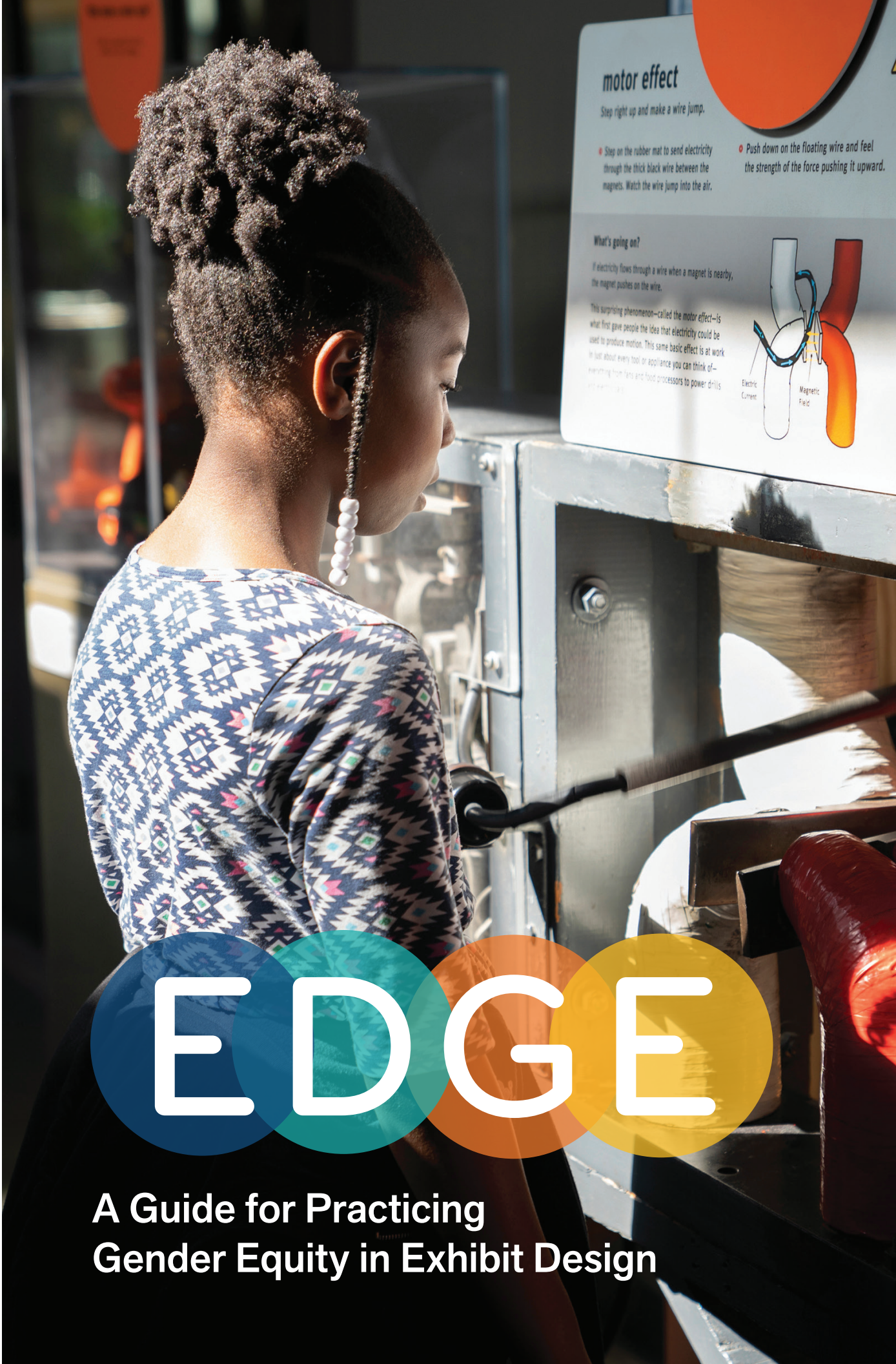


# EDGE

A Guide for Practicing Gender Equity in Exhibit Design



## motor effect

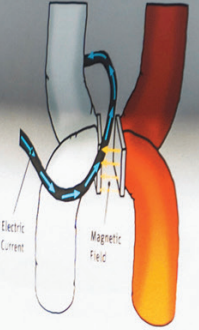
Step right up and make a wire jump.

- Step on the rubber mat to send electricity through the thick black wire between the magnets. Watch the wire jump into the air.
- Push down on the floating wire and feel the strength of the force pushing it upward.

### What's going on?

If electricity flows through a wire when a magnet is nearby, the magnet pushes on the wire.

This surprising phenomenon—called the motor effect—is what first gave people the idea that electricity could be used to produce motion. This same basic effect is at work in just about every tool or appliance you can think of—ranging from fans and food processors to power drills and electric motors.



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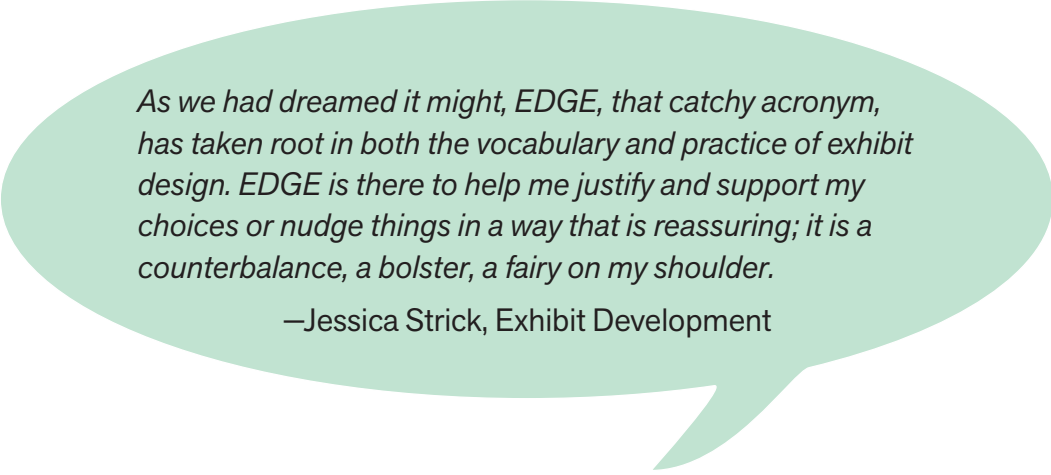
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## Introduction

Welcome to the world of Exhibit Design for Girls' Engagement (EDGE)!

