

WEBGAME EVALUATION

SUMMER 2006

CHILDREN'S MUSEUM OF PITTSBURGH

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WEBGAME EVALUATION

REPORT ON SURVEY AND INTERVIEW FINDINGS

EXECUTIVE SUMMARY

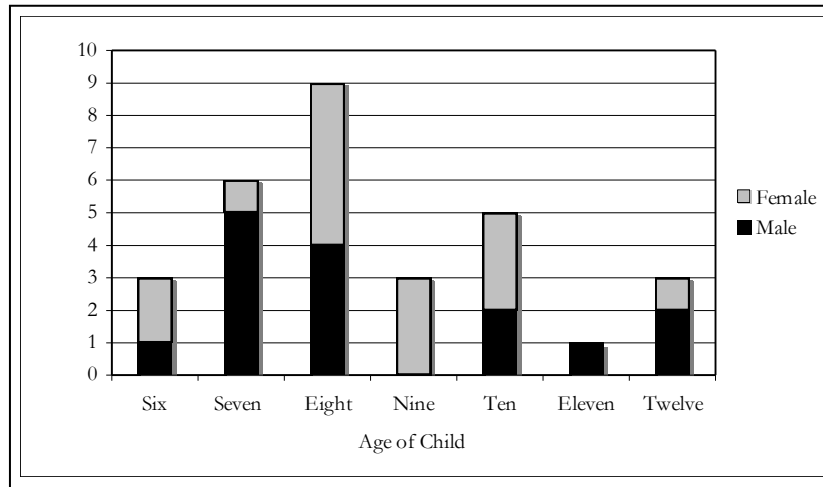
In the summer of 2006, two games were created for the Children's Museum of Pittsburgh's website – Build-a-Fountain and Build-a-Monster. The University of Pittsburgh Center for Learning in Out-of-School Environments was commissioned to evaluate: (1) Whether or not children gained any specific knowledge while playing the game, such as how to silkscreen or think critically; (2) Whether children understood the game's application to the museum; (3) Whether children understood the game's application to the real world versus the virtual world. Findings suggest:

- ❖ Computer usage and access was high among families. Almost all of the families owned a personal computer and two-thirds of the families had high-speed internet, which is required in order to play Build-a-Fountain and Build-a-Monster.
- ❖ An equal number of children were found to be frequent (3 to 7 times per week) and infrequent (0 to 2 times per week) computer users. Regardless of how many times a week they used the computer, children tended to spend no more than one hour on the computer each day.
- ❖ The most frequent activity that children enjoy using a computer for is to play games. Most of the children reported playing online as well as CD Rom games. The games that children report enjoying the most are casual online games that promote brands, products, or TV channels.
- ❖ About a third of the adults reported visiting the Children's Museum of Pittsburgh's website to obtain general information about the museum. No children had visited the Museum's website before participating in the research study. However, after playing the game, 29 of the 30 children said that they were more likely to visit the website to play the game again.
- ❖ Almost all of the children who played the Build-a-Fountain and Build-a-Monster games reported enjoying their experience. Most of the children mentioned that they would like to play each of these games again.
- ❖ After playing both of the games, children were able to recognize the similarities between the exhibits in the virtual world and the exhibits that are in the Children's Museum. Some children were also able to draw connections between objects in the game and objects in real life, such as the pipes used in Build-a-Fountain.
- ❖ Children demonstrated some understanding of the overall goals of the games and appeared to gain more knowledge about specific content, such as how a silkscreen is created or how pipes function in a fountain. Children also improved their critical thinking skills through tasks, such as the puzzle in the Dollhouse.

METHODS

Data was collected across five week days between July 18th and August 1st, 2006. Researchers interviewed and observed 30 children who were asked to play either the Build-a-Monster or Build-a-Fountain web games. Subjects were randomly selected off the floor after entering the museum. Each family was given a free admission pass to the Children's Museum for one adult and one child in return for participating in the study. All of the children interviewed were between the ages of 6- and 12-years-old. The following chart displays the ages and genders of the 30 children who participated in this study.

Chart 1. Age and Gender of Children



All children completed the same interview before playing their respective game. The pre-game interview was comprised of six questions (see Appendix A) designed to gain insight about the child's computer and online habits. The pre-game interviews lasted an average of 1 minute and 38 seconds. Children were then asked to play either the Build-a-Fountain or Build-a-Monster game for a duration of time not to exceed 30 minutes. Fifteen children were assigned to play the Build-a-Fountain game and an additional 15 children were assigned to play the Build-a-Monster game. After engaging with the web game, children were asked questions about their perceptions of their respective game, what they learned, and how the game related to the museum experience. The Build-a-Fountain post-game interview was comprised of 11 questions (see Appendix B). The Build-a-Monster post-game interview consisted of up to 18 questions depending on which rooms the child chose to enter while playing the game (see Appendix C). The post-game interviews lasted an average of 4 minutes and 30 seconds.

In addition, the 30 adults who accompanied these children were surveyed about topics such as their child's computer usage, their experience with the Children's Museum and their website, and the perceived benefits of playing the new web games. The adult survey was comprised of eighteen questions and allowed for both closed- and open-ended responses (see Appendix D). Although most of the adults who were surveyed were parents, the study did not restrict itself to this condition and so other adults including grandparents, aunts, uncles, and babysitters also answered the survey questions.

FINDINGS

ADULT SURVEY AND CHILD PRE-GAME INTERVIEW

This section presents a compilation of the findings from the 30 child pre-game interviews and the 30 adult surveys. Adults and children were asked to report on some of the same questions and their responses to these questions were often similar, if not identical. We used discretion in choosing whether to pull the data from the adult survey or child pre-game interview based on which data provided a clearer understanding of the results. Discrepancies that exist between the data in the adult survey and the data in the child pre-game interview were specifically noted where applicable.

Prior Experience with the Children's Museum and Website

Almost all of the adults surveyed (n=26) stated that they and their child had visited the Children's Museum of Pittsburgh before. Of these families, almost half were frequent visitors, (n=12), and had been to the museum more than five times.

About a third of the adults (n=8) had visited the children's museum website before. Of the third, six adults had been to the website more than three times. These parents visited the website to obtain general information about the museum, such as hours of operation (n=5), directions to the museum (n=3), parking (n=2), exhibit information and events at the museum (n=2), price of admission (n=1), and membership information (n=1). None of the children had visited the website before.

