

ThinkeringSpace

Designing a System of Collaborative Environments for Kids

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Abstract

ThinkeringSpace (<http://www.ThinkeringSpace.com>) is a hybrid system, made of networked physical environments, that seeks to bring school-age children together to tinker with things, both physical and virtual, reflect upon what they do and discover, and elaborate their ideas in ways they can share with others.

Situated in content rich institutions such as libraries, and connected to a mentorship network, these places within spaces encourage self-directed, productive inquiry, and create new opportunities for face-to-face and stigmergic collaboration through tangible interfaces, and large scale and multi-input technologies.

This short paper presents an overview of the ongoing design and development of these collaborative spaces.

Keywords: *Collaborative environment; physical/virtual interplay; design process.*

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Introduction

The word tinkering is originally connected with the tinkling sound made by light hammering on metal, in the mending of household utensils, around the 13th century. From those early times, the understanding of the word has evolved to mean: do-it-yourself, bricolage learning, and physical-virtual co-creation (Moura, Fahnstrom, Prygrocki and McLeish, 2008a). Levi-Strauss (1962), Papert (1993), Turkle (1995), and Brown (2006) describe tinkering as a form of associative and creative reasoning, or way of learning, that can be useful to children, and which can take them beyond the basic skills emphasized by ‘No Child Left Behind’¹.

Considering the importance of fostering tinkering behaviors and other 21st century skills such as innovation and collaboration (Partnership for 21st Century Skills 2007), a new genre of interactive environments or informal places for tinkering is being envisioned, called ThinkingSpace. Funded by the John D. and Catherine T. MacArthur Foundation Digital Media and Learning Initiative, ThinkingSpace (Moura, Fahnstrom and Prygrocki, 2007) is a system, made of networked and remotely accessible physical environments, that seeks to bring children together to explore, collaborate, co-construct knowledge and share discoveries with others. Although the grant initially positions it within libraries and focuses on school-age children, ThinkingSpace potentially applies to a wide range of ages and contexts, from after-school programs to work spaces.

The ultimate goal of the project is to develop: a) a physical structure based on a product system, with multiple possible configurations, and b) an implementation strategy that includes an overall system description and guideline for library administrators and librarians. For this purpose, the design and development process of ThinkingSpace system was structured into four main phases: 1) framing the project, 2) understanding libraries, 3) learning by prototyping, and 4) guiding implementation. The following sections give the overall description of the system and design process.

ThinkingSpace System

ThinkingSpace is a hybrid system combining physical and virtual environments. The physical installations, or ‘places in spaces’, are based on a ‘kit-of-parts’ model. They are: platform-based, freestanding, scalable, reconfigurable, independent of building architecture, easily monitored and maintained, and self-contained with their own infrastructure (Moura, Fahnstrom, Prygrocki and McLeish, 2008b). Located in libraries, as part of the MacArthur grant, or other venues of opportunity that are rich in collections and resources, they seek to take children through the dialectic experience of concrete and symbolic, creating new opportunities for face-to-face and stigmergic collaboration (Elliot, 2007), and fostering a participatory culture (Jenkins, Clinton, Purushotma, Robinson and Weigel, 2006). The physical part of the system is a vessel for current and future off-the-shelf technology, objects, activities and content – adapted to suit in-person, large scale group interaction, tangible navigation, physical-virtual interplay, and collaborative input control.

¹ United States federal law of 2001 - often abbreviated as NCLB, which enacts the theories of standard-based education reform.

Combining multimodal (e.g., Oviatt, 2003) and multi-input technologies (e.g., Pawar, Pal and Toyama 2006), tangible interfaces (e.g., Reville, Zuckerman, Druin and Bolas, 2005), sensorial objects, symbolic cues, open-ended activities and evolving content, that vary depending on community and location, these environments take interactants beyond the traditional keyboard or mouse input and output, where they sit side-by-side, each looking at an individual screen. Instead, they allow them to face each other and work simultaneously on a task, with multiple input, creating new experiential opportunities for collaboration, complex problem solving, co-creation and shared discovery, thus opening the doors for new ways of expression in the physical and virtual worlds.

The virtual environment, ThinkerNet, is the portal that enables kids to connect with or in these physical spaces. Designed to keep the physical interaction as the focus – while extending the opportunities for collaborative knowledge creation, sharing, and community building in the virtual and hybrid worlds – it provides anywhere, anytime access. As the virtual counterpart of the system, it allows tinkerers to: build individual and group profiles based on one's interests, locate interest groups and mentors, brainstorm, collaborate, access tinkering projects to build upon, store one's history of interactions, develop a portfolio, and share creations.

