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Interactive Activities for the Worcester Art Museum

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Interactive Activities for the Worcester Art Museum



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Interactive Activities for the Worcester Art Museum Interactive Qualifying Project

An Interactive Qualifying Project Report
submitted to the Faculty of
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfillment of the requirements for the
Degree of Bachelor of Science

Sponsoring Agency: The Worcester Art Museum

Submitted to:

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Abstract

The goal of this project was to provide recommendations for interactive activities to support the *Reusable Universes* exhibit at the Worcester Art Museum (WAM). Through observations, archival research, interviews, and visits to other museums, we determined what qualities a successful interactive activity should have and identified four such activities. We recommended the WAM use a Rating for Interactive Activities form we developed to identify how successful these activities were to improve these activities, engage all visitors and spark their creativity.

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In addition, we would like to thank all the WAM faculty for providing valuable knowledge pertinent to our project. We would like to give special thanks to Adam Rozan, director of Audience Engagement, Neal Bourbeau, Education Programming Assistant, Brian Scurio, Guest Services Manager, and the WAM guards: Ann-Lisa Norman, Francis De Nicola, Bob Cardoza, and Matt Wotton, for their time and knowledge of the museum.

To complete our project many important interviews were conducted along with visits to similar organizations. We would therefore like to thank the Boston's Children Museum with special thanks to Akemi Chayama for allowing us to visit and interview, the Institute of Contemporary Art with special thanks to Monica Garza for interviewing with us, the Worcester EcoTarium with special thanks to Betsy Loring for allowing us to interview and visit. We would like to thank Worcester Polytechnic Institute professor Joshua Rosenstock for his great ideas and help on our project, as well as Worcester Arts Magnet School teacher Michael Walden for his valuable insight.

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Executive Summary

Museums serve as institutions that preserve, research, teach, and exhibit the heritage of humanity and its environment for the purposes of education and enjoyment in visitors. They are a major part of society and its development because they are a base of knowledge that can be accessed by the public. The Worcester Art Museum (WAM) provides the public with opportunities to increase their knowledge through exhibits, interactive activities, and much more. The WAM is largely involved with art from the past and exhibiting example of historical periods of art, but this summer they will be working with the contemporary artist, Shih Chieh Huang. Along with this exhibit, the museum will use activities at an Art Cart stations next to the gallery and at the Drop-In Studio in their Education Wing. The WAM has never created activities in conjunction with a contemporary art exhibit; therefore, they have been unsure what activities to use.

The goal of this project was to provide the Worcester Art Museum with recommendations for interactive art activities to go along with the upcoming exhibit, *Reusable Universes*, that will promote visitors' curiosity and creativity in this new form of art that involves using everyday technology and objects in different ways. In order to reach this goal, we needed to identify useful and age appropriate interactive art activities that could entertain and engage different age groups and inspire curiosity in the visitors about *Reusable Universes*. These activities should stimulate creativity about the various ways everyday objects could be used. We also wanted to identify a way for museums to determine if the activities were successful. To achieve these objectives, we assessed what other organizations have done, developed design criteria for our activities, researched and brainstormed multiple activities, and finally selected a set of prototype activities.

After gathering the necessary information, we developed three Art Cart activities and one Drop-In Studio activity. Because the WAM did not have a standardized way to determine the success of activities, we also developed a rating sheet and a survey to be used along with the Art Cart and Drop-In Studio. We recommend the WAM implement the Makey, Breadboard Activity, and Artist's Material Bin with an Art Cart. For the Drop-In Studio, we recommend the WAM use the Creative Creations activity. To gather beneficial feedback and improve activities, we recommend the WAM survey the activity participants and use rating sheets while running activities. This project has identified interactive activities to accompany the *Reusable Universes* exhibit and has offered a method for improving visitors' experience.

1. Introduction

Museums have always been an important place for people of all ages to learn about different cultures and history. To engage visitors, many museums include stations with activities for visitors to learn more about an exhibit (Vivian Li, personal communication, November 20, 2016). However, there are endless ideas for interactive activities that can engage the visitor. Therefore, it can be challenging for museums to choose the best activities (Button, Doering, Pekarik, Sharbaugh, & Sutton, 2002).

One of the museums that encourages activities is the Worcester Art Museum (WAM) (2015). It is a popular place for students, families, and art enthusiasts to explore different exhibits and different types of art. Beginning in the spring of 2017, *Reusable Universes*, an exhibit by the artist Shih Chieh Huang, will be displayed at the WAM. In connection with the exhibit, there will be an Art Cart located just outside the exhibit and a Drop-In Studio in the Education Wing of the museum. Both of these will involve interactive activities designed to engage visitors and increase their knowledge of the exhibit. However, the WAM is not certain what kinds of activities to use to support and accompany Mr. Huang's art.

Research has shown that students who participate in activities while on a field trip to an art museum demonstrate improved critical thinking skills, historical empathy, and open-mindedness (Bowen, Green, & Kisida, 2014). Therefore, by investing a great deal in the art-focused activities, museums are investing in the museum's audience. It becomes important for museums to invest in interactive activities that will attract its visitors and keep them coming back for the learning experience. Research has shown that visitors learn certain ways within museums and it is important to design activities and exhibits to facilitate learning with each visitors (Bitgood, 2013). Each museum also prepares each activity differently giving diversity to each

museum. When preparing activities, museums often use contacts with each other to learn of new and innovative ideas (Loring, 2017).

The WAM has used interactive activities in the past with other exhibits, but they had to figure out which ones would work best with Shih Chieh Huang's art style and how they could be incorporated in Art Cart and Drop-In Studio activities. The WAM had not researched these avenues specifically for the activities and they have not determined activities to go along with the innovative art of Shih Chieh Huang.

The goal of this project was to provide the Worcester Art Museum with recommendations for interactive activities to accompany the upcoming art exhibit of the artist, Shih Chieh Huang. We designed activities that would entertain and engage all age groups, inspire visitors to appreciate *Reusable Universes*, and stimulate their creativity about the various ways objects can be used to make art. To achieve our goal, we assessed how other museums and organizations have developed their interactive activities. We interviewed museum staff, art educators, and contemporary artists to develop criteria for our activities. We obtained activity ideas from online sources and brainstormed among ourselves to develop a list of thirteen activities. In consultation with WAM staff we narrowed our ideas down to four and developed prototypes for the WAM to use. During this process, we also recognized the need to evaluate the success of activities at museums. We developed rating sheets and a survey that can help collect data used for designing future activities at the museum. These recommendations will benefit the WAM by educating their visitors about the exhibit and improving visitors' experience now and in the future.

2. Background

This chapter discusses information about museums and their role in society. More specifically, we discuss how each exhibit works within a museum. We also explain what interactive activities are and how they are beneficial to children's learning and beneficial to museums. Different museums' activities are explored and compared to the Worcester Art Museum's activities. The chapter concludes with a focus on the artist Shih Chieh Huang whose art will be shown at the WAM and who will be involved in interactive art activities at the museum.

2.1 How to Measure the Visitors' Learning Experience

When families visit museums, there is a hope that the family members are learning. But how do we know that for sure? Many psychologists and museum staff have tried to answer that question. They have studied how people learn and how that can be measured.

2.1.1 Family Learning in Museums

In order to understand how family learning in museums can be measured and identified, the Academy of Natural Sciences, The Franklin Institute Science Museum, the New Jersey State Aquarium, and the Philadelphia Zoo worked together to investigate current family learning (Borun, 1998). Together they formed The Philadelphia/Camden Informal Science Education Collaborative (PISEC). Their project, the *Family Learning Project*, consisted of a three-phase investigation into family learning in museums. This study was important for our project as it gave us information on how these museums measured learning in their visitors.

There are different behaviors visitors show that are thought to be associated with learning (Borun, 1998). By looking at a list of particular behaviors, educators can decode family behavior

throughout a museum:

- Approach/withdraw from the exhibit
- Engage in hands-on activity (if available)
- Call someone over
- Point at the exhibit
- Climb on the exhibit (Only if allowed/appropriate)
- Read text aloud
- Read text silently
- Comment on the exhibit or explain how to use it
- Ask a question
- Answer a question
- Express “like” verbally
- Express “dislike” verbally

The *Family Learning Project* compared these behaviors using the coding sheet shown in Table 1. They viewed different exhibits and recognized which behaviors actually distinguished successive Learning Levels (Borun, 1998). Learning Levels were defined as a visitor group's understanding of information and connection to prior knowledge. They were established to analyze the family conversations and interviews the study gathered.

TABLE 1 - BEHAVIOR CODING SHEET (BORUN, 1998, P. 61)

Phase 1: Behavior Coding Sheet

<i>Interactions (actor>receiver)</i>	>	>	>	>	>	>
<i>Logistics</i>						
Call someone over						
Point at exhibit						
Approach						
Withdraw						
Climb on/through						
<i>Conversation</i>						
Verbal observation/explain						
Ask question						
Answer question						
Express like						
Express dislike						
<i>Use Graphics</i>						
Read label/picture silent (2 sec.)						
Read label aloud						
<i>Continuous Behavior</i>						
Hands-on						
Time						
<i>Observe Only</i>						
<i>Non-exhibit Behavior Only</i>						

Using this chart, data researchers would mark down in each column each time the behavior was seen (Borun, 1998). They summed the number of times a behavior occurred and would use the greater than symbol on the respective side of the tally to note the initiator and recipient of each behavior. After analyzing the results of the Behavior Coding Sheet, PISEC determined which behaviors were most beneficial to measure by comparing the three Learning Levels describing families with the frequency of the observed behaviors. They defined five behaviors that determine if families are learning from an exhibit: ask a question, answer a question, comment on the exhibit or explain how to use the exhibit, read text aloud, and read text silently. These were called performance indicators.

This study was performed primarily with exhibits whose main message was expressed through text (Borun, 1998). However, the *Family Learning Project* team noted that exhibits utilizing experiments could be measured with behaviors based on interactions. The study continued to note that “hands-on activity should be considered a performance indicator for

interactive exhibits” (p. 19).

The project team also compared the time spent at an exhibit to the Learning Level observed (Borun, 1998). They determined that time spent at an exhibit is directly related to a family’s Learning Level. The higher the Learning Level, the more time spent at an exhibit.

This Phase 1 of the PISEC *Family Learning Project* documented how family learning could be identified and measured by counting the frequency of the performance indicators (Borun, 1998). This provides important information for other museums to use to determine which exhibits are, in fact, educating families effectively.

Phase 2 answered the question: “Are there specific exhibit characteristics that facilitate family learning?” (Borun, 1998, p. 20). This portion of the study took what the group had learned in Phase 1 and determined how to develop exhibits that would facilitate family learning. To do so, they researched previous studies and literature carefully and conducted a series of focus groups. PISEC researched specific exhibit characteristics that facilitate family learning. They looked through the work of many researchers who suggested that presenting content clearly with labels for all ages to read was important to the success of exhibits (Benton, 1979; Bitgood, 1993; Blud, 1990; Butler & Sussman, 1989; Diamond, Smith, & Bond, 1988; Dierking, 1987; Dierking, 1989; Hilke, 1987; Hilke & Balling, 1985; Hood, 1989; Kropf, 1989; McManus, 1994; Spires, 1989). Therefore, WAM’s Art Cart activities would be more successful and easy to understand for visitors if the required information is presented clearly with people of all ages in mind.

In addition to literature research, the PISEC team conducted four focus groups to learn what visitors said makes an exhibit effective (Borun, 1998). The project team learned that good exhibits are self-explanatory, not crowded, interactive, and inviting. While self-explanatory is

important, the respondents also noted that “presence of staff and volunteers improved a museum visit” (p. 21). The participants also gave recommendations for museums that could improve visitor experience. They suggested the museum give parents ways they can discuss exhibits with their children, and that they provide a simple written guide for the museum with tips for other activities to perform with children. Presence of staff is an important feature of any Art Cart activity at WAM as they are always run by staff or volunteers. The WAM does indeed distribute worksheets that guide participants on how the activity functions or contains additional information that parents and children can take to recreate the activity at home.

After reviewing literature, speaking with focus groups, and completing Phase 1 of the *Family Learning Project*, PISEC determined seven characteristics of family-friendly exhibits (Borun, 1998). As shown in Table 2 below, they used these seven characteristics to evaluate exhibits on how well they facilitated learning for families and visitors.

TABLE 2 - TEMPLATE FOR ASSESSING THE FAMILY-FRIENDLINESS OF EXHIBITS (BORUN, 1998, P.62)

Template for Assessing the Family-Friendliness of Exhibits

<i>Seven Characteristics of Family-Friendly Exhibits</i>	<i>Exhibit Name: Fill in Comments Below</i>
<i>Multi-sided</i> Family can cluster around the exhibit	
<i>Multi-user</i> Interaction allows for several sets of hands or bodies	
<i>Accessible</i> Comfortably used by children and adults	
<i>Multi-outcome</i> Observation and interactions are sufficiently complex to foster group discussion	
<i>Multi-modal</i> Appeals to different learning styles and levels of knowledge	
<i>Readable</i> Text is arranged in easily-understood segments	
<i>Relevant</i> Provides cognitive links to visitors' existing knowledge and experience	

After evaluating multiple exhibits for their family-friendliness, PISEC began Phase 3 of the *Family Learning Project* to determine if these seven characteristics of family-friendly exhibits produced measurable increases in family learning. The project team enhanced exhibits using the seven characteristics. They then collected behavioral data from 200 families who visited the original test exhibits and compared them to 200 other families who visited the enhanced exhibits. Phase 3 demonstrated that “exhibits designed to facilitate Family Learning can create a substantial and measurable increase in learning behavior” (p. 50).

The *Family Learning Project* was able to combine theory and apply the ideas to make existing exhibits more family-friendly (Borun, 1998). The study identified that learning in visitors can be enhanced through thoughtful exhibit design. However, they tested this with families and may have missed how adults visiting by themselves or groups of children visiting

with a school may learn. This is important to note as the Worcester Art Museum has groups of children as well as adult citizens who visit the museum, and this study's findings do not automatically apply to those visitors. However, this study has identified important factors to consider when determining how much visitors are learning from exhibits.

2.1.2 Understanding the Museum Visitor

To understand the visitor's experience, one must understand the psychological process all visitors undergo during their visit. All visitors perform a subconscious cost/benefit-type analysis upon coming in contact with an exhibit or activity (Bitgood, 2013). This cost/benefit analysis is used to determine whether or not the visitor participates in an exhibit or activity. Visitors will subconsciously weigh beneficial factors such as potential for learning or satisfaction against "costs" such as time, effort, and money spent on the task. If the possible costs outweigh the benefits, then the visitor will not participate in the exhibit or activity. This decision making process is made instantaneously and subconsciously, so it can be very difficult to determine exactly what made a visitor interested in a certain activity.

Another aspect of the visitor experience at a museum is "visitor attention" (Bitgood, 2013). This is a psychological process that involves three chronological stages of capture, focus, and engagement. Each stage can be altered by a unique combination of variables that motivate actions in the visitor. These variables are influenced by personal factors (i.e. personal value, interest, past experiences, etc.) and setting factors (i.e. social influence, architectural and exhibit design, etc). Therefore, attention can be measured through observations of indicators or dependent variables (i.e. approaching an object, stopping, viewing time, reading about, talking with others about, etc.) with outcomes specific to the current stage.

Data from the visitor's experience can be recorded through a couple different methods. Self-reporting can be a useful strategy in determining the success of an exhibit or activity (Bitgood, 2013). Visitors can be asked to answer questions, fill out a survey, or rank their experience on a scale from one to ten, as they leave the exhibit. This feedback can give exhibit designers a first-hand response to the degree to which an exhibit attracted visitors. However, a major limitation in this method is that the survey cannot be used alone because there is a chance that some visitors won't be sincere. Therefore, this method to obtain feedback about the visitors' experience cannot be used alone.

Direct observation is another method that takes the feedback out of the visitor's hands and instead relies on what the observers see (Bitgood, 2013). Data can be taken from the indicators or dependent variables expressed in the visitor. This can be done through a series of checks made on a behavioral chart or through comments written down for each individual at an exhibit or activity. Once all of the data is taken, analysis can be made to determine the success of the targeted exhibit or activity. The flaw in this method is the difficulty in making the testing repeatable. As an observer, one must record observations in such a way that discretion is not lost.

Data cannot be conclusively drawn from one single method due to the inconsistencies found in both. Bitgood (2013) states, "direct observation and self-report measures give us different types of information; we cannot rely on only one type of measure to give us a complete understanding of the visitors' experience" (p. 15). Combining the recorded data from both direct observation and self-reporting will provide a stronger base of knowledge to analyze. Museums should look to improve their exhibits to the best of their ability and when doing so, have to take the necessary steps to assess their content as carefully as possible. The WAM does not have a method to evaluate the visitors' experience through observations.

