
Designing Tangibles for Children: One Day Hands-on Workshop

Alissa N. Antle

School of Interactive Arts &
Technology (SIAT)
Simon Fraser University
Central City, Surrey, B.C.
V3T 0A3 Canada
aantle@sfu.ca

Jillian L. Warren

School of Interactive Arts &
Technology (SIAT)
Simon Fraser University
Central City, Surrey, B.C.
V3T 0A3 Canada
jlw29@sfu.ca

Emily S. Cramer

School of Interactive Arts &
Technology (SIAT)
Simon Fraser University
Central City, Surrey, B.C.
V3T 0A3 Canada
ecramer@sfu.ca

Copyright is held by the owner/author(s).
IDC '16, June 21-24, 2016, Manchester, United Kingdom
ACM 978-1-4503-4313-8/16/06.
<http://dx.doi.org/10.1145/2930674.2932223>

Min Fan

School of Interactive Arts &
Technology (SIAT)
Simon Fraser University
Central City, Surrey, B.C.
V3T 0A3 Canada
minf@sfu.ca

Brendan B. Matkin

School of Interactive Arts &
Technology (SIAT)
Simon Fraser University
Central City, Surrey, B.C.
V3T 0A3 Canada
bmatkin@sfu.ca

Abstract

This hands-on workshop introduces a foundation for designing tangibles for children. Participants engage in a low-fidelity design challenge using the iPad Osmo system. We focus on how designing tangibles for children is unique from other design problems and processes. We walk participants through an outcome driven design process using the award winning Developmentally Situated Design (DSD) card set – focusing on cognitive, emotional, physical, and social skills specific to children at *different* ages. Small groups create solutions for the same design challenge, but focus on the skills and abilities of a specific age group. We facilitate a compare and contrast exercise of their solutions to help synthesize the complexities of, and showcase skills for, designing child-centric tangibles. Participants are encouraged to review the DSD II cards in advance, available at www.antle.iat.sfu.ca/DSD, as well the papers [1, 2, 3], to get the most out of their workshop experience. These artifacts and papers will be used to within the workshop for hands-on learning and conceptual discussions.

Author Keywords

Interaction design for children, developmentally situated design, tangible learning design framework, learning outcomes, design process, design knowledge.

ACM Classification Keywords

H5.m. Information interfaces and presentation.

Introduction

Many researchers have suggested that tangible user interfaces (tangibles) have potential for supporting children's informal and formal learning [4]. Tangible computing is highly suited to the design and development of children's games and learning activities because it leverages both familiar physical artifacts and digital computation. Designers must understand and consider children's developmental skills, abilities and limitations to ensure that tangible products are appropriate for the intended age group [3]. Researchers must also understand and consider children's developmental skills and abilities to create age appropriate tangible prototypes based on explicit mechanisms related to development and/or learning [1]. In order to achieve these goals, designers and researchers need to know how to bring developmentally specific knowledge about children's cognitive, physical, emotional, and social skills and abilities into a tangibles design process. In this workshop we introduce participants to, and facilitate the practice of, a developmentally sensitive design process focused on how variations in these skills for children of different age ranges impact both usability and learning.

Workshop Duration & Proposed Schedule

The duration of the workshop is planned for 1 day and the proposed schedule is as follows:

- Hour 1: Introduction to Tangible Learning Design Framework (TLDF) [1] and Developmentally Situated Design version II (DSD II) cards [3] with Youtopia tangible tabletop case study example [2]
- Hour 2: TLDF and DSD II in action - Using TLDF and DSD II to walk through Osmo applications to see what strategies have been employed (or not). This will act as an introduction to the capabilities of

Osmo and how TLDF/DSD II can be used to think about designing for children

- Break for Lunch
- Hour 3+4: Participants will be given a set of DSD II cards and will low-fidelity prototype an Osmo application to solve a particular problem. Constraints will be given based on age group and skills/abilities using the DSD II cards and TLDF areas of importance. In pairs or small groups, participants will use physical materials to haptically sketch their design problem.
- Hour 5: Show+Tell/Compare+Contrast solutions

Workshop Proposal

This workshop focuses on the topic of design of tangibles for children of different developmental levels. Designers and researchers will improve their designs and design-based research by better understanding the specific characteristics of the children they are designing for. A design process that highlights requirements and goals for children's age-specific skills and abilities improves the quality of design solutions, especially if children are not available throughout the design process. In particular, it is beneficial to follow a process that highlights design choices relevant for tangible interfaces that might have significant impacts



Figure 1. The DSD II card set consists of 42 cards, describing 14 areas (e.g. fine manipulation, etc.) categorized by domain (physical, emotional, etc.) for ages 5-6, 7-9 & 10-12.

on learning.

