Research_Design: Inclusive Indoor Play

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Research in design, also known as design research, is a new phenomenon, and originally consisted of research into the process of design and development. The activity is domain-specific knowledge within the professional field of design and, as a front-end design activity, develops new information needed to improve the design process and guide design outcome. Historically, children with disabilities have been at a distinct disadvantage when it comes to play. The purpose of the Inclusive Indoor Play project was to research indoor play environments and playthings to develop universal design playthings. The research results lead to the development of five new playthings: a) Turbo Reader ; b) Writing Slate; c) Art Explorer; d) Discovery Table; and e) Music Maestro.

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ABSTRACT

Research in design, also known as design research, is a new phenomenon, and originally consisted of research into the process of design and development. The activity is domain-specific knowledge within the professional field of design and, as a front-end design activity, develops new information needed to improve the design process and guide design outcome. Historically, children with disabilities have been at a distinct disadvantage when it comes to play. The purpose of the Inclusive Indoor Play project was to research indoor play environments and playthings to develop universal design playthings. The research results lead to the development of five new playthings: a) Turbo Reader ; b) Writing Slate; c) Art Explorer; d) Discovery Table; and e) Music Maestro.

INTRODUCTION

Research in design, also known as design research, is a new phenomenon, and originally consisted of research into the process of design and development. The concept has expanded to include research to inform design and is embedded within the process of creating product and environmental design through research-based design practice. The activity is domain-specific knowledge within the professional field of

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design and, as a front-end design activity, develops new information needed to improve the design process and guide design outcome.

The need to know about design has led to the establishment of design research, a view that design has its own things to know and its own ways of knowing them. Design research, though often grounded in social and environmental research is different from other forms of research like scientific research or market research. Bruce Archer articulates this belief, 'there exists a designerly way of thinking and communicating that is both different from scientific and scholarly ways of thinking and communicating, and as powerful as scientific and scholarly methods of enquiry when applied to its own kinds of problems'. (1) This view was developed further in a series of papers by Nigel Cross, collected as a book on 'Designerly Ways of Knowing'. (2,3) Significantly, Donald Schön (4) promoted the new view within his book The Reflective Practitioner, in which he challenged the technical rationality of Simon and sought to establish 'an epistemology of practice implicit in the artistic, intuitive processes which [design and other] practitioners bring to situations of uncertainty, instability, uniqueness and value conflict'.

Though play in outdoor settings has been researched well as a subject of social development and environmental design, the need for designing playthings for indoor play has not received research attention within the domain of design research. Because more play occurs indoors, design research must focus on developing front-end information to inform the design activity, develop new information and guide design development of playthings. Social inclusion is the primary objective of the Inclusive Indoor Play project (iPP) and it researched the needs of children with disabilities as poor design puts them at a disadvantage when it comes to participation in play with other children.

There are many reasons why children play. Through play, children learn about and attempt to understand their world, experiences, (5), and self. (6) Play is said to be a result of the child's biological, neurological, and kinesiologic functions that enable the young child to act (7). When the child achieves success in the player role, it means that the child experiences feelings associated with productivity, satisfactory quality of life, meaningfulness and value (8).

Historically, children with disabilities have been at a distinct disadvantage when it comes to play. For example, mobility problems make it difficult, if not impossible, for children to play hide-and-seek. Visual impairments impede an infant's ability to find and investigate play environments, while cognitive disabilities limit their development of pretend play. In fact, any disabilities (physical, cognitive, or sensory) pose barriers to spontaneous engagement in play and play environments (9). As a result, play repertoires of children with disabilities are reportedly more limited, their play is more often passive and sedentary, (10) and their play occurs less frequently.(11) Their play is more often solitary, (12, 13) social interaction is frequently delayed or distorted, and symbolic play is often significantly limited (13, 14).