The Family Learning Project uses a rating sheet to evaluate the learning in families, but the visitors attending the WAM and participating in activities are not just families (Borun, Family Learning in Museums: The Pisec Perspective, 1998). Other visitor groups at the WAM include students of all ages and senior citizens. In addition, Bitgood's (2013) method of measuring an individual's subconscious for taking part in an activity would work if every situation were perfect, but because that is nearly impossible, those measurements would not be accurate. Thomas' method of using crossword puzzles does engage students within a classroom, but that activity does not apply to what the *Reusable Universes* exhibit will consist of.

2.2 How Children Learn Through Active Involvement

Museums are important because they educate large groups of visitors, especially those in middle school and younger. To understand the best way to educate children in museums, we describe how children are thought to learn the best.

It is important for young children to have an early learning development and receive the appropriate education to gain the essential tools they will need to prosper (Early Childhood-Head Start Task Force, U.S. Department of Education, U.S. Department of Health and Human Services, 2002). All children go through a learning process to gain these essential tools. The learning process is: "a physical phenomenon... also embedded in the world via life experiences, social interactions, and community membership" (Ostroff, 2012, p. 2). Children gain these experiences and interactions through dynamic activities. Research shows children can improve their academic achievement by engaging in dynamic activities that contribute to learning (Vosniadou, 2001).

Teaching children through activities ensures they maintain a motivation to learn (Vosniadou, 2001). While children naturally have a motivation to learn, it is difficult for them to

always be motivated. Educators are challenged when they want to teach students because learning requires a lot from the student; learning requires students to pay attention, to observe, to understand, to set goals and to assume responsibility for their own learning. Students can accomplish all of this by engaging and developing their own natural desire to explore. This active learning keeps the children engaged while mastering topics. Understanding the hands-on method helps educators to design better lesson plans for children.

With students' futures in mind, the educators also continuously look for other ways to improve student activity (Vosniadou, 2001). To keep students driven to learn, schools and their teachers often decide a change of educational environment can be beneficial. Educational organizations such as museums can provide this different environment. Museums create interesting environments that encourage students to become actively involved. Educational environments are important resources to educate both young and middle school students.

Trips to museums are important for the development of young students. Ostroff (2012) explains that as humans, we learn the most and fastest during the first few years of development. Educating children properly during their earlier years is important for each child's future (Global Partnership for Education, 2016).

2.3 Museums and Interactive Activities

Museums have the unique ability to promote and foster the best of the cultural and democratic ideas of the nation (Arinze, 1999). People go to museums for different reasons; some as part of an organized group, such as a school trip, or simply to enjoy a relaxing day off from their busy schedules. However, attendance at museums has fluctuated over the years (American Alliance of Museums, 2015). On average, there are over 850 million visitors to American museums each year, more than the combined attendance at all major-league sporting events and

theme parks. While science museums have seen steady attendance numbers, art museums have not had much success in keeping attendance high (National Endowment for the Arts, 2015). Over the past two decades, attendance at art museums has slowly decreased, with only 33.4% of adults visiting art museums in a one-year period. This number has gone down from a decade ago when 39.4% of adults visited art museums in a one-year span.

One of the biggest reasons for a decline in attendance at art museums is their lack of ability to keep children and other visitors engaged (Alexander, Barton, & Goeser, 2013). Art museums intend to show a lot of information in different ways. While many adults will find the art itself engaging and entertaining, children often become bored in art museums. In order to gain support of the community and keep visitors coming back, museums offer educational experiences to further engage their visitors. They must offer unique learning opportunities that appeal to all ages, while tying into current events of the outside world. If museums do not create a connection to the outside world, then they will not be able to connect themselves to the community.

To combat this problem, one of the main ideas incorporated into museums is the idea of interactive activities. Interactive activities are used as a means of participatory learning (Thomas, 2004). Participatory learning is a type of learning in which the student engages actively in the lesson plan, often involving hands-on experiences. “Its application in education activities of children can intensify the development of their abilities, cognitive needs, interests and motivation” (Brečka & Červeňanská, 2016, p. 1612).

However, when these activities are put into practice, students learn more effectively and have more enthusiasm compared to environments that do not practice these activities (Hood, 2003). When observing interactive activities at a science museum, our group noticed that the

museum primarily used interactive activities to get visitors physically involved in exhibits. Visitors were encouraged to run, jump, and lift bags of sand to teach them about momentum, mechanical advantage, and physical forces. The use of these interactive activities actively engages the audience and keeps the attractiveness of science museums high. Classrooms almost always use interactive activities to keep students engaged in the learning process. For museums to capitalize on the effectiveness of interactive activities, they must use activities that will meet one or more of the six attributes researchers have already identified. The six attributes are:

1. Being with people, or social interaction;
2. Doing something worthwhile;
3. Feeling comfortable and at ease in one's surroundings;
4. Having a challenge of new experiences;
5. Having an opportunity to learn;
6. Active participation.

The first attribute that influences the motivation of individuals to be part of an activity is the social interaction that is involved (Hood, 2003). An individual will participate if he/she weighs the social interaction associated with an activity to be worth more than the time it takes to complete it. The second attribute is the individual's sense that the activity is worth his/her time. As humans, we enjoy being invested in an activity. In addition, the level of comfort associated with completing an activity is another important attribute. The likelihood that an individual will participate in an activity is related to the level of comfort by being part of the activity. The activity should be designed in a form where participants will be successful. Individuals should not be scared to embark on the activity being held. Although the level of comfort should be considered, the activity should be challenging. With a challenging activity, the individual will

gain a new experience. Lastly, active participation is another attribute. Individuals would much rather be physically and mentally involved with something than actively listening to an instructor talk about the interactive activity.

Another simple form of an interactive activity used in classrooms is crossword puzzles or word searches (Thomas, 2004). Creating crosswords or word searches using relevant vocabulary words allow students to learn these needed vocabulary words, but also challenges the students in a creative manner. Creating the sense that the students oversee their own lessons promotes interest in the studied materials. Incorporating activities such as the ones described above should promote more interest in WAM's exhibits and will encourage visitors to come back.

According to Alexander, Barton, & Goeser (2013), the reason why a museum is not increasing their visitor numbers is due to the lack of engagement. Ostroff (2012) and Vosniadou (2001) state that interactions are a beneficial way for children to learn. The Art Cart activities will allow visitors to interact in a hands-on way because it motivates them more compared to an activity where they are not allowed to participate. Hood's statements are practical for our project because in order for the interactive activities to engage visitors they must allow participation. Participatory learning can benefit both child and adults allowing them to gain the most knowledge as possible. Engaging visitors can not only engage them, but also increase the number of visitors to the museum.

2.4 Museums that use Interactive Activities

Traditional museums are starting to recognize the importance of engaging visitors with activities (Thomas, 2004). Compared to a classroom, these museums can play an important role in educating their visitors. Museums have real objects their visitors can see in person. By creating interactive activities, visitors can use more senses to learn about an exhibit.

Museums strive to reach out to grade school students with the intention of delivering knowledge (Simon, 2010). This is knowledge that students may not be able to obtain in the classroom. Museums can host interactive activities with materials and artifacts from exhibits to help them develop certain skills. The programs that use these interactive activities are designed to teach children and create a repeatable and meaningful experience. In this section, we will describe what some museums have been doing to create excellent learning experience.

2.4.1 Boston Museum of Science

The Museum of Science (MoS) (2015) in Boston, MA, has taken on the mission of playing a leading role in transforming the nation's relationship with science and technology. The MoS serves as a great example of a museum that effectively plays a role in K-12 education. Many exhibits, demonstrations, and interactive activities are put on with the purpose of creating a truly interactive experience. Many students find themselves in the museum through field trips, overnight stays, and day visits to take part in this interactive experience. An example of a very popular program held in the museum is called *Design Challenges*. It is intended for students in grades 4-10 and is designed to introduce them to the engineering design process. It incorporates hands-on activities that have students design, build, and test a prototype solution to a given problem. This is a very fun and engaging experience that allows visitors to take part in the innovation process.

2.4.2 Smithsonian's National Museum of Natural History

The *National Museum of Natural History* (NMNH) in Washington, D.C, is dedicated to inspiring curiosity, discovery, and learning about the natural world (Smithsonian, 2016). The museum features a number of exhibits with corresponding programs of interactive activities that aim to encourage learning in students that they may not receive in a classroom. The programs are

based on themes from the museum’s exhibitions and engage students in the kinds of research that scientists take part in. The museum features a popular hands-on exhibit as shown in Figure 3, *Q?rius*, that is intended for grades K-12. The exhibit splits the activities into two groups: grades K-5 and 6-12. The K-5 group is provided a “discovery room” program where students practice their inquiry skills as they interact with objects from Museum exhibitions. The 6-12 group is provided with program options where students are given a problem, and they must use a Smithsonian scientific process to come up with a solution.



FIGURE 1 – KIDS INTERACTING IN THE DISCOVERY ROOM (MGIGANTEUS, 2009)

2.4.3 Cleveland Museum of Art

The Cleveland Museum of Art (CMA) opened its Gallery One on January 21st, 2013, focusing on being a highly innovative and robust blend of art, technology, design, and a unique user experience (Alexander, Barton, & Goeser, 2013).

Its exhibit was based on a six week testing period in which extensive audience research was used to determine what visitors looked for in exhibits. After testing their exhibit for six weeks, various digital activities were created to engage visitors. As seen in



FIGURE 2 - "STRIKE A POSE" (ALEXANDER, BARTON, & GOESER, 2013)

Figure 4, “Strike a Pose” is one of the CMA’s digital activities in which visitors are shown a facial express from an exhibit, and visitors are encouraged to match the expression they see. If they properly match the expression shown, they will move on to the next facial expression, and

so forth. Studio Play allows kids to design art using easels and digital touch screens. Kids can draw different lines and squiggles using a digital touch screen. The program then matches the drawn lines and squiggles with art from the museum. One of the other big draws to the Gallery is their new app, ArtLens. ArtLens allows the visitor to download a free app and complete a variety of functions. Using the app visitors can find exhibits near them, take a tour based on the amount of time they have to visit, and scan pieces of art in order to gain more insight into the history and creation of the piece.

Although similar organizations have had successful interactive activities, the activities might not be successful for the WAM. Activities in those organizations are created at a much larger scale with more space than what the Art Carts allow. Therefore, Art Carts need an interactive activity specifically designed to be used on a small surface. The way the Children's Boston Museum (2013) and EcoTarium (2005) create interactive activities is important for creating activities at the WAM. However, the specific activities at those museums would not be best for the WAM because of their large size.

Although these organizations have hosted successful interactive activities, the activities might not relate directly to the WAM. Activities in these organizations are created at a much larger scale than what the WAM is able to produce. This is a result of limited resources and the restrictions put into place at the WAM. However, the way in which these museums create and implement their interactive activities is important to consider.

2.5 Interactive Activities Specific to the Worcester Art Museum

The Worcester Art Museum has incorporated interactive activities for quite some time. The WAM's "Art Cart" has become a signature event that allows the audience of WAM to take part in what art exhibits are happening at that time. The figures below are current images of how

the Art Carts look at the WAM.



FIGURE 3 - ART CART (WORCESTER ART MUSEUM, 2016)



FIGURE 4 - ART CART 2 (WORCESTER ART MUSEUM, 2016)

Art Carts are run every day that the museum is open and offer a range of interactive activities (Vivian Li, personal communication, November 20, 2016). Activities included in the Art Cart often consist of scavenger hunts, coloring books, and other activities. Each Art Cart is paired with a certain exhibit, and the activities inside the cart are dictated by the exhibit. When the WAM hosted the *Knights!* exhibit, one of the main activities used in the art cart was “dress up.” This activity allowed visitors to try on pieces of armor found in the exhibit such as helmets

and chest pieces. The Worcester Art Museum's *Kahbahbloom* exhibit was innovative as it used interactive activities with it. In this exhibit, one of the basic interactive activities the museum incorporated was creating postcards. Using pencils and colored pencils, the visitors were encouraged to draw on blank postcards following drawing guides created by the artist to practice the artist's techniques. Once the visitor was content with what he or she had created, he or she could put any address onto the card, and the museum would send it to the desired address; this thoughtful activity makes a personal connection between the visitors and the art they created. While not as high tech as some activities in other museums, the basic simplicity and hands-on style make these types of activities very successful. In addition to the Art Carts, the WAM has a Drop-In studio that allows visitors to create more intricate art with the use of glue, scissors, papers and other materials. This is a location where parents and children typically stop in when it's open and spend more time creating art compared to the time they spend at an Art Cart.

2.6 Shih Chieh Huang

The featured artist for this project is Shih Chieh Huang. One of Shih Chieh Huang's several stops along his quest to display his contemporary art form will be the Worcester Art Museum (Vivian Li, personal communication, November 20, 2016). Huang works in the contemporary field of art and creates sculptures with the intention of creating a unique experience for people to explore (TED, 2014). His work is very innovative, as shown in Figure 7, and is inspired by everyday objects that can be found in any household. He finds inspiration from simple technology such as household appliances, lights, computer parts, and toys. He takes apart these objects and uses them in ways that give them an entirely new identity. In this sense, Huang works in the field of hardware hacking, where objects are interpreted differently than how they are normally used. This type of art is a very active style because a lot of trial and error goes into

the creations. It has taken a lot of time to master his style, and Huang has decided to share his way of doing things across the world. Shih Chieh Huang is also taking on the new challenge of captivating an audience while he is creating a sculpture. More specifically, Huang will be putting together a sculptural installation made up of over one hundred various elements in front of a crowd (Worcester Art Museum, 2016). Through this, he hopes to display the true essence of his creativity and the artistic process he goes through when making art. His intention is to recapture curiosity about early technology and inspire his audience to think and create with a similar mindset.



FIGURE 5 – SHIH CHIEH HUANG’S ART (DOWN THE AVENUE, 2011)

Museums have a significant role in society. They have the power to influence children to actively learn about topics through interactive activities. Although the WAM has worked with artists and interactive activities with their Art Carts, they have never collaborated with an artist that uses Mr. Huang’s art style. In the next chapter, we explain how we will help WAM to identify appropriate interactive art activities to complement and support Mr. Huang’s art.

3. Methodology

The goal of this project was to provide the Worcester Art Museum with recommendations for interactive activities to be held in conjunction with the upcoming art exhibit, *Reusable Universes*. The exhibit's artist, Shih Chieh Huang, aims to ignite a curiosity and wonder about everyday technology that will inspire visitors to experiment and create art from these things. In order to achieve our goal, we identified the following research objectives:

- Identify useful and appropriate interactive art activities that entertained and engaged different age groups;
- Identify methods to inspire curiosity in the visitors about *Reusable Universes*;
- Identify methods to stimulate creativity about the various ways everyday objects can be used;
- Identify a way for museums to determine the success of activities;

The methods described below were used to achieve each of the research objectives.

3.1 Identify Appropriate Interactive Art Activities

In order to propose recommendations for the WAM, we first had to establish which activities had been hosted by museums. It was important for us to learn why some activities have been more successful than others. Through a series of interviews with museum staff who have observed visitors' engagement, we identified successful and unsuccessful characteristics of those activities. Additionally, we visited organizations similar to the WAM to learn how other organizations engage family groups through activities. Appendices B-P contain the interview protocols, the ranking rubric of the activities, and the responses we recorded.

3.1.1 Interviews with WAM Staff

We completed a series of interviews with the WAM staff beginning with Vivian Li, who works as the Assistant Curator of Asian Art (see Appendix C: Interview Protocol for Vivian Li). Because Ms. Li is our main contact at the WAM, we wanted to understand her perspectives on the Art Carts and how activities integrate with exhibits. To gain more perspectives on the Art Carts, we interviewed five other staff members:

- Neal Bourbeau;
- Anna-Lisa Norman;
- Francis De Nicola;
- Bob Cardoza;
- Matt Wotton.

Mr. Neal Bourbeau is the Education Programing Coordinator at the Worcester Art Museum (see Appendix D: Interview with Neal Bourbeau). He works in the development of Art Cart activities and oversees them at designated stations in the museum. An interview with Mr. Bourbeau helped us identify interactive art activities that the WAM has used. We also learned which interactive activities appealed to certain age groups. We chose to interview Mr. Bourbeau because he works very closely with the Art Carts. He leads activities for visitors during the week, and he determines which activities will be on each Art Cart. Mr. Bourbeau has an in-depth knowledge of what activities visitors have liked and did not like, along with the how the Art Carts function.

