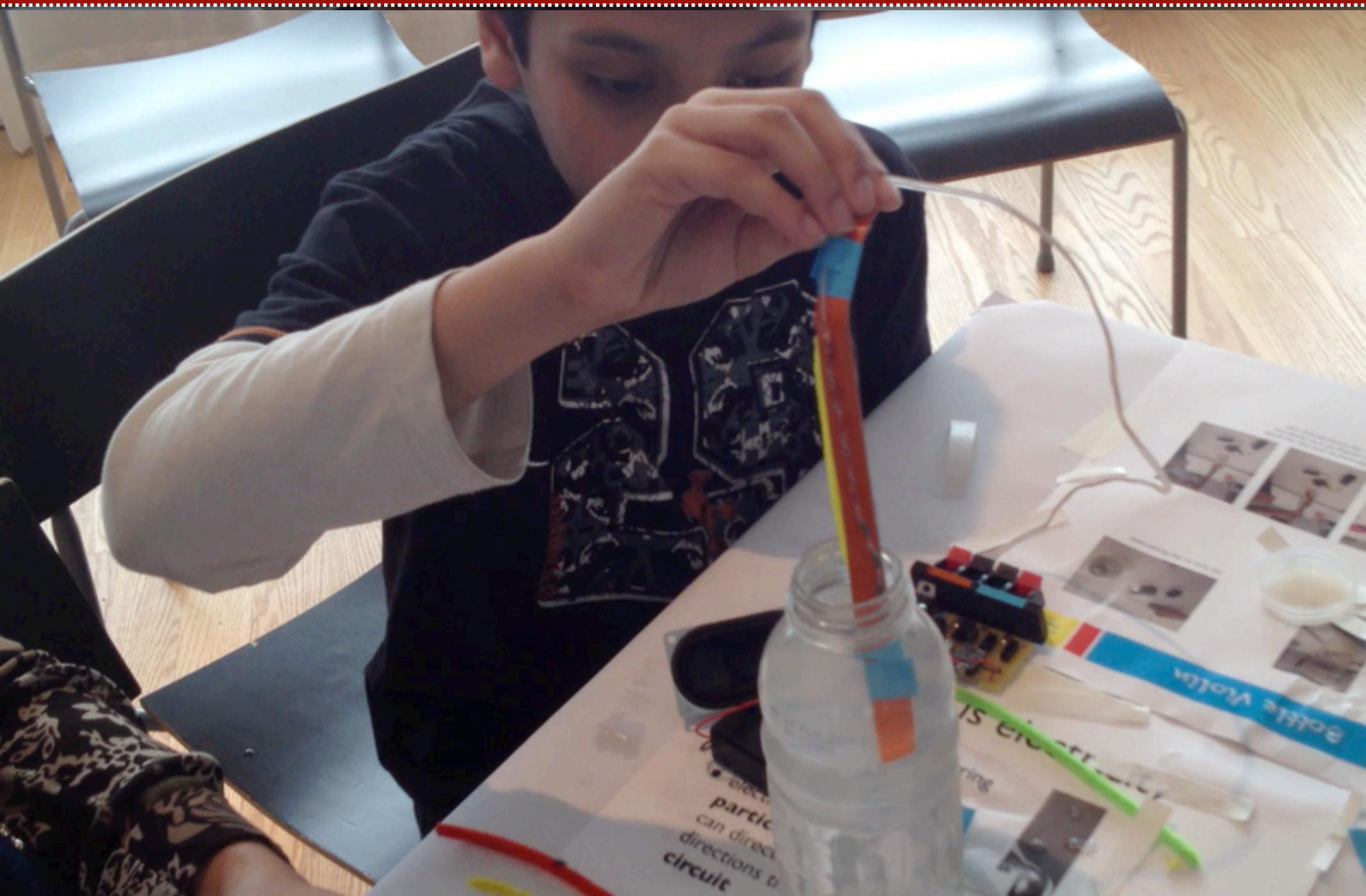
Makers connect the chain to the analog input of the Noisemaker Board and dip the chain into the salt water to create a chain of changing sounds

Learning: activity emphasizes that electricity (or a current) always takes the path of least resistance, while also showing that electrical energy can be transformed into sound.

BOTTLE VIOLIN



BOTTLE VIOLIN



SCRAPYARD CHALLENGE Jr. ACTIVITIES



SCRAPYARD CHALLENGE Jr. ACTIVITIES



SCRAPYARD CHALLENGE Jr. ACTIVITIES

STUFFED ANIMAL DRUMS



SCRAPYARD CHALLENGE Jr. ACTIVITIES

STUFFED ANIMAL DRUMS

2 strips of aluminum foil, wires, copper conductive tape (used instead of solder for younger kids), stuffed animal

SCRAPYARD CHALLENGE Jr. ACTIVITIES

STUFFED ANIMAL DRUMS

2 strips of aluminum foil, wires, copper conductive tape (used instead of solder for younger kids), stuffed animal

Aluminium foil is banded around the limbs of the animal and serve as switches connect to the digital inputs of the board - so that when a child claps the arms together they close the switch and create sound

STUFFED ANIMAL DRUMS



STUFFED ANIMAL DRUMS



SCRAPYARD CHALLENGE Jr. WORKSHOPS



SCRAPYARD CHALLENGE Jr. WORKSHOPS

Scrapyard Challenge Jr., Parsons School of Design,
New York, NY, January 28, 2012, 12 to 4 p.m.
Kids 4 to 6 year olds



SCRAPYARD CHALLENGE Jr. WORKSHOPS



SCRAPYARD CHALLENGE Jr. WORKSHOPS

Scrapyard Challenge Jr., Ridgecrest Intermediate
School, Palos Verdes, CA, February 28, 2012.
Middle schoolers - 7 & 8th grade



SCRAPYARD CHALLENGE Jr. WORKSHOPS



SCRAPYARD CHALLENGE Jr. WORKSHOPS

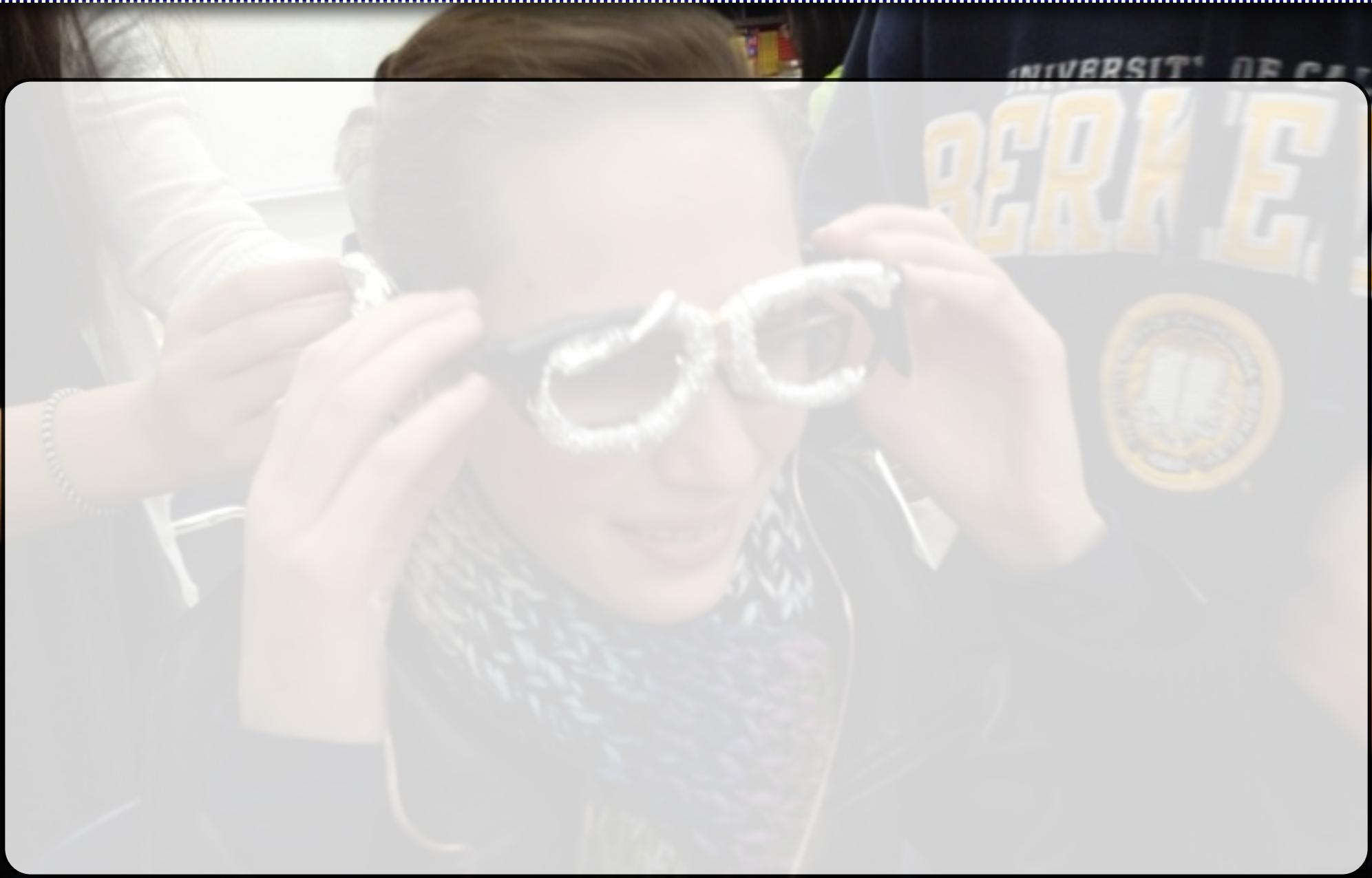
Scrapyard Challenge Jr., USA Science and Engineering Festival 2012, With the National Academy of Sciences, Washington Convention Center, Washington, D.C., April 28-29, 2012, Kids 6 to 8 year olds.