This guide is designed to help you on your journey to create better, more engaging science, technology, engineering, and mathematics (STEM) exhibit experiences for girls—no matter where you are starting from. Here, we share ideas and suggestions, based on the lessons learned first-hand by the Exploratorium team, on how to creatively explore the possibilities EDGE can bring to your organization.

Exhibit Engagement for Girls' Design (EDGE) began as an NSF-funded research project led by the Exploratorium to learn how science museums can design exhibits to better engage girls aged 8–13 with STEM exhibits. Over the course of the research, we identified nine design attributes that were consistently positively related to girls' engagement with these exhibits.



*As we had dreamed it might, EDGE, that catchy acronym, has taken root in both the vocabulary and practice of exhibit design. EDGE is there to help me justify and support my choices or nudge things in a way that is reassuring; it is a counterbalance, a bolster, a fairy on my shoulder.*

—Jessica Strick, Exhibit Development

The Exploratorium then went on a three-year journey funded by the Gordon and Betty Moore Foundation to explore ways to fold the design attributes into our exhibits, with a focus on existing exhibits. By increasing the number of design attributes that better engage girls on our museum floor, we have hoped to expand access to engaging STEM experiences.

For our team, EDGE is a new, essential way of centering girls' engagement with STEM exhibits. We hope this guide is useful, wherever you find yourself on the journey toward gender equitable exhibit design.

## What Is EDGE?

The Exhibit Designs for Girls' Engagement (EDGE) 2016 research project aimed to identify the most important design attributes for engaging girls 8–13 years at STEM exhibits.

We looked at:

**60+** exhibit design attributes

at over **300** STEM exhibits

during a **multisite** project at the Exploratorium, the Science Museum of Minnesota, and the Arizona Science Center.


The result?

**9** design attributes were identified as being strongly and positively correlated with girls' STEM exhibit engagement. None of these were found to negatively impact boys' STEM exhibit engagement; in fact, a few of them were positively related to boys' engagement as well.

## Why Practice EDGE Design?

Science centers and museums can be spaces where children can stumble on unexpected—and unexpectedly fun!—opportunities to engage in unique and exciting STEM activities. They create an environment where visitors can enjoy interactive experiences where they use science-process skills (such as observing changes, or making and testing hypotheses) in ways that can spark continued interest and excitement about the sciences, or help them begin to develop their identity as science learners and doers.<sup>1</sup>

Research has found, though, that not all STEM exhibit designs or experiences engage boys and girls similarly. There is a known barrier for girls' engagement in that certain



*As an exhibit designer and builder, I have noticed a lot of decisions are made from our assumptions based on experience. The EDGE design attributes gave me a tool to help guide my design process.*

—Vicente Oropeza, Exhibit Development

STEM areas—particularly physics and engineering—attract girls less and engage them for less time.<sup>2</sup>

Design in the informal science learning (ISL) environment has also traditionally been masculine centered.<sup>3</sup> Feeling a sense of “belonging” in the space is key for girls’ interest and engagement in STEM.<sup>4</sup> The sense that exhibits or ISL spaces are not designed for them may be a contributing factor to why girls reportedly visit science museums less frequently than boys.<sup>5</sup> As STEM educators and designers, we need to ask ourselves: How can we better understand and meet girls’ needs, so that we can offer them more engaging and welcoming experiences?

We study exhibit design attributes because exhibits are something we can evaluate and change in museum environments. There are many factors around gender socialization that play a part in childrens’ comfort and sense of being invited into science learning, such as experiences at home, school, and with social media. Looking at individual exhibits offers accessible opportunities to explore how we can improve gender equity in science museums.

## Starting Resources

### [EDGE Research Project Overview](#)

This article offers a brief overview of the research behind and primary findings of the 2016 EDGE research project.

### [EDGE Website](#)

This Exploratorium website is a hub to access all EDGE publications.

### [EDGE Design Attribute Guide](#)

Our research project team created an in-depth guide to the EDGE Design Attributes. This is a key resource for coming to a deeper understanding of what the nine attributes look like in practice!

### [EDGE Research Project Webinar](#)

This webinar recording is a practical introduction to the nine attributes for practitioners who prefer visual and/or auditory learning.

## The EDGE Design Attributes

The EDGE design attributes are displayed in no particular order. The best design attributes to select for an exhibit are those that can enhance the content and intended user experience. This means not every exhibit can or should include all nine attributes! Using multiple attributes when they make sense for a given exhibit can, however, be beneficial for better engaging girl visitors.

## EXHIBIT LABELS



**The exhibit label includes a use drawing, giving visitors an idea of how to use the exhibit.** These drawings often show a person doing an action, or how to use an interactive element.



**The exhibit label includes at least one image of a person.** An exhibit label might include an image of a person to add real-world context or help visitors use the exhibit.

## EXHIBIT LOOK-AND-FEEL



**The exhibit includes at least one familiar object that most people have seen before.** Includes everyday things such as kitchen items, household tools, musical instruments, or stuffed animals.



