

Learning Design by Designing Learning Experiences:

A Case Study in the development of strategic thinking skills through the design of interactive museum exhibitions

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Biography

Lisa Fontaine is an Associate Professor of Graphic Design at Iowa State University, where she has taught since 1987. Professor Fontaine recently helped to develop ISU'S new MA degree program in Environmental Graphic Design, the first of its kind in the nation. Through the Institute for Design Research and Outreach, she has supervised the student design of over 180 identity projects, sign systems, placemaking, exhibition design, wayfinding and downtown revitalization projects for Midwestern communities and clients.

Abstract

Realities of contemporary graphic design seem to mandate the development of broad thinking skills, since graphic designers are increasingly asked to design innovative solutions that go beyond the boundaries of print and web-based media. It is vital for design educators to prepare students to view themselves as problem-solvers first, and image-makers second. A popular response to this need has been the introduction of user-centered design problems that involve the design of *experiences* rather than of *objects*.

This case study will present a model for expanding students' thinking skills through the design of interactive learning experiences for museums. For the past 20 years, the author has incorporated museum exhibition into the graphic design curriculum in order to introduce students to design thinking and user-centered design. This paper will present recent work, where students have designed interactive exhibits for the Field Museum of Chicago. Each semester the museum's Design Director presents a different exhibit theme, as well as the museum's content outline, learning objectives, and relevant artifacts. Students design several exhibits that include experiential learning components to help visitors learn about subtopics within the exhibit theme.

Design of these interactive experiences involves the following steps:

1. Students learn about multiple learning styles;

2. Students study a taxonomy of interaction types;
3. Each student proposes 3 different designs for visitor engagement;
4. Museum staff selects one proposal from each student to be completed;
5. Students design the interactive learning components;
6. Students design the exhibition kiosk and graphic elements.

There are several benefits to teaching interactive exhibition design:

- Achieving the museum's learning objective is only possible with a focus on user needs and learning styles
- Students can only rely on images, type, and style after they have devised the goals, methods, and execution of the visitor's experience.

Keywords

Exhibition design

Experience design

Interactive learning

Introduction

Realities of contemporary graphic design seem to mandate the development of broad thinking skills, since graphic designers are increasingly asked to design innovative solutions that go beyond the boundaries of print and web-based media. It is vital for design educators to prepare students to view themselves as problem-solvers first, and image-makers second. A popular curricular response to this need has been the introduction of user-centered design problems that involve the design of *experiences* rather than of *objects*.

In the Graphic Design department at Iowa State University, we are continually evaluating our curriculum for opportunities to frame graphic design as a problem solving discipline rather than a form-making discipline. Experience design is seen as an ideal component in this movement toward problem solving, and is now integrated into our curriculum through courses in mobile and time-based media, as well as through increasingly complex project briefs for brand identity and other projects. These kinds of initiatives are being implemented in many graphic design programs, especially as the profession has begun identifying the design of experiences as being within our expertise.

Exhibition Design at Iowa State University

Unique to our graphic design program is the integration of museum exhibition design as an opportunity in experience design. If the goal is to teach experience design, then visitor interactions in museums can be an ideal format. Exhibits that engage the visitor through interactive experiences are usually the most popular ones, since they build interest and helps with comprehension and retention of the information. Interactive museum exhibitions, where an individual can directly encounter a phenomenon, are productive environments for experiential learning. Through personal contact, information that was once abstract can be translated into concrete realities. By allowing for human individuality, experiential learning encourages creativity and invention.

For the past 23 years, the author has incorporated museum exhibition into the graphic design curriculum in order to introduce students to design thinking and user-centered design. This has blossomed in the recent collaboration with the Field Museum of Chicago. Each semester the museum's Design Director challenges the students with a different exhibit theme, as well as the museum's content outline, learning objectives, and relevant artifacts. Students design several exhibits that include experiential learning components to help visitors learn about subtopics within the exhibit theme. . While designing these exhibits, the students are learning to apply their critical thinking skills, since the Field Museum has very specific learning objectives and specific themes and sub-themes. Design solutions that focus primarily on graphic style cannot possibly succeed in this arena.

This case study documents the student work from the recent 5-year collaboration with the Field Museum of Chicago, and thereby presents a model for expanding students' critical thinking skills through the design of interactive learning experiences for museums.

The Exhibition Design Studio is offered every other semester; it is a required class for students pursuing the MA in Environmental Graphic Design, and is an option class for other graphic design students at the undergraduate and graduate levels. Twenty students per year participate in the course and its collaboration with the Field Museum.