SCRAPYARD CHALLENGE Jr. EVALUATION



SCRAPYARD CHALLENGE Jr. EVALUATION

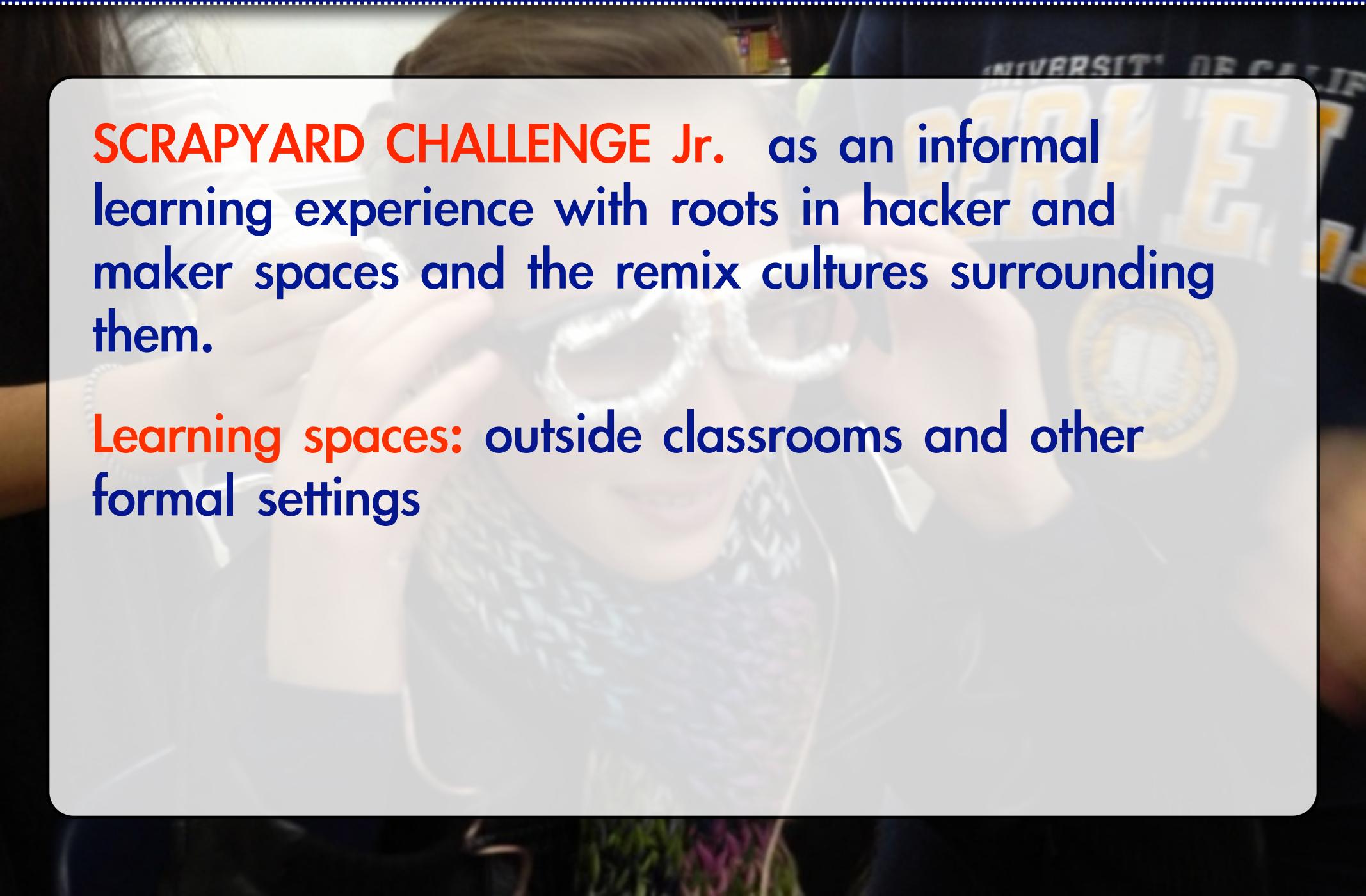


SCRAPYARD CHALLENGE Jr. EVALUATION

A blurred background image shows a person from the side, wearing a light-colored mask over their mouth and nose, and a pair of over-ear headphones. They appear to be focused on something off-camera. In the background, there's a dark surface with some yellow and white text that looks like "UNIVERSITÉ DE CALIFORNIA".

SCRAPYARD CHALLENGE Jr. as an informal learning experience with roots in hacker and maker spaces and the remix cultures surrounding them.

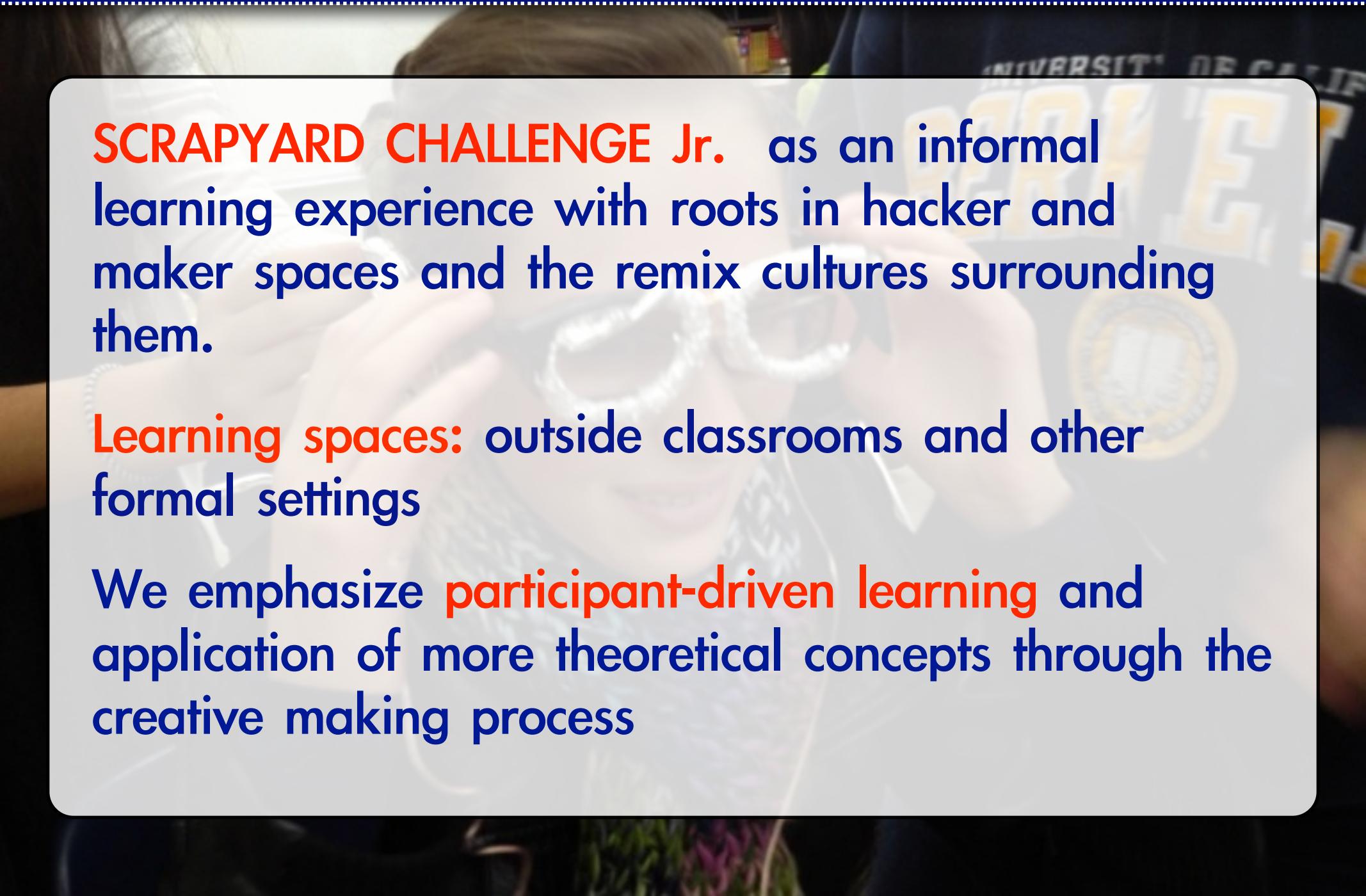
SCRAPYARD CHALLENGE Jr. EVALUATION

A photograph of a person from the chest up, wearing a light-colored t-shirt with the "UNIVERSITY OF CALIFORNIA" logo and a large golden bear emblem. The person has short brown hair and is looking slightly to the right.

SCRAPYARD CHALLENGE Jr. as an informal learning experience with roots in hacker and maker spaces and the remix cultures surrounding them.

Learning spaces: outside classrooms and other formal settings

SCRAPYARD CHALLENGE Jr. EVALUATION



SCRAPYARD CHALLENGE Jr. as an informal learning experience with roots in hacker and maker spaces and the remix cultures surrounding them.

