Designing for Children
- With focus on 'Play + Learn'

DISCOVERING JOHNNY APPLESEED

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ABSTRACT: This paper describes the design and fabrication processes of a service-based project, *Discovering Johnny Appleseed*, designed and completed by students from the University of Cincinnati. The project focused on an interactive and spatial exhibit for children to learn about the life and times of John Chapman (b. 1774). John Chapman, better known as Johnny Appleseed, was a barefoot wanderer who planted apple seeds in Pennsylvania, Ohio, and Indiana. The paper describes a pedagogical design-view in the pursuit of enhancing the learning experience of children, influenced by the poetics of spatial order and discovery. Over a time-span of two semesters, students worked to research and identify the program brief, then designed and fabricated a spatial "*Interactive Learning Experience*".

KEYWORDS: Learning, Interactive, Spatial, Prototyping, Design

Introduction

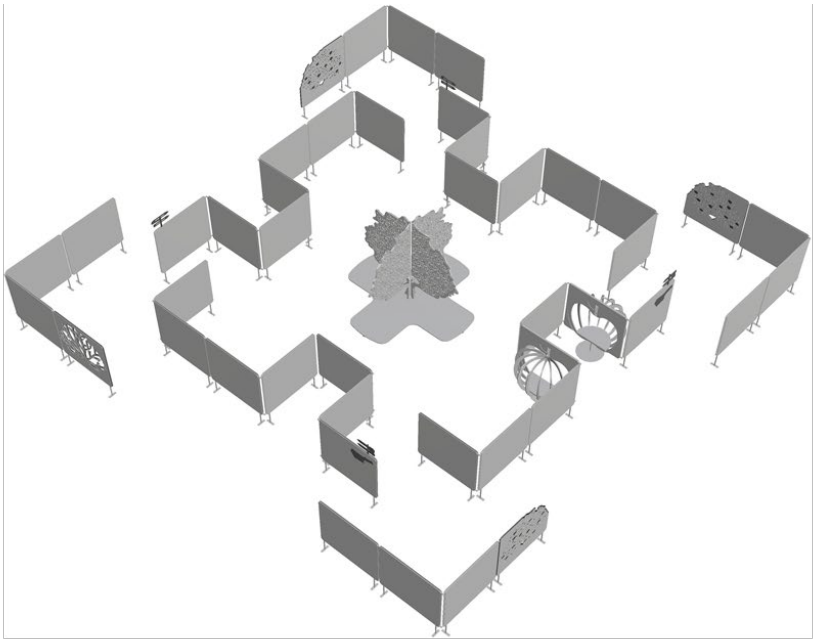
In the fall of 2015, the Johnny Appleseed Educational Center & Museum, part of Urbana University in Ohio, partnered with the University of Cincinnati's College of Design, Architecture, Art, and Planning for UC students to design and fabricate a traveling exhibit for children to learn about the life and times of John Chapman (1774-1845). The exhibit drew inspiration from the educational and learning values embedded in the Froebel Blocks, created by Friedrich Froebel in 1837, (providing children with focused educational experiences based on discovery and active play).

Discovering Johnny Appleseed, is a spatial and physical interactive learning exhibit, with activities and artifacts incorporated for children to learn about the life and times of Johnny Appleseed. The original Froebel Blocks with their spatial template were

fabricated for active and structured-play. Both utilize directed-play concepts and focus on (modules-components) intentionally sized and scaled for children. While Froebel Blocks were made for a child's *hand* to hold, the exhibit was designed and fabricated for a child's *body* to spatially and physically interact with.

In July 2016, the exhibit opened at the Boonshoft Museum of Discovery in Springfield, Ohio, then traveled to Sun Watch Indian Village in Dayton, Ohio, and following, the exhibit travelled to other venues as; *Discovering Johnny Appleseed*, (a.k.a. The Johnny Appleseed Exhibit).