**The exhibit's look-and-feel is homey, personal, homemade, or delicate.** Homey design aesthetics deal with materials such as soft fabrics, wood cabinetry, or small, intimate scale that may give a more personal feeling.



**The exhibit's look-and-feel is playful, whimsical, or humorous.** The central experience or aesthetic fosters a feeling of playfulness rather than a need to “be serious” or “get it right.”

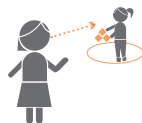
## EXHIBIT INTERACTIONS



**The exhibit has multiple stations or sides, allowing more than one person to experience the phenomenon.** These exhibits give each visitor ownership of a personal space to experience the phenomenon or do the activity.



**The exhibit has been designed with space to accommodate three or more people.** A large room, spacious floor plan, or large table surface create physical space, or elbow room at the exhibit.



**The exhibit is designed so visitors can watch others to preview what to do.** When visitors can see the actions or reactions of another person using an exhibit, it may orient them to the activity.



**The exhibit is open-ended, providing multiple outcomes, activities, or ways to interact.** Exhibits may be open-ended in many ways, for example: the outcome is different every time or it is designed for a multitude of iterations with an assortment of variables.

## Ramping Up to EDGE Design

Taking time to better understand dominant design practices within ISL settings is a helpful starting point for thinking about EDGE design, which, in many ways, is an exercise in self-reflection as well as exhibit design.<sup>6</sup>

Our team had varied comfort in doing this work at the start. Channeling ideas on what might be attractive to girls in exhibits led to conversations on stereotyping, assumptions, and universal design. Team trust and shared vocabulary made it possible to toy with EDGE design ideas.

*Applying the EDGE principles looks straightforward on the surface, but it's a subtle art that involves understanding new audience perspectives, and reconsidering lifelong assumptions and practices.*

—Diane Whitmore, Exhibit Development

As we learned more about gender expansive concepts,<sup>7</sup> we worked to better understand dimensions of masculinity and femininity in design. We learned how we each have and express masculine and feminine aspects within our identities, making us equally capable to engage in this work. And, we remain learners in this work! Active practice and communication are our key tools for continuing to support opportunities for gender equity in design.





## Personal and Team Learning

### 1. Open yourself to **learning** about how design can be shaped by gender expansive thinking, STEM identity, and biases.

These concepts and the many ideas behind them influence how one creates and uses exhibits. Questions to explore by yourself or as a team might be:

- How are dominant STEM identities<sup>8</sup> or ways of learning privileged in design?
- How can design be used to center non-dominant STEM identities or ways of learning?
- How does implicit bias affect design choices?
- Imagine walking into a new space. What are the design elements in the space that make you feel like you belong? What might make you feel the space isn't meant for you?



**TIP for Teams:** When you can, think about ways to invite people with expertise

to talk with you and/or your team about concepts, and to share ideas and build a sense of community in which considerations around gender, identity, and implicit bias can be freely discussed. Keep these questions in mind: How does your team talk/share/learn best? How might you creatively design these sessions to maximize your team's comfort and build conversational trust with one another?



#### **TIP for Individuals:**

Consider keeping a journal as a place to explore your thoughts, emerging questions, and contemplations. Spend a little independent learning time with the [EDGE Design Attributes Guide](#) and other materials. Topics or concepts that might be new can take time to absorb. How do you learn best? Meet yourself where you're at, and go from there!

### 2. Create and use a **shared vocabulary** with your team or project partners.

Many of the EDGE attributes are subjective, and can be viewed differently by different people. Ideas about design can be equally varied based on one's experiences. Collectively discussing subjective EDGE design ideas, such as homey and whimsical, helps reveal this natural variety so that your team can create and agree on a shared vocabulary.

### 3. **Be gentle** with yourself and your team while exploring these concepts.

Moving toward design that embraces more gender expansive identities and ways of being is necessary. Discussing and decentering assumptions around gender in exhibit design can, however, be professionally and personally challenging. Even those on our team who have done this work for many years experienced these challenges! We encourage you to step into these challenges with patience, empathy, dialog, and a listening spirit.

## Doing the Work

### Select Exhibits and Exhibit Areas

Deciding where to start the work, and how to be the most time- and cost-effective, can be challenging. When the Exploratorium team wanted to look for opportunities to do our best and most effective work, we found it helpful to identify exhibits that met a few of the following requirements. Thinking about exhibits in relation to these criteria helped us focus on sections of galleries where our work would have the greatest impact on girls' engagement.

- **Potential:** Is there a core experience that can be explored further?
- **Idea-inspiring:** Do we feel inspired, or find it easy to generate ideas, on how the exhibit(s) can be made EDGE-ier?
- **Data-driven:** Is there existing information that can offer insight on which exhibits or galleries are less engaging for girls aged 8–13 versus boys? Can we ask people at our organization who spend lots of time with visitors to share stories or insights on what they observe? Can we do quick, informal observations ourselves?
- **Thrifty:** Will the EDGE modifications associated with the specific exhibit be low cost, both in terms of time invested and materials needed?
- **Reversible:** Will the EDGE modifications be friendly to a trial-and-error design process, in that they are easy and affordable to add and remove?

*Participating in the ongoing process of adding EDGE elements to our exhibit labels has made me a better designer, and a better advocate for inclusive messaging in all of our materials.*

—Ray Larsen, Graphic Design

## Assess Exhibits for EDGE Design Attributes

### 1. **Get familiar** with the **EDGE Design Attributes Guide** and the **assessment tool** (see the **Appendix on page 28**).

Try a few practice rounds by yourself or with co-workers with some exhibits!