Learning spaces: outside classrooms and other formal settings

We emphasize **participant-driven learning** and application of more theoretical concepts through the creative making process

SCRAPYARD CHALLENGE Jr. FRAMEWORK



SCRAPYARD CHALLENGE Jr. FRAMEWORK



SCRAPYARD CHALLENGE Jr. FRAMEWORK

WE FOCUS ON **4 POINTS** OF EVALUATION

A blurred background image showing a group of students in a workshop or classroom setting. They appear to be working on a project together, possibly related to the Scarpard Challenge Jr. Framework mentioned in the text above.

SCRAPYARD CHALLENGE Jr. FRAMEWORK

WE FOCUS ON 4 POINTS OF EVALUATION

Excitement and interest levels
in learning about how the
physical world works



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Excitement and interest levels
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The nature of scientific
enterprise



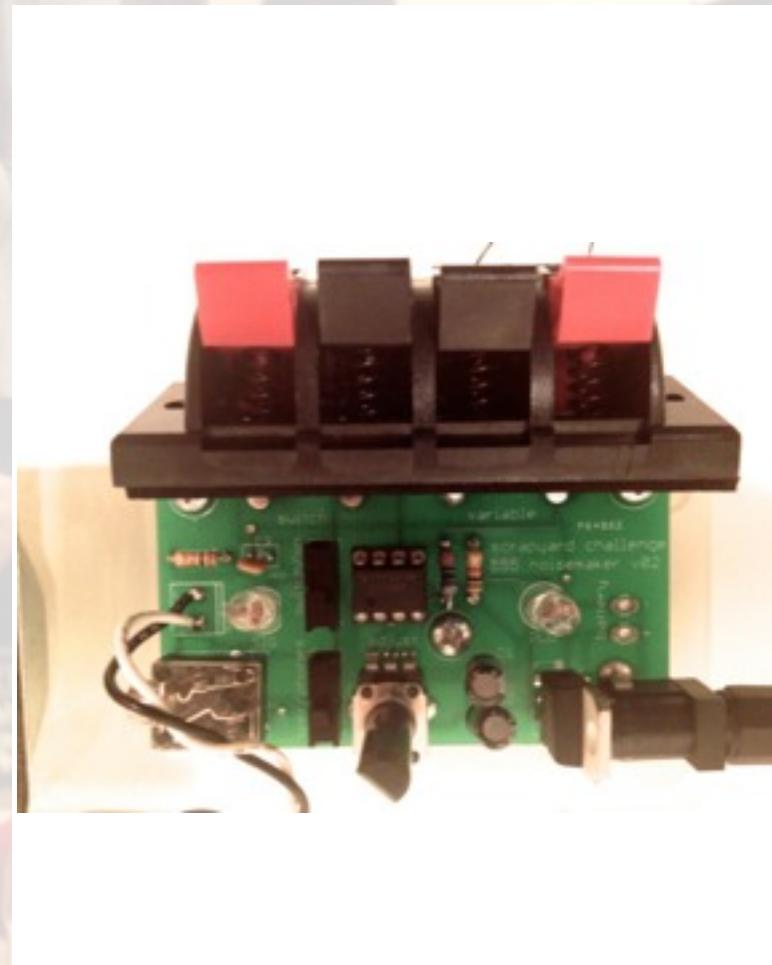
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Engagement in scientific practices



SCRAPYARD CHALLENGE Jr. FRAMEWORK

WE FOCUS ON 4 POINTS OF EVALUATION

Excitement and interest levels
in learning about how the
physical world works

The nature of **scientific**
enterprise

Engagement in **scientific practices**

The degree to which participants
self-identify as science learners.



SCRAPYARD CHALLENGE Jr. OBSERVATIONS

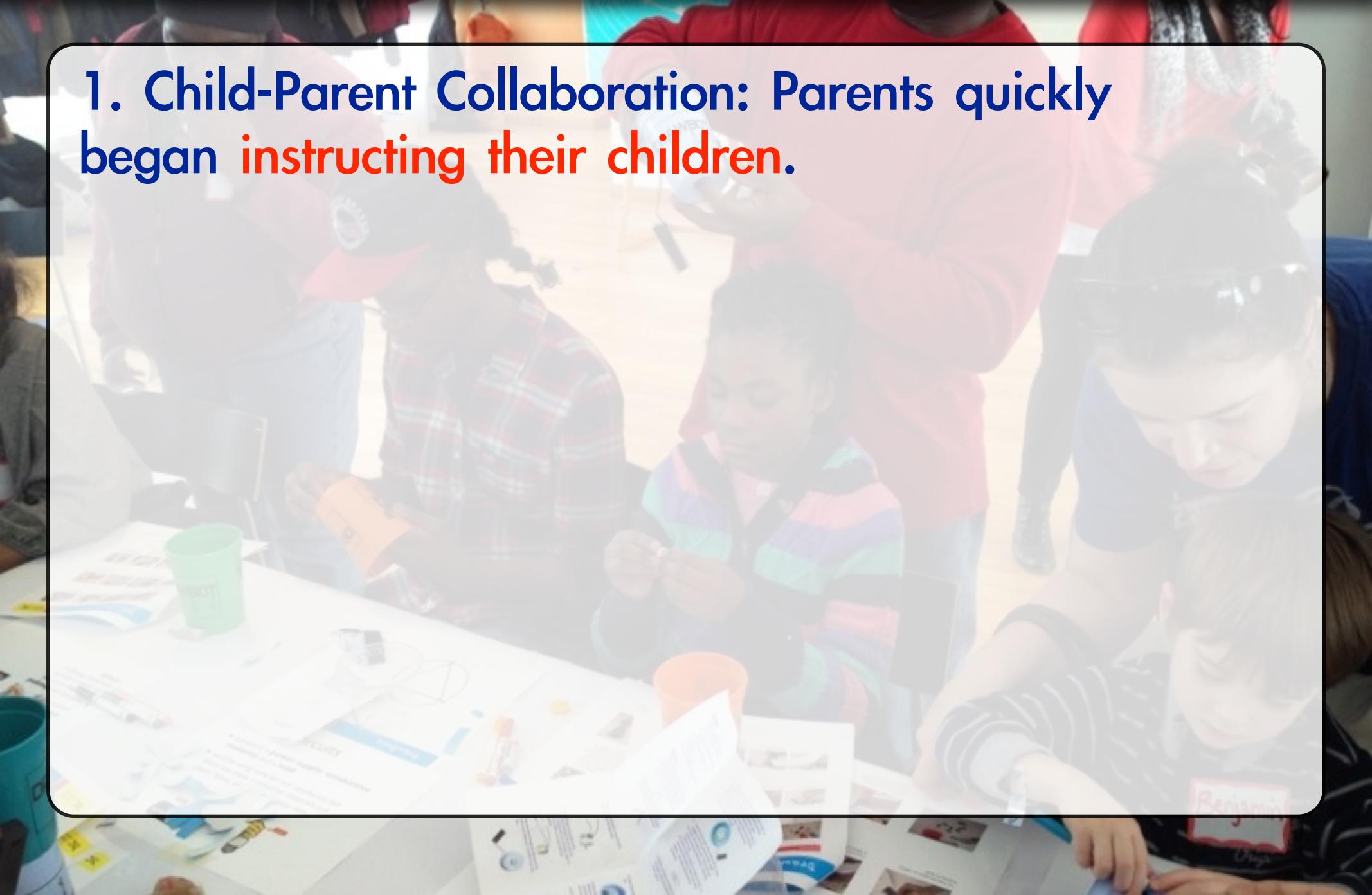


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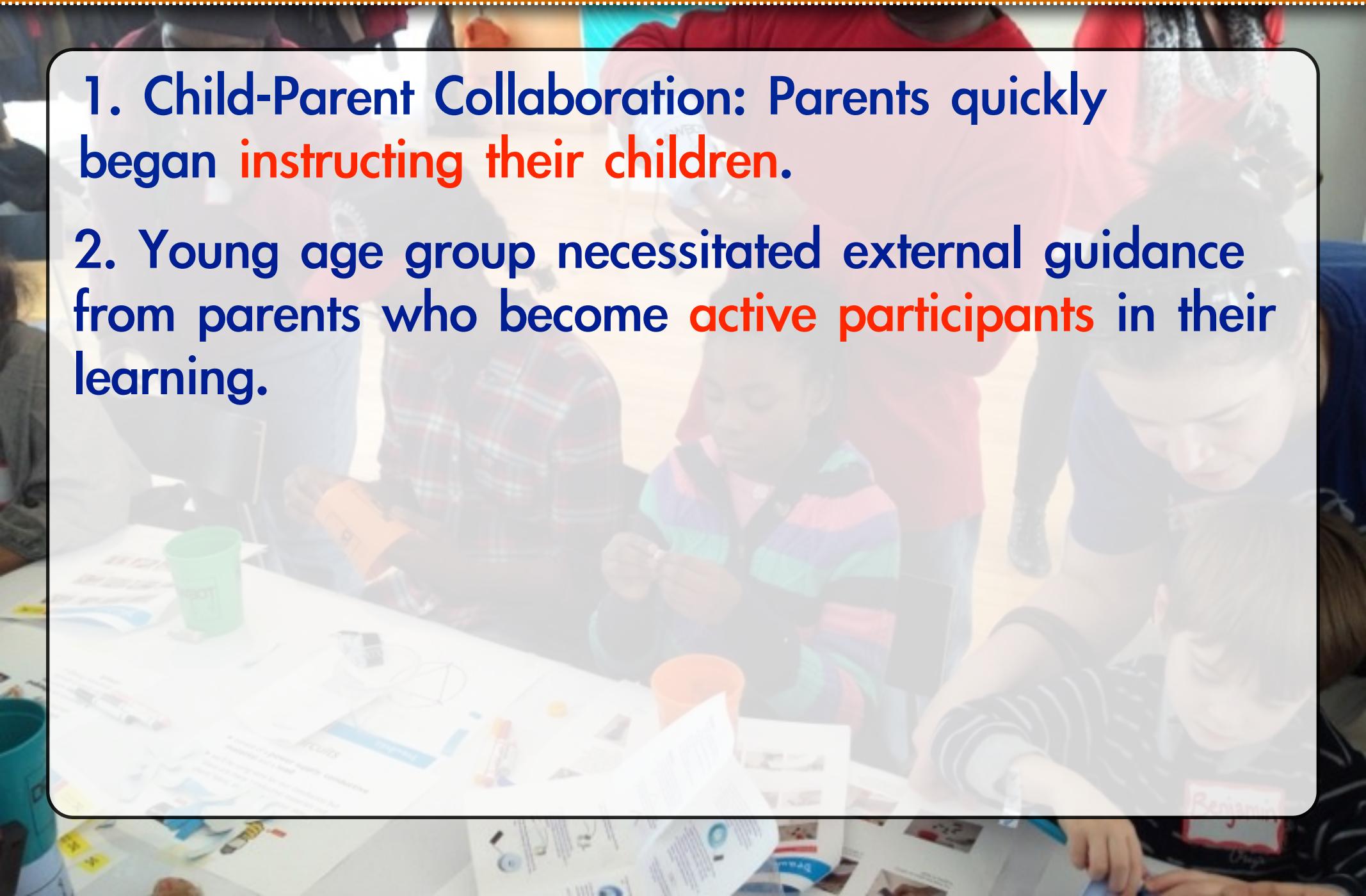