Designing Learning Experiences

The design of interactive visitor experiences for the museum's exhibits involves the following steps:

1. Students learn about multiple learning styles. They explore the different kinds of intelligences to determine which ones could be featured using different interaction methods.
2. Students study a taxonomy of interaction types to determine their usefulness for engaging visitors with different learning challenges. These interaction types (categorized by the author) include: role-play, search and discover, create and build, demonstrate a principle, and test your abilities. Emphasis is on interactions that are open-ended, and

provide a variable experience - one that is different for each visitor.

3. Students research the overall theme of the exhibit and select a sub-topic to pursue in greater depth. A completed research report is submitted, which includes:

- a) detailed outline of the categories of information that might be included in an exhibit
- b) within the outline, list key facts or 'take-aways' that align with the museum's goals
- c) within each topic, show at least 4 relevant images that you might use within the subtopic. Why would these be of interest to visitors? How would they help visitors understand the topic?

4. Students conduct field research at several museums in Chicago: the Children's Museum, the Nature Museum, the Museum of Science and Industry, and their client the Field Museum. They examine the ways that interactive experiences succeed or fail with users, and which interaction types work best for which kind of knowledge transfer. Students locate examples of each of the interaction types they have studied, and observe their effectiveness at engaging the visitors with the exhibit theme. This type of visitor observation as they interact with the exhibits is vital, as it provides an understanding of visitor behavior. The class meets with the Design Director for an in-person discussion about the exhibit theme and how it fits into the museum's broad educational goals.

5. Each student proposes 3 different designs for visitor engagement. Ideas are generated using a conceptual matrix similar to figure 1, which cross-references several potential topic areas with the interaction types to encourage multiple ideas for relevant learning experiences.

	demonstrate a principle	search + discover	explore emotions
your topic: MOVIES / MOVIE MAKING			
subtopic: HISTORY OF MOVIES	* TAKE A LOOK AT HOW MOVIES AND HOW MOVIES WERE MADE THROUGH OUT HISTORY THEIR DIFF. TECHNIQUES	* HAVE TO LOOK AT A MOVIE AND THEN GUESS WHO MADE IT TO SEE WHAT YEAR IT WAS MADE	* MOST POPULAR TYPE OF GENRE * EMOTION THAT GOES WITH IT IN A CERTAIN TIME PERIOD
PRODUCTION OF MOVIES	* HOW THE GEAR IN A CAMERA WORKS HOW YOU GET PICTURE FROM REAL LIFE ON TO THE CAMERA	* GO THROUGH A ROOM TRYING TO FIND THE RIGHT OBJECTS FOR THE PART OF PRODUCTION YOU'RE IN	* HOW EACH STEP OF PRODUCTION GOES TOWARD THE EMOTION AN AUDIENCE MEMBER GETS AT THE END
subtopic: FIGURES	* USE STATISTICS ON WHY CERTAIN TYPES OF GENRE ARE MORE POPULAR THAN OTHER GENRES	* SEARCH FOR THE RIGHT GENRE NAME TO GO WITH THE RIGHT MOVIE. IMAGINES	* WHAT EMOTION DO YOU FEEL WHEN YOU WATCH A CERTAIN GENRE, PUSH A BUTTON → ANOTHER
HOW DO MOVIES WORK	* LEARN HOW A FILM STRIP MOVES THROUGH A CAMERA AND HOW THE PICTURE GETS	* SLIDER = GUESS AND THEN UNCOVER HOW POPULAR AND WHY CERTAIN THAT MOVIE IS POPULAR.	* HOW DOES THE MOVIE HELP WITH THE PERSON'S EMOTION * WHY DOES IT MAKE THEM FEEL IT
subtopic: FOREIGN FILMS	* INFORMATIONAL ABOUT HOW DIFFERENT COUNTRIES HAVE DIFFERENT PRINCIPLES FOR THEIR MOVIES.	* HAVE A MAP → LIST OPEN COUNTRIES AS SECTORS TO SEE WHAT TYPES OF MOVIES ARE GENERALLY FILMED THERE	* WHAT EMOTION IS THIS PERSON EXPRESSING IN THIS FOREIGN FILM.
TRAINING: STUNTS, ACTORS, MAKE-UP, PROPS, COSTUMES, ETC.	* DEMONSTRATE HOW CERTAIN CAMERA ANGLES MAKE CERTAIN THINGS LOOK REAL. LOOK THROUGH THE CAMERA AT DIFFERENT ANGLES	* SHOWS OF ACTORS AND YOU HAVE TO DO DO AN ANGLE AND HOW IT AFFECTS THE MOVIE	* EXPLORE THE WAY MAKE-UP CAN MAKE YOU LOOK LIKE YOU HAVE A DIFFERENT EMOTION.
subtopic: PEOPLE: DIRECTORS, EDITORS, CAMERA MEN, PRODUCERS	* CAMERA MAN: LOOK INTO THE CAMERA + EXPLAIN WHAT ANGLE + WHY IT MAKES THINGS LOOK THE WAY THEY DO	* HAVE CARD BOARD PEOPLE GIVEN NAME TAGS BY THE JOB IN IT. GO THROUGH A TRY TO TAG THE RIGHT PERSON BY NAME	* WHAT EMOTIONS SHOULD EACH PERSON USE TO GET THINGS DONE. ie - DIRECTOR - DOWN / UP OR UNDER
THE EDITING PROCESS	* DEMONSTRATE HOW TO DO CERTAIN EFFECTS AND TELL PEOPLE HOW WE ARE ABLE TO DO THESE TYPE OF EFFECTS ON A MOVIE.	* YOU HAVE A CHIP TO WATCH AFTER YOU ARE DONE YOU HAVE A BUNCH OF SCENES THAT YOU HAVE TO PUT TOGETHER THROUGH IT	* EDIT TO MAKE THE ACTOR HAVE DIFFERENT EMOTIONS WATCH EACH OTHER. SAME ACTOR → DIFF. EMOTIONS ON TAKE
HOW TO EDIT	* DEMONSTRATE WHY PEOPLE REACT TO THE MUSIC THE WAY THEY DO USE A CONTROLLER + SHOW THEM THE TYPE OF NOTES	* HAVE TO PUSH A BUTTON FOR A NOTE AND FIGURE OUT WHAT NOTES ARE BEING PLAYED.	* WHAT EMOTION DOES THIS SOUND TRACK MAKE YOU FEEL