### 2. **Identify** the exhibits or collection you want to assess.

This might be a set of exhibits where you know visitors stay a short time (signaling lower engagement), a series of older exhibits that are due for a refresh, or an area that your team is interested in learning more about. See the section **Select Exhibits and Exhibit Areas** on page 10 for the criteria we use at the Exploratorium to identify opportunity areas for where we could do our best and most efficient work. We encourage you to think about and decide on what areas might be of most relevance, interest, or importance for your projects and audiences.

### 3. **Create a team** that will code the exhibits using the assessment tool.

Assessing exhibits with others helps air out assumptions and open up new ways of seeing the Design Attributes. Think creatively about who can participate in the process. Is there a co-worker who is interested in helping out, or can you turn the assessment into an internship opportunity? When working with one or two others, it is ideal to code the exhibits separately. If you have a larger group, split the group into pairs to code the exhibits. Then, come back together as a group to compare and discuss results and decide on a plan.

### 4. **Compare** your Design Attributes coding results.

Where did you and your teammates differ in coding? Where were you similar? Be sure to hold

plenty of space and time for this conversation, as it's a valuable way to begin building your shared vocabulary and understanding of the Design Attributes.

### 5. **Discuss** which Design Attributes are most and least prevalent.

Are certain attributes already well represented in the exhibits? Are others missing entirely? What, if anything, was surprising to learn EDGE-wise about the exhibits or collection that was assessed?

### 6. **Decide on a plan of action** to start thinking about ways to make the exhibits EDGE-ier.

Consider these questions as you consider your next steps.

- What is the core experience for the assessed exhibit?
- What EDGE Design Attributes does the exhibit have or not have? Are you inspired to use some EDGE Design Attributes instead of others to highlight the exhibit's core experience/phenomenon? Are there any attributes you find yourself shying away from? Can you push yourself into that discomfort and explore and prototype a bit before you skip them?
- What modifications do you imagine?
- What prototypes would you like to create to see if your ideas can work?
- How do those prototypes match your project timeline or budget?
- Overall and compared to other assessed exhibits, does the exhibit seem like a good candidate for EDGE refurbishment?

## Talk About Design Attributes

What does *whimsy* actually look like? Whose home is *homey*? What objects are *familiar*, and to whom? How do we include *delicate* objects in exhibits that need to be durable? When and how do you decide to remake an exhibit to be more *open-ended*?

Our team spent much time talking about each Design Attribute, leaning heavily on the [EDGE Design Attributes Guide](#) as a foundational resource. For some attribute discussions, it was helpful to walk around the museum and find exhibits with clear examples of the attribute in question to focus our conversation and to surface our underlying assumptions and perspectives. Here are a few highlights of our learning, which may offer ideas on how to engage in these reflections with yourself, and in conversations with your teams.

### THE SUBJECTIVE MEANING OF WHIMSY

*Whimsy*, the look-and-feel aesthetic that fosters “a feeling of playfulness rather than a need to ‘be serious’ or ‘get it right,’”<sup>14</sup> was a tricky Design Attribute for our team to come to a shared agreement on. We decided to review exhibits on the floor to characterize how we manifest whimsy in exhibits, and ended up with five types of whimsy. Identifying these together made it easier for us to think about how to meaningfully add whimsy in our galleries in a way that made exhibits more engaging, while providing shared language. What might whimsy look like at your museum?



Visitors dance and play and enjoy the unexpected, immersive delight of *Fog Bridge #72494* which encourages whimsical behavior.

## A Few Types of Whimsy

*Integral Whimsy:* Exhibits that wouldn't exist without whimsy

*Silly Whimsy:* Exhibits with playfully fun and content-appropriate whimsical additions

*Sly Whimsy:* Exhibits that may not appear whimsical at first glance but are surprisingly humorous

*Whimsical Design:* For some exhibits, the whimsy is not one thing, it's how the exhibit is put together! For this category, it would be possible to show the same phenomenon in a nonwhimsical, serious way.

*Whimsical Behavior:* Exhibits that elicit whimsical behavior



Musical Locker's sly whimsy and its interactive component can pleasantly surprise visitors.



A slinky, an integrally whimsical item, is the star of Slinky Treadmill.



Mood Lighting playfully introduces color psychology by inviting visitors to explore a spectrum of colors inside a bubble helmet.



A silly pair of orange feet added to our Coupled Pendulums exhibit makes these pendulums look like a pair of legs, lazily kicking their heels.

## CULTURAL CONSIDERATIONS FOR FAMILIAR OBJECTS AND HOMEYNESS

*Familiar objects* are defined in the EDGE Guide as objects “that can be easily found at home, school, or a department store” with “commonplace shape and form.”<sup>9</sup> A *homey* look-and-feel involves exhibit materials made of “soft fabric, wood cabinetry, pliable cardboard,” or an exhibit style that incorporates “a common home activity—cooking, playing with toys, or sitting on a cozy couch.”<sup>10</sup> However, when designers first think of *familiar objects* or *homeness*, what objects or homes come to mind? Would a diverse audience feel connected to these objects, or find them familiar?

Creating engaging STEM exhibit experiences for all audiences means seeking opportunities to recognize, represent, and respect the non-dominant practices, people, and forms of knowledge that are traditionally excluded from or invisible within ISL settings.<sup>11</sup> For this reason, our team spent time discussing the ways experiences and cultural influences shape design, how we can identify objects that have widespread familiarity to use in our exhibits, and ways we might respectfully represent objects with specific cultural attachments.

Take a moment to pause and think about the many possibilities of what culture means to you and/or your team. How might EDGE Design Attributes intertwine with thinking about creating better STEM exhibits for girls from socially non-dominant backgrounds and life experiences?