Unlike outdoor playgrounds, indoor play environments are designed spaces located inside buildings that allow children to play in a controlled and supervised environment. Because indoor play environments are restricted by the size of interior spaces, they tend to be much smaller than typical public outdoor playgrounds. Commercially available indoor play equipment is designed to maximize the three-dimensional space in the building and accommodate as many children as possible. As a result, they tend to be high and inaccessible to children with disabilities. Located in tight indoor spaces and designed for continuous ascending and descending, this equipment also poses considerable safety risks to children with disabilities. Examples

include indoor play spaces at McDonalds, IKEA and Chuck E. Cheese. Other environments include daycare centers, preschools, airports and hospitals. Despite the growing popularity of indoor play areas, most of them are inaccessible and unusable to children with disabilities. Until 2010, the only materials available for designers of play spaces existed in the form of guidelines for play areas and recreational facilities. (15) These guidelines were incorporated into the 2010 version of the ADA Standards, which became enforceable on March 15, 2011.

RESEARCH

The purpose of the Inclusive Indoor Play project was to research indoor play environments and playthings to develop universal design play guidelines. The project required using the guidelines to design play environments and playthings that are safe and accessible to all children. Considering there are 60.7M children under the age of 15 in the United States, with over 5.3M children with disabilities, of which 1.8M with severe disabilities, and .25M who need assistance (U.S. Census Bureau, 2005), there is a need to develop models of inclusive indoor playthings and environments for all children with and without disabilities to participate equally.

Focus Groups

A focus group was conducted to define play, indoor play, and inclusive indoor play, and to identify design features for inclusive indoor playthings. (16) Participants in the focus groups included parents, educators, therapists, day care operators and toy designers. Focus group participants discussed the characteristics of each type of play. A list of participant perceptions regarding each type of play was prepared, and participants ranked the importance of the perceptions in that play type. The scale used in the rankings was Uniform acceptance, Majority acceptance, Neutral (some accept/some reject), Majority rejection, and Uniform rejection. These rankings helped in the development of final lists of play characteristics.

Focus group participants then were asked to examine a number of playthings and answer several questions:

1. What is your overall impression of the plaything?
2. Why would your child play/not play with the plaything?
3. What might be done to improve the plaything to make it more inclusive?
4. What criteria did your small group use to answer the questions?

A summary of plaything evaluations was prepared which included design features, comments regarding each plaything, and suggestions to improve inclusiveness. A second focus group was conducted to validate the definitions identified by the first group. In addition, the second group validated and ranked the inclusive indoor play design features, adding hierarchy and eliminating features that were unimportant. The results of the two focus group interviews were employed to outline eight criteria important for social inclusion and included durability, safety, interesting, playability, stimulation, inclusion, usability and flexibility.

Drawings / Collage

This project was conducted to study what children like to play indoors and to learn about social/collective play preferences. (17) Children, ages 4-8, with and without disabilities, were asked to draw and talk about six drawings representative of their

interpretation of open play, exercise play, quiet play, pretend play, invention play and favorite play. The children were also asked to create a collage of playthings divided into three selections – things they like a lot, things they like, and things they dislike. Children selected images from a group of 28 prepared images to create this collage. They were encouraged to talk about their selections, what they liked and disliked about each, and identifying their most favorite image.

Findings from this study informed the development of the design guidelines by collecting data from children including their play preferences, needs and concerns. This study provided preferences for social and independent play in relation to play activities and playthings. Child participants with disabilities confirmed literature stating that children with disabilities engage in more independent play, and when they play socially, it tends to be with parents and caretakers more than peers.

Children at Play

The intent was to learn about play through the involvement of children with and without disabilities in realistic play environments. (18) The study explored five important aspects of play: 1) The ability of children to play independently, 2) the level of assistance children need in playing, 3) the level of effort required for play, 4) level of difficulty in play, and 5) level of fun. We wanted to know how children with and without disabilities played.

The study was conducted in an indoor play laboratory equipped with a wide range of playthings that are larger than toys and smaller than play equipment. The laboratory was equipped with computer-controlled cameras to record play actions and voice. Subjects could be observed within the play lab or through the recording system from another room. All children were video recorded as they played, and video was used later to analyze the five aspects of play. Each child was directed to play with 4 playthings, and the playthings were randomized, so each child played with a different grouping of playthings. After playing with each of the playthings, children were interviewed for their opinions as to difficulty in play, and fun.

Findings show that children within the age range of 5-8 years perceive dependence in play as being more fun. Unlike adults, who value independence, children perceive dependence in play as collaboration, which is the same as playing with others and is important for fun. The level of fun did not impact the level of independence in playthings, except for recreational guided play. Educational/Open, and Recreational/Open play forms are highly supportive for people with mild cognitive disability. The children reported a strong correlation between difficulty and fun and their responses suggest that it is more fun to play with challenging playthings.