Design and Development Process

The design and development process of ThinkeringSpace system started, on the summer of 2006, with the framing the project. During this phase: a) working assumptions were identified, b) project approach was defined, c) initial research questions were formulated, d) literature review on learning theory, best examples of existing learning environments, newly available technologies, flexible structures, and social trends was conducted, e) conceptual frameworks were developed from insights and speculation drawn from the influence of the literature review, f) early best-guess actionable design criteria and principles were derived, g) conceptual, structural and behavioral prototypes (Moura, Fahnstrom, Prygrocki and McLeish, 2008c) were generated, h) selected concepts were developed in low level form, i) user observation within the prototype space was conducted, j) data analysis, and iteration and refinement of the design criteria and principles were made, and k) website development was initiated (<http://www.ThinkeringSpace.com>), describing the project and documenting the design process. Amongst some of the high level design principles that were proposed during this phase are: empowering children to become authors, provide affordances for collaboration, support multiple interaction models, and make the environments flexible.

The next phase, on summer of 2007, was concerned with the understanding libraries in the Chicago Metropolitan area and it involved the mapping of the Chicago Public Library system and in-depth study of ten libraries. Secondary research helped to identify many of the facts, issues and forces affecting libraries. Primary research – making use of various information gathering methods and tools, such as video ethnographic observation, individual and group interviews, day-in-a-life journals and questionnaires – provided a rich window on specific library operations. Focus was given on understanding the needs and rituals of librarians, library staff, and patrons, and identifying patterns of behavior. Subsequent analysis

revealed issues that further inform the design of ThinkingSpaces. Included amongst the study insights are: More Than Books – libraries are much more than warehouses of books or media; Constant Change – libraries have made continued efforts to meet patrons' expectations and keep up with technology; Underused Expertise – librarians have a broad range of expert skills that are little known and utilized by the public; and Life-long Relevance – patrons life-long interaction with libraries vary highly (from frequent to no use of the library). From these, implications for design were identified, such as, from the last point: creating opportunities for inter generational interaction and better assessing the interests and needs of different age groups.

The current phase deals with learning by prototyping, and it includes the iterative development of a meta-prototype space (or a prototype of the prototype installations that will be situated in libraries, consisting of the post and beam structural frame and technology-enhanced spatial elements), Figure 1, located at the Institute of Design, Illinois Institute of Technology. This phase also involves the design of interactive prototype concepts that make use of the spatial elements, as exemplars of the range of activities that can be supported by the system. The development of such activities, however, is not part of the core goals of this project. Finally, the in-situ prototyping in the Chicago Metropolitan area library system is also included in this phase, accompanied by user observation and iteration of the concepts and space on the fly.

Included amongst the technology-enhanced spatial elements that are being developed in combination with interactive prototype concepts (Moura, Fahnstrom, Prygrocki and McLeish, 2008b) are: tables with multi-input control, wall-sized screens augmented with wand controllers or batons for large scale group interaction, and artifacts making use of tagging methods to support cross-media linking. For example, standing around a circular collaborative table screen surface, or a 'pond' (Figure 1), a group of users can simultaneously input, browse and select information through multi-mice control, while maintaining face-to-face contact, and, together, for instance, build a 3D simulation about a topic. The central concept is to make it necessary for users to collaborate in order to accomplish any task. Likewise, a group of users can stand in front of a large screen (Figure 1) and share a baton in the input control of the interaction, while organizing information that, for example, other local users send to the screen through personal devices. This type of setting allows users to create a project presentation that integrates multiple modes of representation of information. Another way to collaborate is using artifacts, such as books, as the starting point of the conversation, allowing users to cross-link different media to it, such as a story-telling video they produce, a book review they write, or a website with related pictures they select. When checking in that same book later, other users can scan it into the system and access what others who read the same book linked and authored in relation to it, leading to all the different pathways that were created around the book and living trails for other to find, supporting stigmergic collaboration. Combined with user profile creation and identification of book interests, novel opportunities for networking and interacting face-to-face with people with similar interests could arise.



Figure 1: ThinkingSpace Meta-Prototype Space, including the large screen setting and the collaborative table

The final phase of the grant is concerned with guiding integration into library community, and, informed by the in-situ prototyping study, it includes the description of the final implementation strategy, overall system description and guideline, which will allow library administrators and librarians to define how a ThinkingSpace installation will look like in their library, and what theme and activities will be implemented.

Conclusion

This short paper gives an overview of a new genre of hybrid collaborative environments called ThinkingSpace, and briefly presents the design and development process. In summary, these places within content rich institutions such as libraries seek to bridge the gap between physical and virtual learning experiences, and create new experiential opportunities for collaboration, knowledge co-construction and sharing.

At the present, the ThinkingSpace team is iterating a meta-prototype space situated at the Institute of Design, Illinois Institute of Technology. During the second semester of 2008, prototype installations will be placed in the Chicago Metropolitan area library system. The findings will guide the final implementation phase of the project, as well as indicate new areas of opportunities for ThinkingSpace physical and virtual environments.

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