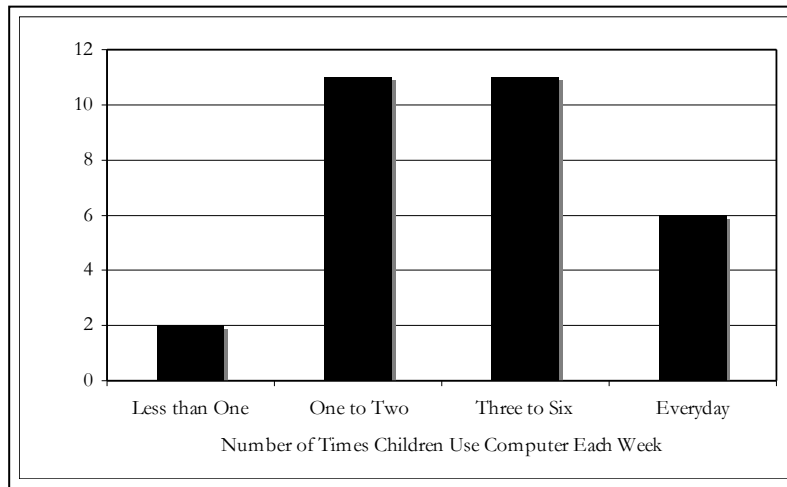
Computer Usage

Computer access and usage was high among families. Almost all of the families had a computer at home (n=29). The one family who stated that they did not own a computer were still avid computer users and mentioned that they regularly accessed the computer at the local public library.

Access to a fast Internet connection was not a problem for most families as well. Two thirds of families had high speed Internet in the form of DSL (n=10) or Cable (n=10). Five families had dial-up, and five families were unsure of their Internet access or connection speed.

While computer access was high, computer usage was split between frequent and infrequent users. Seventeen adults reported that their children used the computer frequently, or three to seven times a week. Thirteen adults marked that their children were infrequent computer users, or that they used the computer zero to two times a week. The following chart displays the number of times a week that adults reported that their children use the computer.

Chart 2. Frequency of Child Computer Use



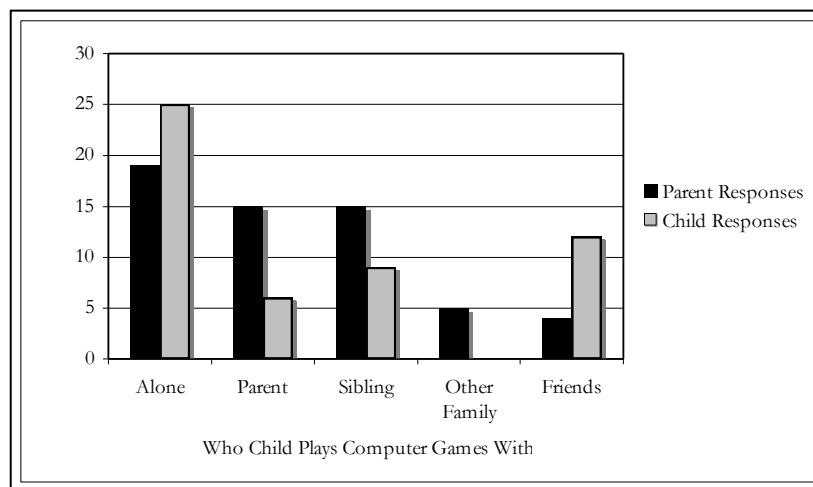
When adults were asked how long their children used the computer for, both frequent and infrequent users did not use the computer for long periods of time. The majority of children spent thirty minutes to one hour on the computer (n=19). Eight children used the computer for less than 30 minutes, and two used the computer for 1 to 1.5 hours. No child used a computer for longer than one and a half hours.

Children and Computer Games

When asked what they use the computer for, all of the children reported playing games on the computer (n=30). Other activities that children used the computer for included homework (n=13), surfing the internet (n=2), chatting online (n=2), making birthday cards (n=1), and writing stories (n=1). In addition to playing CD Rom games, most of the children stated that they play games online (n=24). Of these twenty-four children, two mentioned that although they play games online they do so infrequently. Appendix E displays a complete list of CD Rom and online games that children reported playing. The most common games children reported using were casual online games to promote brands, products, or TV channels such as Disney Channel, Barbie, or Neopets (n=69). Children also played mini or arcade games like solitaire or pinball (n=18) and educational games like Math Blaster or Jumpstart (n=13). In addition, children enjoyed playing strategy or role-playing games such as Roller Coaster Tycoon, The Sims, or Age of Empires (n=12).

Adults and children were asked to report whether or not the child typically plays games alone or if they tend to play with another person such as a parent, sibling, or friend. Visitors were asked to report all of the people that the child engages with while playing computer games and so most visitors gave more than one answer to this question. Due to discrepancies between the two data sets, responses given by both adults and children are compared in Chart 3. Approximately two-thirds of the children reported playing computer games by themselves. It is likely that adults' reports of how frequently their child plays computer games with friends were small because the child engages with friends while in school or outside of the home. In addition to friends, parents and siblings appear to be frequent playmates for children when it comes to computer games.

Chart 3. Comparison of Responses for Who Child Plays Computer Games With



Children were asked to rate their computer abilities as either: awesome/the best, good, average/so-so, or bad. Most children felt that they were good (n=17) or average (n=6) when it came to using computers. Few children placed themselves in one of the extreme categories by rating themselves as awesome (n=3) or bad (n=2). Children had several reasons for why they assigned themselves the rating that they did. Children who felt that they were good or awesome with computers often mentioned that they had a lot of experience with using them.

- ❖ *Because I use it a lot to go to different websites and everything so I'd say I'm pretty good. (Subject 6)*
- ❖ *Cause I've had a lot of experience with my dad. (Subject 11)*
- ❖ *Cause I know like how to use the keyboard and I know how to type and we take computer lessons in school. (Subject 25)*

Another reason that children reported that they were good with computers is that they are able to fix the computer if it is broken or help others who are having problems.

- ❖ *Because sometimes my brother doesn't know what to do so I help him. (Subject 12)*
- ❖ *Because sometimes if the computer freezes out I'll know how to fix it. (Subject 4)*
- ❖ *Because I know how to- like I know what to do if I get messed up or something on the computer. (Subject 26)*

Children who rated themselves as average or bad tended to do so because they knew that there was room for them to improve or they have to receive assistance from other people while using the computer.

- ❖ *It's just that I'm not on the computer a lot so I'm like -I'm afraid I'll blow up the whole computer if touch one thing. (Subject 20)*
- ❖ *I'm not the best, cause I've seen better. (Subject 9)*
- ❖ *I need my dad for help. (Subject 22)*

Adult Response to Computer Games and Children's Museum Website

Adults were asked a series of questions about how whether or not they discuss computer games with their children and whether or not they would encourage their children to play the new games offered on the Children's Museum website. Most adults reported that they talk with their children about playing computer games (n=27). Adults provided one or more examples of what topics they discuss with their children while playing computer games. The most common topics of discussion were how to play the game (n=11), comments about the plot of the game (n=5), and whether or not the child enjoyed playing the game (n=5).