In the first part of the workshop we introduce such a process informed by theoretical knowledge about children’s skills and abilities (presented using the DSD II card set – **Figures 1, 2 & 3**) in the context of TUI design (conceptualized using the Tangible Learning Design Framework (TLDF)). Our main objective is to help designers and researchers think about the interaction between TUI features and children’s developmental levels. Youtopia, a hybrid multi-touch tangible system will be used to illustrate concepts and constraints put forward by the DSD cards and the TLDF. Additionally, to lay the foundation for the design challenge, we do a walkthrough of different Osmo applications in light of the newly acquired DSD and TLDF knowledge. This familiarizes the participants with Osmo as well as practicing how the knowledge can be used to think about tangible design for children.



Figure 2. On one side of the card, users will find a child development construct related to a developmental area along with real examples. On the other side of the card, users will find a set of designer tips provided in the form of questions to ask during the design process as well as an image example.

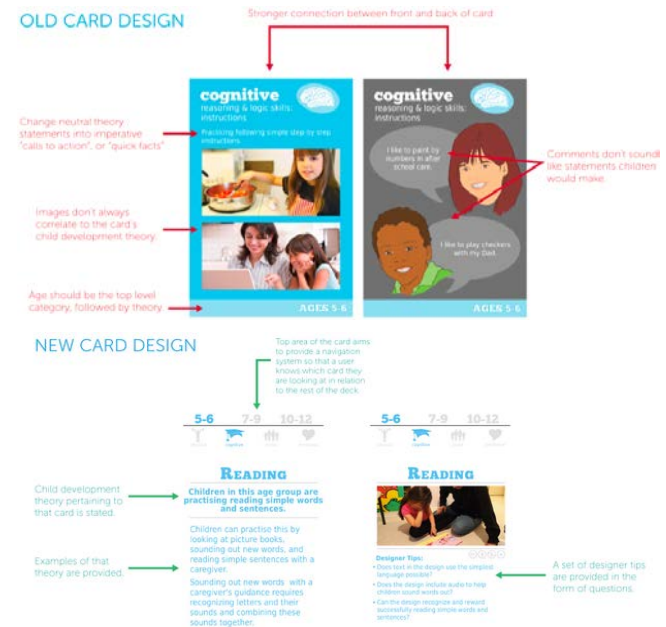


Figure 3. Please note that [3] presents research about the DSD I card set shown in the top view of this figure. All participants will receive a copy of the DSD II card set, which has been redesigned shown in the bottom view of this figure and in Figures 1 & 2. DSD II can be found at <http://www.antle.iat.sfu.ca/DSD>

In the second part of the workshop, participants then apply this process and developmental knowledge in an iterative hands-on design task using an Osmo physical play platform for iPad/iPad mini. The workshop concludes with a compare and contrast of the same design problem explored by participants, which should account for variations in children’s age-related developmental domain skills and abilities (physical, emotional, social and cognitive). Participants will keep their DSD II card set. We will facilitate community

building to extend learning outcomes beyond the workshop. This workshop is targeted to designers and researchers who are familiar with tangibles, but may not have worked extensively with children.

Workshop Learning Goals

The primary learning goals for the workshop are:

- To bring together a *community* of researchers and designers who are creating tangible computing systems for children;
- To understand how an outcome-driven design process enables designers to identify the age-related skills and abilities of children which may be required for interaction, or should be learned during interaction;
- To practice using the Developmentally Situated Design Card set as one way to incorporate theoretical knowledge about children's skills and abilities into a simple design process;
- To practice using the Tangible Learning Design Framework to focus on critical elements of a tangible interface design problem;
- To practice designing with both process and theoretical knowledge during a design problem for a simple tangible application;
- To compare and contrast different design solutions to better understand how age related skills and abilities of children impact design solutions.