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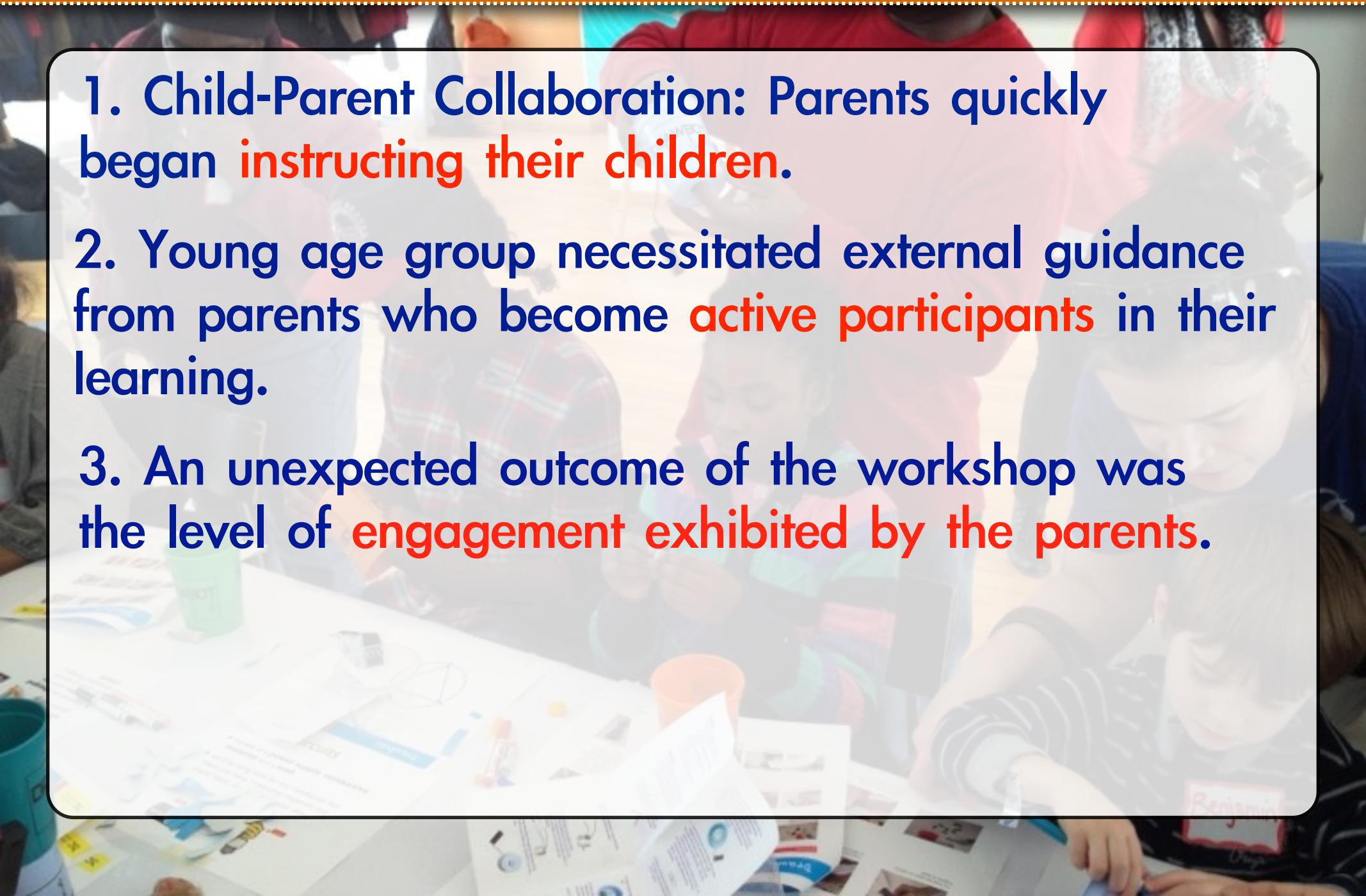
1. Child-Parent Collaboration: Parents quickly began instructing their children.

A photograph showing a group of children and adults gathered around a table. The table is covered with various items, including a green plastic cup, a blue mug, some papers, and what appears to be craft supplies or tools. The adults, who are the parents of the children, are leaning in and pointing at the materials, likely giving instructions or helping the children with the challenge. The children are looking down at the table, focused on the task at hand.

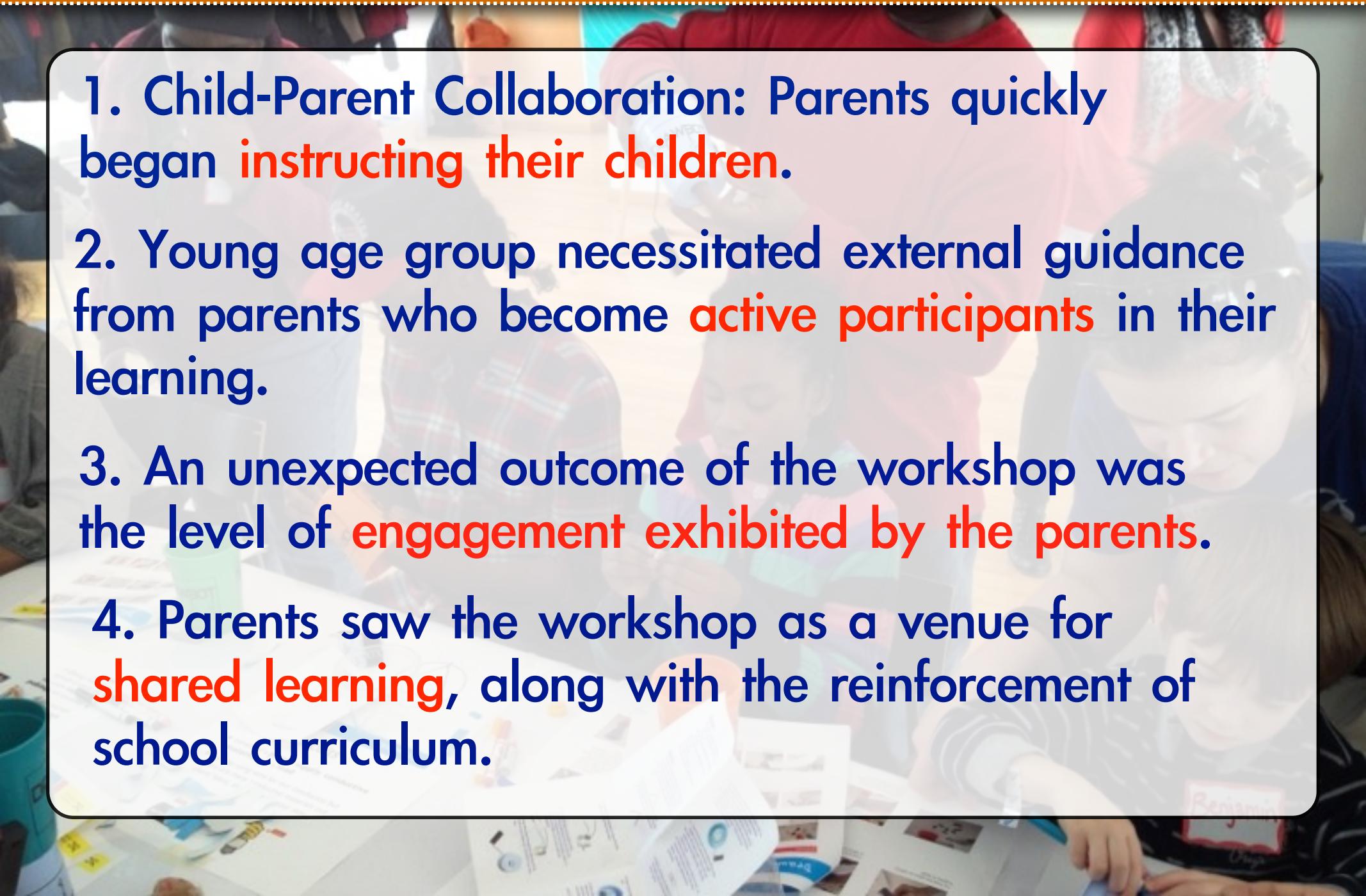
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 2. Young age group necessitated external guidance from parents who become active participants in their learning.

