IPRO 333

Interactive Web Site Module Design & Development for Museum of Science & Industry

Spring 2008

Final Report

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1. Introduction

Interactive entertainment is currently one of the most popular diversions among grade-schoolers. Of those students we sampled, nearly all were familiar with online flash games. IPRO 333 incorporates educational concepts inside interactive flash modules which can be interactive and effective learning tools while at the same time remaining portable and accessible.

2. Background

The Museum of Science and Industry (MSI) recently redesigned their website and came to IIT's IPRO program seeking help to develop an interactive section of the website. IPRO 333 developed modules which are meant to provide enrichment and teach scientific concepts to eighth graders. The modules were developed with Adobe Flash, perhaps the most omnipresent and powerful platforms available for rich web applications. This IPRO does not solve a "problem" in the traditional sense, but rather serves as an enhancement to MSI's website upgrade project. In the previous semester, IPRO 333 conceptualized and developed three module prototypes and brought them in for user testing at a local elementary school. Our work this semester was based on the results of that user testing as well as the feedback we received from our contact at MSI.

3. Purpose

The goals of this IPRO included raising the number of users visiting the MSI website by developing three interactive modules aimed at an eighth grade audience. Each module reflects specific scientific themes based on our own research and analysis. These modules should aid parents, teachers, and students with an eighth grade curriculum, as well as supplement existing or future exhibits at MSI.

4. Research Methodology

Having already developed prototypes for the three modules, the team focused this semester's research entirely on user testing. The first phase consisted of testing our sample content and focus group questions on IIT students. There was a group for each of the three modules. Each group prepared user testing questions and an updated prototype. Each group arranged for several IIT students to serve as test subjects. Each group had one facilitator and at least one note-taker. The facilitator first gave participants a brief survey to fill out. Following this, the facilitator led the participants in a focus group discussion. The facilitator would ask questions from an already prepared list, while the note-takers recorded the discussion. Following this, the facilitator walked the participants through the prototype, asking prepared questions along the way. Following this, the facilitator gave each participant another survey, this time regarding the nature of the prior user testing. This round of testing was intended to help refine the user testing process for the actual testing conducted at John C. Haines Elementary School.

To perform the final user testing there were two necessary tasks that needed to be accomplished. First, each member of the IPRO 333 was required to obtain IRB (Institutional Review Board) certification via a web-based course. Second, student and parental consent forms were designed and were given

to each student who would participate in the user testing. The users were science students in 7th grade at John C. Haines Elementary School and their lab teacher was Bridget Dziedzic. The users were divided accordingly so that each module was able to test 3-5 students. The module teams were allotted 20-25 minutes with the group of users.

Each module team first gave the user profile survey with a set of questions designed to get an overview of the user's background regarding his or her current school work with either genetics, energy conservation, or simple machines (the three subjects of the modules) and other background information such as video game play and Internet usage. Each module team brought two or three laptops with their module and at least 2 members to supervise and take notes of the users interacting with the module. This interaction was facilitated by at least one member taking the user step by step through the module and asking questions regarding specific aspects of the game such as graphics, navigation, content, etc. The machines group also allowed time for a focus group permitting the users to interact directly with the moderator and each other, with the other members taking notes. Some module teams also utilized a debriefing survey which allowed users to express their opinions and ideas in writing. Once the data was collected, members from each module team input the data in standard formatted sheets to quantitatively and qualitatively analyze the data.

5. Assignments

The group is divided into three teams, one focused on each of the three modules for this semester. Each team is organized according to the following chart.

Module	**Leader**	**Content Manager**	**Designer**	**Developer**
Energy	Monica Smith	Monica Smith, Susan Mallgrave	Andrew Hofland, Laura Rodriguez	Joseph Nicorata
Genetics	Daniel Price	Elizabeth Moss	Eri Suzuki	Daniel Price, Kristina Lakiotis
Machines	Marc Huh	Marc Huh, Joe Carden	Joseph Kaiser	Patrick Aubin, Janusz Nosek

Roles within each group are defined as follows:

- **Leader**

  Organizes and oversees flow of work of specific module

- **Content Manager**
  Researches and compiles content for specific module
- **Designer**
  Creates design ("look") of module and supplies graphics
- **Developer**
  Writes the code for each specific module