It can be stated that human sense-making, (i.e., understanding and learning through the senses) are not ideal processes based on self-contained structures – (the Platonic *Hyperuranion)* – yet, they are defined in a strict



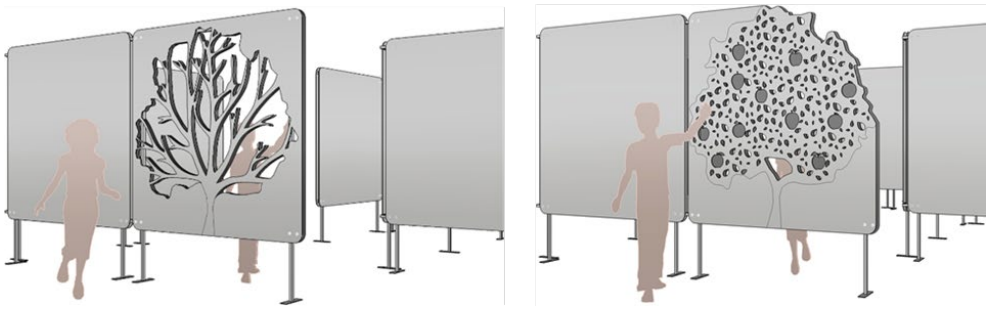


Fig.1 (a-b) Axonometric (1a) shows constructed-modules and layered spatial order without a beginning or ending. Seasons are given presence at each of the four corners of the exhibit, (1b) marking time and passage. (credits: UC students, 2016)

Spatial Interactive Learning

Perception begins with what is experienced, rather than beginning with what is expected; the model is to "see and understand" rather than "understand and see." (Dourish, 2001, p. 21).

According to Gestalt principles, learning is efficiently encouraged when the instruction is related to real life experiences (David, 2015). From the beginning, a goal of the client was to introduce a sense of the cultural and historical context of the early 1800s by utilizing a learning-through-engaging process with interactive activities (i.e., memory game, rubbing game, and dress-up game). Interactive activities were incorporated in the exhibit to nurture the learning curve of children. Physical activities complemented the didactic display of integrated text, graphics, and artifacts, which belonged to the Johnny Appleseed Museum. Seeking to balance active and passive learning, resulted in *a whole project solution,* designed for children to enjoy a range of learning experiences.

Fig.2 (a-d) Herbal Remedies, (above left). Rubbing Game for two, (above right) integrated in the exhibit's panel system. Travel Game (below left) an interactive activity to learn if it's faster or slower to travel by foot, by horse or by boat. The central apple tree (below right) serves as a public place for children to gather, sit, and read. (credits: J. Postell, 2016)

Active learning experiences incorporated in the module-panel system, resulted in direct user-engagement with the exhibit system. The activities give the child a specific and distinct cosmos. The physical engagement with each activity generates impressions made by the activity. The activities invite arranged learning opportunities through "play" and the engagement transforms and creates experiences of learning. The physically interactive activities took the form of games, which lead to learning about the life and times of John Chapman. The exhibit includes eight activities (a.k.a. games): *Dress-Up, Memory Game, Plinko Seed Drop Game, Cider Press Game, Rubbing Game, Herbal Remedies, Travel Game, and Story Time*. Discovery through these non-linear activities generated a self-directed insight into the cultural and societal geography of the Midwest, between 1774 and 1845.

