Guided Playful Learning: Developmental, Computational, and Educational Perspectives

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Keywords: guided play; computational modeling; science of learning; playful learning

Workshop Summary

Learning is a continuous process that is contingent on temporal, developmental, and social factors. Well-timed guidance is critical for successful learning. Further, the needs of learners vary with their stage of development, and the social context in which learning takes place has important implications for learning. Researchers from a variety of backgrounds, including cognitive development, computational modeling, and education have explored these various components in isolation, however, understanding learning requires the examination of the interactions between the temporal, developmental, and social factors involved.

Interactions among these factors are of critical importance in fields such as cognitive development, computational modeling, and education. Take, for example, educational settings, where didactic approaches such as direct instruction have been favored over more free-play based approaches (Stockard & Engelmann, 2008). In direct instruction, learning is not just social, it is adult-initiated and adult-led, and by its nature less responsive to temporal factors that may affect a learners performance. Free play, in contrast, allows the learner to lead, which allows greater responsivity to temporal changes. Aside from the developmental merits, the debate between direct instruction and free play is emblematic of the need for a better understanding of how the social and temporal components interact to foster learning (Yu et al., 2018). Similar issues arise in the developmental and modeling literatures.

Recently, guided playful learning has been put forth as an integrative child-led, adult-assisted approach for promoting learning. However, many unanswered questions remain regarding the interplay of factors involved in guided playful learning. The goal of this workshop is to bring together an interdisciplinary group of researchers, with expertise in cognitive development, computation, and education in an effort to merge these separate literatures, draw general conclusions, and develop directions for future research.

Research in cognitive development on the effectiveness of guided playful learning is mixed. There is some evidence that guided learning is more effective than adult-led discovery (i.e. direct instruction) and unassisted discovery (i.e. free play) for promoting learning in children (Honomichl & Chen, 2012). However, some research indicates that direct instruction is equally, if not more effective, in achieving explicit learning goals (Becker & Gersten, 1982). Others still find that there is no substitute for the wide-ranging benefits of child-initiated free play, which is intrinsically motivated (Rubin, Fein, & Vandenberg, 1983). One possible reason for the differing conclusions is different definitions of guidance, which have included questioning, modeling, enhanced materials, and feedback. Thus, it remains unclear what kinds of guidance are most effective for promoting learning. Understanding the nature of effective guidance will also help to clarify the underlying cognitive mechanisms that lead to changes in children's knowledge.

In computational modeling, there has not yet been significant progress toward an understanding of guided playful learning. Research has investigated free exploration. Two versions of this that are prominent in the literature are active learning, which is commonly formalized as maximizing Expected Information Gain of the next observation (Russo & Van Roy, 2014), and reinforcement learning which maximizes expected reward over time (Niv et al., 2015). Research has also investigated instruction. For example, models have formalized selection of data by a knowledgeable and helpful teacher as well as formalized learning from such data, where the learner reasons both about the data and the teacher's intent (Shafto, Goodman, & Griffths, 2014). Guided playful learning lies at the nexus of these three themes, where guidance aims to foster learning over time through self directed exploration. Moreover, guided playful learning requires modeling of when to provide guidance, which adds layer of complexity not considered in this previous work.

In education, researchers have asked if guided playful learning is effective in various domains of learning. Specifically, guided playful learning may be more effective in domains in which learning is promoted through child-led exploration, as with causal learning (Bonawitz et al., 2011). Similarly, guided playful learning may promote learning in domains in which child engagement is crucial, such as literacy (Lillard & Else-Quest, 2006). But it remains unclear if guided learning is effective in domains that are

traditionally associated with rote memorization, such as mathematics. In addition, educational researchers have focused on the role of individual differences in guided playful learning. The effectiveness of guidance content can be influenced by individual differences, such as children's cognitive style, background knowledge, socioeconomic status, and language learner status.

Developing a unified theoretical and empirical understanding of guided playful learning will allow for the discovery of the complex interplay of temporal, developmental, and social factors in children's learning. By bringing together researchers from traditionally distinct communities, we hope to begin to answer this foundational set of questions about the nature of cognition.

Workshop Structure

The workshop will feature well-known experts from different fields. The workshop will also invite poster submissions from the broader cognitive science community, with "poster teasers" flash talks related to guided playful learning. Additionally, the schedule has built in ample time for questions for mini-panels of each sub-area of guided playful learning, ensuring maximum opportunity for audience engagement.

Proposed Schedule

9:00-9:15: Opening Remarks (Elizabeth Bonawitz)

9:15-10:45: The Role of Play in the Development of Knowledge

Roberta M. Golinkoff *"A helping hand: Adult-infant play and infant category learning"*
Yuan Meng *"Leveraging self-explanation to scaffold causal learning in children"*
Pierre-Yves Oudeyer *"Computational models of intrinsically motivated learning, autonomous goal setting, and how it can self-organize long-term developmental structures"*

10:45 – 11:00: Coffee/Tea Break

11:00–12:30: Intuitive Pedagogy in Playful Learning

Kathleen H. Corriveau *"Variability in parent-child guidance during dyadic STEM learning"*
Todd Gureckis *"Modeling intuitive teaching using POMDPs"*
Maureen Callanan *"Children learning about science through family conversations"*

12:30-1:40: Lunch

1:40-2:00: Poster Teasers

2:00-3:30: Inferential Consequences in Guided Play

Ilona Bass *"A computational account for the exploratory benefits of guided play"*
Emily N. Daubert *"Promoting psychosomatic understanding using pedagogical questions during storybook reading"*
Patrick Shafto *"A unified computational framework of learning for oneself and from others"*

3:30-3:45: Coffee/Tea Break

3:45-4:15: Poster Viewing

4:15-5:15: Bringing Guided Play to the Classroom and Beyond

Jamie Jirout *"Exploring to learn: Methods of encouraging curiosity in the lab and in the classroom"*
Kathy Hirsh-Pasek *"Playful learning landscapes: Where guided play meets architectural design"*

5:15-5:30: Closing Remarks (Elizabeth Bonawitz)

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