Individual project roles include:

Meeting Roles

- **Agenda Maker:** Hannah Cho
- **Minute Taker:** Elizabeth Moss
- **Time Keeper:** Monica Smith
- **Master Schedule Maker:** Hannah Cho
- **Igroups Organizer:** Andrew Hofland

Deliverable Roles

- **Project Plan**: Monica Smith
- **Code of Ethics**: Kristina Lakiotis, Joe Carden
- **Midterm/Final Reports:** Joseph Kaiser, Susan Mallgrave
- **Midterm Presentation/Slides:** Joe Nicorata
- **User Testing:** Marc Huh, Daniel Price, Laura Rodriguez
- **Meeting Minutes:** Elizabeth Moss
- **Project Documentation:** Hannah Cho
- **Website:** Andrew Hofland
- **Posters/Brochures:** Patrick Aubin, Janusz Nosek
- **Client Deliverables:** Eri Suzuki

6. **Obstacles**

Work in IPRO 333 has progressed smoothly for the most part. It is felt that team members who were in Fall 2007 IPRO 333 learned from some early mistakes, and current semester team members are reaping benefits from this earlier learning curve.

An obstacle for the genetics team was the selection of a reward for each student once they complete playing the module. The team wanted to give the student a set of points, but was unsure how to include this feature. They discussed having the student print out a certificate, but decided that eighth graders would consider this rather beneath their age group.

The decided-upon strategy has been to create a survey that each student can print out at the end of the genetics portion of the module. This survey can be used with family members, to determine who inherited dominant and recessive traits in their own families. However, there is some concern that this strategy may not be entirely politically correct, as many children do not live with their biological parents. The team is waiting for feedback from a proposal sent to the client, to determine if they should keep this form of reward.

An obstacle for the energy team has been that it has taken more time and effort to successfully research alternative energy costs for the module than was originally thought to be necessary. There are many variables involved in assessing such expenses.

The decided-upon strategy is to meet with IIT faculty members for guidance and advice on costs related to various sustainable energies.

An obstacle for the machines team was their desire to make their module very educational content heavy, rather than focusing on entertainment. At first the team members wanted to give the student users text-based "word problems" in the game. Stephen reminded them, at the Museum of Science and Industry client meeting on February 8, that the main priority was for the game to be fun and interactive. So the machines module was redeveloped, to merge the graphical adventure with animated graphic puzzles with which the student can interact. They feel the proper balance of enjoyment and interaction has been reached.

IPRO 333 faces a few known challenges in the remaining weeks of the semester. Each sub-team recognizes that they must balance the suggestions from user testing with the comments they receive back from the client.

The machines team expects to run into a time constraint problem, in terms of fully developing the game, as they did a major overhaul on what had been done in IPRO 333 in the Fall 2007 semester. They have only one developer to code the flash, and he must work quickly. They are investigating having other members of their team learn flash to aid with the coding process; another alternative might be to find help from other IIT students, outside of the IPRO.

Remaining Obstacles

No major obstacles remain. One issue that has arisen in the second half of the semester is one of coding. The genetics team had a "code crash" after the mid-point in the semester, and so the coding process had to be restarted from scratch.

The machines team had planned less time for coding than turned out to be practical, as the coding for such an interactive module is complex and multi-layered. Their solution was to implement a flash application program interface, allowing them to place coordinates and set specific rules regarding physics interactions for each object. Once the developer had finished this implementation, the team was able to upload texturized images in place.

The energy team came to realize, from attempting to utilize their research results, that geothermal energy is not yet widely available as a practical