Constructing Space

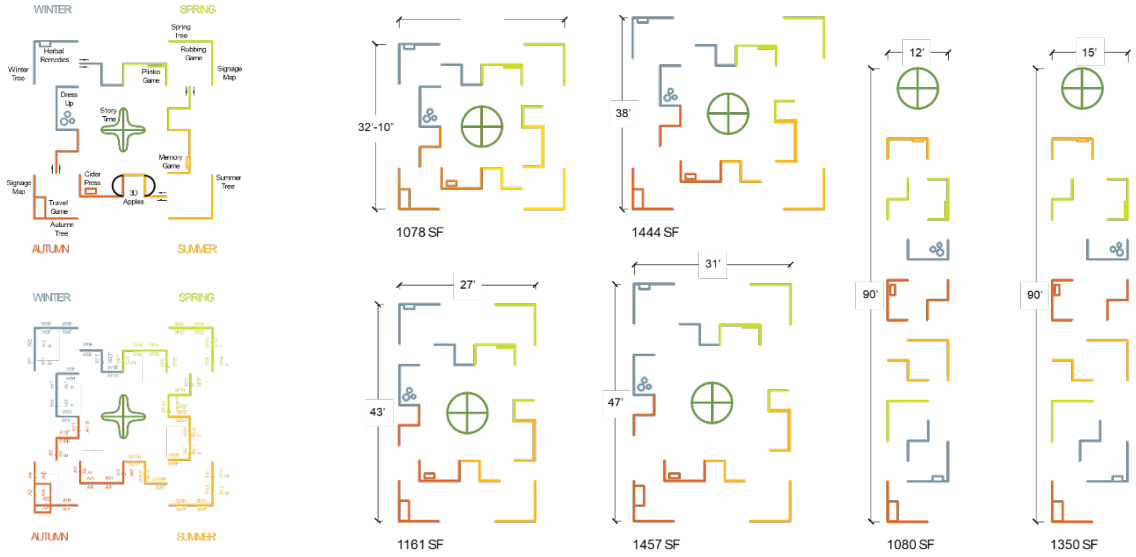


Fig.3 Diagrams of the exhibit's spatial order indicate the placement of the activities (upper left), coded notations (lower left), and spatial variations, based on uncertain spatial contexts for the traveling exhibit. (credits: UC students, 2016)

The overall spatial order of the exhibit was created using a spatial-module, based on a child's body and organized by the cyclical rhythm of the four seasons. The spatial order of the exhibit was fabricated using Baltic birch plywood panels bolted to inter-welded metal frames, which served as structural armatures for the exhibit's content. Each plywood panel, whether it contained text, graphic information, artifacts, or an interactive activity, had a letter of a season coded (i.e., A, W, SP, SU). The front and

backside were coded with an (A) or (B), and a number laser-etched on each panel to instruct installers about the panel's location within the exhibit. All components were designed to be assembled, disassembled, packaged, stored, and transported by truck with a 15' x 8' cargo bay.

Future venues for the Johnny Appleseed exhibit were uncertain. The spatial organization of the exhibit had to remain flexible, so it could retain a coherent spatial order despite potentially distinct spatial constraints. The exhibit's circulation needed to remain accessible and multi-directional. Children needed to explore different activities per their interest, in any sequence.

Spatial-Design ideas embedded in the exhibit include:

1) constructed-space utilizing a distinct module and spatial order based upon four seasons
2) incorporating activities, information, and artifacts within the panels and spatial order
3) open-accessible sequences and multi-directional circulation
4) open lines of sight – enabling children to see through, under, and between the panels

Maintaining open lines of sight throughout the exhibit and enabling views through some of the activities are intentional and contribute to realizing a spatial design concept that Steven Holl and Juhani Pallasmaa refer to as *enmeshed experiences,* resulting from movement through perspectival space (Kharvari, 2017). Four seasons were given presence at each of the four corners of the exhibit to indicate the significance of time and to create passage between them. The four seasons become spatial place-markers, but do not declare a beginning or ending point in the exhibit. As children might explore the exhibit from perimeter or center, they would see and learn about apple trees, and discover something new about the life and times of Johnny Appleseed through journey and discovery.

The metal armature and plywood panels give spatial structure and guide children through the exhibit. ¼" plywood panels are sized at 47" x 47" with a 12" open space below each panel (open to the ground). The height of the panels is 59" above the ground, which prevents children from seeing over the panels yet enables most adults to see over the panels. 90-degree metal connections and broad floor plates give stability to the exhibit. No more than two panels were linked in a co-planar manner.

Research

Before students began the design process, they worked to clarify the program brief, sought to identify the problem(s) to solve in the design, and researched the following:

- UX (user experience) research how young children behave and learn
- Persona & Empathy (consider what it might be like for children visiting the exhibit)
- Case Studies, (look at other exhibits designed for children), focusing on interactive activities, display of artifacts and information, spatial order, issues of durability, safety, and liability.