- ❖ *He explains the different levels of the game. I ask general questions about the game. Who are the characters, etc. (Subject 11)*
- ❖ *What did they do, how did they like it. (Subject 19)*
- ❖ *How to use the game, how to work your way through when something difficult appears. (Subject 7)*

Adults also discussed specific concepts that are present in the game and what the game might be able to teach their child (n=4).

- ❖ *What they are doing, whether it is "good", "quality" and "appropriate, and whether the time is well spent or what they may be learning. (Subject 24)*
- ❖ *How to play the game itself, about the dinosaur information in the game and whether it is actually true information etc. (Subject 12)*

Some adults explain to their children why they are not allowed to play violent computer games (n=3).

- ❖ *I don't let them sign up and give away personal information. I don't allow them to play anything violent. I have to discuss it if they are too materialistic - like Barbie dress up sites where they act like "valley girls". (Subject 5)*
- ❖ *I explain she can't play games with violence or tell her why certain games aren't valuable or should be played minimally. (Subject 20)*
- ❖ *I'll help them play a difficult part and explain how they can do it. We also talk about why they aren't allowed to play violent or nasty games. (Subject 4)*

Most adults reported that the addition of the Build-a-Monster and Build-a-Fountain games on the Children's Museum website would make them more likely to visit the website with their children (n=24). The remaining six adults reported that it was possible that they might be more likely to visit the Children's Museum website with their children. Adults were asked whether they would be more likely to play the new web games with their children before or after attending the museum. Three adults reported that they would be more likely to play before attending the museum while eight adults thought that they were more likely to play after completing their museum experience. In addition, eight adults mentioned that they would encourage their children to play the games on the website both before and after attending the museum. Six adults had no opinion about when they would play the web games with their children. Adults felt that it would be beneficial to play the games before attending the museum because it would allow the children to become familiar with the areas in the museum and to build their interest for the visit. Adults also mentioned that playing the games after visiting the museum would be beneficial because it would help them reflect on their experience and review what they learned in the museum.

- ❖ *Before to warm them up for their visit and after to retain their interest and remind them of what they did at the museum. (Subject 26)*

- ❖ *I feel she could review/ share what she learned. (Subject 27)*
- ❖ *To schedule future visits, to see what's new, to get the most out of each visit. (Subject 18)*
- ❖ *I think this would be a great link for the kids to discover what they may see and then allow them to master the game. (Subject 7)*

BUILD-A-FOUNTAIN INTERVIEW

Perception of the Game

All of the children who played the Build-a-Fountain game reported enjoying their experience (n=15). Most children reported that they would like to play the game again (n=11) and an additional three children mentioned that they might want to play again. One child reported that they would not like to play the game again because "it's really hard". The reason given by the fourteen children for why they would want to play the game again was that it was a fun and enjoyable experience.

- ❖ *Because it was really fun. (Subject 15)*
- ❖ *Because it's fun and it's just fun (Subject 2)*

Describing the game. Children were asked to describe what the purpose of the game was. Four children reported that the purpose of the game was to construct a fountain or put the pipes together.

- ❖ *Build the best fountain. (Subject 13)*
- ❖ *The goal is to make - is to connect as many pipes as possible. (Subject 8)*

Four children made the connection that they were supposed to build a fountain that kept the water flowing by getting it in the drain.

- ❖ *Well, it kind of looks like you're supposed to get the water running through a faucet and down the drain. (Subject 5)*
- ❖ *Like trying to build a - like a fountain and trying to get it to where it could come back up. Cause there's this little part right here and so I figured that if I got the water in there it would come back up so there was more water to go up." (Subject 2)*

Children also mentioned that their role was to stop the tank from overheating and to progress through the levels (n=4).

- ❖ *Um, to keep that pipe from overheating for as high - as many levels as you can get. (Subject 6)*
- ❖ *To win. You're trying to not get the thing to explode. You've got to get the water in the sink. (Subject 12)*

Other descriptions of the game included that it was about trying to fix the faucet (n=1), blocking the water (n=1), and the Waterplay area (n=1).

Children were also asked to explain what they did while they were playing the game. Most children mentioned that they connected the pipe pieces together to construct a fountain (n=5) or that they built the pipes to keep the water flowing (n=3). Some children realized that they had to keep the water flowing so that the tank would not overheat and explode (n=4)

- ❖ *You had to click on the pipes and hook them to the one that's already there and keep building one, but make sure you don't build too much because then it might catch on fire and you don't want it to catch on fire cause you want to keep on playing. The pipe, it was, the water, it was clogging up, it was clogging up too much and the water was going to spill out everywhere and it started to get all messed up cause of how much water was in. (Subject 3)*

One child mentioned that the different shaped pipes were worth different points and that they played an important role in advancing through the levels.

- ❖ *Well first there'd be different fountain pieces and each fountain piece would be worth different points and you have to get to a thousand I think it was. Yeah, to get to go to the next level. And also I think you have to make it kind of work, like make it go in the faucet. (Subject 5)*

Favorite part of the game. Children mentioned many reasons for why they enjoyed playing the Build-a-Fountain game. Six children reported that they enjoyed being able to build and manipulate a fountain.

- ❖ *Well, it was that you were actually able to turn the pipes and like slanted and everything and other games you can't really do that that much. (Subject 6)*
- ❖ *Um, we have a water garden and I like just building fountains. (Subject 9)*

Three children enjoyed the thought and strategy that was involved with playing the game.

- ❖ *You had to find out how to try to block the water. (Subject 10)*
- ❖ *Probably learning why or why not it didn't work. (Subject 5)*

Three children liked advancing through the levels and winning the game.

- ❖ *I like how you get the pipes and the big water squirts out and then you usually get to the next level. (Subject 8)*
- ❖ *When you won. (Subject 12)*

Two children liked specific parts of the game such as the water tank and the special pipes.

- ❖ *The leaking part. (Subject 7)*
- ❖ *Like the really cool parts. Like that fountain the sprays water out. I like that. I like the exploding tank. (Subject 1)*

Finally, one child just thought that the game was fun in general.

Least favorite part of the game. The most common feature of the game that children reported as their least favorite was when the water tank blew up or got hot (n=4).

- ❖ *When the tank blew up. (Subject 12)*
- ❖ *You didn't know how to cool it. I forgot how to cool it off. (Subject 6)*

Three children identified other features of the game that they did not like and all of these responses are given.

- ❖ *It was kind of hard to like drag pipes all the way there and sometimes if you didn't get it like kind of near it, it would like go back so you'd have to do it again. (Subject 5)*

- ❖ *Well I didn't notice, but if there's a certain time in like the fourth level or something that it would stop and say put your initials here. (Subject 2)*
- ❖ *Just like the plain old parts. Just like the plain old ones. Like just the straight parts. (Subject 1)*

Two children mentioned that they could not name a least favorite part of the game because they liked it all.