The original Thermal Impressions exhibit (top left) achieved the goal of sharing a complex STEM topic of heat exchange in an interactive way, but was not visually engaging. The result of brainstorming for EDGE-y concepts led to a redesign (above) that includes colorful Mexican tin ornaments, household keys in nature patterns, and other familiar objects.

## 1. Reflect on **representation**.

What dominant or non-dominant cultures or identities are represented in your identity, or that of your teammates? What are the dominant or non-dominant cultures or identities you want to feel welcomed by or familiar with the gallery space or exhibits? Be specific and honest with yourself about intent and goals.

## 2. **Invite** others in.

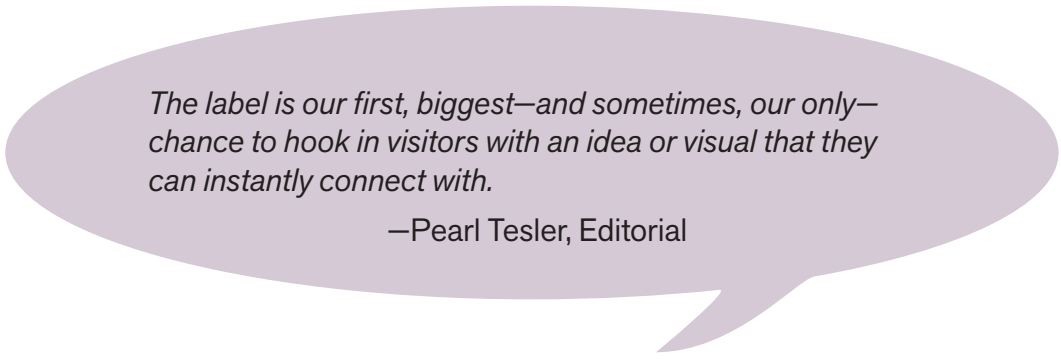
Take the humbling standpoint that you don't know for certain what people think. How can you create opportunities to learn about their experiences, and hear from them firsthand? There are many creative ways to invite multiple perspectives and experiences into the design process:

- Explore your audiences' possible needs through resources like [SciGirls CONNECT Project](#) and the [CAISE STEM Identity website](#).

- Want to know what girls think? Invite them to participate in focus groups and listening sessions or create a Girl Advisory Committee!
- Check your assumptions through observation, listening, and meaningfully practicing participatory<sup>12</sup> or co-creative<sup>13</sup> design with the people your museum actively engages.

## 3. **Brainstorm ideas** on objects that might speak across broader ranges of cultural backgrounds and experiences.

When thinking about familiar objects to fold into exhibit experiences, consider: What might be “familiar” to more than just one audience group? Are there some objects more than others that may appeal to non-dominant audiences? Carefully consider how and when to respectfully—without tokenism or appropriation—include objects that are specific to a certain audience, particularly if the objects do not belong to the culture of anyone on the exhibit team.



*The label is our first, biggest—and sometimes, our only—chance to hook in visitors with an idea or visual that they can instantly connect with.*

—Pearl Tesler, Editorial



## Lean on Label Design

Labels! The easiest part of an exhibit to update, right? Well . . . sometimes.

Label reviews can offer insights and ideas on opportunities to incorporate EDGE Design Attributes. Depending on the exhibit, a label update may be a more financially practical way to incorporate EDGE than physical modifications. Starting off by considering the exhibit label also offers an opportunity to creatively consider ways to add gender representation in a “use drawing” or “image of a person,” and visual references of familiar and friendly objects.


When modifying labels, our team found that a label was most improved when the EDGE design changes matched an exhibit's usability or content needs. Discussing a given exhibit's intended use and content goals before planning changes helped us decide how to EDGE-ify the label to best benefit the exhibit experience.

Adding “use drawings” and/or an “image of a person” on labels also provides opportunities to improve representation. Consider the following:

- Who do the people on your labels look like? Do they look like your audience in age range, personal and social identities, etc.?
- When creating new use drawings, can you use actual visitors as models? Try to indicate enough detail in the person to convey a sense of individuality without distracting from the functional, instructional purpose of the drawing.

### Blow Out Your Toaster

Your breath can cool red-hot metal.



- Turn the knob and watch how quickly the wires heat up.
- When the wires glow orange, blow on them through the mesh. What happens?
- Turn the power up and down. Notice how the length of the wires changes as they heat and cool.

**What's going on?**

These wires are like the ones you see in toasters and electric heaters. They're so thin it doesn't take much current to increase their temperature. The wires heat up to 800°C, or almost 1,500°F. But even when they're red-hot, they don't really hold much heat. You can blow it away with your breath.

Most things expand as they heat up, but usually it's hard to see. These wires change temperature so dramatically, you can easily see them stretch.


**More to try:**

- With the power turned up, use the lever on the left to hold the magnet near a wire. Watch the wire's reaction. You'll see it vibrate in response to the alternating current (AC), which changes direction 60 times a second.


### Blow Out Your Toaster

Your breath can cool red-hot metal.

**Try this:**




- Turn the knob and watch how quickly the wires heat up.
- When the wires glow orange, blow on them through the mesh. What happens?



- Turn the power up and down. Notice how the length of the wires changes as they heat and cool.

**What's going on?**

These wires are like the ones you see in toasters and electric heaters. They're so thin it doesn't take much current to increase their temperature. The wires heat up to 800°C, or almost 1,500°F. But even when they're red-hot, they don't really hold much heat. You can blow it away with your breath.



Most things expand as they heat up, but usually it's hard to see. These wires change temperature so dramatically, you can easily see them stretch.