We asked the guards who stand inside and outside the art exhibits a series of questions to help us clarify what they have observed about visitors and exhibits (see Appendix E: Interview Protocol for Guards and Appendix F-I for interviewee's responses). We interviewed four guards:

Anna-Lisa Norman, Francis De Nicola, Bob Cardoza and Matt Wotton, to get a variety of responses. These guards were selected based on their supervisor's recommendations (guards who are the most observant and closest to Art Carts). These interviews were crucial to gain insights on what they observe from the daily engagement of visitors. Although we had multiple interviewees, we came to one conclusion; visitors of all ages enjoy the physical connection with objects at a museum. From these interviews, we gained a better understanding of the Art Carts' function within the museum and how visitors interact with them.

3.1.2 Interview with Professor Joshua Rosenstock

We interviewed Joshua Rosenstock who is a professor at WPI in the Interactive Media and Art department. He has advised projects at WPI in interactive public art that have been put on display at the Boston Museum of Science. We gained insight on how he has used interactive media to teach students at WPI as well as a different perspective on interactive art style (see Appendix L: Interview with Professor Joshua Rosenstock). We benefited from our interview with Professor Rosenstock because he gave us advice on the process of developing of art activities and how these activities are used in a classroom setting to gain the most educational value from them.

3.1.3 Visits to Similar Organizations

Before we developed interactive activities for the WAM, our team visited and observed different museums that use interactive activities along with their exhibits. Through direct and participatory observations, we determined what activities attracted the most visitors. Below is a list of different museums and organizations similar to the WAM we visited:

- Boston Children's Museum;
- EcoTarium;

- Institute of Contemporary Art;

We explain further why visiting these organizations was another important step for completing our project in the following paragraphs.

Boston Children's Museum

The Children's Museum in Boston, MA, follows its mission statement: “engaging children and families in a joyful discovery of experiences that instill an appreciation of our world, develop foundational skills, and spark a lifelong love of learning” (Boston Children’s Museum, 2011). Many of the exhibits at the Children’s Museum are fully interactive; allowing children to truly get involved in the exhibit. An example of a popular exhibit in the museum is the Art Studio. This exhibit allows children to create art in numerous ways and fully hands-on. The Construction Zone is a popular science based exhibit that encourages children to operate smaller replicas of real construction machinery, to build model bridges, and to strengthen their problem solving skills as well as their spatial visualization skills. While at the Children's Museum, our group observed how activities were used to capture the attention of children and retain their focus. We noted which activities taught children specific skills while simultaneously keeping them involved. We observed the success of individual activities and ways we might incorporate these activities into our own project. Although the Children's Museum exhibits do not directly relate to an art museum’s content, we gained new perspectives on ways children's curiosity could be used to capture and engage visitors.

EcoTarium

We visited the EcoTarium in Worcester, Massachusetts. This is an interactive museum focused on inspiring a passion for science and nature in children in grades K-12. The museum features several exhibits, events, and activities with the purpose of getting children involved and

inspiring creativity. We interviewed Betsy Loring (see Appendix K: Interview with Betsy Loring), the Director of Exhibits, to learn about how each exhibit is created to engage visitors. Because Shih Chieh Huang's art is meant to be an immersive experience, by interviewing Ms. Loring we learned how she organizes exhibits to be immersive as well. After our interview, we explored the EcoTarium, making direct and participatory observations about the types of interactive activities in the museum. We noted ways in which the EcoTarium uses the activities to stimulate the different senses to engage visitors and which activities drew the most visitors.

Institute of Contemporary Art

The Institute of Contemporary Art (ICA) in Boston, Massachusetts specializes in displaying modern and unique forms of art. Many artists displayed in this Institute have similar styles to Shih Chieh Huang, i.e., creating art from unusual objects. While at the ICA, we interviewed the Director of Education, Monica Garza (see Appendix J: Interview with Monica Garza). This interview was conducted to gain a perspective into ways in which this museum works with contemporary artists to create interactive activities. We also asked questions focused on what observations and decisions the Director of Education makes when choosing what type of activity captures the visitors' attentions. We interviewed the Mrs. Garza because we aimed to gain knowledge about the educational background that goes into the design process of interactive activities.

3.1.4 Interactive Activity Ideas

From our interview with Professor Rosenstock, we learned of some websites that would identify possible activities for our project. We also used Google search engine to look for activities that others have used to engage children and their creativity. Because Shih Chieh Huang's artwork is created through intricate technology and circuitry, we searched for activities

based off this idea. Through research online, we identified interactive activity ideas to present to the WAM. By gaining their feedback, we were able to identify how many and which ideas would work best for the WAM.

3.2 Identifying Methods to Inspire Curiosity about Reusable Universes

Before we identified the appropriate ways to inspire the visitors' curiosity, we had to understand the artist's perspective that would be incorporated into his exhibit. We sent Shih Chieh Huang an email with questions to learn more about his upcoming exhibit at the WAM, *Reusable Universes* (see Appendix N: Email Interview with Shih Chieh Huang). We aimed to gain more insight on the inspiration that has been incorporated into this exhibit and what he envisions his audience should take away. We discovered his preferences about what participants could be permitted to create with the interactive art activities, and what he preferred us to accomplish through the activities we designed. We learned about the outcomes of exhibits he has completed at other museums as well. Through this interview, we identified ways Mr. Huang has inspired his audience and about the methods he has used to ignite a spark of curiosity in visitors to his exhibit.

3.3 Identify Methods to Stimulate Visitors' Creativity to Create Art from Everyday Objects

One way we identified how to stimulate visitors' creativity was by interviewing other artists with similar art styles as Mr. Huang. The first interview we completed was with Viktor Lois, who creates sculptures from recycled materials at his home studio in Acton, MA. Then we interviewed an elementary school teacher and part-time artist, Michael Walden. In this interview we gained insight into how children's creativity and curiosity is inspired and encouraged.

Through this research, we identified ways to inspire visitors to take note of their own artistic potential and inspired them to create art from old materials.

3.3.1 Interview with Viktor Lois

We interviewed Mr. Lois at his home in Acton, MA, where he displays most of his current sculptures. Before meeting with him, we developed an interview protocol to gain information on his art perspective (see Appendix O: Interview with Viktor Lois). We took a tour through his studio where his sculptures are on display and we asked him the series of questions. We learned about his inspiration and the creative process he goes through when creating his art. Because Mr. Lois specializes in turning everyday objects into sculptures and works of art, we learned how he uses unwanted items in artistic ways. After this interview, we realized that contemporary artists use current ideas as a form of inspiration for their art; therefore, we incorporated that concept of his artistic style along with Mr. Huang's vision into the recommended activities for the WAM.

3.3.2 Interview with Michael Walden

We also interviewed an art teacher at the Worcester Arts Magnet School, Michael Walden, to gain another art educator's perspective (see Appendix M: Interview with Michael Walden). We learned ways in which Mr. Walden inspires children to look at the world differently, and we learned how he stimulates creativity and maintains involvement in his class. We asked questions to determine how he decides the difficulty involved in his lessons as well as how he gets children to want to engage in his lesson plan. Although it is important for our project to take into consideration the age group of elementary students because they are a large part of the audience of the Art Carts, the WAM would like us to focus on family groups especially for the summer. Mr. Walden is a staff member of an educational organization that we needed to

learn more from in order to understand the educational side of an interactive activity's purpose.

3.4 Identify Metrics to Determine the Success of Activities

In order to identify which Art Cart activities were the most successful we needed a proper metric to evaluate activities. In order to do this, we conducted archival research into rating systems at different museums, as well as the psychology behind visitor engagement. We met with key WAM staff members such as Brian Scurio, the manager of guest services at the WAM, to identify ways that the WAM has ranked success in the past. Other WAM staff members such as Neal Bourbeau and Adam Rozan were consulted about how long Art Cart activities should run for, the difficulty, the age groups each activity is meant to attract, and other ways that the success of Art Carts are ranked. WAM guards were also interviewed to gain insight into any observations they had while on duty (See Appendix E: Interview Protocol for the WAM Guards). Lastly, while visiting similar organizations, we asked how each organization judges the success of an activity or exhibit they display.

3.5 Summary

Our methods helped guide us to create the most appropriate types of interactive activities the WAM can use in their upcoming art exhibit of Shih Chieh Huang's work. We planned and executed the interviews with organizations similar to the WAM and with individuals who had qualifications that we knew would help further our research about interactive activities. The results of our research along with an analysis of our findings are presented in the next chapter.

4. Results and Analysis

In this chapter we present the results that sponsor, the WAM, with appropriate recommendations for interactive art activities. We will first discuss all of the data we collected from our visits to other organizations and the interviews we completed. We will then discuss the criteria we established for the interactive activities followed by the activities we chose to recommend.

4.1 Determining Activity Criteria

We visited and interviewed the staff at the WAM and similar organizations, to identify key characteristics of successful activities. In addition, we gained insight from different artists and learned about their creative process to inspire curiosity about *Reusable Universes* and stimulate creativity about the different ways that everyday objects can be used.

We found that the Boston Children's Museum exhibits incorporated interactive activities. Their activities are intended to teach children a certain skill whether it be simple or complex. The exhibits in the museum are very diverse, ranging from topics about history, construction, and even the physics behind roller coasters. We learned that families (children and their parents) were encouraged to and did participate in activities together. The observations we made at the museum were not explicit because our time was limited there. However, we were able to make general observations about the activities in the museum. We observed that most visitors were found at the hands-on activities in the exhibits while informational exhibits drew less of a crowd. We also observed that families tend to participate in activities together as we saw parents and their children at the same activity. Refer to Appendix P to see more details about our visit. We observed the same family involvement in the short time we spent at the EcoTarium. There, we noticed the same trend that there were fewer people at exhibits that didn't involve hands-on

activities. Additionally, we found that they incorporate a lot of standalone activities that allow visitors to walk up and start participating immediately. Children are able to walk up to, understand, and begin any activity in the EcoTarium because each activity was simple and well explained.

We also discovered how activities were created for specific exhibits in the museum through Betsy Loring, the Director of Exhibits at the EcoTarium (see Appendix K: Interview with Betsy Loring). She explained how they undergo an engineering design process when creating and implementing activities at the museum. The steps they follow occur in an iterative manner by designing an activity, then testing it, finding any problems with it, and then going back to previous steps to make modifications. Ms. Loring did not provide a detailed explanation of assessment, but rather a general idea that they complete the assessment of the activities throughout the “slow seasons.” This allows the museum to test any ideas, good or bad, during time periods where they don’t expect a lot of visitors. During our interview, Ms. Loring mentioned that they go through a process of prototyping about 70 interactive activities for every new exhibit and then narrow down their options. This process takes a while to carry out due to all of the testing, but it is highly effective because they can weigh their options and select the best activities to use in their exhibits. We also learned that the EcoTarium develops all of their activities based on learning goals for children and keeps them simple. These learning goals are institutional targets established by the EcoTarium as visitor outcomes. This allows them to keep their activities educational while allowing them to create a lot of different types of activities that translate well with children.

We learned from Monica Garza, the Director of Education at the Institute of Contemporary Art, that they develop their activities in a similar manner to the EcoTarium (see

Appendix J: Interview with Monica Garza). She explained how the ICA develops themes for activities, which allows for a wider range of topics and ideas. This caters to the difference in opinions on what types of activities visitors want to engage in. Using a theme increases the amount of knowledge that can be taught during activities and gives the instructors less restrictions in their plans for activities. Therefore, it is important to create an activity from a theme rather than a single piece in an exhibit. Basing an activity off a single piece in an exhibit could be more restrictive because the activity would only relate to that one piece instead of the whole exhibit. Creating a theme that engages all ages is essential to increasing learning in visitors. Additionally, Ms. Garza explained how younger age groups are generally more open to activities. She found that adults tend to be more reserved with activities based on contemporary topics while children take more initiative in the activity.

Michael Walden, a 3rd through 6th grade art teacher at Worcester Arts Magnet School, reinforced this same ideal about creativity in children (see Appendix M: Interview with Michael Walden). He stated that “younger kids are more open to being creative.” He wants his students to remain open-minded and generate their own individual ideas. They are at a certain stage in their educational development where they focus more on their thought process and less on the outcomes. He gets the most out of his students by creating an environment where they can express their thoughts. Students in his class can talk and collaborate with each other and that stimulates more creativity in each student. We also found that he wants his students to use art as a way to understand things differently. Through simple activities, his students are can develop their own artistic perspectives. Therefore, this type of activity does indeed draw out students’ unique creativity.

Professor Rosenstock, Associate Professor in the Interactive Media & Game Development department at WPI, informed us that a complex activity may frustrate some people and keep them from participating (see Appendix L: Interview with Professor Joshua Rosenstock). He explained that simple activities will attract and engage a broader range of people. Those who may not consider themselves to be artists are more likely to participate in simple activities. Additionally, he stressed the fact that when he creates projects he always attempts to make the guidelines very lenient. He stated that “he gives students half a picture and they must fill in the rest on their own.” His lesson plans are designed to provide students with necessary tools and enough information to express themselves. He gets his students to think outside of the box and express themselves by limiting restrictions and allowing them to incorporate their own ideas.

Neal Bourbeau, the Education Programming Coordinator at the WAM, provided us with more specific information about the activities currently in the museum (see Appendix D: Interview with Neal Bourbeau). Through his experience, we discovered that activities where visitors can touch and interact with materials are the most popular activities with children. On the other hand, activities that inspire conversation and debate are most popular with adults. We also received more specific information about the characteristics of activities in the museum. Art Cart activities are intended to last about 10-15 minutes while Drop-In Studio activities allow visitors more time to create art.

The four WAM guards provided us with insights on activities through their observations. The four interviews we completed with them can be found in Appendices F through I. They agreed that hands-on activities are the most popular activities for visitors in the museum. They also all agreed on the point that children enjoy activities where they can create their own art

while adults prefer informative activities that teach about different subjects. For the WAM guards, it was a common observation that visitors spent about 10-15 minutes at Art Cart activities.

Shih Chieh Huang told us that his specific theme for the exhibit is “a world occupied by living creatures derived from repurposed everyday life materials” (see Appendix N: Interview with Shih Chieh Huang). The basic concept behind his work is to take materials from whatever surrounds you and repurpose them. To go along with this, he would like an activity where visitors are allowed to participate in a workshop in which they can create their own sculptures. He expressed that any activity involving electricity would correspond well to his exhibit. He also wanted us to take into account the amount of time the WAM would allow the visitor to spend at the activities and provide them the necessary amount of time and resources they need. We learned that the materials he will use for *Reusable Universes* are: cooling fans, garbage bags, shopping bags, painter's tarps, LED lights, motion sensors, light sensors, scrap wood, highlighter pens, water, Mr. Clean, plastic tubes and any used toys. There are no limitations to the materials he uses in his artwork, which is exactly what can spark people's curiosity.

We established a list of criteria from all of the information we found in our research. Through our visits to the Boston Children's Museum and the EcoTarium, we determined that our activities had to be hands-on in order to get the best engagement from visitors of all ages at the WAM. Through our interviews with Betsy Loring and Monica Garza, we determined that the best way to develop our activities would be to use the engineering design process and develop them from a theme. Through Michael Walden's and Joshua Rosenstock's interviews, we determined that we would keep our activities simple so visitors wouldn't feel restricted and would have the opportunity to use their creativity. We established more specific criteria through

our interviews with the WAM staff. We decided to keep our activities consistent with the 10 to 15-minute duration for activities already in the museum. We also decided to create activities that are meant to teach about the exhibit in order to engage a wider range of visitors at the WAM. These activities are described below.

4.2 Activity Idea Development

We began the development of our activities by implementing the engineering design process. We established the theme of our activities to be using everyday objects in different ways than their normal use. The first step of our process led us to the development of 13 different ideas for activities. Each idea we came up with fit within the criteria described above. The criteria we established for each activity were:

- A. Uses everyday objects in different ways than their normal use;
- B. Hands-on;
- C. Simple;
- D. Roughly 10-minute duration;
- E. Educates the visitor about *Reusable Universes*.

We identified useful and appropriate interactive art activities that could entertain and engage different age groups while teaching about the corresponding exhibit. The list of 13 activity ideas along with how we generated them and the criteria they fit can be found in the table below (see Appendix S for description of activity ideas).