- ❖ *No, I liked it all. (Subject 15)*
- ❖ *I didn't really have a least favorite part. I liked it all. (Subject 4)*

Four children were not asked this question and two children could not identify what their least favorite part of the game was.

Ways to improve the game. In accordance with their least favorite part of the game, three children reported that they would improve the game by making it so the tank did not explode.

- ❖ *To make it not run out of water and burn up. (Subject 11)*
- ❖ *Have the pump not blow up. (Subject 9)*
- ❖ *By not burning the pipe. (Subject 3)*

Two children reported that they would make the game easier in general.

- ❖ *A little more easier. (Subject 10)*
- ❖ *Well, I could make other pipes, like easier pipes, like you could attach them easier and stuff like that. (Subject 8)*

Other suggestions for improving the game included slowing down the time and allowing players to construct their own pipe pieces.

- ❖ *I would slow down the time. (Subject 15)*
- ❖ *I might let, like that exploding tank, I might like make new parts of it. (Subject 1)*

Four children were not asked this question and four children reported that there were no changes they would make to improve the game.

Comparison to Museum

Most of the children reported having previously attended the Waterplay area during a museum visit (n=12), but one of these children did not remember details of the experience. The eleven children who remembered the Waterplay area were asked whether they thought the Build-a-fountain game was similar or different from the Intriguing Pipes exhibit that is located in the museum. Most of the children felt that the web game was similar to the exhibit (n=9). These children mentioned that the web game and exhibit were similar because the activity is the same and they utilize similar looking pipes.

- ❖ *You put the pipes together. (Subject 10)*
- ❖ *Because they have like some of the same pieces. (Subject 1)*

Two children reported that there were differences between the web game and the exhibit.

- ❖ *You did not get wet in this game and upstairs you got wet. (Subject 15)*
- ❖ *Well, because in like, fountains, they don't really use pipes, they just, it's kind of water squirting up. I would say it'd just be kinda different. (Subject 8)*

Five children who had never attended the Waterplay area in the museum were asked whether they thought the web game worked the same way that real pipes would work. Three children felt that the web game was similar to real pipes and one of the children provided a reason for why.

- ❖ *Well by- if the pump runs dry it will blow- like it won't work anymore." (Subject 9)*

Two children mentioned that the web game had similarities and differences to the way the real pipes work.

- ❖ *Because like, they build sculptures sometimes and they build - they have people and then they have like a mouth open and the water goes through it or something. And it's a lot different sort of but can also go like that cause I've seen some like that too. I think it's the same because there's like, well, I think there's like a drain or a hole that could suck it back up, cause that's what it's like in my parents, um, their bathtub that has jets. (Subject 2)*
- ❖ *Well, cause you might not have the same pipes that go sideways, up, down, down, down, you might need a circle one and a pipe out like that so you can stick it to another one and it'll go in circles and go back out. But the shape, heights and how it goes straight and sideways, that's one of the same things about real pipes. (Subject 3)*

One child felt that the web game worked differently than real pipes but did not provide a reason why.

Learning

The following questions revealed that most children were able to make connections between specific parts of the game, such as the pipes and the water tank, and the overall goal of the game. Almost all of the children demonstrated at least some understanding of the overall goal of the game. Children seemed to understand that they were trying to progress through the levels and that they had to keep the pump from overheating by getting the water to flow through the tank. Some children demonstrated a higher understanding of the components of the game, with a few recognizing that the pipes they used to build their fountain determined the number of points that they received in each level.

Pipes. Children were asked a series of questions about the pipe pieces that were used to play the game in order to find out if they were able to notice features of the game and to figure out the important role that the pipes played in the game. All of the children recognized that there were differences between the pipe pieces. Some of the children mentioned that only some of the pipes were different but that similar pipes could also reappear (n=10).

Children were asked why they thought the pipes were different shapes instead of all looking the same. Most children reported that they were different so that you could change directions while you were building the fountain (n=9).

- ❖ *Cause if you used only one, you'd keep going straight, straight, straight or that way, that way, that way. (Subject 3)*
- ❖ *To make it like curve or go up or to go over to the drain. (Subject 2)*

- ❖ *Cause if they were just like all straight or something then it would just straight up and then the, uh, motor would overheat. (Subject 14)*

Three children provided additional reasons for why the pipes were different shapes.

- ❖ *Because in a real sink there's lots of different parts. (Subject 7)*
- ❖ *Because than it would be easier or harder to get the things right. (Subject 6)*
- ❖ *To make them different from just regular ones. (Subject 10)*

Three children could not come up with a reason for why the pipes were different shapes.

Children were asked to report what happened when they used the different shaped pipes. Some children mentioned that they were able to build a better or different fountain with the unique pipes (n=4).

- ❖ *You just kind of come up with a different structure. (Subject 5)*
- ❖ *You would get a better fountain. (Subject 4)*

Many children were able to make the connection that the different shaped pipes allowed them to get the water in the sink, which allowed the water to keep circulating (n=5).

- ❖ *Like it - the water would go higher and curve over to the drain so it could come back up and just keep going like that. (Subject 2)*
- ❖ *You get closer to the sink and then you have to reach the sink with the pipes and you've won. (Subject 12)*

One child recognized that the different shaped pipes played an important role in getting a higher score and advancing to the next level.

- ❖ *Like I kept the one - I kept the pump going longer. You got a high score. (Subject 9)*

Four children did not know what happened when they used the different shaped pipes.

Children offered many theories about how they were able to advance to the next level while playing the game. A few children mentioned that they had to build a good or correct fountain but did not specify what that involved (n=3). Some children mentioned things like getting the water into the tank (n=4) or stopping the tank from exploding (n=2). Other children offered incomplete explanations such as "I pushed the big rectangle button" (n=3). Only three children mentioned that they had to get a certain number of points to advance to the next level and two of these children who had already demonstrated an understanding of the pipes reiterated that the different shaped pipes gave them a different number of points.

- ❖ *You had to get a lot of points. (Subject 13)*
- ❖ *I have to have a certain score by the time the pump runs out of water. [R: And how did you get more points then?] I think by using different pipes. (Subject 9)*
- ❖ *You have to have - you have to build like a thousand points. Each thing, I mean, each pipe has a different amount of points. Some is twenty-five and some is a hundred. (Subject 5)*

Water tank. Children were also asked a series of questions to discover what they noticed and learned about the twelve-gallon tank that was used in the game. Eleven of the children recalled noticing the twelve-gallon tank in the lower corner of the game. Two children did not remember seeing it and two children were not asked this question. Of the eleven children that remembered the tank, four mentioned specific functions they thought the tank played in the game. Children mentioned that the tank was used to push up the water (n=1), help them advance to the next level (n=1), measure how much time they had left (n=1), and measure how much water was left (n=1).