DESIGN

The key to balancing research and design lies in their connections with one another through interlocking cycles, each one stimulates and guides the others in a process centered on the dynamic design process. While the process is cyclical and complimentary, design is the final outcome of design-research task and aims at informing the design process through designerly information. Connecting the research-design information ensures that research is relevant and representative of design, and it provides a base for analytical perspectives and development of design concepts that is

portable across the development process and can be leveraged in the development of product and environmental systems.

Several important design considerations emerged from the design research and they included:

1. Focus on indoor play through development of a technological product that connects play and education and offer fun and learning simultaneously.
2. Employment of easy-to-use technology that is interactive and engages children though the play process.
3. Serve as many children as possible, through designs that are customizable and suits individual and collective needs.
4. To be used for indoor play, the design must require less physical activity and more cognitive involvement.
5. Rugged design to protect the technology, visual appearance soft and pleasing to children, and styling flexible enough to engage ages 4-8 (preschool through 3rd grade)

In specific, three play principles provided directions to five new playthings: 1) offer many play opportunities, 2) provide many modes of play, and 3) include many levels of play challenges. These principles are fundamental to inclusion in play and helped develop five new playthings: a) Turbo Reader ; b) Writing Slate; c) Art Explorer; d) Discovery Table; and e) Music Maestro.

Writing Slate

Art Explorer

Play Maker

Turbo Reader

Reading tablet that teaches alphabets, words and sentences pictorially for younger children, and through adaptation, it can be reconfigured for older children to read stories in a format that has more words and fewer pictures. Technology allows making content and operational changes and children can customize the tablet to suit individual needs.

Writing Slate

Writing tablet offers many possibilities including alphabet, word and sentence for younger children and cursive and non-cursive writing for older children. Technology allows making choices and customizes writing options for children varying in age and disabling condition.

Art Explorer

Drawing tablet allows illustrating with a stylus or finger. Color and line thickness can be varied and underlays for those needing help are available. Technology provides drawing choices and allows children the opportunity to personalize.

Play Maker

A handheld device prompts children with lines and gestures needed to participate in group play through acting out and participation in plays. The prompting level can be varied to suit the needs of children while maintaining a challenge level to keep them engaged and maintain fun. Technology allows making adjustments to the content, visuals and pace of information delivery and fosters participation and enjoyment in group play.

Music Maestro

The musical instrument allows children to learn and play many types of musical instruments ranging from keyboards to wind instruments. Attachments can be incorporated to transform the instrument from one type to another, and though programming, the instruments can be made to offer many levels of challenge while proving the needed support to perform. Technology allows making choices in musical instruments and provides challenges and support needed to maintain interest while providing education and fun.

The new playthings employs technology to offer customization and better attain children-design fit so they can address their needs and achieve high degree of education and fun. Two important design achievements include:

1. Personalization through approaches best described as flexible designs and choice of input methods like gesture, touch, stylus and voice.
2. Acceptability by children through flexible visual appearance that allows making gender and age choices, and incorporate decorative and functional parts for individuals to make aesthetic decisions.

CONCLUSION

Design research is a systematic search for and acquisition of knowledge related to general design problem, considered from a 'designerly way of thinking perspective. The iPP, an exercise in design research, collected design information using three different research tools and clarified complex human needs, behaviors, and perspectives as it related to education and fun in indoor play. Field research through interviews, simulation and drawings helped identify contextual and environmental factors that shape interactive learning experience in children. Clearly, good design research doesn't end with good data; it hinges on clever interpretation of the data and inventing unusual modes of application so innovation can be created. In design research, it is important to:

- **Collect data from unusual sources:** This includes designing research tools to investigate problems and focus on creative application of these tools to obtain design data.
- **Make sense of the data.** This includes filtering the data for relevancy and categorizing data using taxonomies that support future needs and

opportunities. It is important to establish interconnectivity and outline information priorities to develop affinity maps needed to draw relationships between data points and identify creative design applications.

- **Distill data into insights.** The data must produce insights to inform the problem-solving process and revel causations and consequences so the insights can be applied and innovative design concepts developed.
- **Translate insights into actionable formats.** The data must be easily accessible and immediately useful to the design process so 'best-guess' attempt at how to solve the problem produces a wide range of innovative design concepts.