Workshop Positioning

This workshop introduces knowledge about design processes and child development by supporting participants' application of knowledge in a hands-on, directed-design activity. We position this workshop as

an exposure to accessible theory about child development in the context of designing tangibles using two established design methods (DSD II, TLDF). We conclude with a compare and contrast activity that enables participants to see how theory may play out differently depending on the child-specific parameters of the design problem.

Coordinator Information

Please note, all coordinators have the following affiliation:
School of Interactive Arts & Technology (SIAT)
Simon Fraser University
Central City, Surrey, B.C. V3T 0A3 Canada

Alissa N. Antle

aantle@sfu.ca

Web Site (www.antle.iat.sfu.ca)

Alissa N. Antle is an expert in tangible computing and interaction design for children. She has run several workshops on the topic of interaction design for children as well as embodied interaction at ACM CHI, ACM TEI, ACM IDC, and ACE. Before her current position as a professor at the School of Interactive Arts and Technology, SFU, Dr. Antle worked as a designer and producer in the children's new media industry.

Jillian L. Warren – Primary Contact

jlw29@sfu.ca

Workshop Web Site

(www.antle.iat.sfu.ca/IDC2016TangiblesChildrenWorkshop)

Jillian L. Warren is a Ph.D. candidate, under the supervision of Dr. Antle, interested in how tangible, wearable input/output systems can play a role in our understanding of the embodied 'self'. She holds a Master of Science from Simon Fraser University in Interactive Arts & Technology, where she focused on how the design of tangible applications for collaborative

learning mediate learner/teacher interaction as well as impact classroom integration. She holds an (hons.) Master of Arts in Media Culture from Maastricht University and a (hons.) Bachelor of Arts in Media Studies and Computational Thinking from the College of Charleston. She successfully ran a similar workshop at the ACM International Conference on Tangible, Embedded and Embodied Interaction (TEI) 2016 in Eindhoven, NL.

Emily S. Cramer

ecramer@sfu.ca

Emily S. Cramer holds a Bachelor of Arts in cognitive science from the University of British Columbia and a Master of Science in Interactive Art and Technology (SFU) from Simon Fraser University. Emily has published several papers in the field of tangible and visual interface strategies for children's learning applications, with a focus on integrating basic psychological research with software design. Emily is continuing her research as Dr. Antle's Ph.D. student. She successfully helped facilitate a similar workshop at the ACM International conference on Tangible, Embedded and Embodied Interaction (TEI) 2016 in Eindhoven, NL.

Min Fan

minf@sfu.ca

Min Fan is a Ph.D. candidate under the supervision of Dr. Antle. She is interested in tangible and child-centric interaction design. She has a strong background in multimedia design and has been involved in many research and industrial-oriented projects. Her current research focus is about designing a tangible system that can support literacy acquisition for children with dyslexia.

Brendan B. Matkin

bmatkin@sfu.ca

Brendan B. Matkin is a Master of Arts candidate in the School of Interactive Arts and Technology (SIAT) at Simon Fraser University. His research interests include building and studying tangible interactive systems, embodied cultural values, embodied metaphors, and interaction design for children. Brendan is a designer, artist, researcher, technologist, and all around maker and tinkerer. He holds a Bachelor of Fine Arts in New Media from the University of Lethbridge.

References

1. Alissa N. Antle and Alyssa F. Wise. 2013. Getting Down to Details: Using Theories of Cognition and Learning to Inform Tangible User Interface Design. *Interacting with Computers*. <http://doi.org/10.1093/iwc/iws007>
2. Alissa N. Antle, Alyssa F. Wise, Amanda Hall, et al. 2013. Youtopia: a collaborative, tangible, multi-touch, sustainability learning activity. *Proceedings of the 12th International Conference on Interaction Design and Children, ACM*, 565–568. <http://doi.org/10.1145/2485760.2485866>
3. Tilde Bekker and Alissa N. Antle. 2011. Developmentally situated design (DSD): making theoretical knowledge accessible to designers of children's technology. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, ACM*, 2531–2540.
4. Bieke Zaman, Vero Vanden Abeele, Panos Markopoulos, and Paul Marshall. 2012. Editorial: the evolving field of tangible interaction for children: the challenge of empirical validation. *Personal and Ubiquitous Computing* 16, 4: 367–378. <http://doi.org/10.1007/s00779-011-0409-x>