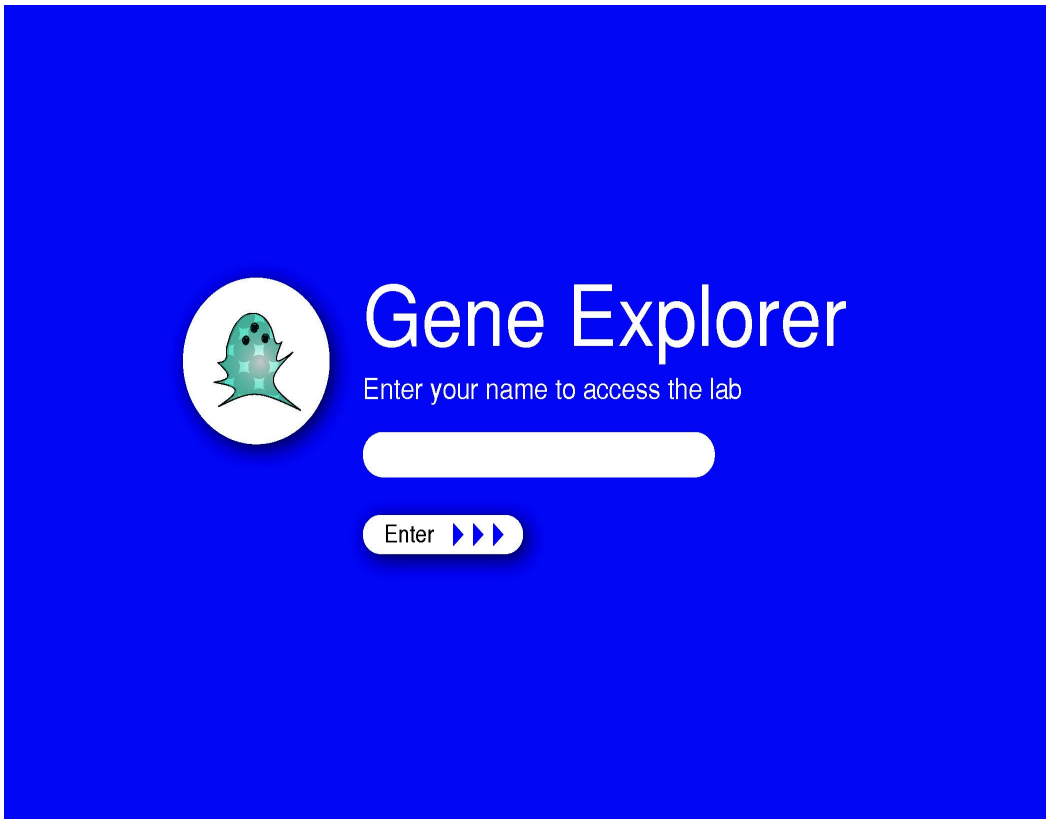
alternative energy source and so made a decision to remove this resource from their module.

7. **Results**

User Testing

Our IPRO team held group user testing at John C. Haines Middle School on April 10. The participants were 8th grade students, as the purpose of this project is to develop three interactive modules aimed at this grade-level audience.

Team Result
MODULE ONE: GENETICS



	Male/Female	Previously learned G?	Where learned G?	Internet usage	Place/Owner	Computer Ga
1	M	Y	School	Everyday	Home/Own	y
2	M	y	School	Everyday	Home/Own	y
3	F	y	School/Museum	Everyday	Home/Own	y
4	F	y	School	Everyday	Home/Own	n
5	M	y	School	Everyday	Home/Own	y
6	M	y	School	Everyday	Home/Own	y

User testing result

I. User profile summary of MODULE ONE: GENETICS

Internet Websites	Game names	Favorite Websites
y	Gunz	Gmail.com,anime6.org, instantz.net
n	Albatross 18, Gunz	Gmail.com,anime6.org, instantz.net
y	Maplestory	youtube.com, google.com, maplesim.com
y		google.com, youtube.com, onemanga.com
not much	Maplestory, needforspeed mostw anted	gmail.com, youtube.com
y	Age Of Mythology	gofish.com, youtube.com, chipublib.com

II. Data collection summary of MODULE ONE: GENETICS

	Scene1	2	3	4	5	6
1	What do we enter	reading	reading	reading	reading	reading
2	What do we enter	reading	reading	reading	reading	reading
3						
4						
5	Reading				Confused	
6						

7	8	9	10	11	12	13
reading	reading	reading	reading			
reading	reading	reading	reading			
		got excited from the punnett square				

14	15	16	17	18	19	20	21
Solved puzzle and talked about the correct answers							
Solved puzzle and talked about the correct answers							

22	Survey
Discussed the question	Would use and liked.
Found it hard to understand	Would not use.
Didn't understand thought it was wrong	Didn't wanna do it because they don't like science
Didn't understand thought it was wrong	Didn't wanna do it because they don't like science
	Would not use.
	Would use.

