

City Science

Pathways: From the Lab to the Neighborhood An Interactive Living Exhibit for Advancing STEM Engagement with Urban Systems in Science Museums

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City Birds



Magnetic Neighborhood

Project team members

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University of Massachusetts- Amherst
 Clark University
 Loyola Marymount University
 Ecotarium Science Museum, Worcester



Phase Two (Continued)

Methodology: Testing Protocol

- Four exhibit prototyping stations set up on museum floor over two-day period.
- Stations moved to different locations on day 2 to account for location effects in museum.
- Mimic natural visitor-exhibit environment: visitors choose which exhibits to visit.

Exhibit Passport

Visitors handed a passport at the first exhibit they visit and will be free to visit as many or as few as they wish. At each exhibit their passport was stamped so that their progress was tracked upon reaching the Magnetic Neighborhood exhibit. The order in which visitors interact with each exhibit was designed to be as random as possible.

Participants: (Target sample size- n=80)

- Museum visitors (family groups)
- Youth groups (summer camps): Ages 12-18.

Instruments

- Ecological exhibits: Observations only (to avoid influences of interaction between staff facilitators on neighborhood design.)
 - Interview form targeting two distinct age groups; <4-11, and 12-66+.
 - Clarify responses and help understand why participants built their neighborhood a particular way and chose the pieces they did.
 - Pictures taken of the neighborhood design for later data analysis.

Data Analysis of Evaluation (to be conducted)

- Neighborhood design analysis: green space volume, connectivity, percentage of buildings and transportation connectivity.
- Interview sessions: reasons for designing their ideal neighborhood, inclusion or exclusion of green spaces, and the different animals participants believe could reside in their neighborhoods. Comments revealing consideration of tradeoffs and consideration of quality of human and animal life will also be analyzed.
- Comparisons between control group (visited Magnetic Neighborhood first) and those who had pre-exposure to ecological exhibits.

Project Purpose

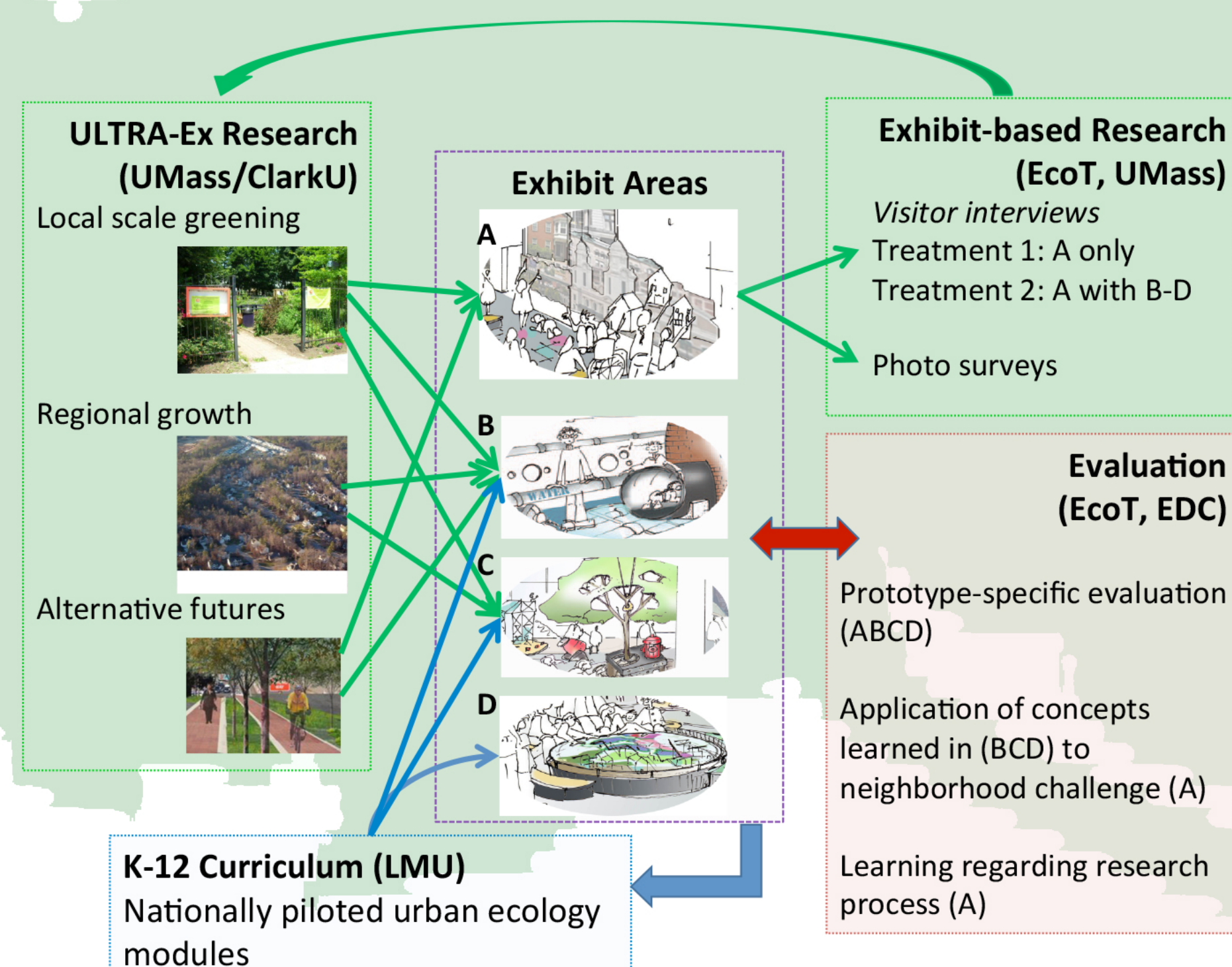
The purpose of this PATHWAYS project is to develop a nationally-replicable model for integrating the newly-emerging science of urban systems into exhibits in urban science museums. This model is being piloted through the development of the new City Science exhibit at the EcoTarium science museum in Worcester, MA that integrates scientific research and inquiry with informal learning opportunities. Specifically, the project will study how exposure to ecological exhibits focusing on urban biodiversity, land use change, and urban heat islands influences urban planning decisions.