Once a promising idea has been found, the student is asked to prepare a detailed written proposal that identifies the specific learning objectives and what the visitor will do in this engagement. The student also needs to describe why this is the best possible way to teach this information.

Many of the interactive methods can be accomplished through either a physical or virtual experience. Students must consider the advantaged and disadvantages of each approach. While some of the learning experience may be delivered through digital interactions, the interactive components might involve physical elements such as buttons, levers, gears, etc.

6. Museum staff selects one interaction proposal from each student to be completed.

Their selection is based on how well the proposed interaction teaches the topic, how well it engages the visitor, how wide the audience could be, and how aligned it is to the museum's content outline.

7. Students design the interactive learning components, exploring several different options for each interaction. For example, what does a visitor do? How do they know

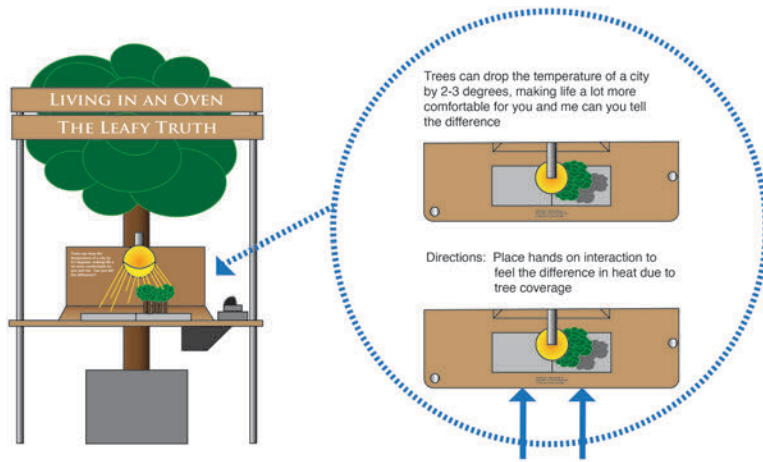
what to do? If there's a guessing game, how will they know if they got it right? What kinds of buttons, levers or devices are used for guessing? How might they misinterpret what you want them to do? What are the choices offered? What is the 'reward' for learning? Effective interactions must avoid confusing messages, teach the intended lesson, and reward the visitor's participation.

6. Students design the structure of the exhibition kiosk and the graphic style.

It is only at this stage of the design process that the students are allowed to consider the graphic style of the exhibit. The exhibit workstations must remain approachable from at least 3 sides, and should be designed for possible relocation in the future. The space should allow for more than one visitor to interact with it at the same time. The placement of images, typography and interactive elements should be carefully determined so that they enhance the information hierarchy and are located at appropriate heights for visitors. The size of each exhibit stand is determined by the nature of its content and activities.