TABLE 3 - ACTIVITY IDEAS

Name of Activity	Source of Idea	Criteria that it fits
Breadboard Activity	Brainstorming	B, C, D, & E
Take Home Recycled Wind Chime	Brainstorming, Inspired from Shih Chieh Huang's sculptures	A, B, C, D, & E
Character Creation out of Computer Parts	Online search "recycled art activities" which led to the use of: www.recyclart.com	A, B, C, D, & E
Objects Used in Reusable Universes	List of materials provided by Shih Chieh Huang	A, B, C, D, & E
Light Box with Magnets	Boston Children's Museum	B, C, & D
littleBits	Online search with keywords "wiring for children"	B, C, D, & E
Makey Makey	Interview with Professor Rosenstock www.makeymakey.com	A, B, C, D, & E
Miniature Replication of Organic Concept	Shih Chieh Huang's Demonstration of Organic Concept	A, C, D, & E
Material Thickness	Boston Children's Museum.	B, C, & D
Take-Apart Center Where Kids Can Explore like Engineers	Adam Rozan	A, B, C, D, & E
Potato Light Project	Adam Rozan	A, B, C, & D
Circuit Bugs	Online search with keywords "Circuit activities for kids"	A, B, C, & D
Patterned Light Triggering System	Inspired by the TED talk video for Shih Chieh Huang	A, B, D, & E

4.3 Finalizing Activity Ideas

For our next step, we took our activity ideas to some of the WAM exhibit staff and received feedback on how well the activities would run at an Art Cart. Because of time

constraints, we knew we would not view the activities running at an Art Cart so could not record any data about the age, interest, or involvement of visitors. For these reasons we decided to present our ideas to staff members who have everyday interactions with the carts. They provided us with the right feedback about which activities would be best implemented by the museum.

Each idea had its own strengths and weakness, and we knew we had to choose a select few to present as recommendations to the WAM. When meeting with Vivian Li, every idea was discussed to understand how well each activity would run at the museum. It became clear that some ideas would be best implemented in the Drop-in Studio as they needed to use materials, such as a hot glue gun or tape, that were not allowed at the Art Carts. We cut our original 13 ideas down to four ideas; three Art Cart activities and one Drop-in Studio activity. The three Art Cart activities are the Makey Makey, the Breadboard Activity, and the Artist Material Bin. The Drop-in studio activity, Creative Creations, came from a combination of three possible Art Cart activities. We decided to take these ideas and adjust them to be even more specific to the exhibit.

The Makey Makey is an activity that turns any object that can conduct electricity into a computer keyboard. When connected to things such as bananas, soda cans, even graphite pencils written on paper, the Makey Makey will read these objects as the keyboard and mouse inputs on a computer. This activity was selected for a variety of factors. It is a very engaging activity for all ages, as children and adults alike will love the hands-on aspect. It is also a fascinating piece of technology that most people have probably never seen before. The power of electricity and current ties in nicely with the electric sculptures Shih Chieh Huang creates, as well as the fact that practically any everyday object can be used in this application. It is a simple idea that encourages visitors to try it out and is not too overwhelming to understand. Positive factors such as the cost (\$50 per unit), the ability for the WAM to connect it to a projector, and the possibility

to use this activity in future exhibits made the Makey Makey a very appealing option for an Art Cart activity.

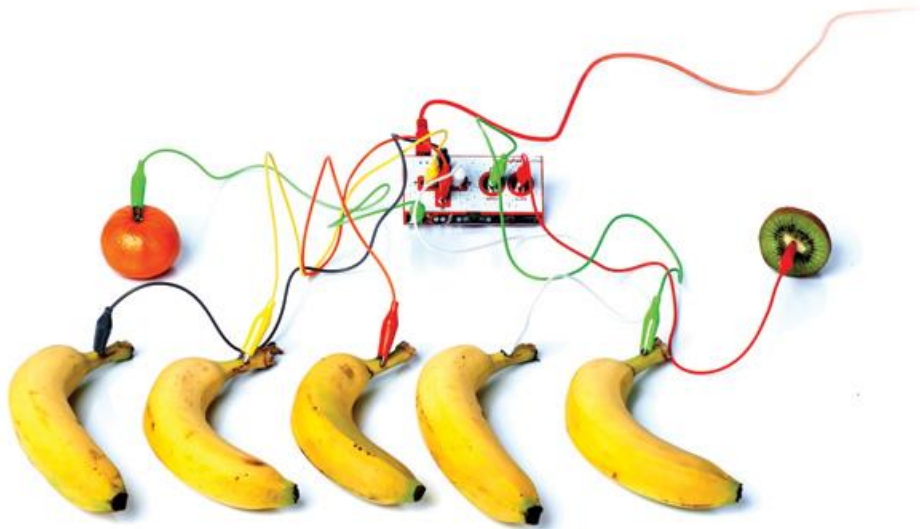


FIGURE 6 - MAKEY MAKEY (SANSING, 2015)

The Breadboard Activity is a simple idea that was identified by WAM staff as a good Art Cart activity for many reasons. The general idea of creating circuits follows the type of art created by Shih Chieh Huang and it provides a new experience to most people. It is a very hands-on activity and appeals to all ages by allowing visitors to learn a new skill. Through instructions provided by our group, there are multiple circuits visitors can create (See Appendix V: Activity Instruction Sheets). Although creating the circuit may seem tough, having a model displayed on the Art Cart will not only attract visitors to come explore the activity, but also help guide visitors to successfully create a circuit. The Breadboard Activity is also very inexpensive as a kit including a breadboard, jumper wires, LEDs, resistors, and a 9V battery harness will cost less than \$15.

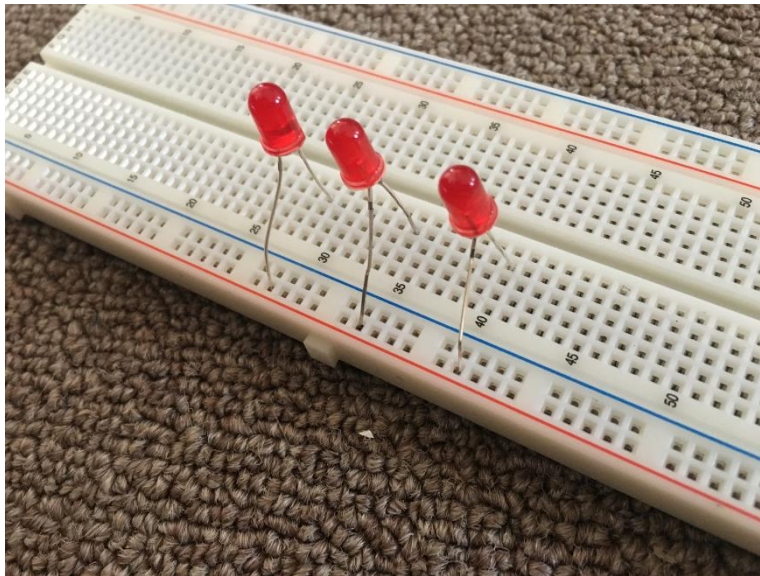


FIGURE 7 - BREADBOARD WITH LEDs

The Artist Materials Bin is an idea that incorporates objects from artist Shih Chieh Huang's art on display in the exhibit. This idea was constructed based off a list of materials provided by Shih Chieh Huang along with interviews we completed with WAM staff members. In these interviews, a recurring observation made by the staff about the Art Carts was that most adults wanted to gain more information about the exhibit, and cared less for some of the hands-on activities. Taking this into consideration, the Artist Materials Bin allows for visitors to gain a more in-depth knowledge of the exhibit. Visitors can pick materials up from the bin and gain knowledge about where in everyday life that particular object is used. When attempting to cut back our ideas, this idea stuck out as a very good candidate to keep as it directly relates to the exhibit. It is a very simple idea that will help visitors gain a connection to the exhibit as they will understand how and from what Shih Chieh Huang's artwork is created. It is very inexpensive as all materials can be found at recycling centers or local hardware stores.

The last idea for the Drop-in Studio activity is the Creative Creations activity. This idea came into formation after assessing three possible activities that may not reach full potential at

an Art Cart. We decided that they could be combined into one activity that can be implemented well in the Drop-In Studio. This idea is a great activity for the Drop-In Studio as it ties into the exhibit and open-ended as well. It can be as simple or as difficult as the visitor wants to make it. The duration spent on the activity is also completely up to the visitor. It is very engaging for all ages as there are no strict instructions; visitors are simply prompted to use their creativity to create basically anything they would like. By getting materials needed for this activity from local recycling centers the cost of this activity can be kept to a minimum. Along with the ability to engage the visitor, this activity also provides the WAM with the opportunity to use it for marketing the exhibit and the museum itself. Visitors will be encouraged to take a picture with their creation or to leave it at the museum. The WAM can then use these photos and displays to help promote *Reusable Universes*. These factors make Creative Creations one of the most appealing ideas presented.



FIGURE 8 - CHARACTERS

We had a Skype video chat with Shih Chieh Huang a couple of weeks after our email interview to get feedback on our activities. He gave us a tour of his studio and explained all of the objects and materials he uses to along with the aspects of his sculptures that different objects are used for. This increased our knowledge about why he uses certain materials and we then

added this information to our material bin activity. We showed him the four activities that we had selected as the best recommendations for the WAM. He gave us a lot of positive feedback and said they were all very relevant and interesting activities. We received the necessary feedback from the artist to finalize our ideas for activities.

The recommended interactive activities will inspire visitors to be creative in their daily lives while providing more knowledge about the art in *Reusable Universes*. Museum staff liked the potential of using these ideas not only in the upcoming *Reusable Universes* exhibit, but even in future exhibits throughout the museum.

4.4 Implementing a Rating System

The Rating Interactive Activities system was developed to establish quantitative parameters that can be used to find distinctions between activities that are more or less effective for our purposes. The measurements can be used for different activities in museums that keep visitor engagement in mind. These dimensions take into account the duration, popularity among visitors, and visitor engagement with an activity. These measures can also be used as a way for organizations to assess the activities within their respective museums. If the WAM were to use the Rating Interactive Activities sheet and the Activity Evaluation Sheet, then the WAM would obtain results that can potentially help them identify successful activities in the future. By identifying successful activities, the WAM can study what exactly makes each activity more successful and design activities based on those findings. When conducting our research, we found that the best way to rate any type of activity was to use triangulation. This involved using a self-assessment survey as well as an observational rating sheet. If both the self-assessment survey and the observational ranking sheet determine the activity to be successful, it is fair to say that both findings are accurate.

After meeting with Brian Scurio and getting his feedback on our proposed survey, it became apparent the best way to gather useful data was to use a series of yes or no questions. By using yes or no questions people are more likely to answer honestly. Questions were focused around the length, engagement, interest sparked, and difficulty of the activity. A separate comments section allowed visitors to provide any other comments or feedback they might have (See Appendix Q: Activity Evaluation Survey).

The observational rating sheet uses a scoring system between one and five to describe events respectively as poor, below average, average, good, excellent. The first parameter of observation rates the time it takes visitors to complete an activity. The optimal time for an activity was identified through our interviews with staff at the WAM. The WAM guard staff, Anna-Lisa Norman, Bob Cardoza, Francis De Nicola, and Matt Wotton, provided us with their daily observations about the activities (see appendices F, G, H, I). The staff's main point was that the activities should not take up too much of the visitor's time. The guards agreed that the preferred time to spend at an Art Cart was a maximum of 10 minutes. The time marked as excellent is 5-10 minutes because it was determined that this was around the amount of time that most visitors typically spend at activities. As the time increases, it was determined that too much time was being taken away from the visitor's museum experience. Therefore, the 10-15 minute range was rated as good, 15-20 minutes was rated as average, 20-30 minutes was rated as below average, while less than 5 or more than 30 minutes was rated as poor. While visitors are encouraged to stay for as long as they would like, the WAM does not specifically want Art Cart activities to be designed to last for longer than 15 minutes due to the limited space on the Art Cart. Activities designed to last longer are encouraged to be Drop-in Studio activities. During this portion of rating an activity, the observer must take into consideration the complexity of the

activity. If someone is simply spending 30 minutes on an activity because they enjoy the activity that does not make the activity poor.

The second row of the observational sheet involved the involvement from different ages in the museum. To measure this, we broke ages up into four age groups: children (1-12), teenagers (13-19), Adults (20-64), and senior citizens (65+). The split between the ages of senior citizens and adults came from the WAM's admission plan, where a senior citizen discount is offered for visitors over the age of 65. The observational rating for this portion of the activity is based on the number of visitors at an Art Cart from each age group. This parameter was developed from our original meeting with Mrs. Vivian Li, where she told us that the WAM wished for activities that appeal to all ages. If a member of each of the four age groups came to the Art Cart, then the activity was determined to be excellent because it could be classified as an activity that engaged all ages. As the engagement from each age group decreased, the rating score for this parameter of the activity also decreased. If only 3 different ages out of the 4 age groups came it was determined to be good, if 2 out of the 4 age groups came to the activity it was determined to be average, if only 1 out of the 4 the age groups came to the activity it was determined to be below average, and if no one visited the Art Cart the activity was determined to be poor.

The third row of the observational rating sheet involves the popularity of an activity in terms of visitor percentage: visitors in the total museum versus visitors that participate. The criteria for the exact visitor percentage came from background research on ways museums count success of activities and made more specific through an interview with Neal Bourbeau. This measures how well an activity captures visitors' attention and attracts them to participate. If a visitor walks by it can be determined that the activity did not capture their attention. Therefore, if

every person that walks by stops, producing a 1:1 ratio, the activity is considered excellent. To give leeway to this category an excellent score if 81-100% of the visitors come to the Art Cart. As the percentage decreases, the popularity of the activity decreases. If 61-80% of the visitors that walk by the activity come to the Art Cart, the activity is considered good. If 41-60% of the visitors that walk by the activity come to the Art Cart, the activity is considered average. An activity is considered below average if 21-40% visitors come, and considered poor if less than 20% come to the Art Cart. In order to achieve this, measure the observer must count the number of visitors that come to the art cart then compare this number to the total number of visitors to the museum. This number will be recorded by the front desk as to make the observer's job easier.

The last row in the observational sheet involves perceived engagement. Perceived engagement was measured by the involvement of the Art Cart. If all visitors could be involved in the activity, then that activity would be more successful than an activity where not all visitors could participate. To measure perceived engagement, we decided that if 95% of all visitors who came to the Art Cart took place in an activity then this activity was excellent. If not all visitors to the Art Cart could participate at the same time or participate at all the score for how well the activity is went down. If 75-94% participated then the activity was good, if 50-74% participated then the activity was average. Likewise, if 25-49% participated this activity was considered below average, and if 0-24% participated this activity was deemed poor due to the low involvement of every visitor. This measurement system was a result of an interview with Monica Garza in which she said the best way that the ICA can judge engagement of an activity was by simply watching and seeing how many people overall participate in the activity. This idea was reinforced when we participated in the Flora exhibit and lead an Art Cart. While leading the Art Cart we noticed that some visitors would simply walk over and watch an activity instead of

participating. Some activities would have more visitors simply watching while better activities had most or all visitors participating.

The observational rating sheet was created to supplement the survey, by reinforcing or proving false the responses from the survey. By using both sheets and therefore the rating system as a whole the WAM will be better able to improve the visitor's experience.

4.5 Summary

We used three main methods to determine the best interactive activities needed for the WAM. We visited similar organizations to learn how they prepare for visitors through activities and exhibits. We found that most organizations use simple activities that offer a learnable skill and engage each visitor. To learn how these activities were created, we interviewed staff at these organizations as well as those at the WAM. A range of people were interviewed from curators to elementary school teachers. Finally, we used direct and participatory observation was used to create activity ideas and a ranking sheet. The ranking sheet can be used to determine the success of an activity or exhibit.

5. Conclusions & Recommendations

Our research generated many possible interactive activities to recommend to the WAM. This allowed us to have various options to present to the WAM as possible activity recommendations. Our conclusion and recommendations for the WAM follow basic guidelines and criteria we discovered through the short period we had for research. These recommendations are for the WAM to consider implementing in the next few months as well as for future exhibits.

5.1 Activities

Our group came up with the recommendation that the WAM should implement three Art Cart activities as well as one Drop-In studio activity. These three Art Cart activities should vary in difficulty and style, and be easy to understand. The activities should appeal to all ages as well as follow the common theme of the exhibit they are supporting. The first activity we recommend is the Makey Makey activity (see figure below), the second is the Breadboard Activity, and the final one is the Artist Material Bin (see Appendix T for details about each activity).