Blow Out Your Toaster is a heat and temperature exhibit. The exhibit itself is large and abstract looking, and so our team wanted to use EDGE Design Attributes to make the experience and content easier to understand. The updated label includes a use drawing to help nonreaders and early readers better understand how to engage with the wires as they heat up behind the protective mesh, and an image of a familiar household object (a toaster) gives visitors a clear, real-life connection with the content.

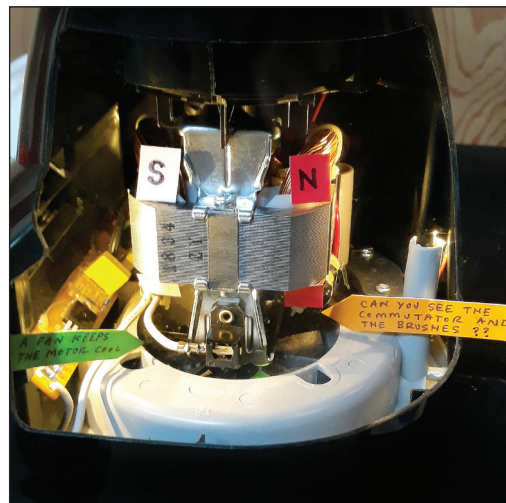


## Exhibit Stories

Here are some examples of exhibits before and after we applied EDGE Design Attributes and the icons representing those attributes.

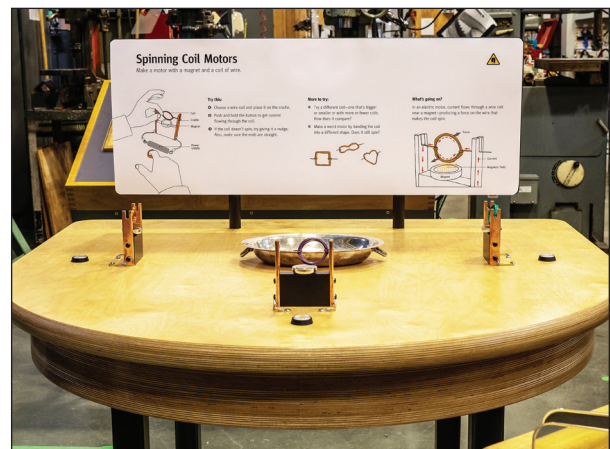
### Familiar Objects Vitrine

Creating more engaging experiences with EDGE design can also be done with creative setting additions. For example, many electricity and motors gallery exhibits demonstrate STEM content well, just not in an EDGE-y way. We decided that instead of making changes to individual exhibits that we wanted to play with adding something new that might make the content more relatable. This resulted in the Familiar Objects Vitrine, a unique showcase of familiar, motor-run household objects (a blender, a drill, house fan) with the plastic sidings removed. The chance to peer in and see the hidden motors inside each object is a unique experience that has helped visitors easily make real-life connections with the surrounding exhibit content.



## Stripped-Down Motor

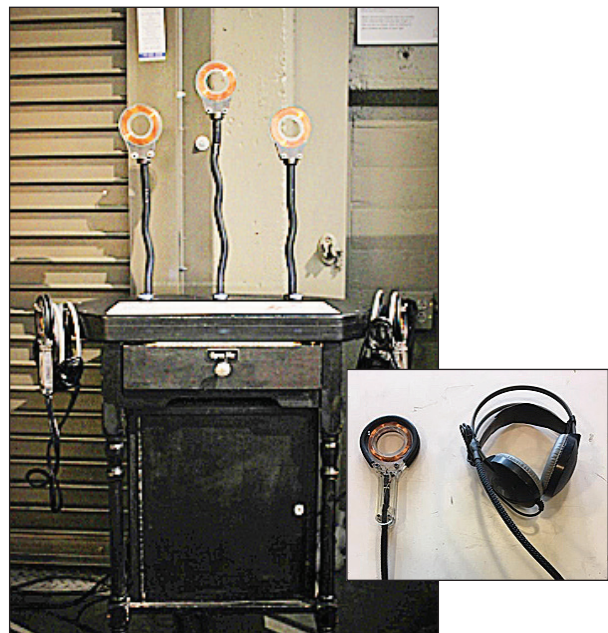
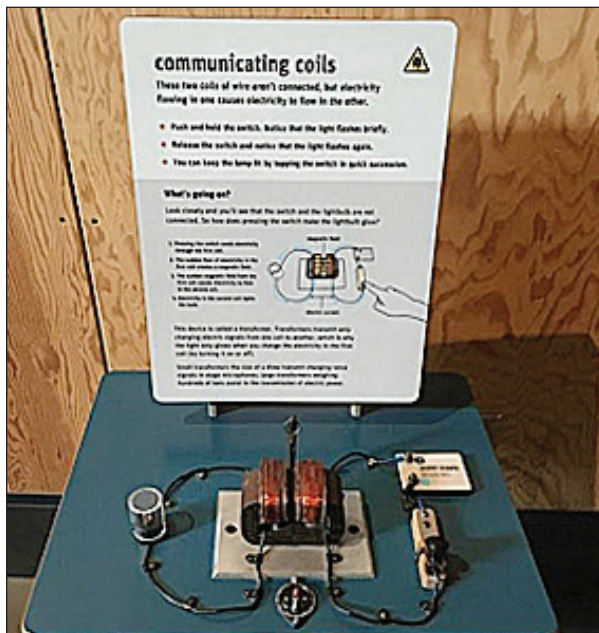
Girls exhibited low engagement at Stripped-Down Motor (below left) in the 2016 EDGE research study. We wanted to play with ways to feature the same STEM concept with an open-ended use experience, as in the home activity version of Stripped-Down Motor,<sup>15</sup> while still including a use drawing and image of a person in the label to make it easier to connect with how to use the exhibit. The result was Super Stripped-Down Motor (below right). As this was a new exhibit, we wanted to watch and talk with museum visitors to see if there were ways to improve it.<sup>16</sup> Based on what we learned, the team decided to also add multiple sides to the next version, Spinning Coil Motors (bottom right). This EDGE design addition affords visitors the opportunity to share their success and help each other.