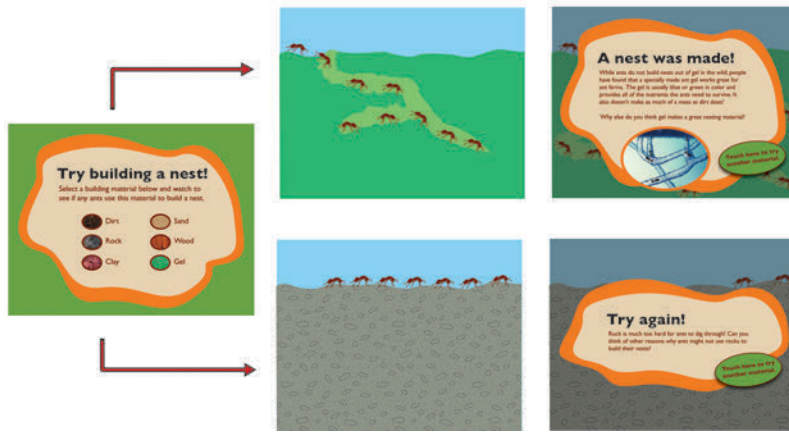
Project Outcomes

Five different exhibit topics have been explored during the Field Museum collaboration. In the *Conservation* project, students selected from a wide range of subtopics identified by the museum staff. Whether designing an interaction about soil conservation, green buildings, endangered species, or coral reefs, the students' focus needed to always be on the ways that these complex topics could be made engaging and understandable through interactive experiences. In the *Leafy Truth* exhibit, for example, the student has created an interactive experience where the visitor learns how much cooling is provided when trees are present within a city (figure 2).



In the *ANTS* project, students explored ways to communicate the amazing and unique abilities of ants, compared to other insects or even compared to human abilities. For example, In the *Ant Nests* exhibit, the student has designed an interaction that helps visitors understand how skillful ants are at nest building. In a digital interaction, visitors attempt to make the right choices of nesting materials to see if they can make these decisions as well as ants (figures 3 and 4).





In the on *Egypt* project, students worked on an exhibition that could travel in the region while the museum’s permanent Egypt exhibit was closed for refurbishing. Topics ranged from cultural history to archeology and agricultural history. Each student made a determination regarding the most engaging aspects of their subtopic. These included mummification methods, canopic jars, and reasons why the Nile delta was so fertile. For example, In the Egypt Timeline exhibit, the student has designed an interactive timeline showing 7 time periods in Egypt’s history, showing how the size of Egypt changed over time, as well as the different religions, population and art of each of the periods (figure 5).



In the Mummy Maker exhibit (figure 6), the student has devised an interaction based on the game ‘operation’, where the visitor learns about the process of preserving human

organs in canopic jars. For each organ, there is a god that guards its particular jar. On a table in front of the canopic jars, a body with exposed organs allows the visitor to guess which canopic jar is intended for each of the organs, and which Egyptian god is designated as its guardian.



In the Biomechanics exhibit, students developed interactive experiences that explained some of the ways that living things have adapted to their environments. These topics included locomotion, generating forces, temperature regulation, and staying in one piece. In the Discover a New Species exhibit, for example, the student has designed a digital game that teaches visitors how species are categorized and identified based on characteristics such as the quantity and type of legs, type of skin, and type of mouth (figure 7). In some cases, as seen here, the student determines that their focus will be on the design of a touch screen rather than a physical experience. Even in these cases, though, there is still a kiosk designed to house the touch screen.



Pedagogical advantages

There are several benefits to teaching interactive exhibition design. As a method for emphasizing design thinking, this challenge is well suited, since it is only possible to achieve the museum's learning objectives with a focus on user needs. Visually appealing graphic solutions cannot be the primary goal of the students. By learning to solve the visitor's learning challenge first –with graphic concerns to follow later – the students become familiar with the high level thinking that will be expected of them in their graphic design careers. After they have devised the goals, methods, and execution of the visitor's experience.

Since many of the experiences the students design involve physical – not virtual – activities, they are also learning to expand their definition of experience design beyond that of web and mobile media. Their visitor experiences can involve kinesthetic or auditory aspects; areas that graphic design students have never considered yet in their design work.

Challenges

This is a new challenge for graphic design students, especially for the 3rd year students who have yet to experience the user-centered problems our curriculum will present to them later. At the earliest stages of the project, many students would prefer to hang onto their previous definition of graphic designer as style-maker; some present fierce resistance when challenged to downplay their carefully honed styling skills. The design solutions are complex and multi-faceted, so they cannot be easily appreciated with a quick glance or sound bite. This makes them less 'digestible' as portfolio pieces, and for students who are motivated by portfolio, they sometimes find projects such as this to be uninteresting, simply because of their preconceptions about what future employers might want to see. Some are still skeptical that an exhibit project should appear in their portfolios, unless they plan to interview at an exhibit design firm or museum. It is challenging to make them see how valuable their critical thinking skills are, and how evident they are in these experience design solutions.