III. Debriefing summary of MODULE ONE: GENETICS

	1. Overall Impression	2. Play Again?	3. How Difficult was it to play the game?
1	3	Yes	4
2	3	Yes	4
3	3	Yes	5
4	3	Yes	5
5	4	No	4
6	3	No	5

4. Did you like the images?	5. Did you like the colors?	6. Did you like the creatures?
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	No
Yes	Yes	Yes

7. Were you able to understand the vocabulary?
Yes
Yes
Yes
Yes
Yes
Yes

8. Did you get confused at all? At what part?
No, I didn't get confused in the game
I got confused at a question, where i was asked if all 4 offspring could be homozygous dominant
Yes, at the part where it asks you the question, “In this situation, is it possible for all of the children to be homozygous dominant”
(left blank)
No
I didn't get confused

10. Do you think that you learned anything new?
I don't think I really learned anything new
Since I've already learned about genetics, I've already learned these things, so no
No, because I already learned most of these things
Kind of, more like reviewing
No, I learned it before
I didn't learn anything

11. What would you like to see to make this game more fun?
I don't think there's anything to change in this game
I don't think this can be made anymore fun, without cutting down on learning about genetics
More complicated games and questions
A little more challenge
More types of challenging games
I would look to see moving characters to game this game more fun

12. Would you use the survey at the end of the module?
I would use the survey at the end of the module
I don't think I would have used the survey at the end
Maybe
Maybe
Maybe
I would use the survey at the end of the module

13. What part of the module did you like the best?
I like how you can drag things to the game and it would say if it is correct or incorrect
I like how you can drag and drop for the Punnett squares
The games where you drag the box to the right place and answering questions
Deciding which child belongs to the parent
I liked the matching part most
I liked task 2 of the module the best

14. What part of the module did you like the least?
I think they were way too many text, but without people wouldn't understand how to play
I think it would have been better if there was less text
Nothing
Nothing
I liked the reading part least
I liked the task one the least

MODULE TWO: ENERGY

I. User Profile summary of MODULE TWO: ENERGY

	Male/Female	Previously learned Sustainability?	Where learned G?
1	F	n	
2	F	n	
3	M	y	Museum, TV
4	M	n	

Internet usage	Place/Owner	Computer Games	Internet Websites
Everyday	Home/Own	y	y
Everyday	Home/Family	n	n
Everyday	Home/Own	y	y
Everyday	Home/Own	y	y

Game names
Solitaire
First person shooting, puzzle, rpg, strategy
Action, shooting, adventure, mystery

Favorite Websites
youtube.com, aom.com, facebook.com
google.com, youtube.com, onemanga.com
youtubecom,yahoo.com, veoh.com
youtube.com, maxgames.com, speedsolving.com

II. Data Collection summary of MODULE TWO: ENERGY

Notes from User testing

- The idea is good, the topic is nice
- It is not clear where the score came from
- The best thing is that you have money choices on how to spend

- Add more locations, different averages, change city looks
- Show darker/lighter days
- Game is too easy as is, you need to add more challenges
- Graphics are pretty
- Maybe you can add math problems? Like how many solar panels are needed in relation to the wind speed?
- They like the following exhibits at MSI: CSI, airplane, inventions of sky

III. Debriefing summary of MODULE TWO: ENERGY

	1. Overall Impression	2. Play Again?	3. Was this game difficult to finish?
1	3.5	Maybe	No
2	3.5	Yes	No
3	3	No	No
4	3	Yes	No