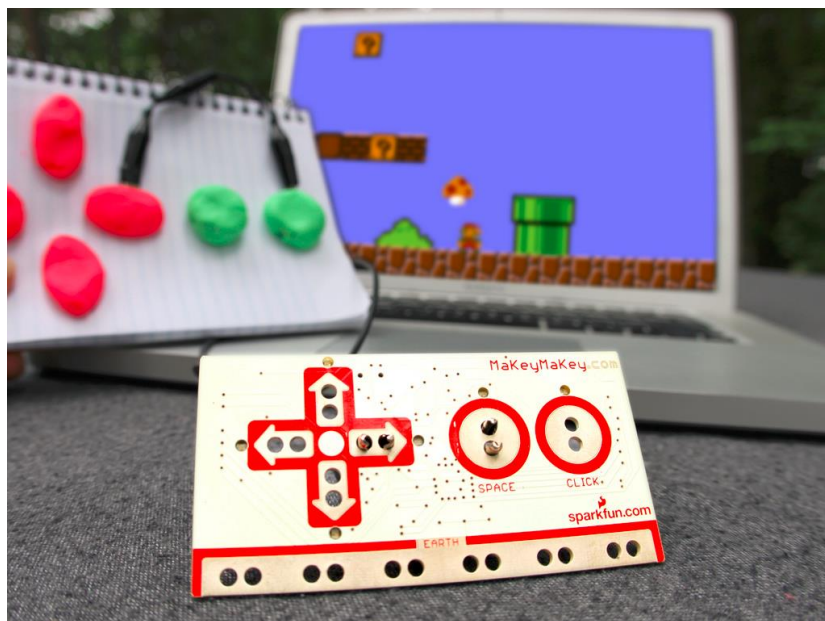


FIGURE 9 - MAKEY MAKEY PRODUCT PHOTO: PLAY DOH MARIO (JAYAHIMSA, 2012)

After receiving feedback from the WAM staff, and interviewing key staff members, we also recommend that the WAM implement one Drop-In Studio activity. We recommend this Drop-In Studio activity be open ended, follow the theme of the exhibit it supports, as well be less restrictive compared to the Art Cart activities. This Drop-In Studio will engage all ages, and provide a good marketing opportunity for Shih Chieh Huang's exhibit as people will be able to create art that resembles his style more closely. Our recommended activity for the Drop-In Studio is the Creative Creatures (see Appendix T for details about activity).

5.2 Improving the Visitors' Experience

In order to identify successful activities for future exhibits, we recommend that the WAM also implement a rating system. The rating system we recommend is a two-part system that involves direct observation as well as a survey. We recommend that the WAM have appropriate staff members observe visitors who interact with the Art Cart and Drop-In Studio, and use the chart and questions provided in Appendix Q to rate the success of the activity. We also recommend that the WAM place iPads near associated Art Carts and the Drop-In Studio that enable visitors to take the survey provided in Appendix R. This rating system will enable the WAM and other museums to determine their most successful current activities as well as those in the future.

5.3 Further Research

Due to our own limitations of time, we believe that further research should be conducted to continue assessing the success of the interactive art activities for the Worcester Art Museum. Future researchers can use the rating sheet we created to determine which activities work the best in the WAM and other museums. They could also use it to determine other activities that would

work well on the Art Cart. A more comprehensive specific rating sheet that is adapted to the museum's needs could provide more useful solutions.

5.4 Conclusion

Based on the research we conducted, we have proposed a specific series of interactive activities that the WAM could use in association with its upcoming exhibit, *Reusable Universes*. The purpose of our recommendations is to strengthen the Worcester Art Museum's ability to achieve its mission of educating the public, teach museum visitors that art can be constructed from everyday objects, and inspire people of all ages to go out and create art like that of Shih Chieh Huang.

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Appendix A: Sponsor Description

The Worcester Art Museum's (WAM) purpose is to provide the community with formal and informal experiences with a wide range of educational and experiential programs. As a public, non-profit organization, the WAM is funded through their Business Partner Program, which includes sponsors such as Unum, AbbVie, Fallon Health, People's United Bank, Rand-Whitney Container, Tufts Health Plan, and many more. There are also donors and members who contribute to WAM. It was founded in 1898 and since then has expanded its collection of paintings, sculptures, decorative arts to better serve Worcester and the broader regions nearby.

There are other independent organizations in the Worcester community that have a similar goal statement, but do not directly compete with WAM such as the Worcester History Museum and Ecotarium. The WAM is hosting the upcoming exhibit, *Reusable Universes*, by the artist Shih Chieh Huang. Our sponsoring organization is structured in a way that there are multiple important divisions of leaders within its employees, but the sections that are specifically relevant to our project are the interactive art exhibitions.

Appendix B: Interview Protocol with Museum Faculty

Pre-Interview Questions:

1. Would it be OK if we record our interview?
2. Can we quote you?
3. What is your position in the museum, building, etc.?
4. How long have you been working here?
5. Any past positions?

General Interview Questions for Museum Faculty:

1. Have you hosted interactivities before?
2. If so, how often do you host interactive art activities? What are these activities?
3. What is the purpose of the interactive activities you host?
4. What would you like to see happen as a result from these activities?
5. How do you think this museum benefits from the activities?
6. How does the public benefit from the activities?
7. From your experience what activities have been most successful?
8. What is the age group you tend to focus on for these activities?
9. In your opinion, what exhibit attracts the most visitors?
10. Does it have interactive activities? If so, what are they?
11. Do you think these are why the exhibit has succeeded? Why?

Appendix C: Interview Protocol for Vivian Li

Pre-Interview Questions:

1. Would it be OK if we record our interview?
2. Can we quote you?
3. What is your position in the museum, building, etc.?
4. How long have you been working here?
5. Any past position?

General Interview Questions for Ms. Li:

1. What are your expectations for this project?
2. What are any ideas that you may already have in mind for this project?
3. What is the target audience for the activities?
4. Is there a set budget for the interactive activities?
5. What technologies are available to us?
6. Have you hosted interactivities before?
7. If so, how often do you host interactive activities?
8. What is the focus when you host these interactive activities?
9. What would you like to see happen thus from these activities?
10. How do you think this museum benefits from the activities?
11. From your experience, what activities have the most success?

Informal Interview Questions for the 1st Meeting

1. Could you please clarify the problem statement?
2. Would the interactive activities be in series of one another or unrelated from one another?
3. Who are the targeted audience for the interactive art activities?

4. What is the financial budget for the interactive activities?
5. Who is our primary contact resource for this project?
6. In your opinion, how close do you see us working with the artist?
7. Could you define the dynamic of WAM? For example, who are the employees we will be working with, who oversees each department, etc.

Appendix D: Interview with Neal Bourbeau

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Of course.

- 3. What is your position in the museum, building, etc.?**

Education Assistant Director

Interview Questions for Mr. Bourbeau:

- 1. How long have you worked at the WAM?**

3 years.

- 2. How often do you directly work with the Art Carts?**

I work about 2 or 3 times a week. The Art Carts run for about 8 sessions a week.

- 3. What are the most popular activities for children?**

Activities where kids can touch and interact with materials.

- 4. What activities attract adults the most?**

Activities that inspire conversation and debate about historical pieces.

- 5. How many interactive activities do exhibits usually have?**

Each art cart varies. *we were provided with a list of all the activities currently in use*
Limitations of the art cart are that we are somewhat limited to pencils and colored pencils...
limited to one activity at a time.

- 6. Are the activities run by volunteers and if not who runs them?**

There are some activities that are only run by docents.

- 7. From your observations, what were the most successful interactive activities?**

Medieval armor, Games like chess/checkers and the Mosaics.

Appendix E: Interview Protocol for the WAM Guards

Pre-Interview Questions:

1. Would it be OK if we record our interview?
2. Can we quote you?
3. What is your position in the museum, building, etc.?
4. How long have you been working here?
5. Any past positions?

Interview Questions for WAM Guards:

1. How would you describe your daily observations as a guard?
2. How often do you observe the Art Carts?
3. While observing visitors (kids in particular) interact with the Art Carts, can you tell us about the most successful activities? (ask for details of the activity)
4. When observing the interaction between children and the Art Carts, can you tell us about the least successful activities? (ask for the details of the activity)
5. What do you notice that adults enjoy the most with the Art Cart's activities?
6. What do you notice that adults enjoy the least with the Art Cart's activities?
7. What is the main difference that you notice between adults and children when they approach an Art Cart?
8. Which activities stick out as being the most engaging over all?
9. If you were a guest at the WAM, how long would you like to stay at an Art Cart activity?
10. Any other useful observations?

Appendix F: Interview with WAM Guard Anna-Lisa Norman

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**
Yes.
- 2. Can we quote you?**
Yes.

Interview Questions for WAM Guard:

- 1. How would you describe your daily observations as a guard?**

I usually see groups, a lot of families. They make rounds around the museum or they start at one point and make their way around the museum.

- 2. How often do you observe the Art Carts?**

Not really. The Knights! gallery was the only exhibit with an Art Cart inside it.

- 3. While observing visitors (kids in particular) interact with the Art Carts, can you tell us about the most successful activities? (ask for details of the activity)**

N/A

- 4. When observing the interaction between children and the Art Carts, can you tell us about the least successful activities? (ask for the details of the activity)**

N/A

- 5. What do you notice that adults enjoy the most with the Art Cart's activities?**

Parents get the most enjoyment out of their child's enjoyments.

- 6. What do you notice that adults enjoy the least with the Art Cart's activities?**

None. Visitors usually like the Art Cart activities;

- 7. What is the main difference that you notice between adults and children when they approach an Art Cart?**

- 8. Which activities stick out as being the most engaging over all?**

Activities that involve all ages.

- 9. If you were a guest at the WAM, how long would you like to stay at an Art Cart activity?**

10 min. max.

- 10. Any other useful observations?**

Parents sometimes have this idea the museum is trying to sell them something so when the person leading the Art Cart activity is in the middle of inviting them to participate in the

activity, parents will interrupt them and say, “No, thank you.”

Appendix G: Interview with WAM Guard Francis De Nicola

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Yes, but please do not misunderstand what I am trying to say.

- 3. What is your position in the museum, building, etc.?**

Guard.

- 4. How long have you been working here?**

10 years.

Interview Questions for WAM Guard:

- 1. How would you describe your daily observations as a guard?**

I mainly see groups and a lot of families. Very rarely will you see an individual by themselves although there are some cases.

- 2. How often do you observe the Art Carts?**

I will go around before my shift to see where the Art Carts are located, but I don't really see them. They (Art Carts) are (in a) rotating (schedule). The Art Cart is also only there for a couple hours.

- 3. While observing visitors (kids in particular) interact with the Art Carts, can you tell us about the most successful activities? (ask for details of the activity)**

- 4. When observing the interaction between children and the Art Carts, can you tell us about the least successful activities? (ask for the details of the activity)**

- 5. What do you notice that adults enjoy the most with the Art Cart's activities?**

They get joy out of seeing their children interact with stuff.

- 6. What do you notice that adults enjoy the least with the Art Cart's activities?**

None.

- 7. What is the main difference that you notice between adults and children when they approach an Art Cart?**

- 8. Which activities stick out as being the most engaging over all?**

9. If you were a guest at the WAM, how long would you like to stay at an Art Cart activity?

Have it be entertaining (for children) and informative (for adults), but about 10 min. or 15 min. max.

10. Any other useful observations?

Contemporary art is usually abstract and that is seen as negative. I direct visitors to the Art Carts because sometimes they are not aware that they are free activities.

Appendix H: Interview with WAM Guard Bob Cardoza

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Yes.

- 3. What is your position in the museum, building, etc.?**

- 4. How long have you been working here?**

- 5. Any past positions?**

Interview Questions for WAM Guard:

- 1. How would you describe your daily observations as a guard?**

I usually see groups, a lot of families. They make rounds around the museum or they start at one point and make their way around the museum.

- 2. How often do you observe the Art Carts?**

Not really. The Knights! gallery was the only exhibit with an Art Cart inside it.

- 3. While observing visitors (kids in particular) interact with the Art Carts, can you tell us about the most successful activities? (ask for details of the activity)**

Activities that relate to the exhibit are the best. Visitors want to see more of the exhibit.

- 4. When observing the interaction between children and the Art Carts, can you tell us about the least successful activities? (ask for the details of the activity)**

Most are successful, but activities that take too long such as the medieval games are usually the least popular. Visitors don't want to have to spend a long period of time learning something new.

- 5. What do you notice that adults enjoy the most with the Art Cart's activities?**

Parents get the most enjoyment out of their child's enjoyments.

- 6. What do you notice that adults enjoy the least with the Art Cart's activities?**

None. Visitors usually like the Art Cart activities

- 7. What is the main difference that you notice between adults and children when they approach an Art Cart?**

- 8. Which activities stick out as being the most engaging over all?**

Activities that involve all ages.

9. If you were a guest at the WAM, how long would you like to stay at an Art Cart activity?

10 -15 min. I wouldn't want to spend large amounts of my museum experience at an art cart. The art cart supplements the knowledge I learned in the exhibit, so it should be a small quick experience.

10. Any other useful observations?

Parents sometimes have this idea the museum is trying to sell them something so when the person leading the Art Cart activity is in the middle of inviting them to participate in the activity, parents will interrupt them and say, "No, thank you."

Appendix I: Interview with WAM Guard Matt Wotton

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Yes.

Interview Questions for WAM Guard:

- 1. How would you describe your daily observations as a guard?**

I usually see groups, a lot of families. They make rounds around the museum or they start at one point and make their way around the museum.

- 2. How often do you observe the Art Carts?**

Not really. The Knights! gallery was the only exhibit with an Art Cart inside it.

- 3. While observing visitors (kids in particular) interact with the Art Carts, can you tell us about the most successful activities? (ask for details of the activity)**

The Knights art cart is the most successful. Visitors love to be able to touch the swords and armor instead of simply just seeing it. Being able to blend the exhibit with the art cart creates a lot more interest in the art cart.

- 4. When observing the interaction between children and the Art Carts, can you tell us about the least successful activities? (ask for the details of the activity)**

The medieval games. They are too long and time consuming, they also don't follow an exhibit so the interest is low.

- 5. What do you notice that adults enjoy the most with the Art Cart's activities?**

Parents get the most enjoyment out of their child's enjoyments. In terms of activities adults like activities that teach them more about an exhibit or in depth knowledge of the activity.

- 6. What do you notice that adults enjoy the least with the Art Cart's activities?**

None. Visitors usually like the Art Cart activities.

- 7. What is the main difference that you notice between adults and children when they approach an Art Cart?**

Adults can be more reserved, they don't always want to approach an art cart, sometimes they think you must pay for it or that they are trying to be sold something. Children's curiosity makes them more willing to approach the art cart, if they can see an activity that

looks fun and exciting it is more drawing to them.

8. Which activities stick out as being the most engaging over all?

Activities that involve all ages.

9. If you were a guest at the WAM, how long would you like to stay at an Art Cart activity?

10 min. max.

10. Any other useful observations?

Parents sometimes have this idea the museum is trying to sell them something so when the person leading the Art Cart activity is in the middle of inviting them to participate in the activity, parents will interrupt them and say, “No, thank you.”

Appendix J: Interview with Monica Garza

(Director of Education at the Institute of Contemporary Art)

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Yes.

- 3. How long have you been working here?**

8 ½ years.

- 4. Any past positions?**

I actually worked with Vivian with my previous employer at the Museum of Fine Arts in Houston.

General Interview Questions for Mrs. Garza:

- 1. What is your role as the Director of Education?**

I oversee a great staff that focuses on all different kinds of educational programs and initiatives, and included in that are all of the gallery staff. They play both an educational and security function. So it's a very different role for an art museum. So all of those individuals and gallery supervisors and so forth all fall under my preview, but we also work with different kinds of audiences, all kinds of audiences.

- 2. What interactive activities are the most popular and why?**

There's different ones for different audiences, I would say. A lot of our resources at the ICA, both staff resources and economic resources, go into developing the teen audience. So that is definitely an area of strength for us. So we have to different programs for that, this (the room we are sitting in) is one of them. This space that we are in... where we offer after school programming and other kinds of programming as well. Where kids can even get school credit... But there's different types of programs, every audience is different. We get a lot of great comments regarding our gallery staff and the interactions and basically they are in the education areas because they are trained to talk about the works of art and engage in conversation and try to make help people feel more comfortable around contemporary art...

3. What interactive activities are the least popular and why?

Activities that require a lot of instructions or take a lot of time are the least successful. No one wants to constantly be asking for help, make activities simple and open ended.

4. From your time as the Director of Education, have there been any complaints or compliments about activities you hear often?