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SCRAPYARD CHALLENGE Jr. OBSERVATIONS

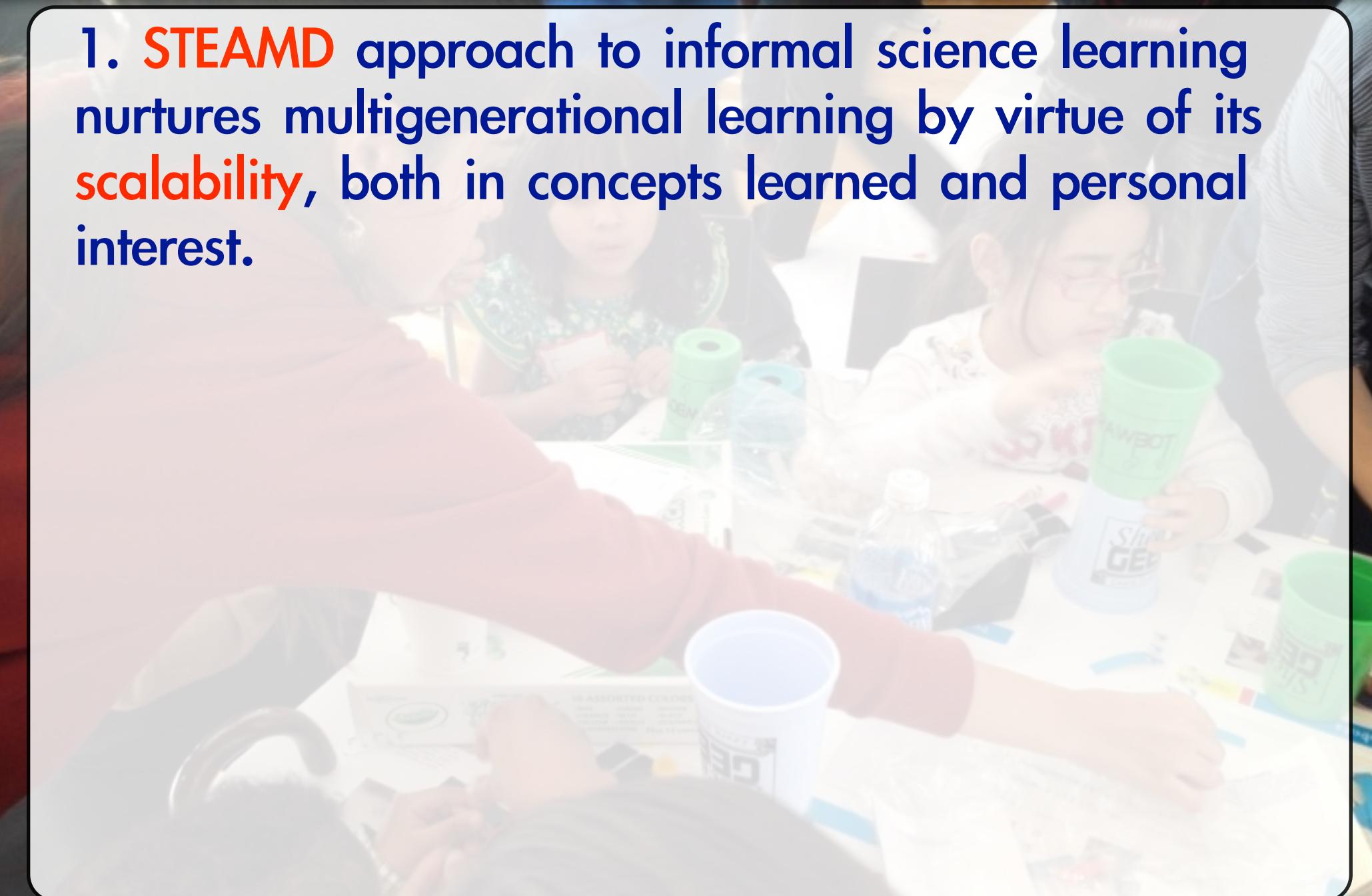
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 2. Young age group necessitated external guidance from parents who become active participants in their learning.
 3. An unexpected outcome of the workshop was the level of engagement exhibited by the parents.
 4. Parents saw the workshop as a venue for shared learning, along with the reinforcement of school curriculum.