It is important to bear in mind that design research must: 1) offer frontend information to the design process; 2) produce "designerly" information that has strong design application; 3) employ creative tools to enable a wide range of data that has strong design application; 4) suggest a creative process by which a problem can be solved and design innovation created.

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References

[1] Archer, Leonard Bruce (1979). "Whatever Became of Design Methodology?". *Design Studies* **1** (1): 17–20.
[2] Cross, Nigel (2006). *Designerly ways of knowing*. London: Springer. ISBN\ 978-1-84628-300-0. OCLC 63186849.
[3] Cross, Nigel (2007) [2006]. *Designerly Ways of Knowing*. Basel [u.a.]: Birkhäuser. ISBN 978-3-7643-8484-5. OCLC 255922654
[4] Schön, Donald Schön (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books. ISBN 978-0-465-06874-6.
[5] Piaget J. Play, dreams, and imitation in childhood. W. W. Norton, New York; 1962.
[6] Thyssen S. Child, Culture, Play and Child Development. Early Child Development and Care. 2003; 173 (6), 589-612.
[7] Kumar S, Harizuka, S. Cooperative learning-based approach and development of learning awareness and achievement in mathematics in elementary schools. Psychological Reports; 1998. 82, 587-591.
[8] Case-Smith. Pediatric occupational therapy early intervention. 2nd ed. Butterworth-Heinemann;1993.
[9] Lane S J, Mistrett SG. Play and assistive technology issues for infants and young children with disabilities: A preliminary examination. Focus on Autism and Other Developmental Disabilities. A Journal of the Hammil Institute on Disabilities; 1996. 11 (2), 96-104.
[10] Florey L. An approach to play and play development. The American Journal of Occupational Therapy; 1971. 25 (6), 275-280.
[11] Krawkow JB, Kopp CB. The effects of developmental delay on sustained attention in young children. Child Development; 1983. 54, 1143-115.
[12] Bergen D. Play as the vehicle for early intervention with at-risk infants and toddlers; 1991. ERIC Document Reproduction Services, ED 335115.
[13] Jennings KD, Connors RE, Stegman CE. Does a physical handicap alter the development of mastery motivation during the preschool years? Journal-of-the-American-Academy-of-Child-and-Adolescent-Psychiatry; 1988. 27(3): 312-317.

[14] Missiuna C, Pollock N. Play deprivation in children with physical disabilities: The role of the Occupational Therapist in preventing secondary disability. The American Journal of Occupational Therapy; 1991. 45(10), 882-888.
[15] U.S. Access Board Guidelines; 2010. http://www.access-board.gov/gs.htm. Accessed September 20, 2012.
[16] Mullick Abir and R.L. Grubb. Inclusion in Indoor Play. Proceedings of the Include Conference, Royal College of Art, London, U.K., April 4-5, 2009.
[17] Mullick, Abir.,Topping, Marisa., and Wooyoung Sung. Inclusive Indoor Play: Children's Drawings. Proceedings of the Conference on Human Factors and Ergonomic Society, San Antonio, TX, October 2009.
[18] Mullick, Abir., Endicott, Sarah., and Kar, Gaurabh. Inclusive Indoor Play: Children at Play. Proceedings of the Conference on Human Factors and Ergonomic Society, San Antonio, TX, October 2009.
[19] Brown, T. (2009). Change by Design. *Journal of Product Innovation Management*, 28, 381-383.
[20] Wineman, J.D, (1982). Office design & evaluation. *Environment & Behavior*, 14(3), 271-298.
[21] Buchanan, R. (2010). Wicked problems in design thinking. Kepes, (6).
[22] Diffrient, N., Tilley, A. R., & Bardagjy, J. C. (1974). *Humanscale I/2/3*. Cambridge, MA. MIT Press.
[23] Panero, J., Zelnick, M., (1979). *Human Dimension and Interior Space: A source book of design reference standards*. New York: Watson-Guptill Publications.
[24] McCelland, I., & Suri, J. (2005). Involving People in Design, In *Evaluation of Human Work, Third Edition*, edited by Wilson and Corlett. Boca Raton: CRC Press.