Like stated above if an activity takes too long or is too hard we usually hear about that. Other than that most feedback is compliments on a good activity

5. How do you interact with contemporary artists?

There's three educational spaces within the museum, this is one of them (room we conducted the interview). Then the first floor next to the lobby is our art lab which is a more traditional multi-use classroom space... opened it up on weekends for the general public. We commission... we work with different contemporary artists to come up with an interactive space with us and the educational depart. We totally redo the entire space. So there are wall items on the wall that people are making and adding to the wall and encouraging more interpretation of the work of art they are going to be seeing or the different themes they will be seeing... The next artist we will be working on opens in April... we have huge exhibit upstairs on our third floor of the contemporary artist Nari Ward and he deals a lot of issues of citizenship and democracy. He, himself was born in Jamaica and became a U.S. citizen so he tries to also unveil a lot of the democracies involved on what it means to become an American citizen and so forth. We are working with another artist to think about those ideas of migrations and citizenship... Usually they have some say in the exhibit and the activities as a whole. They don't always create the activities but they will often participate to help the activities out, either by running them or simply being around for questions.

- We ask artists to meet with visitors
- Kids lead interviews with artists to get to know the artists better

6. What is the main focus you have when you have an exhibit for certain age groups?

No, it's all mixed... We want to make sure it's addressing all different audiences. Young kids are far more open to new ideas and different ideas and new situations than adults would be.

7. If any, could you explain an interactive activity that was unsuccessful?

We've had in the past other programs where we've experimented drop-in drawing classes or drop-in drawing sessions and so forth where the kids are in it, they get it, they're into it and the instructions, the feedback and the adults are totally reserved about it. So it's the people who are really self-selecting. I mean you're putting yourself out there - I didn't expect so many people have that many reservations or feel like they were really putting themselves out there.

When it's drop-in, a lot of it (determining whether an activity is successful or unsuccessful) is anecdotal unfortunately... We do get those people who are monitoring those spaces to write up their observations. But I mean in terms of success hey if people are staying longer and talking about it than that's the biggest success.

8. What is the process behind creating an interactive activity?

I have developed deeper respect for people in our marketing team. We have partnered a lot together, collaboratively to how to work and craft language and so forth and that's been actually pretty successful.

- Put some program text together
- I ask for more advice and questions
- More welcoming to those suggestions
- I mean my job; I just want people to be engaged

There are different strategies when creating an activity. It could be a total replica of what the artist is trying to do or pick the general idea of what the artist is trying to do and then come up with your activity... depends on the age group too. If they are young kids, they are barely getting a hold of their motor skills and that's the tricky part.

Pick that big theme. What do we really want to focus on? What do we want to be the main idea? How can people talk their own personal experiences? More options to address ideas.

9. Do you test your interactive activities before opening them up to the public?

Yes - Ask specific people; a diverse group (kids, adults, etc.) & Part of the marketing company. We also got to test out the activity

Appendix K: Interview with Betsy Loring

(Director of Exhibits at the EcoTarium)

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Yes, but please do not misunderstand what I am trying to say.

- 3. How long have you been working here?**

16 years. As the director of Exhibits, there are three departments: collections, exhibits, wildlife also known as the living collection.

General Interview Questions for Ms. Loring:

- 1. As the Director of Exhibits, what is the process behind set up an exhibit?**

We go through a process similar to the engineering design process to come up with activities for the exhibits. Prototyping of about 70 interactive activities and failing early. Take that ones that work. About 26/70 ideas will be fully considered to become the exhibit's activity.

- 2. What types of exhibits are the most popular and why?**

Exhibits with hands-on and open-ended activities. Bringing children outside the classroom.

- 3. What types of exhibits are the least popular and why?**

Same usual exhibits that have been there for a really long time.

- 4. What type of planning goes when creating any type of activity with the exhibits?**

Think of the setup of the activities as the engineering design process.

- Front end work - research and development and brainstorming.
- Think about ways to do hands-on activities to get people involved.
- Create learning goals for what you want children to learn from each activity which is usually a skill and not much on content.

- As for the prototypes; test and if it tanks make changes. We test our activities with our visitors during the slow seasons such as the winter compared to the summer where school is out.

Start with a paper prototyping then build it to more.

Must take note of the restrictions: practical so no straws and balloons, stay away from crayons and stickers, NO TAPE, don't be boring.

5. How do the activities correlate to the exhibits on display?

Through their learning goal. The activities technically make up most of the exhibits.

6. Have you personally worked with interactive activities? If so, could you please explain what the activities consisted of.

No, the staff runs the activities. We have programs for the whole public, less hands-on. Meanwhile, during the vacation weeks especially during the summer, we focus more on hands-on activities.

7. Do you have a guideline of how you measure the success of the activities held in the EcoTarium?

Not really, mostly (direct) observations.

8. Any advice you would like to share with us as we continue to research about our project?

You can't just rely on feedback like "that it is cool." The learning goals are entirely up to you and each activity has its own learning goal. As for the prototyping, fail early. Focus on the family audience.

- Little Makers (suggested idea: maker movement and children's museum, alligator clips or magnets)

9. Are the interactive activities at the museum intended for all ages (families)?

Family audience.

Appendix L: Interview with Professor Joshua Rosenstock

(WPI Interactive Media Professor)

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Yes.

- 3. How long have you been working here?**

12th years at WPI, artists, 1st artists hired at WPI, specialized more in art and media.

- 4. Any past positions?**

IGMD

General Interview Questions for Professor Rosenstock:

- 1. How do you decide what your lessons plans will be for the term; are there certain details you look at?**

Try to provide student with set of tools to be creative. Designs projects that are open ended so students must think for themselves and express themselves. "Give students half a picture, they must fill in rest on their own."

- 2. What do you consider when teaching? (any measurable details that define the success of a lesson plan)**

Does teach interactive art classes. Approaches it in a way to provide students with tool, gives them an assessment, open ended so they can express themselves.

- 3. What have you learned from the years you have been teaching?**

Interactive electronic art, computer vision to track what someone is doing with their body, practice what they already learn. Create something expressive, an assignment can reinforce what a student has already learned. Open to the interpretation of the student. Main focus: art can allow people to express themselves. Encourages students to get out of their comfort zone by... came back from a meeting, a lot of simple, low tech activities come to where people are at instead of pushing to where you want them to go

- 4. What was your experience when meeting CJ?**

Met him at the WAM last year. He has seen some of CJ's sculptures.

5. Any advice you would like to share with us?

- Makey Makey interface that uses everyday objects, very easy to use.
- THEME: Start with a concept, sit back and have a constraint, important to have something of why you are doing it.
- Don't make something fragile, make it durable.
- Certain tools or art supply will suggest something, cool equipment will inspire them to pick it up and play with it.
- Easy to take a recycled object, poke some holes and put light and make some shadows.
- Simple is better, it can have complexity, but look for a simple start to allow people to start in comfortable place.
- People like to figure things out; need something that will inspire them to start.
- Another challenge is figuring out other complex interactions (figuring things out about what is going on with a system can make two strangers interact with each other as well).

6. What are the topics you are teaching in your classes?

Currently teaching a light course, take a look at the course website; lights and shadows.

7. How do you determine if these goals are reached by students?

Has a guideline/rubric. Asks questions to help with this: what the original concept behind your artwork, do you push your ideas/concepts, how well did you express that, did you manage to express that, did you use skills you were taught? Was the student's artwork appealing or visually interesting (this is harder to qualify). The actual process, doing an experiment to see what worked and what did not. Did the student listen to the feedback they were given?

Appendix M: Interview with Michael Walden

(Elementary School Teacher at the Worcester Art Magnet School)

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes.

- 2. Can we quote you?**

Yes.

- 3. How long have you been working here?**

8

- 4. Any past positions?**

Artist in his spare time.

General Interview Questions for Mr. Walden:

- 1. What grades do you primarily teach?**

Teaches grades 3rd to 6th. There is an art club every morning for grades 1st to 6th.

- 2. How does the curriculum change as the students get older?**

Younger kids are more open to being creative, the curriculum changes with each person. This school does well with inspiring creativity, but other schools squash creativity. These schools squash creativity by being afraid of failing, not teaching kids correctly.

- 3. What are some of the skills that your students are developing in class?**

Less focused on skill. Doesn't want kids to focus on creating perfect drawings, paintings, mixing colors, etc. Wants kids to focus on "the creative process", meaning that think of their own ideas and art. Becoming a good painter or drawer can happen later or take lessons, etc. at this age, children need to become creative and expressive.

- 4. What is the skill you focus on when teaching and why?**

Same answer as above. He focuses on making his lesson plans as open minded as possible so that children think for themselves.

- 5. What are some of the ways you get students more engaged in art activities? Is it different for each grade?**

Using everyday news and current events inspires kids to want to get engaged. Letting them choose their own subject matter, less guidelines, simply inspiring kids to be creative. Using children's curiosity to want them to get participate. Don't focus on perfection.

6. Do you involve hands on activities, such as creating sculptures, in your class?

Does some sculptures, but isn't a large part of the curriculum. They do a lot of drawings.

7. What are some of the more popular activities among the children?

Building things, clay, any really hands on 3D activities. They enjoy being messy.

8. Do you have a specific quantitative rubric to verify that an activity is successful with the students?

No, looks at more of the effort the children put into activities along with the creativity they incorporate.

9. Would it be possible to test out our ideas for the art cart in your classroom?

Yes.

10. What goes into creating a lesson plan?

Looks at what's going on in the world. Has a basic idea of topics he wants to cover but wants to use art as a way for people to understand things differently. Current events dictate the direction he goes in.

Appendix N: Email Interview with Shih Chieh Huang

Interactive Activities for the upcoming exhibit *Reusable Universes*

Overview

To remind you of our project, we have included an excerpt from our Executive Summary chapter of our project proposal:

The goal of this project is to provide the Worcester Art Museum with recommendations for interactive art activities to go along with the upcoming exhibit, Reusable Universes, that will engage visitors' curiosity and creativity in this new form of art that involves using everyday technology and objects in different ways.

Questions

Below are questions we have for you that would help us decide which interactivities would be best for the WAM.

1. Can we quote you?

Ok

2. Is there a specific theme for your exhibit you want to express to visitors?

A world occupied by living creatures derived from repurposed everyday life materials.

3. Knowing our project, are there any specific ideas you want us to incorporate?

Workshops for visitor, making things with common household materials

4. Do you have any ideas for interactive activities to go together with your art?

Workshop

5. What influences your art?

Many things and places that came across my life, environment, science, biology, sci-fi movies.

https://www.ted.com/talks/shih_chieh_huang_sculptures_that_d_be_at_home_at_the_bottom_of_the_ocean

6. What are your expectations for the interactive activities we will be designing, if any?

Fun and playful

7. What would you like your audience to take away from the interactive activities?

Objects have more function/usage than their original intended purpose.

8. Are there certain materials you would like us to use with the interactive activities?

Any easily accessible materials.

9. What materials do you use in your sculptures?

Garbage bags, shopping bags, painter's plastic sheets from the hardware store, plastic heat sealers, LED lights, motion sensor lights from the hardware store, scrap wood, highlighter pens, water, Mr. Clean, plastic tubes, and any used toys, motorized toys; anything you can find around the house. There are no limits to the materials. The concept behind my work is taking what you have around you and repurposing them. Even with materials not found in my work.

10. Any other recommendations you would like to give us?

For the workshops, please keep in mind how much time each visitor has to complete their project.

Appendix O: Interview with Viktor Lois

Pre-Interview Questions:

- 1. Would it be OK if we record our interview?**

Yes, much easier for you.

- 2. Can we quote you?**

Yes, of course.

Interview Questions for Mr. Lois:

- 1. How long have you worked as an artist?**

His whole life.

- 2. How do you go about creating your art? Do you get the materials then come up with ways for it to work together or have an idea and then go out and search for the materials?**

I go to the dump, find the material and build from that.

- 3. What is the theme of your artwork? Is it consistent in all of your pieces?**

No strict theme, but it does change according to society. I build with a lot of humor in mind, making fun of the restrictions that are on our society today. You are not free, (points to cell phone) I am free.

- 4. How do you draw an audience from people who may not be into contemporary art?**

I create art that everyone can relate to; humiliation was a theme for an exhibit that I completed in 2015.

- 5. Where do you get most of the pieces in your sculptures?**

From the dump.

- 6. What is the point you try to get across to your audience?**

I put a mirror in front of my audience and show them what their society truly is.

Appendix P: Boston Children’s Museum Meeting with Akemi Chayama

While visiting the Boston Children’s Museum (BCM), we were led around the museum by a staff member, Akemi Chayama. She is in charge of the Japanese House that is built in the museum. While this prevented us from conducting a formal recorded interview, we were able to take notes throughout the visit from what Akemi described and we also recorded our observations. Below is what we learned from our visit:

Museum Information:

The museum is over 100 years old and was begun by science teachers in 1913. It was started as a place for activities and learning that can’t be done in a classroom. It started in the Jamaica Plain. The museum is interdisciplinary, but mostly science and art. Visitors who attend this museum undergo a 5-senses-experience and the activities are multi-layered. Akemi also mentioned that the museum’s visitors are 50% adults and how they support them is a large part of their mission.

Activities:

While speaking with Akemi, we learned what activities work best for the BCM and which work best for certain age groups. She explained that role play works great for children as it keeps them engaged while they learn about a certain skill. Children can pretend to be a doctor, teacher, and much more. The museum also has a play space for children that contains games to teach the children as they play. They also had a section within the museum where visitors can learn about different cultures through dialogues and stories. This kept the topic interesting for the adults and children. The museum strives to make every activity hands-on to facilitate learning in children and adult visitors. Some of the most popular exhibits were Big Dig and the Climber. The Big Dig had different sections throughout the room. One area allowed children to climb on construction machines, and another area had small building blocks for children to move with smaller construction machine toys. The climber was a large sculpture made specifically for the BCM. It was designed so children could climb in it and up three stories. Because it was designed so the children could not fall, the children could climb safely and interact with the sculpture.

Appendix Q: Rating Interactive Activities

Rubric Grading Guidelines:

	5 Excellent	4 Good	3 Average	2 Below Average	1 Poor
Duration of Activity	8-10min	10-15min	20-25min	25-30min	< 8min or > 30min
Appeals to all ages (Family oriented)	A member of each age group participates, (children, teenager, adult, senior)	$\frac{3}{4}$ members of the age group participate	$\frac{2}{4}$ members of the age group participate	$\frac{1}{4}$ members of the age group participate	No members of the age group participate
Popularity (Visitor Ratio)	81 - 100% activity attendance compared to museum attendance at time	61 - 80% activity attendance compared to museum attendance at time	41 - 60% activity attendance compared to museum attendance at time	21 - 40% activity attendance compared to museum attendance at time	< 20% activity attendance compared to museum attendance at time
Involvement (Perceived engagement)	95% or above of visitors to activity participate	75% to 94% of visitors to activity participate	50% to 74% of visitors to activity participate	25% to 49% of visitors to activity participate	0% to 24% of visitors to activity participate

Below is a detailed explanation of the Rating Sheet above:

Four categories that determine the success of an activity. The first category is the duration of the activity which measures how long the activity lasted. The second category is whether it appeals to all ages especially family oriented. The third and fourth category are popularity and involvement which measure the visitor rates and perceived engagement. Through this process, we obtained knowledge about why certain exhibits are more popular than others.

Measurable Factors

Museum:

Exhibit:

Name of Activity:

Pre-Questions:

Does the activity fit inside an Art Cart? Yes No

Does the activity relate to the exhibit? Yes No

Can more than one person participate at a time? Yes No

	5 Excellent	4 Good	3 Average	2 Below Average	1 Poor
Duration of Activity					
Appeals to all ages (Family oriented)					
Popularity (Visitor rates)					
Involvement (Perceived engagement)					

Comments:

Appendix R: Activity Evaluation Survey

Worcester Art Museum Art Cart Survey

Reason for visit (Circle):

- A. Recreational activity
 - B. School related trip
 - C. Conducting research
 - D. Other (Please specify below)
-

What is your age? (Please check one):

- A. ____ (Under 12)
- B. ____ (13-19)
- C. ____ (20-65)
- D. ____ (65+)

Visitors accompanying you (Please check all that apply):

- E. ____ Infants (0-3)
- F. ____ Children (4-12)
- G. ____ Teenagers (13-19)
- H. ____ Adults (20+)

Directions: Please answer the following questions about the exhibit/activity you recently participated in.

1. Did you enjoy your visit today?
Yes No
 2. Did you visit the Art Cart before or after the exhibit?
Before After
 3. Was the activity easy to follow?
Yes No
 4. The length of the activity was:
too short just right too long
 5. Did you learn something new from this activity?
Yes No
 6. Did this exhibit/activity spark your interest and curiosity?
Yes No
 7. Would you recommend to a friend?
Yes No
 8. Other comments or suggestions?
-
-

Thank you for your time and we hope you enjoy your day!