Some children were asked whether or not the water tank was an important part of the game (n=6). Five children reported that the water tank was important and one child mentioned that they were unsure whether or not it was important. Most of the children who were asked felt that the water tank was important because it regulated the flow of water and allowed them to see how much water there was (n=5). While one child reported that the water tank served as the timing mechanism for the game.

- ❖ *Cause the water wouldn't be able to go up, it'd just sit there. It wouldn't be able to shoot up. (Subject 2)*
- ❖ *So then you could know how much water you have. So then your thing doesn't burn up. (Subject 11)*
- ❖ *To time you. (Subject 15)*

Some children were also asked whether or not they noticed the water levels in the tank rising while they were playing the game (n=7). Most of the children reported noticing a change in the water level (n=6). Four of these children were able to recognize that the water level in the tank was rising because the water was not getting through the pipes. These children also recognized that the water that was in the tank got hotter as the water level continued to rise.

- ❖ *Because it wasn't running. It was just leaking and it would get so tight that it could explode. (Subject 5)*
- ❖ *Because the water was getting hotter and hotter. (Subject 12)*

BUILD-A-MONSTER INTERVIEW AND OBSERVATIONS

Perception of the Game

Almost all of the children who played the Build-a-Monster game reported enjoying their experience (n=14). One child did not enjoy playing the game because he didn't understand the directions of the game. All of the children said that they would definitely (n=9) or maybe (n=6) play the game again.

- ❖ *Yeah. Cause it's fun and you can learn stuff from it. (Subject 16)*
- ❖ *Yeah maybe. Because like it's fun. And it sort of reminds you of the Children's Museum. (Subject 27)*
- ❖ *It was fun. I'm probably going to play it when I get home cause it's the funnest game ever. (Subject 29)*

Describing the game. Children were asked to describe what they thought the Build-a-Monster game was about. While answers varied, most children were able to describe at least one aspect of the game. Four children made the connection that the Build-a-Monster game took place at the Children's Museum of Pittsburgh.

- ❖ *Find the things and explore the Children's Museum cause like if you don't know where – what like the Studio is or where the Café is. (Subject 20)*

- ❖ *Children's Museum. (Subject 27)*

Another four children thought Build-a-Monster was about finding monster parts.

- ❖ *That you need to find - the parts of the monsters, and then you need to put them together. (Subject 17)*
- ❖ *I was trying to do – like find these arms [and then] put them in the backpack. (Subject 29)*

Solving puzzles or learning was a third type of description children gave about the game (n=4).

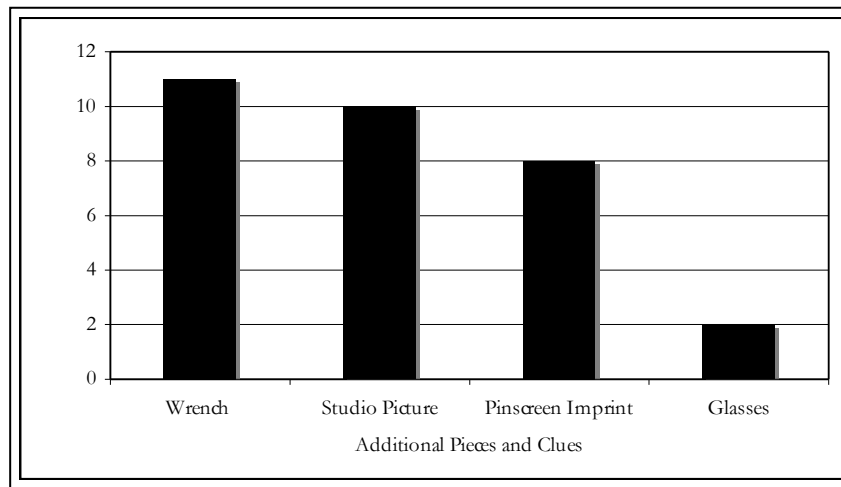
- ❖ *Well you had to try to get the monster's clothes and stuff. But I think it helped- like, you had to think about it a lot. [R: What were you thinking about] Like whenever you had to tell them the order. You had to decide which went first and how to solve it and stuff. Like mind teasers or something. (Subject 18)*
- ❖ *Like I'm thinking it was about like to help you with your strategies cause I know that like one of my hardest strategies is looking for things- Cause like sometimes they're easy to find but like sometimes they're not- and like whenever they get harder and harder I'm like "what should I do!" I think the game would help you a lot because then you could always – it shows that like if you can't find something in one place that there's like a whole 'nother place to look for it. (Subject 26)*

Finally, one child mentioned that patience was needed in solving the game, and six children either did not know the answer or were not asked the question.

Playing the game. Children on average spent twenty-two minutes playing the Build-a-Monster web game. At least two children were stopped by the researcher because they wanted to continue playing past the designated time. On average, children found 18 out of the 26 possible monster pieces, with some children finding as few as six pieces and only one child finding all 26. The child who successfully found all 26 pieces played for longer than the allotted time period and received a lot of assistance from his older sister.

In addition to the monster pieces, children were able to find four clues and additional pieces while playing the web game. The additional pieces were a wrench and a pair of glasses and the clues were a picture of the monster in the Studio and an imprint of the monster at the pinscreen exhibit. The clues were necessary for completing the Build-a-Monster activity, since they demonstrated how the monster pieces should be placed together. Most children found one or more of the clues and additional pieces (n=14), however only two of these children successfully found all four. The following chart displays the number of children who found each of the four clues and additional pieces. The glasses were the only additional piece that most were unable to find, because they had to successfully complete a two-color process silkscreen in order to obtain this object.

Chart 4. Additional Pieces and Clues that were Found



Favorite part of the game. Children mostly enjoyed visiting the different rooms of the museum in the game, especially those with an activity. Some children reported enjoying more than one exhibit area or activity in the Build-a-Monster game. The Attic/Dollhouse was the children's favorite (n=6) followed by the Studio (n=2), and Mister Rogers' Neighborhood (n=1).

- ❖ *I liked the Dollhouse. Yeah, that was cool. (Subject 25)*
- ❖ *I like the silkscreen. (Subject 30)*
- ❖ *Like the easy part of it. I think it's one of these. I don't know what it's called. The Mister Rogers', yeah, that's what I mean (Subject 28)*

Children also enjoyed finding the monster parts (n=4) even though several children believed the monster parts were clothes instead of actual pieces of the monster.

- ❖ *I liked trying to find all of the different clothes. (Subject 18)*
- ❖ *Probably just doing everything, trying to get all the pieces. (Subject 23)*

A few children liked that the Build-a-Monster Game made you think (n=2), or mentioned liking the game in general (n=1). One child also enjoyed watching the introductory Build-a-Monster video.