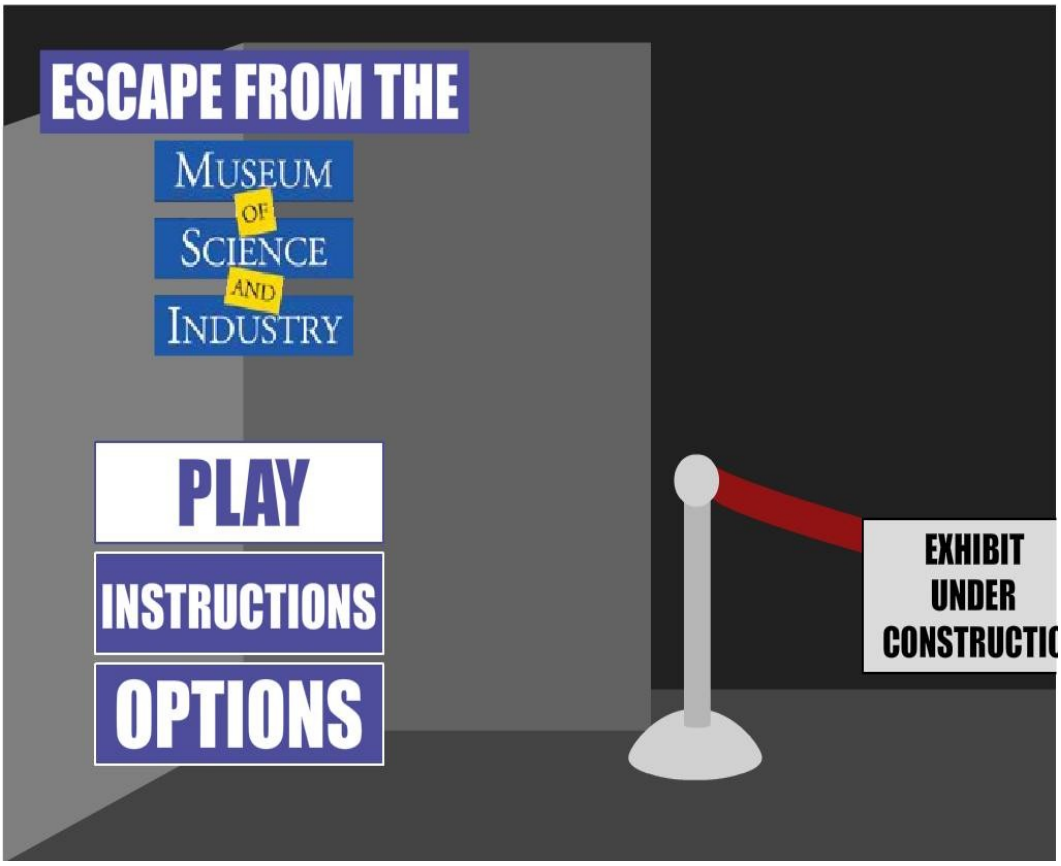
4. Did you like the images?	5. Did you like the colors?	6. Do the puzzles look interesting?
Yes	Yes	No answer
Yes	Yes	Yes
Yes	Yes	Yes
Yes	Yes	Yes

7. Did you like the music in the game?	8. What do you think about the story of the game?
No	The story of the game seems interesting
No	Could be improved with winning and losing
No	Err…
No	What story?

9. Do you think that you learned anything new?
Yes
Yes
Yes, I learned about geothermals
Yes

11. How do you think we could make this game better?
Try to change the average wind and average sunshine for the different locations
Changing the city average information, more levels
Create harder levels, add music/sounds, change different windspeeds and sunlight, different pictures for different pages
Yes, you could improve the game by making it harder, different looking towns, lower budget

MODULE THREE: MACHINES



I. User Profile summary of MODULE THREE: MACHINES

	Male/Female	Grade	Previously learned E?
1	M	7	Y
2	M	7	y
3	M	7	y
4	F	7	y
5	F	8	N

Learned E in class?	Define E	Know simple machine?	Know Pulley?
N		N	Y
N		N	Y
N		N	Y
N	E is a type of force	Y	Y
N		Y	Y

How does pulley work?
by using a string and a machine to pull things up
pulley helps to lift heavy objects vertically by applying weight on the end of the other side
use ropes to pull on to lift a weight on the other side of the rope
you turn a knob and it'll turn whells to pull whatever you are trying to pull

Why use a SM?	KE?
to help us get thigns done easier	N
I think they use them because it makes our lives easier	Y
it makes things easier for them	N
to save time and make peoples lives easier	N
to make life easier and less complicated	N

PE	Fulcrum?	Circumference?	Use Comp @ home?
N	N	Y	Y
N	N	Y	Y
N	N	Y	Y
N	N	Y	Y
N	N	Y	Y

Play video games?	Solve puzzles?	What kind puzzles?
Y	N	Y
Y	Y	strategy
Y	N	
N	N	
Y	Y	sudoku