Program Brief

Good programming does not guarantee good design, however, programming is an important pre-design activity that establishes parameters, goals, and objectives for a project. The program brief sought:

- An exhibit for children between 6-9 years to learn about the life and times of Johnny Appleseed.
- The design should promote learning and discovery and include 8 interactive activities
- As preferred by the client, the exhibit was not to utilize smart or digital interaction technologies.
- To display specific artifacts; (a bible, an LP, a plate, an animated cell from a movie, some books).
- The exhibit to function in a variety of institutional and spatial contexts up to 1500 sq. ft.
- Accessible for children and adults. Entries, exits, and pathways should be at least 60” wide.
- The length of a visit to the exhibit (30-90 minutes). Number of children visiting at a time: 24.
- The exhibit was to display information and artifacts in a spatial and interactive manner.
- Safety is an important issue. Avoid sharp edges and sharp corners or projections.
- The exhibit should emulate the idea of time and journey, teaching that John Chapman traveled through many states in his sojourn to plant apple trees.
- To maintain open lines of sight throughout the exhibit.
- Movement through the exhibit could begin and end anywhere.

- The exhibit should maximize efficiency of material to reduce overall project-related costs.
- With 12 students enrolled in each of the two seminars, a projected draw of 2,160 hours came from the students, generating an in-kind value of $30,000 for the project.
- Urban University provided $20,000+ for purchasing supplies, materials, and covered other costs.

Research + Program Brief + Design Pedagogy + Design Methodology = Result

Knowledge gained from the research, helped to manage parameters and goals in the program brief which influenced direction and pedagogy for the design, guiding studies into solutions, motivated by:

- A desire to incorporate human sense-making concepts from the research (i.e., discovery and learning) through spatial order and spatial hierarchy (public and private)
- The will to integrates the spatial order and module-components of the exhibit with:
    - informational text and graphics (learning by seeing and reading)
    - physically interactive activities (learning by doing)
    - cultural heritage (learning through the embedded meaning of selected artifacts)
- Pragmatic need to work within the available limits of time and resources

Tactile Tectonic

"Touching something fires a whole battery of sensors and nerves; we feel resistance, temperature, surface quality, softness, weight, and more" (Hornecker, 2011, p. 21) and all the pieces of information deriving from our different senses finally merge into the whole, providing meaning, awareness, experience, performance, pleasure, affect, emotion, persuasion, etc. (Kaptelinin & Nardi, 2009, p. 253). The tactile tectonic pedagogy was based on UX research that suggest learning is informed by these notions and children best learn and retain by engaging in visceral and physical processes, "enabling children to induce learning, manipulate, and share meaning" (Dourish, 2001, p. 126).

Prototyping was central to the design methodology and critically important (though difficult) to advance the design forward. Initial sketching and drawing eventually yielded to a study-through-making process (i.e., fabricating working-prototypes) to better see and

test design ideas. Prototyping was necessary, because the activities had to function dependably and durably.

Making a prototype is a way to foresee, (i.e., to perceive, study, and learn in advance, about a part or component of the exhibit at full size). According to Scaletsky, et al. (2014) "the act of designing represents a projection in time, throwing the designer forward, to build something that did not exist." It is a way of generating knowledge through a process of learning, obtained primarily by doing. The process of figuring out how to make, became an important lesson for students to determine what outcomes they were trying to achieve through design.