Appendix S: Activity Ideas

Below are some of our ideas for activities. The “Learning Outcomes” are what the visitors would take away from the activity. We would like to decide which learning outcomes would be best for the visitors. These are in no particular order and some of these may work better in the drop-in studio.

1. Knowledge is Powerful (write out “powerful” in an artsy way)

Theme: Electricity

Learning Outcome: Learn how to power a light or fan through activity

Details:

- Less expensive - already have many of the materials from an old class
- Trial and error with electronic breadboard
- Create a worksheet explaining this activity and each of its components. (electronic breadboard, wires, battery, light system)
- Use the electronic breadboard along with wires and batteries to show audience how the electronic breadboard functions.
- Must make the light system light up.
- Along with an explanation of what wire should go where and explain why it works.
- Explain why not setting up the wires in the correct form, does not make the system work.
- Audience learns about electricity and sees how electricity provides the power to create art.
- Light System will be a night light connected to the wires.
- Audience can create the material covering up the night light and create all sorts of shapes with the light.

2. Take Home Recycled Wind Chime

Theme: Repurposed recycled materials

Learning Outcome: To develop a personal creation and predict the factors that will cause movement and sound on the wind chime while blowing in the wind.

Details:

- Less expensive - we can get a lot of the materials from recycle shops and companies that give away scrap materials for free (Wachusett Earthday, etc.)
- The visitor will be provided with the necessary materials that it takes to create a wind chime at the art cart.
- This object will replicate the moving parts found in Shih Chieh Huang’s sculptures but instead of mechanical movement, the object will move as a result of wind.
- Recycled materials such as Styrofoam cups, paper plates, and plastic bottles will be provided as a base for this object. (More recycled materials such as colored plastics, rubber pieces, scrap metal, etc. will be provided to the visitors from the cart as decorations for the object.)
- Explanation that these objects take many years to decompose so we benefit by reusing them as art pieces; worksheet explaining this will be provided from the Art Cart.
- Pencils will be provided to poke holes in the paper cups or plates and holes will already be punched into plastic bottles with a hole puncher.

- Wires and pipe cleaners will be provided as a way to connect and create this piece as a whole.

Optional idea: A fan can be used on the Art Cart as a method to show visitors how their piece looks and sounds in an air current. Gives them an opportunity to change their artwork just like artists do.

3. Character Creation out of Computer Parts

Theme: Technology

Learning Outcome: To see recycled computer parts in a new manner and come up with a completely original interpretation of a life-like figure inspired by computer parts.

Details:

- Less expensive - Can locate most materials at recycling centers, dollars stores, or hardware stores
- Bins of recycled components taken out of computers will be separated and provided to visitors.
- These will consist of resistors, fuses, integrated circuits, fans, hard drives, wires, etc.
- Visitors will be given a tutorial or worksheet of how to glue and connect different components together.
- Explanation of how these different components can actually look like different parts of the human body/ animals. (i.e. resistors as the body, wires as hair, and hard drives as a face)
- Taking from this inspiration, visitors will be encouraged to take whatever components they need and create their own character that they can take home.
- Help will be provided as needed, and googly eyes will also be provided to make them appear even more lifelike.
- This activity may strictly have to take place in the studio/workshop due to the materials visitors will be working with.

4. Objects Used in Reusable Universes

Theme: Learning about everyday objects

Learning Outcome: Learning how the everyday objects are used for art

Details:

- Less expensive - can find most materials at recycle centers or for a few dollars at hardware store
- Collect basic materials used in CJ's art work. Ex. light sensors, computer fans, LED lights, motorized toys, plastic bags, plastic heat sealer, painters tarp, highlighters etc.
- Have a brief explanation of where each object is found in everyday life and where it can be found in CJ's art along with its purpose.
- Visitors will be able to pick up and interact with the part they are reading about
- Example- Light sensors are used in burglar alarms, garage door sensors, motion detecting lights. They control the voltage, (amount of electricity) through an object which therefore makes it behave differently. CJ uses them to help control movement in his art work. He will attach a light sensor to the joint of a part of his artwork. When the sensor picks up

light it will cause the joint to move, when it picks up no light the sensor returns the joint to its original position

5. Light Box with Magnets

Theme: Transparency

Learning Outcome: How light shines through objects (Different types of transparency)

Details:

- Less expensive - WAM already has a light box and would just need to buy the plastic pieces for activity
- Have plastic pieces of different shapes with magnetic edges.
- By connecting the pieces magnetically and having light shine from below, visitors can learn how layering different pieces can create a transparent effect.

6. littleBits

<http://littlebits.cc/shop/kits>

Theme: Electronic Circuits

Learning Outcome: Children and adults are given a simple and easy way to make their own circuits.

Details:

- More expensive - would use up most of budget
- No-mess
- Awesome way to power lights and fans in different ways.
- A really cool option for children to learn more about how Shih Chieh Huang
- Similar - less expensive idea that would only cost around 80\$:
<http://www.steampoweredfamily.com/activities/circuit-bugs/>

7. Makey Makey

<http://www.makeymakey.com/>

Theme: Inventions made simple

Learning Outcome: Visitors will learn how different objects are more conductive. Directly from the website: "We want to help people start to think of themselves as Makers and agents of change. When you have the "Maker's Mindset," you know you can change the world."

Details:

- More expensive
- As shown on website can be used in many different ways to play games
- Great for the new technology age - it will be very engaging for visitors
- A simple concept for even young children to grasp on to as well as those visitors who are unfamiliar with technology - yet different enough to engage those who are familiar with technology
- Pencils and color pencils work for this exercise

8. Miniature Replication of Organic Concept

Theme: Organic Concept

Learning Goal: To understand that the trial and error process is used to come up with the best

possible outcome in this case.

Details:

- Less expensive - can find most materials at recycle centers or for a few dollars at hardware store
- This activity will serve as a small scale replication of Shih Chieh Huang's Organic Concept idea. Visitors will go through a trial and error process in which they pick from a bunch of different plastic tarp materials and choose the one that they feel would best serve the purpose of being inflated. The visitor will then shape the tarp into whatever shape they want and lock in the shape using rubber band or twist ties. Then, the visitor will have to opportunity to connect their finished product onto a small tabletop fan found on the art cart. The art cart operator will flip the switch and the visitor will be able to see their creation come to life just as Huang's piece does. If the visitor is unhappy with the outcome, they are encouraged to keep trying out new materials or shapes while at the cart.

9. Material Thickness

Theme: Material/Electronic

Learning Outcome: By using trial and error, visitors can learn how different material thickness and its weight can determine its use for a sculpture

Details:

- Less expensive - will get many of the materials for free
- Will go hand in hand with the miniature Organic Concept
- Visitors can use computer fans to inflate different types of plastic bags
- Thicker bags will need a more powerful fan and power supply to inflate, while thinner bags will be easier to inflate.
- Using a light underneath, the computer fan, the visitor will be able to see how different types of plastics have different transparencies.

10. Create a Take-Apart Center Where Kids Can Explore Like Engineers

Theme: How this are put together

Learning Goal: To understand how items are put together. Visitors will be more comfortable taking items apart in the future.

Details:

- Less expensive - can find most materials at recycle centers or for a few dollars at hardware store
- There is no shortage of technology castaways. With a community that has become obsessed with having the latest and greatest new technological toy, there is always plenty of old hardware floating around waiting for a new life in a preschool deconstruction center.
- Collect a few old pieces, taking care to remove batteries or other dangerous components, and let the children take a shot at disassembling them.
- Provide screwdrivers and pliers and I guarantee that your kids will have some of your old tech appliances disassembled in no time. Some of the world's top engineers got their starts this way! There is much to be learned from simply studying the printed circuit board you find inside an old computer. As a bonus, your students will be developing their fine motor skills.

11. Potato Light Project

Theme: Experimenting with light

Learning Goal: Learn how you can get power from different objects.

Details:

- Less expensive - very inexpensive materials
- Adam Rozan mentioned this idea to us briefly when we met with him two weeks ago.
- Simple idea for children and adults to experiment with

12. Circuit Bugs

<http://www.steampoweredfamily.com/activities/circuit-bugs/>

Theme: Circuits and Bugs

Learning Goal: Visitors will learn how to create small bugs with simple supplies while incorporating circuit work

Details:

- Less expensive - can find most materials at recycle centers or for a few dollars at hardware store or dollar store
- From the website: “These cute bugs incorporate great fine motor and creative crafting skills, but also circuit work that will keep your older kids enthralled and challenged.”

13. Patterned Light Triggering System

Theme: Light Sensors

Learning Goal: Understanding how a light sensor works and using that knowledge to control a light bulb with an original pattern.

Details:

- Less expensive - can find the sensor and wires cheap at a hardware store and only need a phone on top of that
- A light bulb will be connected to a photocell light sensor that detects visible light. Because the sensor will keep the light off while it is exposed to the surrounding light, it can be triggered simply by covering the sensor. This will cause the light bulb to turn on. This will be taken a step further through the use of a smart phone. The visitor will record a video on their own personal device (or on a provided device) of their eye blinking or pupil moving in an original pattern. The light sensor will be placed on the phone screen directly over the eye while the video is playing. When the eye is open and the sensor rests on the dark pupil, the light will turn on. When the eye is closed or the sensor rests on the white part of the eye, the light will turn off. This will occur in a pattern that replicates the work Shih Chieh Huang adds to some of his sculptures.

Appendix T: Final Activity Ideas

1. Breadboard Activity

Theme: Electricity

Learning Outcome: Learn how to align and power on small LED lights on a breadboard

Details:

In this activity, visitors will be provided LED lights, computer fans, light switches, and wires to connect to a breadboard and 9V battery. The intention of the activity is to get electricity to these different components. There will be a few different arrangements laid out on the art cart either on paper or a physical example. They will vary in difficulty and the number of components involved. The visitor will be able to pick whichever arrangement they want to attempt to replicate. With the supervision of the person running the art cart, the visitor will be able to accomplish one of the arrangements.

Materials Link:

http://www.jameco.com/webapp/wcs/stores/servlet/ProductDisplay?storeId=10001&productId=2244551&catalogId=10001&langId=-1&CID=GOOG&gclid=Cj0KEQiAlsrFBRCAXcCB54XEILEBEiQA_ei0DOxji-0S21w8JKfH-9oCGQaglxswGIya_wHzj8zTaPEaAoie8P8HAQ

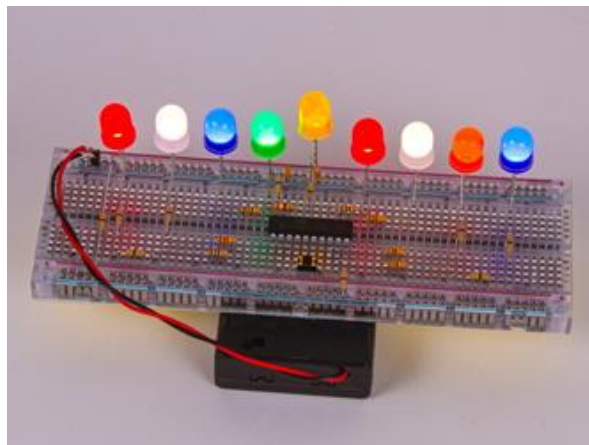


FIGURE 10 - MUSICAL MENORAH MOD (EDMAN, 2013)

2. Makey Makey Activity

Theme: Interactive Media

Learning Outcome: Inspire a new perspective about everyday objects

Details:

The Makey Makey device is a piece of hardware that can turn everyday objects into inputs on a computer. It is able to control the input from a mouse, directional keys, spacebar, letters, etc. It works by connecting one side of alligator clips to the Makey Makey device, and the other side to any object that can conduct electricity. We will use it inspire people about the way they see the objects around them.

Materials Link: <http://www.makeymakey.com>

Online Websites: <http://virtualpiano.net/>

<https://www.funbrain.com/>

<http://makeymakey.com/apps/>

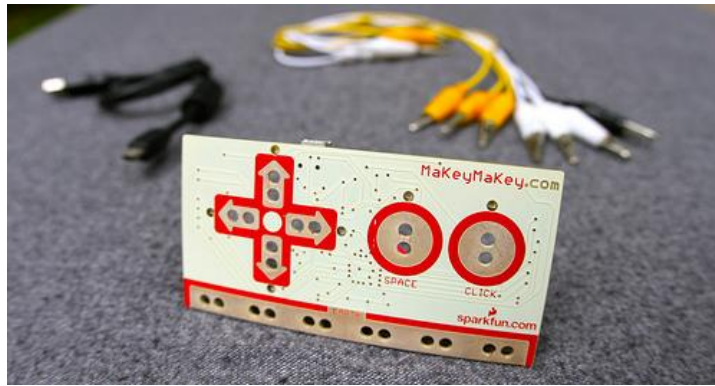


FIGURE 11 - MAKEY MAKEY (MAKEY, 2012)

3. Artist's Materials Bin Activity

Theme: Interaction with exhibit materials

Learning Outcome: Learn more about the objects used in the exhibit

Details:

A bin full of the different objects found in sculptures in the *Reusable Universes* exhibit will be displayed on an art cart. It will include: light sensors, computer fans, LED lights, motorized toys, plastic bags, plastic heat sealer, painters tarp, highlighters etc. (basically any item found in the sculptures). A description of each item will be in the box to help the visitor understand how it is used in the exhibit. A matching game will also be provided so visitors can match up the everyday use of objects to the repurposed use that can be found in the exhibit. This will all be intended to give more knowledge to the visitors walking into or out of the exhibit.

Where to get materials: Hardware Stores, Amazon, Recycle Centers

4. Creative Creations Drop-In Studio Activity

Theme: Creating sculptures

Learning Outcome: Access creativity to create unique sculptures from recycled materials

Details:

This activity will be held in the drop-in studio room at the WAM. Visitors will be encouraged to access their creativity and create a sculpture of their own. Upon walking in, they will be given the option to take apart a computer or begin building their own sculpture. If visitors choose to take apart a computer, they will be provided a screwdriver to use. They will be able to identify some of the key components within a computer (cooling fans, circuit boards, wires, etc.). They will notice some of the objects are the same ones used in the *Reusable Universes* exhibit. In this process, visitors will also be able to choose any materials that they would like to include in their sculpture. Visitors who choose to begin building their sculpture will be directed to the materials they will use. Bins full of recycled electronics and everyday objects will be provided to the visitors. They will be able to take anything they need to create their sculpture. A couple of ideas through step by step instruction sheets for different sculptures will also be available to the visitor, but they can take off with their own ideas as well. One idea that will be presented to the visitor will be a type of wind chime sculpture. Visitors will have to pick a base and hang different materials from it. Another idea will be a character creation. For this, visitors will connect different materials they find to look like a type of toy character. Tools and glue will be put out so visitors have all the materials they need to create their individual sculptures.

Where to get materials: Hardware Stores, Amazon, Recycle Centers

Appendix U: *Reusable Universes* Art Cart Location

The Art Cart will be located just outside the Rotating Exhibition Gallery on the second floor of the Worcester Art Museum.