Top three websites
armorgames.com, heavygames.com, newgrounds.com
armoredgames.com, crazymonkeygames.com, primarygames.com
armorgames.com, crazymonkeygames.com, xgenstudios.com
I don't play videogames online

II. Data Collection summary of MODULE THREE: MACHINES

	Comments overheard
1	what is it supposed to show us. I don't get it
2,3	I don't know what the goal of this is..., I think we learned this in class
4,5	I don't get it (Students had difficulties understanding what machine they were working with. They realized only after they saw the name on the screen.) It may be helpful to put the name of the machine on the screen. "That was fun!" "It moves too fast!" "

Obervations of what users tried to do w module
slider crank (tried many times), pulley, never heard of gears, it's too fast, that was fun
hit stuff with objects, watched items move before interaction, read titles of puzzles out loud, didn't scroll through games until told, threw objects around, liked to see things break/crash
It took a while for them to realize that everything on screen was movable. Instructions weren't clear. Once they found that out, they went crazy with the mouse. Played the same game multiple times to see different outcomes.

III. Debriefing summary of MODULE THREE: MACHINES

Do you play vid games?	Fav. Games?
yes	mario party, halo, army of two, super smash bros

What kind of games?	like to solve puzzles in games?
maple story, flyff, RS, CS, gunbow	it it is part of killing, some buzzles, build forts

normal person/superhuman?	big storyline?
both	yes, BIG. Same story in each game

like museums?
no, since parents don't speak english. Yes, new facts

fav. Types museums	expect to see?
science, darwin exhibit, skeletons, fermilab	animal experiments

see exhib. Under construc?	feelings?
yes	curious, want to see

how far willing to go?	museums safe?
depends, if won't get caught, give up	yes, unless something falls

graphics of sample module?	would you play this game?
pretty good, avg. flash type, pretty plain	yes, only if it had a good name/violence

first thing you would try to do?	what do you think is going on in pic?
go to X, pull the pulley, spill the can	construction/ rolling falling,

8. Recommendations

The members of IPRO 333 benefited greatly from meeting early in the semester with Steven Beasley, the Manager of Web & Interactive Media at the Museum of Science and Industry. Because of this gain, we believe that continuation of this interprofessional project, or any other collaborations between the Museum and IIT students would also profit by additional meetings with Steven and other web professionals at MSI. It is felt that insights and suggestions from the specialists who will ultimately deal with the interactive module on a regular basis would be invaluable in the early stages and on-going design and development of an interactive educational web module.

The members of IPRO 333 also found that their working structure of alternating class time between group work of individual teams and regular presentations of progress from each of those teams worked well for this kind of team assignment, and would recommend this strategy for future IPROs.

9. References

American Solar Energy Society <www.ases.org>

American Wind Energy Association <www.awea.org>

California Energy Commission <www.consumerenergycenter.org>

Energy Information Administration: Official Energy Statistics from the U.S. Government <www.eia.doe.gov/>

Geothermal Energy Association <www.geo-energy.org>

Public Policy Institute of New York State <www.ppinys.org/reports>

U.S. Department of Energy: Energy Efficiency & Renewable Energy) <www.energy.gov>

"Green" Tips for kids:

<www.tvakids.com/electricity/conservation.htm>
<www.energy.gov/forstudentsandkids.htm>
<www.energyquest.ca.gov/story/index.html>
<www.kids.gov/6_8/6_8_science_environment.shtml>

10. Acknowledgements

The members of IPRO 333 wish to acknowledge the contributions of the following people:

Bridget DzieDzic, Teacher—John C. Haines Middle School
Ms. DzieDzic's generous cooperation and assistance during our user testing with her eighth-grade students was invaluable.

Steven Beasley, Project Sponsor
Manager, Web & Interactive Media at the Museum of Science and Industry

Tom Jacobius, Director
Interprofessional Studies and the IPRO Program

Our team's thanks are extended to several IIT faculty who took time to help us understand the current state of solar and wind energy technologies:

Said Al-Hallaj, Professor
Chemical and Biological Engineering Department

Peter Land, Professor
Architecture Department

Our team would also like to thank our faculty advisor, Dr. Amy Stolley and our TA, Anna Wilkins, for all of their help and guidance.