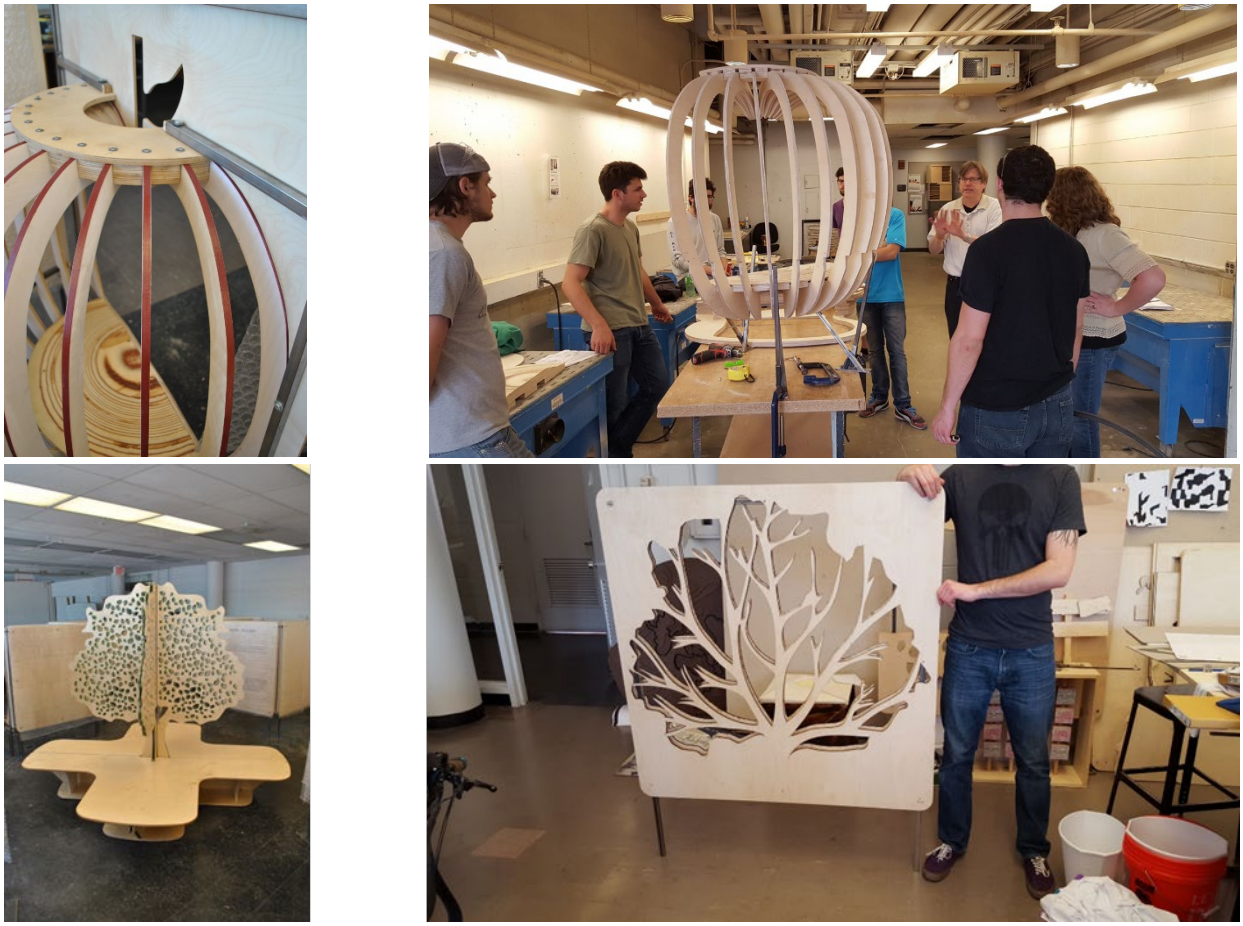


Fig.4 (a-d) Prototyping as a way of seeing, testing, and experiencing the Johnny Appleseed Seating (above), a place to sit and participate in story time (below left) or consider scale and size of the winter tree (below right). (credits: J. Postell, 2016)

Text and graphics highlighting aspects about the life and times of Johnny Appleseed were applied to the panels. The area for the text was initially covered by tape, laser etched, then the tape was carefully removed by hand to expose only the lettering. The exposed lettering was hand-stained using a gel and rag application.