SCRAPYARD CHALLENGE Jr. DISCUSSION

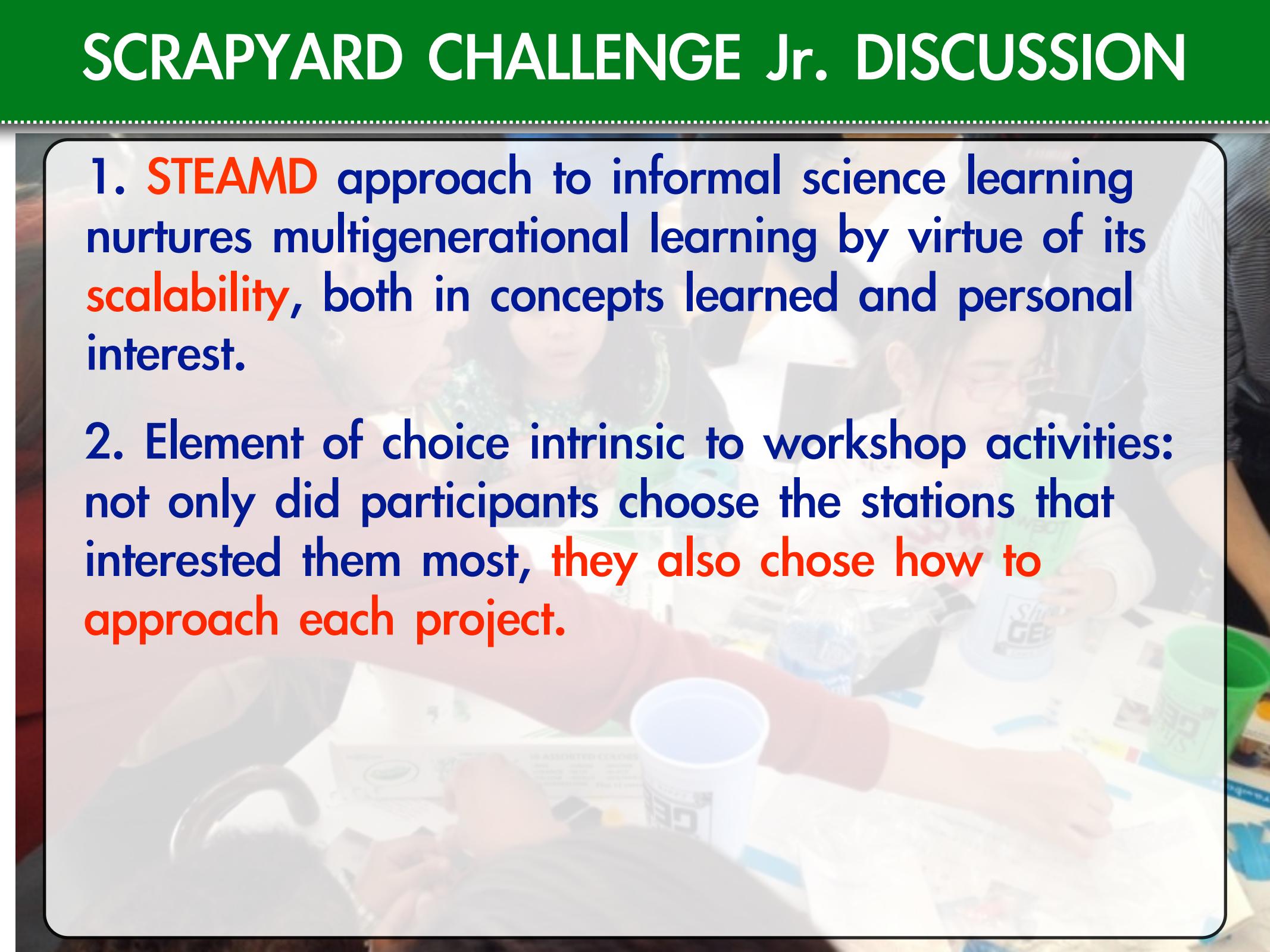


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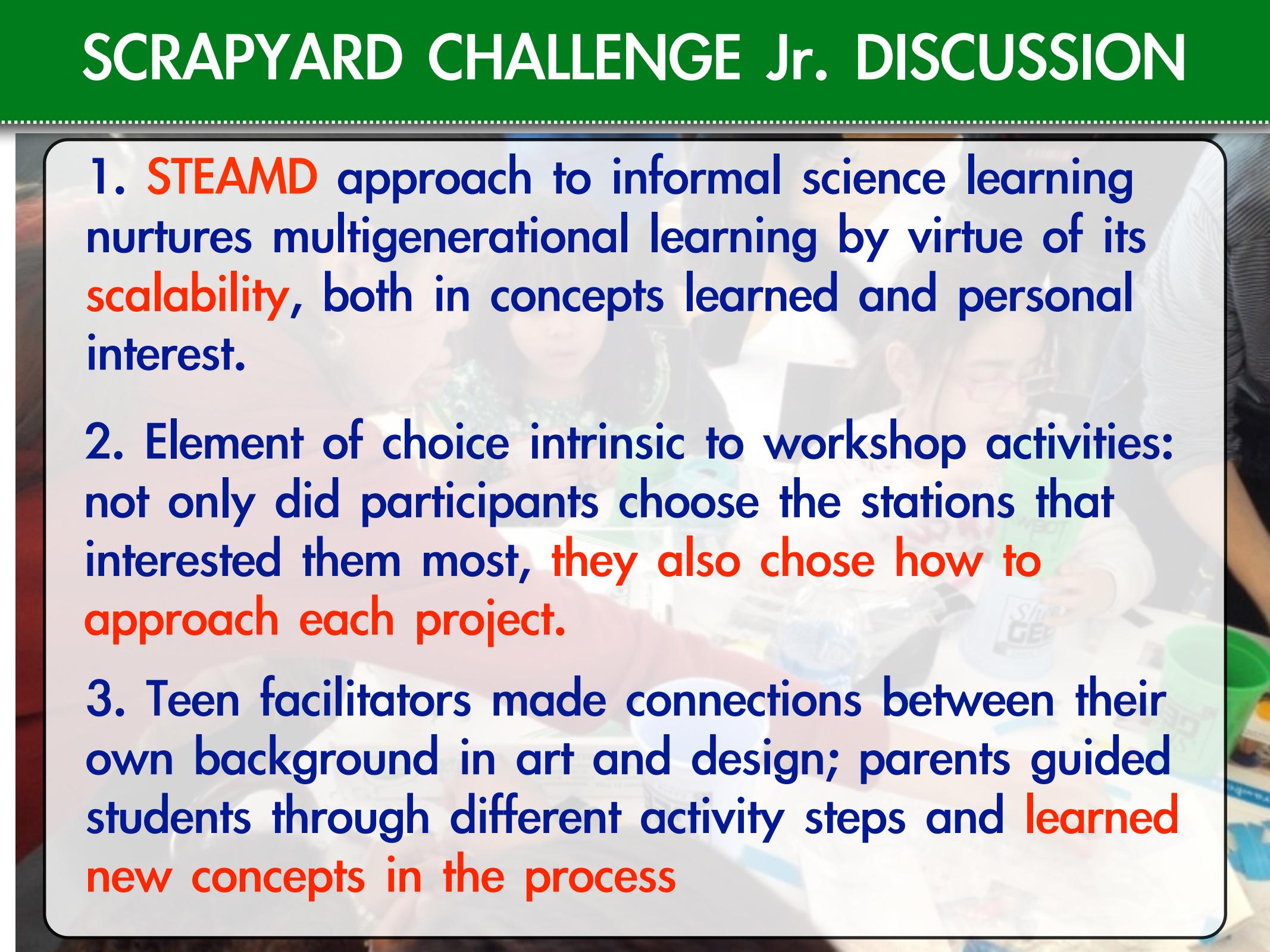
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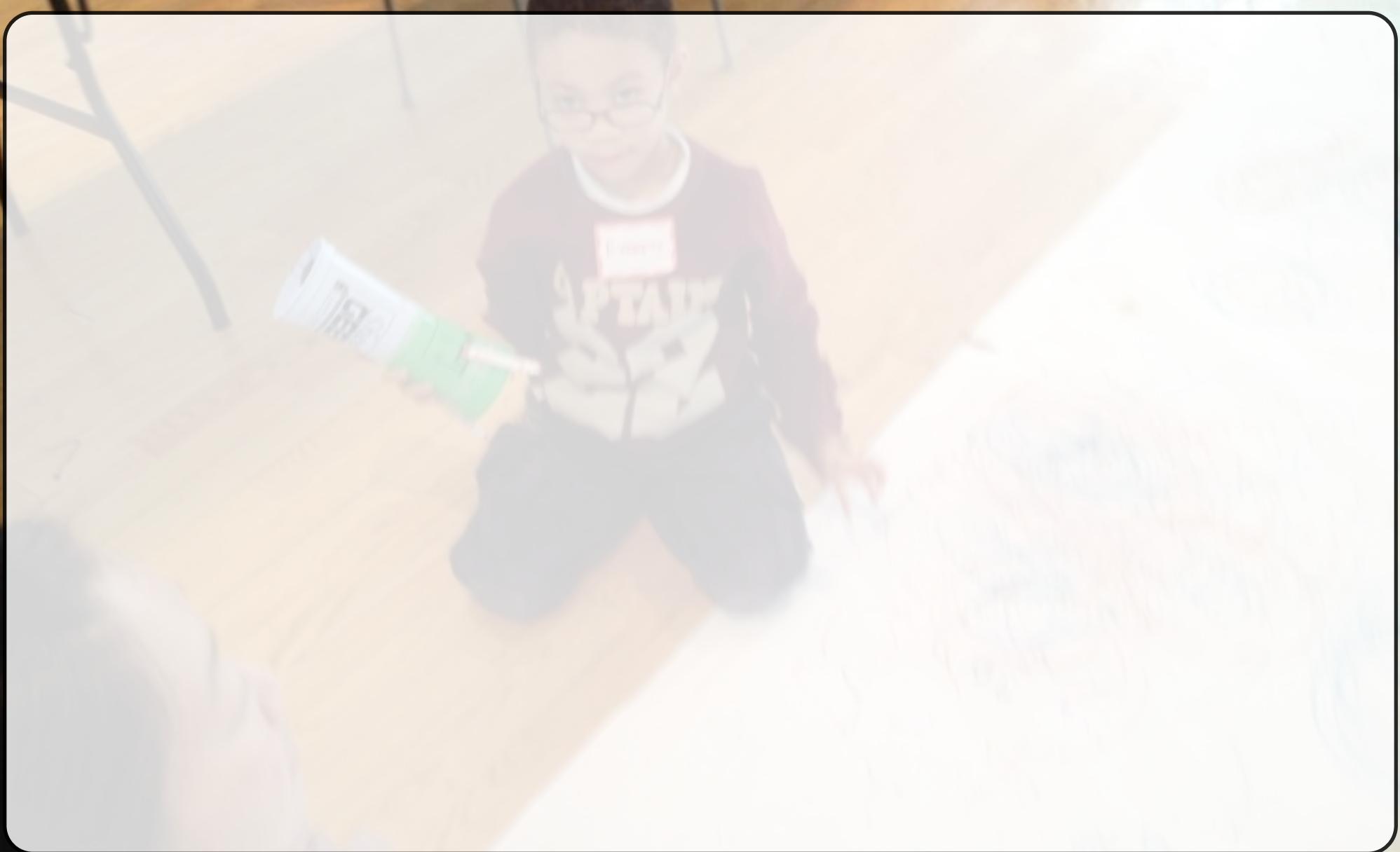
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1. STEAMD approach to informal science learning nurtures multigenerational learning by virtue of its **scalability**, both in concepts learned and personal interest.
 2. Element of choice intrinsic to workshop activities: not only did participants choose the stations that interested them most, **they also chose how to approach each project.**
 3. Teen facilitators made connections between their own background in art and design; parents guided students through different activity steps and **learned new concepts in the process**