- ❖ *Like it wasn't too easy. Like it wasn't like boring. Like it wasn't like it gave you all the answers and stuff. Like it was tricky in some parts, which makes it more challenging and fun. (Subject 27)*
- ❖ *The best part about the game is just the whole thing. (Subject 26)*
- ❖ *Where the guy was talking about he only had one part of his body – his head and stuff. (Subject 16)*

Least favorite part of the game. Many of the activities that were the favorite for some children were the least favorite for others. The areas and activities that were both liked and disliked by children were those that were most difficult, such as the Dollhouse puzzle. This difference seems to have less to do with the child's

age and instead is related to whether or not a child enjoys engaging in difficult or challenging tasks. Two children specifically mentioned that the game was hard in general.

- ❖ *That it was hard. (Subject 20)*

Although many children had reported liking the Attic/Dollhouse, some children reported that this was their least favorite part of the game because the puzzle was too difficult to solve (n=4).

- ❖ *Well some of the clues were sort of confusing for the Dollhouse. So that was sort of confusing. (Subject 27)*
- ❖ *Well the Dollhouse was hard. (Subject 22)*

Another activity that was liked by some children and not by others was finding the monster parts (n=3).

- ❖ *Some of the stuff was really, really hard to find. (Subject 18)*
- ❖ *Trying to find the stuff. (Subject 16)*

Other areas of Build-a-Monster that children mentioned as their least favorite were the Café (n=1) and the Garage (n=1), but no reason was given for why they did not like these rooms. One child was bothered by the fact that the videos were not loading properly. Also, one child mentioned that she did not like how her hand got tired while she was playing the game.

Ways to improve the game. After playing the Build-a-Monster game, children were asked to name a room they had seen in the game that they would want to explore further. The rooms that children mentioned were evenly distributed between the Garage (n=3), Waterplay (n=3), Café (n=2), and the Theater (n=2). In addition, Mister Rogers' Neighborhood, the Studio, and the Attic all received one response each. Listed below are some ideas children had on what additional games they would like to see added to these areas.

- ❖ *Cause I know in that Garage there's like a car I think. Like maybe like a little driving thing or something like that. (Subject 18)*
- ❖ *I wished the water room would have more things to do cause it only had like two body parts in it. The game should have like - the rooms should have more body parts in them because there - then it's just like "where -where should I look I've looked everywhere!" And I also wish Mister Rogers had some games on it. Like make your own puppet show or something? Cause yeah like- or like create your own puppet, something like that. (Subject 26)*
- ❖ *Maybe the art. Maybe like you could do like arts and like crafts and stuff. And like draw. (Subject 27)*
- ❖ *The Theater. Like you would have to put a play together or something. (Subject 30)*

In addition, children mentioned that some of the rooms in the web game were too dark and it made it hard to see the pieces, especially the Theater. Children also mentioned that providing more hints or directions might make the game less difficult.

Comparison to Museum

Children were asked to compare the virtual areas that appeared in the web game to the areas as they actually appear in the Children's Museum. Most children reported that the exhibit areas that they viewed on the web game were similar to the exhibit areas in the museum (n=10). These children reported that the web game and the museum were similar because they looked the same and shared the same rooms (n=5). Some

children mentioned specific areas that they felt were particularly similar such as Mister Rogers' Neighborhood (n=2), the Café (n=2), the Studio (n=1), and the Attic (n=1). One child felt that the web game and the Children's Museum were similar because they are both fun.

- ❖ *Cause there's all the rooms and they look the same. (Subject 18)*
- ❖ *Cause it's like the stuff in Mister Rogers' Neighborhood and everything. (Subject 16)*
- ❖ *Because it's fun like the Children's Museum, it's – it actually kinda looks like the Children's Museum. I'm like I realize all this stuff and I like – I look at all the stuff and I'm like I actually know where that is. It's just like wow. (Subject 26)*

Three children reported that the web game and the exhibits in the museum were different. When asked to provide specific areas that they felt were different from the museum, these children mentioned the Garage Workshop (n=1), the Theater (n=2), and Waterplay (n=1).

- ❖ *Well, you know, the garage was very different from – and so was the theater. (Subject 21)*
- ❖ *[R: Which parts would you say are not real?] Like the water. (Subject 12)*

Two children were unsure how to answer this question because they had no prior experience with the exhibits in the Children's Museum.

Learning

Four areas in the Build-a-Monster game were designed with educational goals in mind, the Silkscreen area in the Studio, the Dollhouse in the Attic, the Build-a-Monster Activity, and three educational videos about the museum that are embedded throughout the game interface. Children were only asked questions about the specific areas that they had visited while playing the web game.

Silkscreen. Nine children visited the Silkscreen area in the Studio and were asked a series of questions about what silk-screening is, how it works, and how it relates to the museum. Of these nine children, five were observed to have successfully completed the one-color silkscreen process. Four were observed to attempt the two-color silkscreen process. Of those four, two were observed to have successfully completed the two-color silkscreen process. Children who completed the two-color process were able to correctly explain the difference between making the monster arm (one-color process) versus making the monster head (two-color process).

- ❖ *The monster head you have to do twice. Two times of doing the silk screening. (Subject 30)*
- ❖ *The first one you only had to do one color on it. And I think the pieces were easier to put together. (Subject 18)*

The Silkscreen area was difficult to understand for many children, and six children could not continue without assistance from the researcher. Three children who did not ask for help were able to put the newspaper pieces together in the first step of the silk-screen process, but then could not figure out the next step. Feeling baffled, they clicked on the museum map instead, exiting the activity thinking they had completed it.

A reason for this may be because some children did not know what silk-screening was. When asked, only three of the nine children were able to describe the entire silkscreen process they had just completed, explaining that the three necessary steps were cutting the paper and putting it together, layering paint over the

cuttings, and sending it through the dryer. Four children explained that they were trying to match the goal image or solve a puzzle, and this may be because they did not complete the next two steps, visiting the Silkscreen Beds and the Dryer. Two children were not able to give an explanation.

- ❖ *You had to look at the picture. You had to put the papers together. And then- Then you had to pick the paper and the paint to match the picture. And then you had to dry it. And then you had to dry the picture and the piece would come out. (Subject 30)*
- ❖ *I made the littler picture thing. I had to put the pieces together then pick the colors I wanted and dry it. (Subject 24)*
- ❖ *I was making this picture exact cause I'm pretty good at making pictures exact. You have to figure out – you had to put the pieces like this, you had to try to make that. (Subject 26)*
- ❖ *Like you were putting it to match this. To match the goal image. (Subject 27)*

Children who had previously visited the museum were asked if they had done a silkscreen before. Four children had done a silkscreen in the museum before and two had not. Four children were also asked if they thought silk-screening in the game was the same or different than silk-screening in real life. Three children thought it was different and one child thought it was the same.