The tectonic order and its visual expression, as seen in the joinery and modular panels, point towards an architecture created by Baltic birch plywood panels attached to welded metal frames, fabricated from ¾" sq. steel tubing. The Baltic birch plywood panels were attached using bolts, washers, and acorn nuts. The systematic relationships between the parts and the whole, all developed significantly from iterative prototyping studies.

Kenneth Frampton describes a kind of "tectonic condensation" as an intersection embodying the whole in the part." In this sense, joinery and components become, as Frampton suggests in the work of Carlo Scarpa, "the generator rather than the plan, not only in respect of the whole, but also with regard to alternative solutions lying latent as it were, in any particular part".

Fig.5 (a-f) Sitting under an apple tree (upper left). Maintaining lines of sight throughout (upper right). Activities and artifacts (middle). Baltic birch panels assembled to metal frames with bolted connections (lower left-right). (credits: J. Postell, 2016)

Discussion

Embedded in human experience, form is nearly always *discovered* versus made through an abstract intellectual process outside of human experience. John Dewey, in *Experience and Nature*, argues "the experiences and elements of interaction determine formal identity and are a type of natural rhythm" (1938). Dewey argues that the rhythms of relations constitute artistic form and that rhythm discovered in nature underpins all poetry, painting, architecture, and music. The spatial order of the exhibit was valued by the students and client for these reasons. Integration of the physical activities into the spatial order contributed to the exhibit's meaning and value as a learning experience.

Reasons for taking on the service-based, design-build project through two elective seminars were tethered to the desire to give students an opportunity to explore design ideas and generate design solutions based on the constraints of a real project, and to explore communication design-ideas in a physical and spatial context to influence the learning process of children. A significant motivation to complete the project was predicated upon Urbana's generous funding, which covered the prototyping and fabrication costs.

The design process and installed exhibit foregrounded in this paper, tenders a reflection that physical & spatial interactive activities might best navigate through the design-make iterative process, where issues of physical engagement are significant to the project's value. Students discovered a pedagogical focus within the visceral and tactile project through the poetics of making. It is anticipated that the children who visit the exhibit will discover Johnny Appleseed through their "corporeal imagination", and their pursuit of learning be revealed and enhanced by their engagement with discovery and active-play through an interactive, spatial experience.

Conclusion

Studies demonstrate that learning is enhanced when children are actively engaged in creative, generative activities (e.g. Chi, 2009; Hall, Bailey, & Tillman, 1997). Generative activities have been shown to benefit comprehension of domains involving invisible components. Wittrock's (1990) generative theory stresses the importance of learners actively constructing and developing relationships. When learners make connections between pieces of information, knowledge, and experience, deeper understandings result.

Physical interaction, involving the whole body, is distinct from what we know about digital interaction, which typically utilizes smart and digital technologies via software programs written for computers and mobile devices. Spatial thinking is distinct from digital thinking, in that spatial thinking involves the sum of: sequence, movement, physical and visceral engagement of objects, and considers the size, orientation, location, and shape of one component to another. Might today's Generation Alpha, (*a.k.a. iGeneration),* gain sufficient understanding from manual activities and visceral engagement devoid of a digital interface? Surely the life-style and digital culture of the children visiting the exhibit will influence their perception and "take-away" from the learning environment. An important post-occupancy evaluation needs to follow-up and the results incorporated in a second paper, complementing this one

Further research in this topic is necessary to develop stronger scientific evidence quantifying the pursuit of learning tethered to the poetics of making, spatial order, interaction, active-play, and discovery. This paper has presented a process and completed work by students who attempted to align spatial and physical interactive learning with structured active-play and discovery. Essentially, the prototype, the craftsmanship, and engineering that resulted from the process, generated a pedagogical view among the students charged to complete the exhibit. For these students, the pursuit of learning through discovery was influenced by the poetics of making, spatial order, and structured play. This paper remains focused on the description of their work, the methodology and pedagogy within the work, and the final result as understood from the point of view of the teacher and students – describing the challenges and what the students were able to accomplish within the constraints and parameters of their research, programming, and design processes.

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