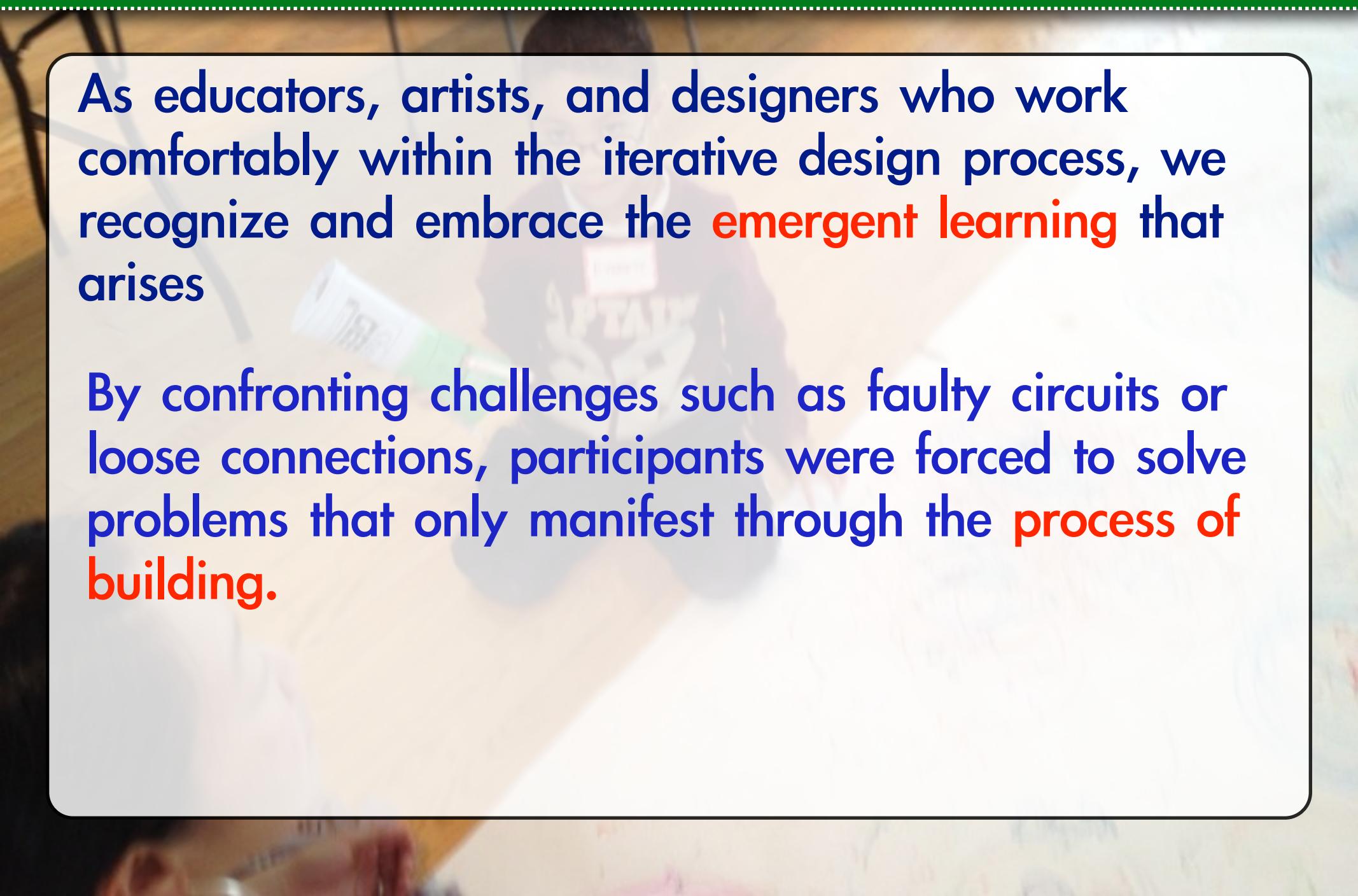
SCRAPYARD CHALLENGE Jr. DISCUSSION



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As educators, artists, and designers who work comfortably within the iterative design process, we recognize and embrace the **emergent learning** that arises

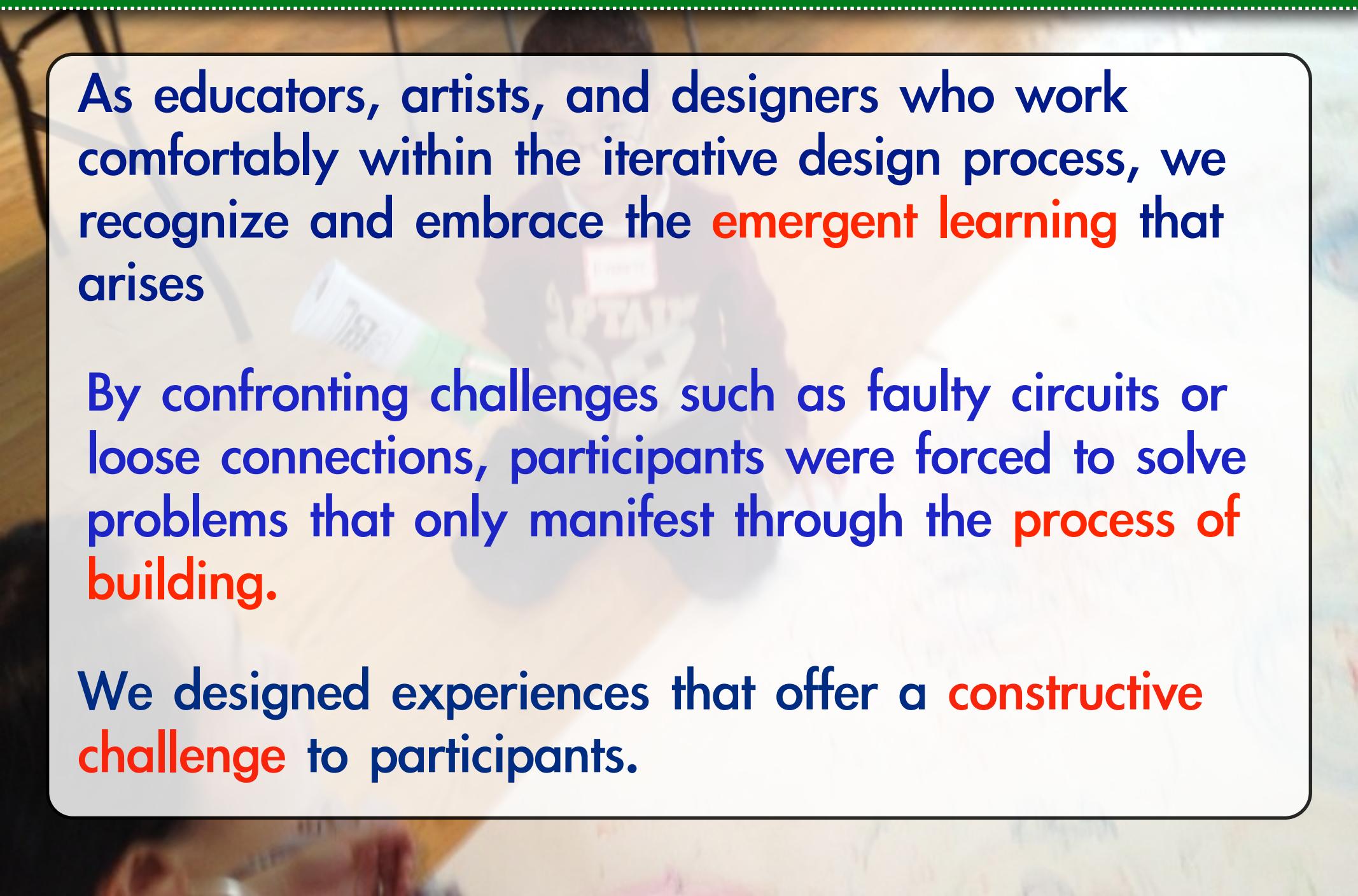
SCRAPYARD CHALLENGE Jr. DISCUSSION



As educators, artists, and designers who work comfortably within the iterative design process, we recognize and embrace the **emergent learning** that arises

By confronting challenges such as faulty circuits or loose connections, participants were forced to solve problems that only manifest through the **process of building.**

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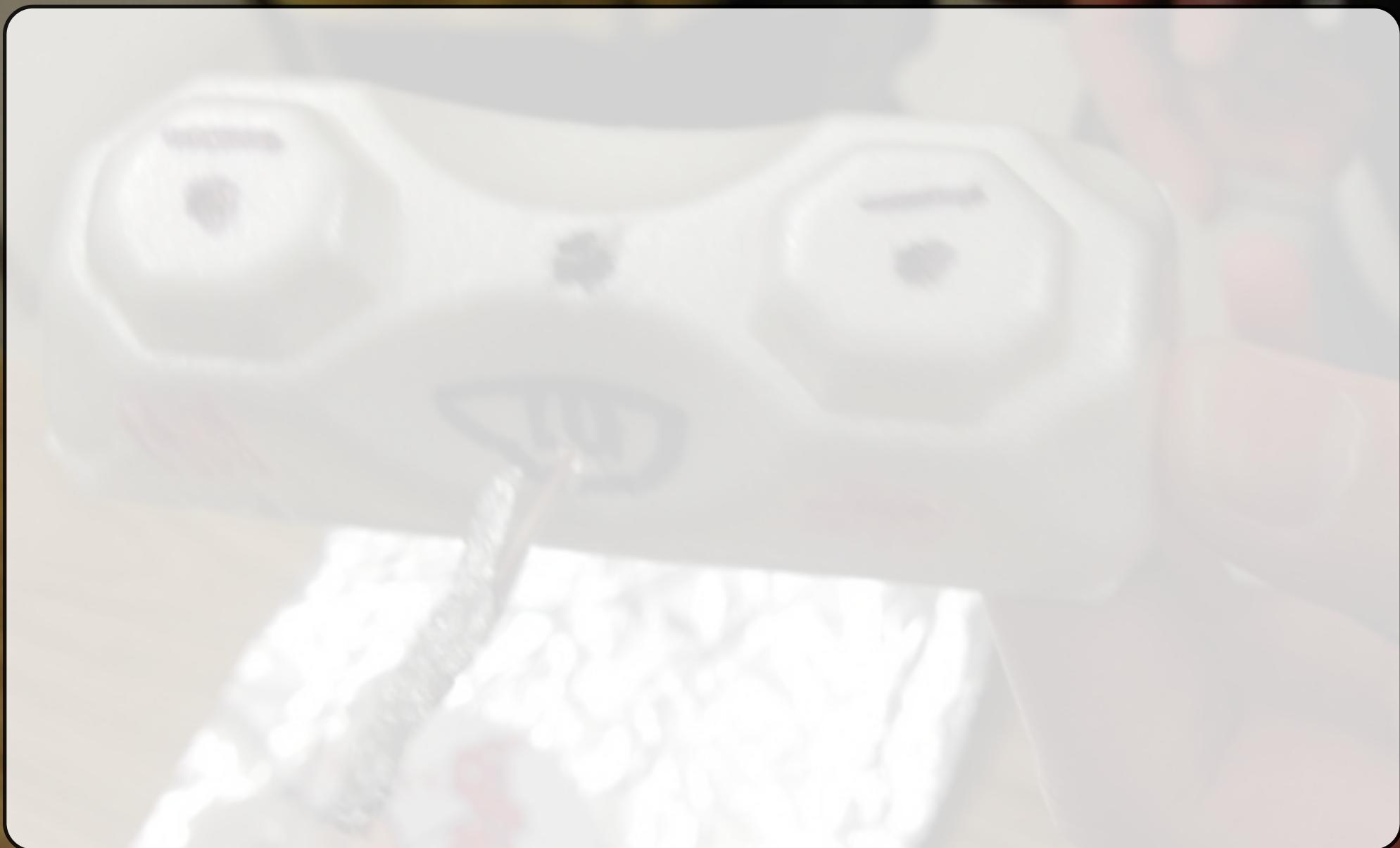


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By confronting challenges such as faulty circuits or loose connections, participants were forced to solve problems that only manifest through the **process of building.**

We designed experiences that offer a **constructive challenge** to participants.