- ❖ *It was a little different, because one you didn't get to cut out the pieces. (Subject 30)*
- ❖ *It was kinda different, because he– [the monster in the game] kinda made little scribbles but that one [in real life] there was a brush that went up and down. (Subject 19)*
- ❖ *I think it was similar. (Subject 18)*

Three children also felt they could do a silkscreen better after playing the game.

- ❖ *I think I would understand it more. (Subject 18)*

Attic/Dollhouse. Thirteen children were observed to attempt the Dollhouse puzzle while playing the Build-a-Monster game. These children were asked a series of questions to discover how they chose to engage with the Dollhouse puzzle and whether or not they found it to be complex. Of the thirteen children, six people were observed to successfully complete the Dollhouse puzzle while the remaining seven children attempted but could not solve the puzzle. Most children made several attempts at completing the puzzle before they either succeeded or stopped trying and moved on to another area of the game. Three children required help from the researcher or the adult who accompanied them in order to understand the directions for completing the puzzle.

Most children reported that the Dollhouse puzzle was difficult to solve (n=8). Many children felt that it was difficult because the clues were confusing and they had a hard time understanding what they meant (n=5). Even though children may have found the game difficult, several people throughout the interview mentioned that the Dollhouse puzzle was fun because it was so challenging.

- ❖ *It was pretty hard because I didn't understand exactly what to do. (Subject 17)*
- ❖ *Like the dollhouse is really hard cause like, I didn't know what to do. And I was getting confused and just like click – clicking random things. (Subject 20)*
- ❖ *Like I finally got it. It was challenging, which made it fun. But the clues were sort of confusing. (Subject 27)*

Several children reported that it was difficult to understand the puzzle at the beginning but that it got easier to figure out as they continued to read the clues and started to figure out the correct order (n=4).

- ❖ *In the middle because once you figured like one out they kind of – it went easier after you got it. (Subject 18)*
- ❖ *Hard at the beginning cause I didn't know how to do it. Then when I figured out that there was clues and stuff, it was easy. (Subject 23)*

One child reported that the Dollhouse puzzle was easy to solve, however this child received a great deal of assistance from his older sister while completing the task.

The Dollhouse puzzle was designed to provide children with several resources that they could utilize to help them solve the task. The worksheet that allowed children to keep track of what activity may or may not take place at a certain time was only observed to be used by three children. The hints that were provided on the screen and by clicking on the Monster head were essential to successfully determining the order of the activities. The nine children who were observed to use the hints while attempting to solve the puzzle were asked whether or not they found the hints to be helpful. Most of these children felt that all or some of the hints were helpful (n=7).

- ❖ *I think they were helpful. (Subject 18)*
- ❖ *Some of them were helpful, some I didn't understand though. (Subject 17)*
- ❖ *They helped because I was really just clicking randomly at things and then the clues helped me a little. (Subject 21)*

Two children reported that the hints were not helpful when attempting to complete the Dollhouse puzzle.

- ❖ *It was like kinda– I didn't really get what he said. (Subject 20)*
- ❖ *They were kinda confusing. It didn't help me that much. (Subject 22)*

Build-a-Monster Activity. The Build-a-Monster activity could only be completed once most of the monster parts were found in the game. Thus only three children attempted this activity, and only one completed the activity because they continued to play the game well past the designated thirty-minute stop time. Of the three children, two felt the activity was easy to solve. One child had used the clues given in the game to solve the activity, while the other had used a trial and error technique. One child found the Build-a-Monster activity hard because they had not yet finished finding all of the required missing pieces.

Educational Videos. Three educational videos were embedded into game – a video about the Theater room in the museum, a video about the clay exhibit in the Studio, and a video describing the silk-screening process in the Silkscreen area of the Studio. Because several bugs were still being worked out at the time of this evaluation, we were only able to get feedback on the clay exhibit video. Six people found and watched the clay video. While most children who watched the videos enjoyed them (n=4), two children found them boring.

- ❖ *It was pretty interesting. (Subject 30)*
- ❖ *I wasn't really paying any attention. I don't really watch any boring things. (Subject 19)*

When children were asked if they wanted to see more videos, reactions were mixed. Three children said they wanted more videos, one specifically mentioned wanting a video for each room. Four children were content with the current amount of videos already in the game.

- ❖ *I thought they were pretty good cause they taught you about the stuff and you learned like what it's about and how to do it and stuff. [R: Do you think you would want to see more videos?] Yeah, maybe like one in every room. (Subject 18)*
- ❖ *I think that was enough. (Subject 30)*

RECOMMENDATIONS

- ❖ Kids are already used to and enjoy playing online games that promote a product and will likely enjoy playing Build-a-Fountain and Build-a-Monster if they know that the games are available on the Children's Museum's website. Advertise the web games clearly as a banner on the front/home page of the website and make sure that the links are easily accessible. Also, provide a flyer at the admissions desk and in the museum newsletter that provides a synopsis of the games and where they are located.
- ❖ Parents are likely to view these forms of advertisement and take their children to the website to allow them to try out the games. However, if you want to reach children directly than you should have a kiosk in the lobby of the museum where children can play a five-minute demo of the game. This will expose them to the game for long enough that they will find it enjoyable and want to play more.
- ❖ Since adults talk to their children about playing games, it is important to encourage and support parent-child interaction while they are playing the web games. Parents, especially those with younger children, will need to be able to read and help explain directions for children to be successful in the games.
- ❖ Children reported playing on the computer frequently for brief periods of time. Only one child was able to complete the Build-a-Monster game successfully and it took him about 40 minutes with assistance. Children who have limited computer time may become frustrated with the game if they are never able to complete it. Consider having a save button for Build-a-Monster so that children can play for awhile one day and then return to where they left off the next day. Build a fountain is successful because play time is short, yet challenging.
- ❖ Consider having different levels of difficulty or parsing the game so that children do not have to play it in its entirety. This will allow children of varying ages to experience and enjoy the game. For example, younger children expressed interest in putting the monster pieces together but may be unable to find all of the pieces in the current Build-a-Monster game.
- ❖ Some children found the game difficult and suggested having additional hints or directions for the games or clarifying the existing hints and directions.
- ❖ If you expand this game, add further educational content to other exhibit areas by including more videos or additional mini games that would help expand on critical thinking skills or teach children about a knowledge concept, such as how an engine works.

APPENDIX A: PRE-GAME INTERVIEW QUESTIONS

1. How old are you?
2. Do you ever play games on the computer?
 - A. If yes, how many times per week?
 - B. What are your favorite games to play on the computer?
3. Have you ever gone to the Children's Museum website before?
 - A. If yes, what did you do on the website?
4. How good are you at using the computer? (Awesome/the best, good, so-so, bad)
 - A. Why do you give yourself that rating?
5. Do you ever play games online?
 - A. If yes, what games do you play/what websites do you go to?
6. Who do you play computer/web games with?
 - A. Do you ever play alone?
 - B. Do you ever play with anyone else (friends, parents, sibling)?