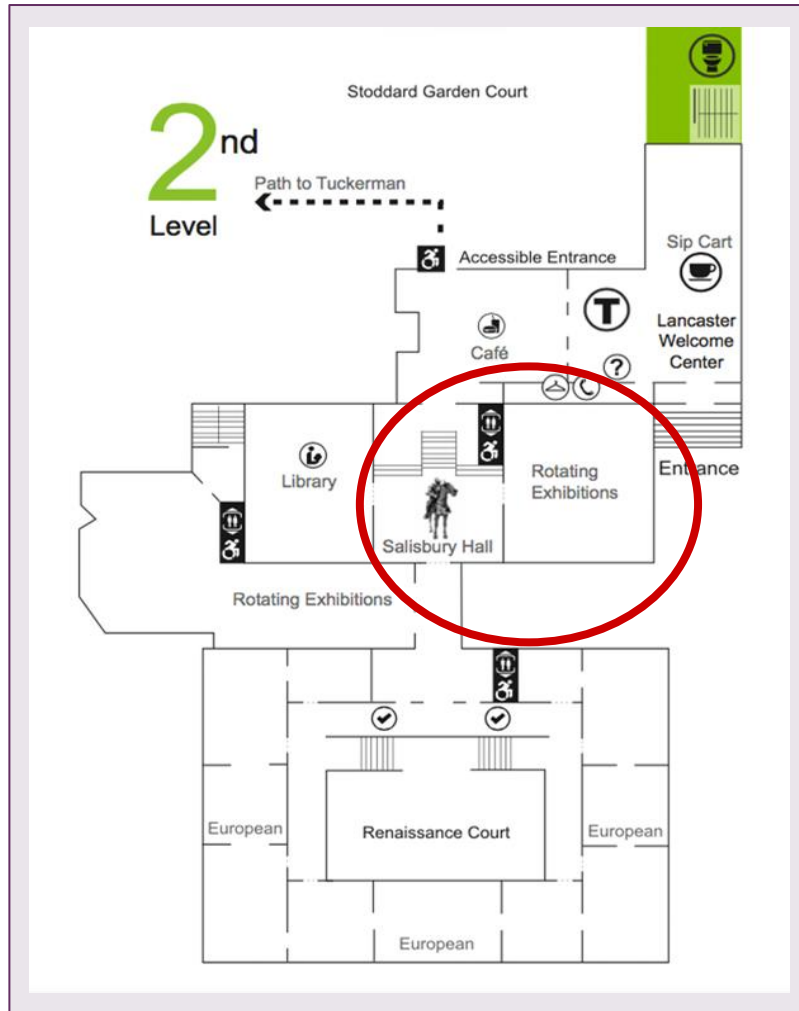


FIGURE 12 - ART CART LOCATION (WORCESTER ART MUSEUM, 2016)

Appendix V: Activity Instruction Sheets

Character Creation Activity

1. Choose a piece that is big enough to serve as your character's torso. A good example of this is either a circuit board or a relay.
2. Choose a piece that can be your character's head. This can be a keyboard key or even a transformer.
3. Decorate the rest of your character with whatever you want. Choose items that can be arms, legs, or hands and then items that can be eyes or hair. Use your creativity here.
4. When all of your items are selected, use the provided glue and tools to put your character together. Take a picture of your character with our iPad so we can share it with other visitors!

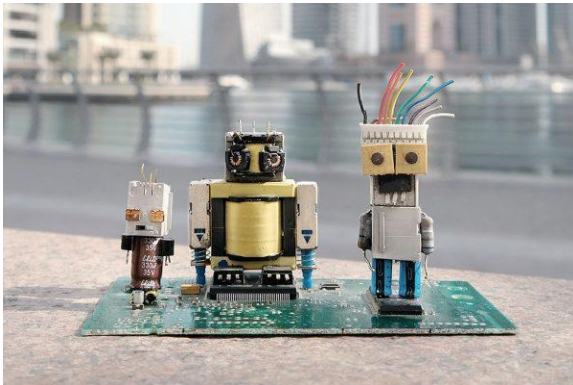


FIGURE 14 - CHARACTERS #1

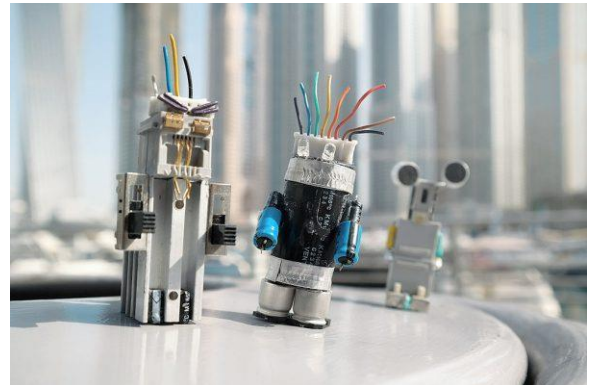


FIGURE 13 - CHARACTERS #2

Recycled Wind Chime Activity

1. Choose a base to use as the centerpiece of your wind chime. You will connect and hang other materials from this base. A good material for this will be something like a plastic bottle or cup.
2. Choose whichever materials you would like to hang from your wind chime. Keep in mind how many materials you think your base can hold. Different metals will create different sounds when colliding in the wind. Different colored plastics and other materials will add a nice looking touch!
3. Count the hanging materials you have chosen and punch that same number of holes into your base material using the tools provided.
4. Tie a single wire to each of the different materials you have selected.
5. Connect the other end of each wire to the holes you made in your base material. Use the provided clips or plugs to make a secure connection. Remember that if you want to hang this outside, it will have to be secure enough to withstand the wind.
6. Decorate your wind chime with the art materials provided to you. Color it in, paint it, or whatever you would like to do to make it look even better! Take a picture of it with our iPad so we can show it off to other visitors!

Breadboard Activity

Materials Required:

- Breadboard
- 9V battery
- Wiring Harness
- 3 LED Lights
- Jumper Wires
- Light Switch
- Computer Fan
- Three 1k ohm Resistors

Terminology:

A **breadboard** is a board for making an experimental model of a circuit. When using a breadboard, always a line the board so you are looking over top with the long edge of the board vertical as seen below.

The **power rails** are the two columns highlighted in red. The **positive rail** is marked by a positive sign at the top and is closest to the red line. The **negative rail** is marked by a negative sign at the top and is closest to the blue line. See the picture below.

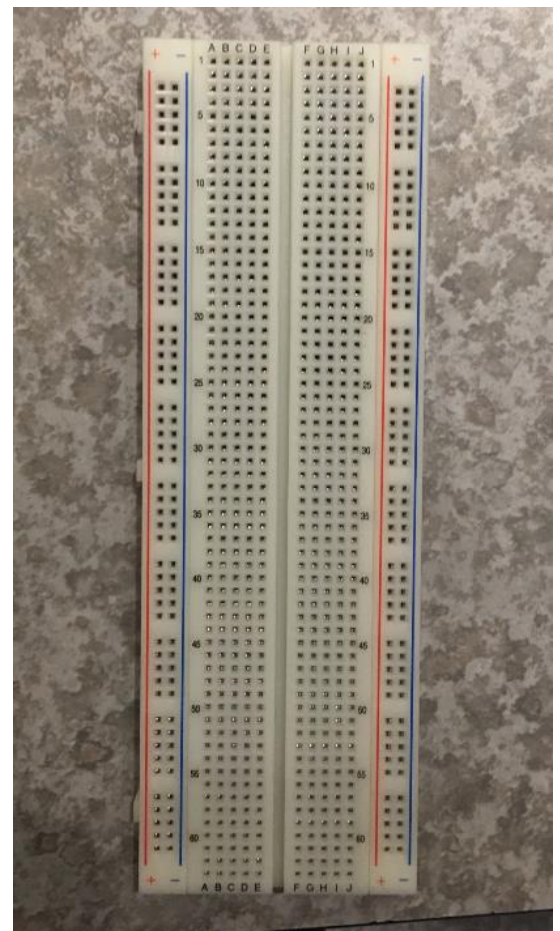


FIGURE 15 - BREADBOARD 1

When wires are placed in a line horizontally they are in **series**. Wires placed on each side of the gap in the center will still be in series, but there will need to be a wire connected the gap, as shown in the picture below. Series is a common type of wiring circuit and can be thought of as placing things in line. Electricity flows through the first object it comes in contact with and then will continue to the next. See below.

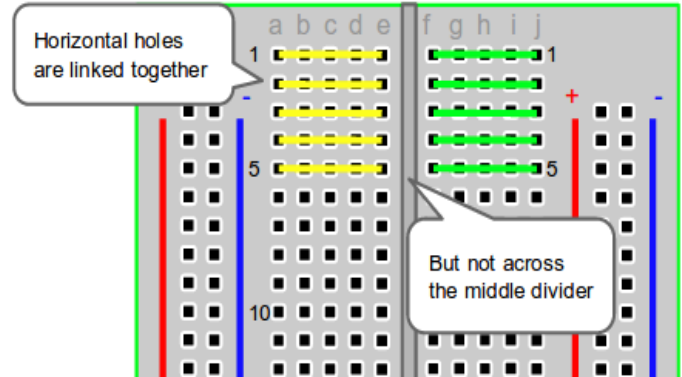


FIGURE 16 - BREADBOARD DESCRIPTION (MILLER, 2013)

Wires in **parallel** are also a common type of circuit. A parallel circuit can be thought of as two or more circuits in series. For this exercise both parallel and series circuits will be used. When more than one LED is attached they are in parallel, not series. This can be seen below.

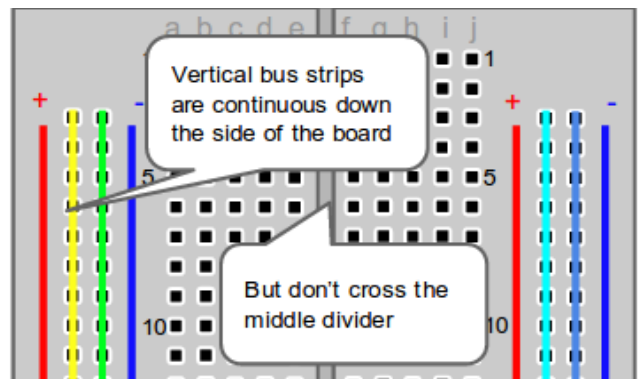


FIGURE 17 - BREADBOARD DESCRIPTION (MILLER, 2013)

When working with an LED light, there is a positive wire and a negative wire. The positive end is also called the **anode**. This is the longer of the two legs on the LED light. The negative end is called the **cathode**, which is the shorter leg of the LED light.

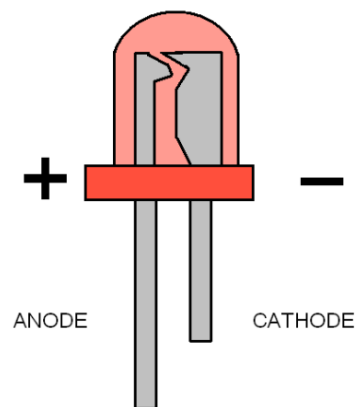


FIGURE 18 - LED LIGHT (VERMA, 2016)

Activity Option 1

Step 1

Insert the LED with the long leg (anode) placed in the positive rail of the breadboard. When looking from above the rails of the bread board are the two outermost columns, they are separated from the rest of the board by two lines; one red, one blue. If desired use more than one LED, but place each LED in a different row, as seen in the picture below.

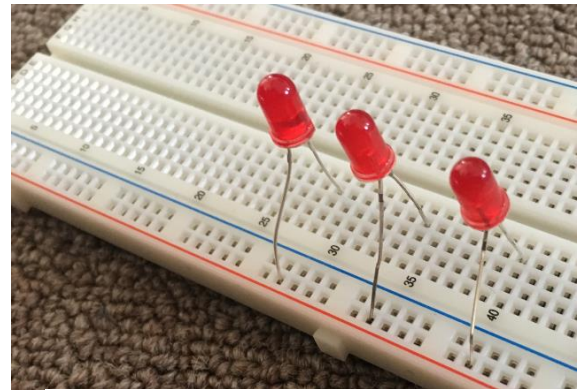


FIGURE 19 - BREADBOARD ACTIVITY STEP 1

Step 2

Insert the resistor into the board with both ends in the same horizontal row as the LED's cathode (short) leg. The resistor is not polarized so it does not matter which direction you insert it. Use one 1k ohm resistor, bridging the gap in the center of the breadboard as seen below.

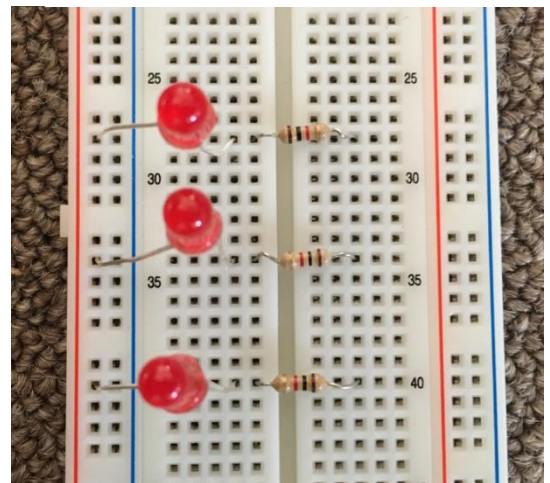


FIGURE 20 - BREADBOARD ACTIVITY STEP 2

Step 3

Wire each horizontal row to the negative ends of the power rails. The negative end should be connected to the right side of the resistor. See the picture below. The negative power rail is the outside rail closest to the blue line.

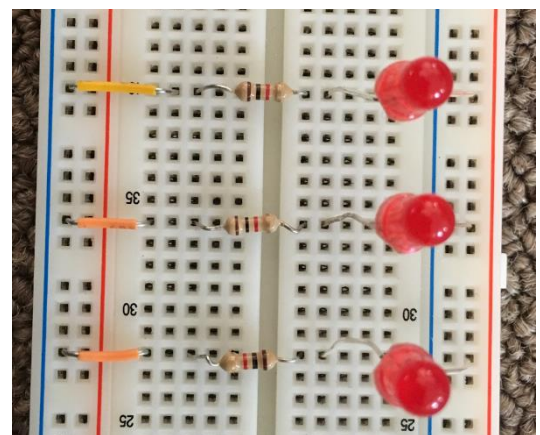


FIGURE 21 - BREADBOARD ACTIVITY STEP 3

Step 4

Plug the switch into the breadboard. Choose a location above the LEDs you have in place. One wire of the switch should go into the positive rail of the breadboard, while the other should go into the negative rail. See the picture below.

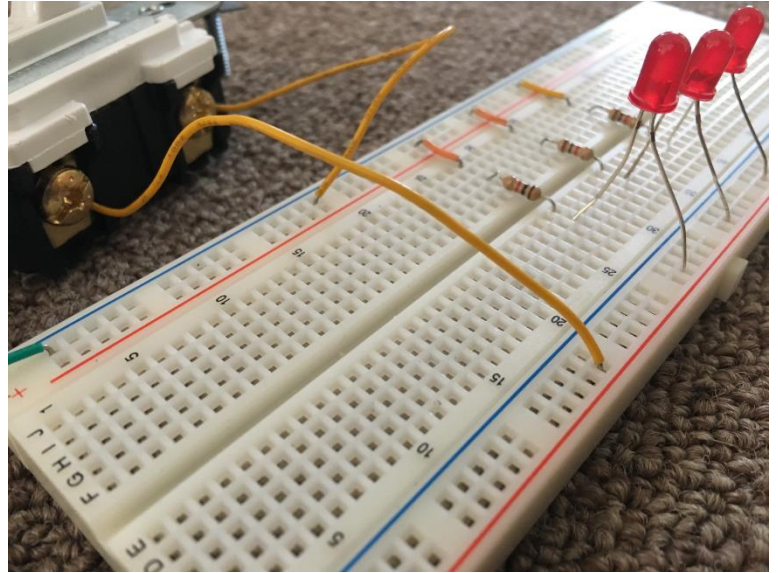


FIGURE 22 - BREADBOARD ACTIVITY STEP 4

Step 5

Attach the wiring harness to the 9V battery. Using the wires from harness attach the positive wire (Red) to the positive rail. Attach the negative (Black) to the negative rail. A finalized picture can be seen below.



FIGURE 23 - BREADBOARD ACTIVITY STEP 5

Activity Option 2 (Fan)

Step 1

Attach lead wires from fan to positive and negative power rails. The black wire is the negative wire and the red is positive. Place red in positive rail and black in negative rail.

Step 2

Place lead wires from switch into positive and negative rails. The polarity (positive/negative) doesn't matter for the switch, if they are mixed then the on will be off and vice versa. Make sure the lead wires for the switch come before the lead wires on the fan. From the top of the breadboard it should be battery, switch fan.

Step 3

Attach battery harness to 9V battery and attach appropriate lead wires to board. See image below.

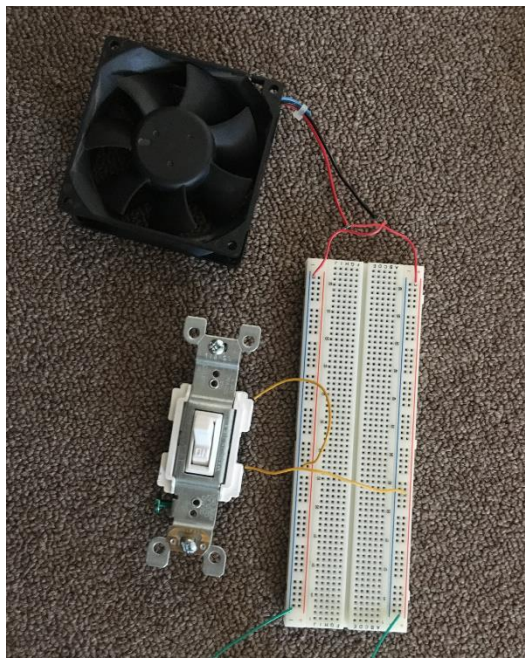


FIGURE 24 - BREADBOARD ACTIVITY OPTION 2