

Investigation of Young Children's Use of Gestural Interface

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Presentation

- Digital play
- Touch Screen Technology, Gestural Interface and iPads
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Touch Screen Technology, Gestural Interface and iPads

- Touch Screen Technology
- Gestural Interface
- Play-based learning and iPad
- Digital technology and Digital Play
- Early childhood education

Research Methods

- This research used qualitative research methodology and observation research method. **Semi-structured field observation** can be used as a “fundamental basis of all research methods” in social and behavioural science (Denzin & Lincoln, 2005).
- **Eighty children participated in this study.** Children were classified as 3-4 years age group (43.8%), and 4-5 years age group (56.3%).
- The **Involvement Scale** *Assessing for learning and development in the early years using observation scales: Reflect respect relate*” (DECS, 2008, p. 81) was used and described nine signals that a child participating in an activity was indeed ‘involved’, they include: (1) *concentration*, (2) *energy*, (3) *complexity/creativity*, (4) *facial expression and posture (non-verbals)*, (5) *persistence*, (6) *precision*, (7) *reaction time*, (8) *verbal utterances/language*, and (9) *satisfaction*. Concentration, energy, complexity/creativity and persistence are four essential signals that must be present for sustained, intense involvement.
- Using the Gestural Interface App Rating Scale (GIARS) developed from the Haugland Scale (Haugland & Wright, 1997), 50 early childhood **numeracy Apps** were also chosen from the Game Centre component of the Apple website.

Findings

It was found almost all the areas other than verbal utterances and language were rated above medium engagement. Among them, the areas facial expression and posture, persistence and concentration were rated closer to high engagement.

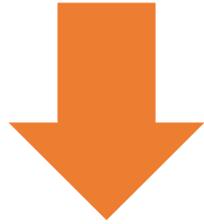
Table 1: Engagement of Children's Playing Apps (Means)

	Mean	SD	N
Facial expression and Posture	2.90	.47	80
Persistence	2.83	.50	80
Concentration	2.80	.47	79
Reaction time	2.50	.57	80
Precision	2.39	.65	80
Satisfaction	2.26	.51	80
Energy	2.23	.50	80
Complexity and Creativity	2.05	.37	80
Verbal utterances and Language	1.79	.64	80

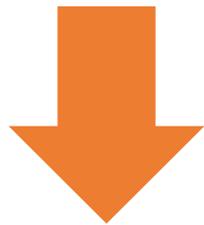
Note. (a) The means are presented in order, from highest to lowest, using 4-point scale anchored (0 = no engagement, 1 = low engagement, 2 = medium engagement, and 3 = high engagement). (b) A repeated measures ANOVA on the above means revealed a significant effect, $F(8, 624) = 90.17, p < .01$.

Children's Mathematical Thinking

Concrete



Mental Image /
Simulation



Abstract

Findings

The elements of Gestural Interfaces, including contextual environments, spatial design, seamlessness, scaffolding, no touch left behind and the autonomy of a gesture, was categorised **if the child attempted to use elements of the gestural interface to assist with the cognitive load of answering the numeracy question**. The following text shows an example of the Use Elements of GI:

Child No.7 was playing the App Monkey Numeracy. The App asked Child No.7 to complete a pattern: shell, jellyfish, shell, jellyfish, shell ...Child No.7 pointed at each sea character in the question (the App calls out the name of the object), then she pressed the three alternative answers provided at the bottom of the screen: shell, jellyfish and clam (again the App calls out the name of the object). Child No.7 then repeated the question again pushing the three shells and two jellyfish, she finally placed her finger on the middle answer (jellyfish) and dragged it into the answer box. This indicated that Child No.7 was able to use the gestural interface elements to assist in solving the numeracy question posed of her.

Findings

The following presents an example of a child who did not use elements of GI:

Child No.63 was also playing the App Monkey Numeracy. The App asked Child No.63 to solve the equation of $1+2$. It provided Child No.63 with a set of sea horses that the child could count in order to assist with the cognitive load. At the bottom of the screen were three potential answers: 3, 5 and 2. Instead of using the sea horses to count, Child No.63 placed her finger on the number 5 and dragged it into the answer box, when the App made an error noise and reversed the action; Child No.63 placed her finger on the number 3 and dragged it into the answer square receiving an affirmative response from the App. Therefore, the child did not use the gestural elements provided by the App to assist with the cognitive load, rather she used a trial and error approach or conversely she believed she already knew the answer, thus not needing the gestural interface cues.

Findings

Elements of GI was significantly correlated with the following areas in children's engagement scale (See Table 2). This result explains that when children use the gestural interface features they had higher levels of engagement in almost each area. This result clearly shows that educators and parents should encourage children to use the gestural interface device to maintain engagement within gameplay. This will require adults to scaffold children's use of the interface to maximise the Apps' potential.

Table 2: Correlations between Elements of GI and Persistence, Concentration, Precision, Reaction Time, Satisfaction, Energy, Complexity and Creativity, Verbal Utterances and Language, and General Ranking

Item	<i>r</i>	<i>p</i>
Persistence	0.25	0.02
Concentration	0.26	0.02
Reaction time	0.59	<0.01
Precision	0.66	<0.01
Satisfaction	0.35	<0.01
Energy	0.23	0.04
Complexity and Creativity	0.39	<0.01
Verbal utterances and Language	0.26	0.02
General ranking	0.65	<0.01

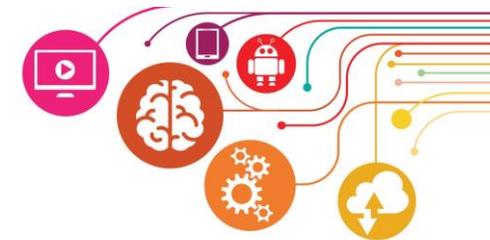
Note. *N* = 80.

Discussion and Conclusion

- **When children used the gestural interface appropriately, they had higher levels of engagement.**
- A tablet computer is a gestural-based mobile computer, and it allows users to manipulate software via physical interaction, because it “features a large, high-precision, touch-sensitive display that requires no physical force” (Apple, 2011).
- Children showed higher levels of engagement when using the gestural interface suitably supports the statement that the use of gestural interface devices is an appropriate hardware choice for young children’s engagement during learning (Goldin-Meadow et al., 2009; Kucirkova et al., 2014; Yelland et al., 2014).
- The gestural interface provided by iPads can be leveraged better with children’s learning needs (Wigdor & Wixon, 2011).
- **Gestural interfaces allow for embodied interactions, which links appropriately to the way young children learn via gestures with their hands and fingers (Stone et al., 2014). Gestures such as finger counting are used by young children to comprehend as a problem solving tool (Wigdor & Wixon, 2011).**

Discussion and Conclusion

- The interactive designs of gestural interface devices are certainly appropriate for young children.
- With the developing capacities of children within the early years it is pertinent to note that **as the children age the use of a gestural interface becomes easier and more effective. Children are able to refine motor skills, leading to higher outcomes** (Dodge et al., 2002).
- The use of gestures thereby benefitting learning in ways that previous standard desk/laptop computers could not.
- **As a result, the acceptance of digital play as a pedagogical approach needs to be considered in the light of advances in technology. It validates digital technologies, specifically the use of gestural interface devices, as appropriate tools for learning.** Which given the ECA statement on digital technology helps validate the early childhood educators decision to integrate gestural devices into care settings.



Early Childhood Australia
Statement on young children
and digital technologies

Thank you and questions?