APPENDIX B: BUILD-A-FOUNTAIN INTERVIEW QUESTIONS

1. Did you like the game?
 - A. What was the best part about the game? Why?
2. What did you like least about the game? Why?
3. What do you think this game is about?
 - A. What was the goal of the game?
4. Can you just explain what you just did?
 - A. How do you play the game?
 - B. Pretend you had to tell your mom/dad what you just did. What would you tell her?
5. Were all the pipes in the game the same or were some different?
 - A. Why would you use different shapes in the fountain?
 - B. If different - Why do you think they are different shapes?
6. What happens when you use the different shaped pipes?
7. How do you get to the next level in the game?
 - A. How do you win?
 - B. If answer is "By getting more points": How can you get the most points?
 - C. Is there anything else that helps you get to the next level?
8. What is the box in the lower corner for (12 gallon tank/water level)?
 - A. Do you think it's important to the game? Why?
9. Did you notice the water levels rising?
 - A. If yes, why do you think this was happening?
10. Have you been to the Water Play area in the Children's Museum before?
 - A. If yes, do you think it's the same or different as the Build a Fountain exhibit there?
 - B. Do you think you'd be able to do the same thing that you did in this game there? Why?
 - C. If no, Do you think this is how real pipes work? Why?
 - D. Is this how you really build a fountain?
11. Do you think you would play this game again? Why or why not?

APPENDIX C: BUILD-A-MONSTER INTERVIEW QUESTIONS

1. Did you like the game?
2. What was the best part about the game? Why?
 - A. What was your favorite activity/room to do? Why?
3. What was the worst part about the game? Why?
 - A. What was your least favorite activity/room to do? Why?
4. Are there any rooms that you wished you could explore more or that you wished had a game? A.
Which room/rooms?
5. Do you think the game is similar or different to the Children's Museum?
 - A. How do you think museum in the game is different than the museum in real life?
 - B. How do you think the museum in the game is the same as the museum in real life?
6. Would you play this game again?

Silk Screening in the Studio

7. Can you explain what you just did in the studio?
8. What was different about making the monster head versus the monster arm? Why?
9. Do you know what silk screening is?
 - A. Do you know how it works?
10. Have you ever done a silkscreen in the museum before?
 - A. Is it different or the same as doing it at the museum?
 - B. What is different about it? What parts are the same?
 - C. If no, do you think you could do a silkscreen now?

Attic/Dollhouse

11. Was the puzzle easy or hard?
 - A. What made it easy or hard?
12. Were the hints helpful?
 - A. Why or why not?
13. How did you solve the puzzle/figure out the answer?

Videos

14. Why do you think there were mini videos in the game?
15. What do you remember from the clay/silkscreen video?
 - A. Was the silk screen video helpful when playing the game? If yes, how?
16. Would you want to see more videos?
 - A. About what/which rooms?

Build a Monster Activity

17. Was it easy to put the monster together?
 - A. Why or why not?
18. How did you know what parts to put together?

APPENDIX D: ADULT SURVEY QUESTIONS

1. Have you or your child been to the children's museum before? (Circle One)
 - a. No, this is my first time.
 - b. Yes, once
 - c. Yes, 2-3 times
 - d. Yes, 3-5 times
 - e. Yes, More than 5 times

2. Have you been to the children's museum website before? (Circle One)
 - a. Yes
 - b. No

3. If yes, how many total number of times have you visited? (Circle One)
 - a. 1 time
 - b. 2-3 times
 - c. 3-5 times
 - d. More than 5 times

4. If you have visited the website, what did you visit the website for?

5. Do you have a computer at home? (Circle One)
 - a. Yes
 - b. No

6. What type of Internet connection do you have? (Circle One)
 - a. Dial-up
 - b. DSL
 - c. Cable
 - d. Other (Please Specify) _____

7. How many times does your child use the computer per week? (Circle one)
 - a. 0 times per week
 - b. 1-2 time per week
 - c. 3-6 times per week
 - d. Everyday
 - e. Other: _____

8. How long does your child use the computer for during each sitting?
 - a. Less than 30 minutes
 - b. 30 minutes to 1 hour
 - c. 1 hour to 1.5 hours
 - d. 1.5 hours to 2 hours
 - e. More than 2 hours

9. Who does your child typically use the computer with? (More than one answer can be circled.)
 - a. Alone
 - b. With sibling
 - c. With a parent
 - d. With other family member

- e. With friends
- f. Other: _____

10. What activities does your child use the computer for? (ex/ homework, play games, surf the net, chat online, etc)

11. Does your child ever play games on the computer?

- a. Yes
- b. No

12. Which games?

13. Do you ever talk to your kids about the computer games they play?

- a. Yes
- b. No

14. If yes, please elaborate. What do you talk about?

15. When would you encourage your kids to play the Build a Fountain game? (Circle One)

- a. Before Visiting the Museum
- b. After Visiting the Museum
- c. Both Before and After
- d. Never
- e. Other: _____

16. Based on your response to Number 15, why did you choose that response?

17. Now that this game is available online, do you think you are likely to visit the Children's Museum of Pittsburgh's more often?

- a. Yes
- b. No
- c. Unsure/Maybe

18. Now that this game is available online, do you think you are likely to visit the Children's Museum of Pittsburgh's WEBSITE more often?

- a. Yes
- b. No
- c. Unsure/Maybe

APPENDIX E: COMPILED LIST OF COMPUTER AND ONLINE GAMES

Games/Websites Mentioned More Than Once	Games/Websites Mentioned Once
Disney Channel (16) Educational games (9) Barbie (6) Cartoonnetwork.com (6) Nickelodeon (6) Rollercoaster/ Zoo Tycoon (6) Solitaire (6) Neopets.com (5) PBS kids.com (4) Millsberry.com (3) Star Wars (3) Bratz (2) Hot wheels (2) Lego.com (2) Pinball (2) Sims (2) Trollz (2)	Addictinggames.com Age of Empires American Girl Backgammon Backyard Soccer Battlefield Bionicle Bowling Candystand.com Chess Concentration Curious George Dear America Demolition Derby Dinosaur Adventure Dragon Fire Eyes Dream on Figure 8 race Freddy Fish II Guild wars Harry Potter Hillbilly game Hunting Game Jumpstart Lemonade Stand Mah Jong Nancy Drew Nintendo.com Polly Pocket Putt- putt Scooby Doo Storybook Maker Thomas the Tank Engine Veggie Tales Webkins.com