## Communicating Coils

Communicating Coils (below left) was a straightforward exhibit with a guided use experience: the user pushes a button, a chain wiggles slightly and a light turns on to show how electrical signals can seem to pass through the air and aren't only constrained to wires. Our team decided to creatively rethink this exhibit using EDGE design principles.

The result of the imaginative rebuild was Jumping the Gap (below right), an open-ended experience that demonstrates how electrical signals in the form of music can “jump” through air between a mounted coil and a handheld coil attached to headphones (inset) and lets users experiment with distance and other variables to see what affects the electric signals.



Upbeat songs were selected from a variety of musical genres to add a silly whimsy to the experience, and using a bedside table sourced from a thrift shop as the exhibit base added a sense of hominess. Additionally, we selected a feminine person as a model for our new use drawing to boost visual representation of female identities in the gallery area.


### Jumping the Gap

Electricity seems to jump from one wire coil to another.

**Try this:**

- 1 Put on the headphones and hold the paddle next to one of the coils attached to the table.
- 2 Move the two coils closer together, and farther apart.

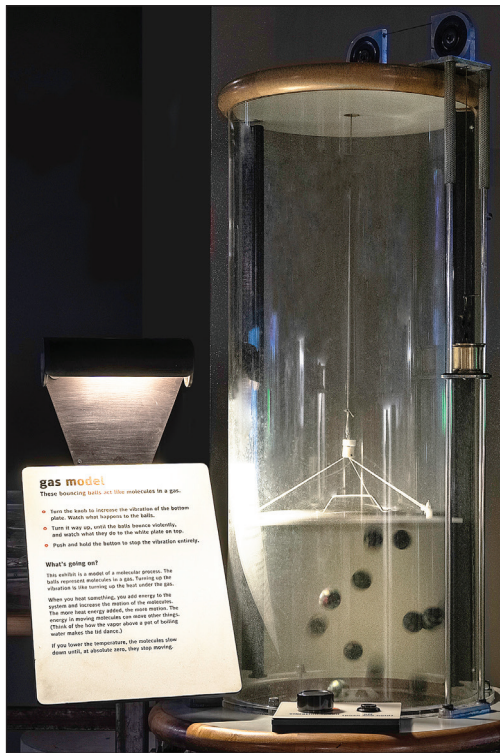
(For more to try, open the drawer.)



## Gas Model

Minor EDGE changes can be as helpful as major ones. Gas Model (below left) demonstrates the properties of molecules in gas using small rubber balls as model “molecules.” Our team decided to make two small design changes to highlight familiar experiences visitors might have had in real life with gas molecules that speed up, collide, and expand as they get hotter.

A label rewrite highlighted the way molecules might cause a boiling pot's lid to jiggle and popcorn kernels to expand (below right), and a stock pot lid replaced the plain flat panel as the top that contains the bouncing “molecules” (bottom left). A benefit of the stock pot lid is that its familiarity extends across a range of kitchen experiences. (For one staff member, it brought up memories of making tamales with family, while another was reminded of the pot their family uses for spaghetti.)



## Gas Model

Bouncing balls act like molecules in a gas.

### Try this:

- Turn the knob to increase the vibration of the bottom plate. Watch what happens to the balls.
- Turn it way up, until the balls bounce violently, and watch what they do to the white plate on top.
- Push and hold the button to stop the vibrations.

### What's going on?

In this model, the balls represent gas molecules. Turning up the vibration is like turning up the heat under the gas.

Whenever you heat something, you add energy to the system and increase the motion of the molecules. The more heat added, the greater the motion. The energy in moving molecules causes expansion that can move other things—jiggle the lid on a pot of boiling water, push a piston inside an engine, or pop a kernel of popcorn.

Only at *absolute zero*, the coldest possible temperature (-273° C), do molecules stop moving.



Expanding gas inside a heated kernel of popcorn is what makes it pop.

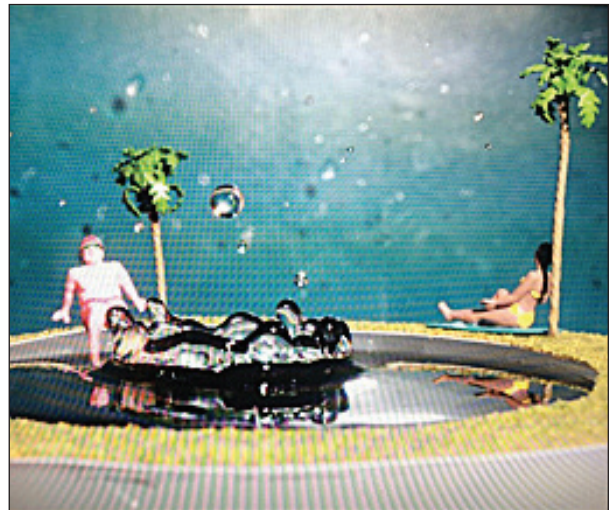
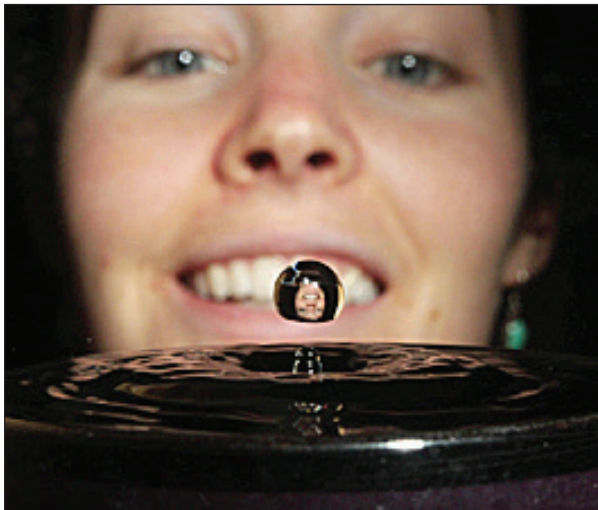


