A Framework of Touchscreen Interaction Design Recommendations for Children (TIDRC)

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(TIDRC = “tide-rock”)
Research-Practice Gaps in HCI

• Beck & Ekbia, CHI 2018 [8], noted:
  • “...theory — the academic side of HCI research — lacks utility and applicability for practice. And this ...problem... goes back decades to the early days of the field...1985...”

Research Questions

• **RQ1:** How can we synthesize evidence-based design recommendations for children’s touchscreen interfaces?
  • Literature review and meta-analysis

• **RQ2:** Is there a gap between research and practice for touchscreen interface design for children, and if so, how can we characterize it?
  • Empirical analysis of existing apps

• **RQ3:** If this gap exists, how can we work towards closing it?
  • Identification of gaps and future work
Literature Review

• 31 total papers

• Inclusion criteria: peer-reviewed research paper reporting an empirical user study of children (under age 12) that led to design recommendations
TIDRC Framework

• 31 papers → 57 design recommendations

• **Cognitive, physical, and socio-emotional** needs

• Mapped to Piagetian* developmental stages:
  • Pre-operational in ages **2 to 7** (86% of recs)
  • Concrete operational in ages **7 to 11** (31%)
  • Or both stages from ages **2 to 11** (26%)

*Chiasson & Gutwin, Interfaces 2005 [17]
*Jean Piaget, 1976 book [51]

Actionable Design Recommendation: “avoid using visually complex application backgrounds as children can get confused when interacting on them” (B5, TIDRC)

*Aziz et al, SAI 2013 [6]
Cognitive

- Visual design features
- Audio features
- Interactive features
- Application responsiveness
- Informational features

Physical

- Gesture and target features

Socio-Emotional

- Contextual features

framework is a one-sheet download
TIDRC Framework

**Cognitive**
- Visual design features
- Audio features
- Interactive features
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**Physical**
- Gesture and target features

**Socio-Emotional**
- Contextual features

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Empirical Analysis of Existing Apps

• 50 popular free iPad apps
• “Kids” category: games (56%) and education (44%)
• Ages targeted: 5 and under (58% of apps), 6 to 9 (28%), 9 to 11 (10%)

some of the apps we included in our empirical analysis
# Qualitative Coding

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<thead>
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@lanthonyuf
@UFINITLab
## Overall Findings

- 51% of apps were consistent with **cognitive** recommendations
- 67% of apps were consistent with **physical** recommendations
- 72% of apps were consistent with **socio-emotional** recommendations

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<td>Activity Structure</td>
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<td>Social Sharing</td>
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Example: Cognitive: **Interaction Prompts**

- Types of interaction prompts:
  - Audio prompts, e.g., in-app voice recordings
  - Static visual (text) prompts
  - Animated hand prompts
  - Animated visual prompts

*Hiniker et al, IDC 2015 [34]*
Example: Cognitive: **Interaction Prompts**

- I19, TIDRC: Provide explicit scaffolding such as interaction prompts to help children remember how to accomplish tasks [17,34]:
  - 54% of apps included interaction prompts to guide children [ages 2-11].

- I24, TIDRC: Provide animated prompts to help children learn what gestures to make... [34,44,66]:
  - 32% of apps followed this recommendation [ages 2-7].

*Animated hand prompts vs Animated visual prompts*

*Hiniker et al, IDC 2015 [34]*
Take-Aways

1. Research-practice gap
2. Conflicting guidelines
3. Socio-emotional needs
4. Closing the research-practice gap
1. Research-practice gap

- **Cognitive (51%)**
  Physical (67%)
  Socio-emotional (72%)

- **Motor** abilities of children are well-supported (physical).

- **Cognitive** abilities are less well-supported.
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Take-away: without addressing this gap by making relevant design guidelines accessible to practitioners, children’s touchscreen apps may, at best, be abandoned for lack of ability to use them, and, at worst, hinder children’s development by ignoring opportunities for design.
2. Conflicting guidelines

• Not all empirical evidence was consistent with each other!

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<th>Found a feature “worked”:</th>
<th>Found a feature did not “work”:</th>
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• We **did not recommend a feature** if any studies showed that children may have problems with some features, since this means the feature is not likely to work well for all children.
2. Conflicting guidelines

Take-away: these areas of conflicting evidence are important directions for future research to clarify and seek convergence to create solid recommendations for multiple age groups.
3. Socio-emotional needs

- While 72% of apps followed recommendations for supporting children’s socio-emotional needs, only **four recommendations** (out of 57) pertained to this developmental category at all.

- Other types of research could be relevant to TIDRC, including apps designed for **parent-child dyadic use or children’s interactive media**.
  - How can these apply to touchscreen app contexts?

- Social computing and novel interaction research communities tend to be disconnected within SIGCHI (Bernstein, CHI EA 2011).
3. Socio-emotional needs

Take-away: we call for the social computing and systems research communities to work together toward the larger goal of holistic design for children’s range of developmental needs.
4. Closing the research-practice gap

• **Leverage conceptual frameworks** (like TIDRC)
  • Create accessible frameworks and keep them updated
  • Send us your research to add to TIDRC!

• Translate research findings into **actionable design guidelines**
  • Use language like “use” or “avoid” to make clear what designers should do

• **Disseminate research findings more broadly**
  • Don’t solely publish in academic communities
    • Consider: UXPA Magazine*, SIGCHI Bulletin, CSCW Blog, etc.
  • Participate in bridging workshops and public scholarship efforts

*Anthony, Kientz, & Hiniker, UXPA Mag 2018 [2]
4. Closing the research-practice gap

Take-away: we publicly release the TIDRC framework guide as a one-sheet download for researchers and practitioners to easily access: https://init.cise.ufl.edu/tidrc/
Thank you!

- Download the TIDRC framework here: [https://init.cise.ufl.edu/tidrc/](https://init.cise.ufl.edu/tidrc/)
- Contact us if you have new research to add to it!

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