Project Approach

- To establish a new three-way partnership between the EcoTarium, and two existing NSF-funded networks (urban ecology researchers and science curriculum developers and teachers).
- To integrate the urban ecology research and K-12 curriculum work from these two networks with four new exhibit prototypes for the planned “City Science” exhibit.
- To bring together staff from 6 other science museums in California and New England to review the prototypes, provide feedback, and begin the planning phase of introducing these – or similar – exhibits to their museums and beyond.

1 Boston Urban Long-term Research Area Exploratory (ULTRA-Ex) grant NSF-BCS #0948984.
 2 Instructional Materials Development grants NSF-IMD #0628143 and #1110524.

Research Exhibit Feedback Loop



Project flow diagram, showing the feedback among the three components (research, exhibit design/testing, and K-12 education). Exhibit prototypes are (A) Neighborhood Design, (B) Land-Use & Land-Cover Change (LUCC), (C) Urban Biodiversity, and (D) Urban Heat Island.

Integrating research experiments and exhibit prototypes

- Project scientists, Clark University and UMass graduate and undergraduate students worked on prototype development, testing and revisions; and literature reviews.
- Informal science evaluations were conducted in collaboration with Jacqueline DeLisi from the Education Development Center.
- As a result of the prototyping sessions all four interactives have passed stage one testing.

Focus on 4 exhibit design areas for “City Science” exhibit at EcoTarium

- Neighborhood Design Area (Magnetic Neighborhood)
- Urban Biodiversity Area (City Bird Scientist)
- Land Use/Land Cover (Turtle’s Eye View)
- Urban Heat Island (City Hot Zones)



Magnetic Neighborhood



City Birds



Turtles Eye Vie



City Hot Zones

Phase One: Iterative Prototyping of Individual Exhibits

- Each of the exhibit design areas have gone through the **first phase of iterative prototyping** for usability, scientific process skills and concept understanding with family groups, school groups and focus groups.
- During 2 school vacation weeks (2014), University and Museum partners ran multiple interactive stations simultaneously resulting in approximately 200 group observations and interviews each week, and roughly 500 individuals total per week. In addition to these two weeks Museum staff and interns have conducted numerous additional prototyping sessions with museum public collecting data from over 300 additional groups.
- There have been **2 stages in the exhibit prototype development**: project research assistants summarized relevant studies and research team area experts collaborated with museum staff to analyze salient research and exhibit issues and insights.
- City Science exhibit prototypes were reviewed and critiqued by museum staff from the **Environmental Exhibit Collaborative** (EEC) including ECHO Lake Aquarium and Science Center (Burlington, VT), The Discovery Museums (Acton, MA), and the Children’s Museum and Theatre of Maine (Portland, ME).

Phase Two: Piloting the Research Feedback Loop on the Museum Floor: Studying the Relationship between Individual Prototypes.

Goal: to determine how exposure to ecological exhibits focusing on urban biodiversity, land use change, and urban heat islands influences urban planning decisions.

Overview:

In August, 2014 EcoTarium staff and interns, as well as UMass staff and graduate students are conducting a four station study in the Museum exhibit halls. Researchers will examine the potential effects of exposure to urban ecology principles on museum visitors’ perceptions of city planning issues. The study will include prototyping the neighborhood design area (Magnetic Neighborhood) in conjunction with three other prototype areas related to urban heat island (City Hot Zones), urban biodiversity (City Bird Scientist), and land use change (Turtle’s Eye View). The neighborhoods created by visitors who have participated in these urban ecology exhibits will be compared to the neighborhoods of visitors who have not participated. Each neighborhood will then be analyzed to see if there are any statistically significant differences between key variables, like green space diversity and urban density.

Research Questions

- Is there a relationship between previous exposure to ecological exhibits and the type of “ideal” neighborhoods participants create?
- How does participants’ background (i.e., residential setting- urban, suburban, or rural) influence their perceptions of the “ideal” neighborhoods they create?



Magnetic Neighborhood



Challenges

- The prototype interactives were hands on activities with no side-bars or information panels as would be found in the next phase of prototyping, thus the conclusions or insights that may have been “surmised” by participants may not be drawn from scientific facts.
- Data analysis for the Magnetic Neighborhood relies on hand-counting of designs which is time consuming (see below).
- Magnetic Neighborhood has many individual land use types and categories which may affect usability and interpretability.

Future Research

Our goal is to be able to allow visitors to compare their neighborhood designs to other visitors. The current magnet designs are being captured by the researchers using photographs and then analyzed by hand for number of different land use types and area covered which is slow for data analysis. We are working with a computer programmer to develop an automatic data capture method whereby visitors could put their Magnetic Neighborhood designs under a bar code reader to automatically allow the designs to be stored, analyzed, and compared to other visitors’ designs.



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