SCRAPYARD CHALLENGE Jr. NEXT STEPS



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SCJ version 1.0 was designed to gauge interest in multigenerational learning in STEAMD tinkering activities.

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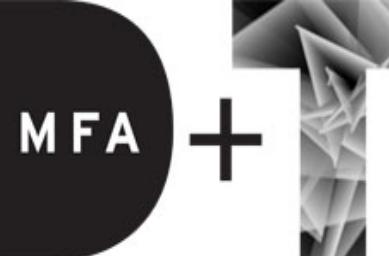
Could evolve to include simple lessons around basic concepts of audio wave forms and audio theory

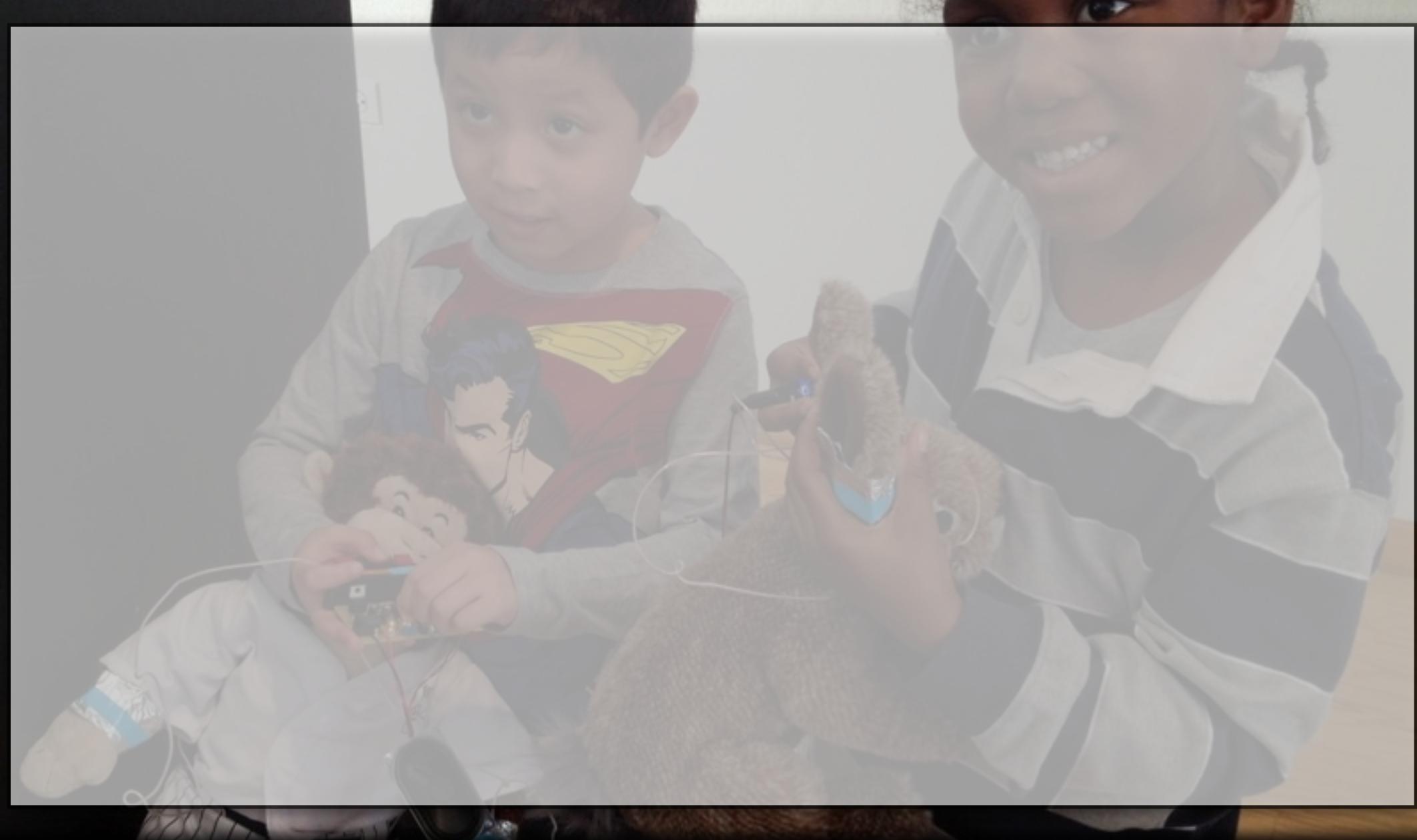


Jonah Brucker-Cohen, Katherine Moriwaki,
Louisa Campbell, Joe Saavedra, Liza Stark, Liz Taylor

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Parsons, the New School for Design, New York, NY

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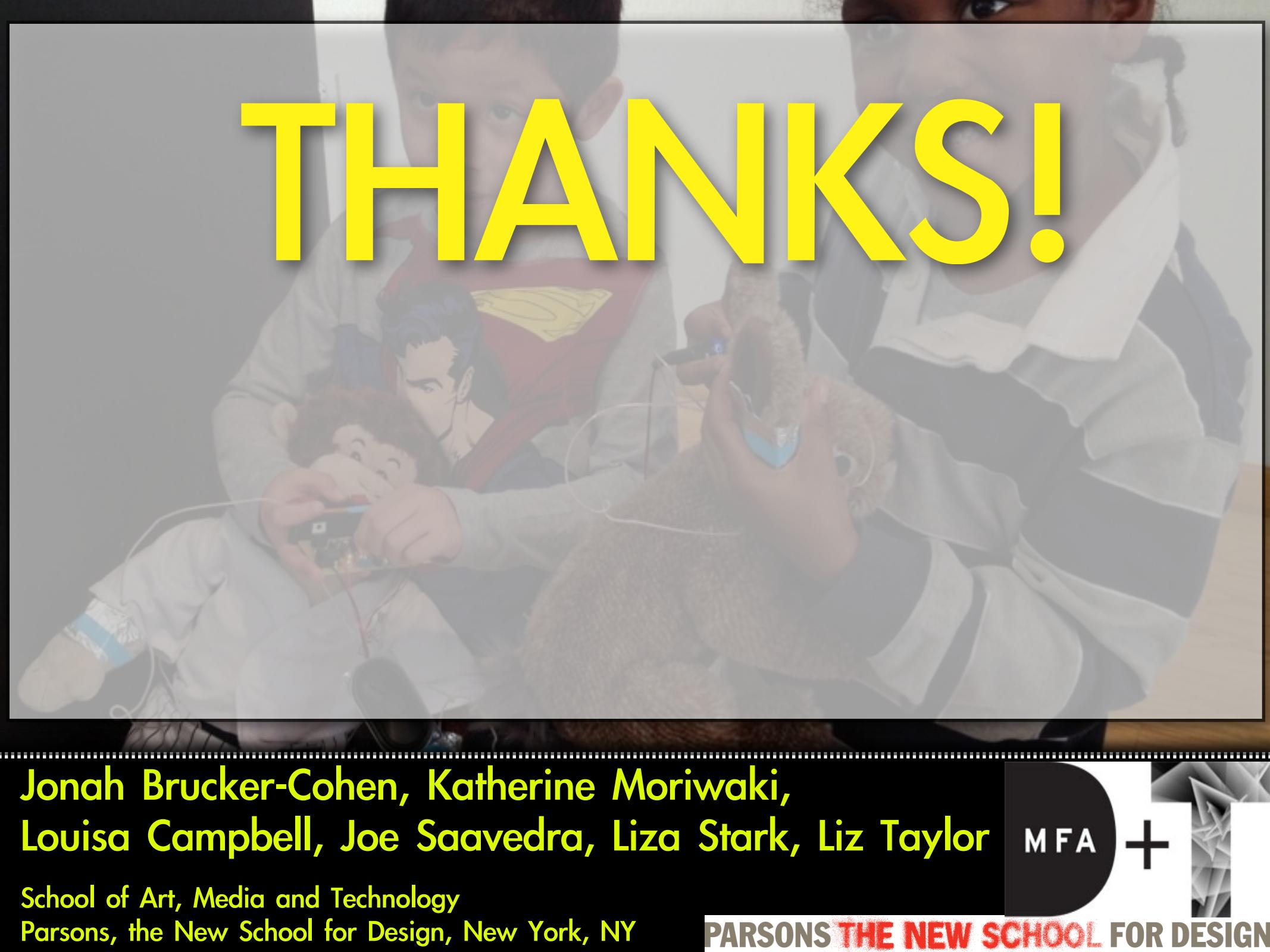
**Jonah Brucker-Cohen, Katherine Moriwaki,
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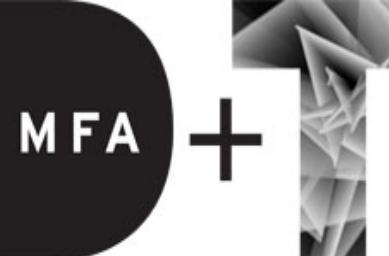
THANKS!



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THANKS!

Twitter: @scrapchall

jr.scrapyardchallenge.com

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QUESTIONS? COMMENTS?

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