## Water-Drop Photography

EDGE design additions should always support exhibit engagement goals. Sometimes, a design change idea doesn't work out well in practice. Water-Drop Photography is an exhibit where people can observe a droplet at different stages of its journey into a small pool of water (left) using an adjustable timer camera. The open backdrop allowed visitors to be a part of the scene and, when well-timed, users could even capture the perfect moment where they themselves are in the droplet.

In the original EDGE study this exhibit engaged boys better than girls. We felt it was a good candidate for a design change and decided something whimsical might be a good addition given the small scale. Small, replaceable scenes were created to place around the mug holding water (right). What we quickly realized after observing visitors was that although people appeared more drawn to the exhibit after the change, these miniature scenes unfortunately transformed the exhibit from an open-ended exploration of the water-drop cycle into a single-viewing experience. Looking back, we also realized it was the people's faces in the photos that held the whimsy; adding scenes actually detracted from the visitors' participation and ownership in exploring the phenomenon.

In trying to create something whimsical, we had lost that magical "something" in the exhibit. We took this lesson to heart, and now approach possible EDGE design changes with a new lens: "This is a fun idea! Will it support the exhibit content and desired use experience?"



# Conclusion

At the end of our three-year EDGE refurbishment journey, our team has learned a lot . . . and still has much to learn!

Below are the big “take-aways” from our experience. We hope they’ll be useful for you, too, as you start or continue your journey with designing for girls’ engagement.

## 1. Build in time to **think and talk**.

Making space to have pre-work, during-work, and post-work conversations can take time and emotional energy. However, that time is critical to build connectivity, get on track, be honest with each other, and make sure the work is both effective and impactful.

## 2. Embrace the **peculiarities**.

Each exhibit or exhibit area has its own formula for which EDGE Design Attributes can be used to make it as engaging as can be! Whether looking to add whimsy or warmth, multiple stations, or more familiar objects, the attributes chosen need to fit with the vibe of the institution, gallery, and audience(s) as well as the individual exhibit.

## 3. **Plan and prioritize your end goals**.

Thinking about cost, priorities, and impact all go hand in hand for deciding where to start a journey toward EDGE design. Shifting an existing exhibit from a single user experience to having multiple stations, for example, may involve a complete rebuild; but, that may be just what an exhibit needs for becoming more appealing for girls!

However, ask yourselves: Is a complete redo necessary? Are there other creative alternatives?

To achieve our specific end goals, our team found that it took a great deal of time to strategize, review data, plan courses of action, document our work, and evaluate the refurbishment results. Inexpensive prototyping materials offset some of the labor costs for us.

## 4. **Partner with others**.

We were able to test ideas, get wider input, dig deeper into our preconceptions, and benefit in so many other ways by inviting in and listening to the expertise of a variety of staff who do work such as graphic design, writing, and visitor experience. Working with others in this way, if and when possible, gives an invaluable boost!



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# Appendix: EDGE Design Attributes Assessment Tool

Exhibit Name: \_\_\_\_\_ Date: \_\_\_\_\_

Gallery/Collection: \_\_\_\_\_ Coder Name: \_\_\_\_\_






EXHIBIT LABELS	Attribute Present in Exhibit?
 <p><b>The exhibit label includes at least one image of a person.</b> An exhibit label might include an image of a person to add real-world context or help visitors use the exhibit.</p>	Yes   No
 <p><b>The exhibit label includes a use drawing, giving visitors an idea of how to use the exhibit.</b> These drawings often show a person doing an action, or how to use an interactive element.</p>	Yes   No

EXHIBIT LOOK-AND-FEEL	
 <p><b>The exhibit includes at least one familiar object that most people have seen before.</b> Includes everyday things such as kitchen items, household tools, musical instruments, or stuffed animals.</p>	Yes   No
 <p><b>The exhibit's look-and-feel is homey, personal, homemade, or delicate.</b> Homey design aesthetics deal with materials such as soft fabrics, wood cabinetry, or a small, intimate scale that may give a more personal feeling.</p>	Yes   Slightly   No
 <p><b>The exhibit's look-and-feel is playful, whimsical, or humorous.</b> The central experience or aesthetic fosters a feeling of playfulness rather than a need to “be serious” or “get it right.”</p>	Yes   Slightly   No



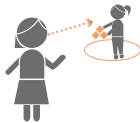
**The exhibit has multiple stations or sides, allowing more than one person to experience the phenomenon.** These exhibits give each visitor ownership of a personal space to experience the phenomenon or do the activity.

Yes | No



**The exhibit has been designed with space to accommodate three or more people.** A large room, spacious floor plan, or large table surface create physical space, or elbow room at the exhibit.

Yes | No



**The exhibit is designed so visitors can watch others to preview what to do.** When visitors can see the actions or reactions of another person using an exhibit, it may orient them to the activity.

Yes | No



**The exhibit is open-ended, providing multiple outcomes, activities, or ways to interact.** Exhibits may be open-ended in many ways, for example: the outcome is different every time or it is designed for a multitude of iterations with an assortment of variables.

Yes | No

**Total Design Attributes:**

Notes:





