Activating childhood expertise to engage with disciplinary concepts

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Abstract: Child experts in museums have demonstrated their ability to rehearse well organized dinosaur knowledge in conversation with their parents that distinguishes them from novice children and parents (Palmquist & Crowley, 2007). This study builds on research about parent-child learning conversations and considers the potential opportunities made possible when prior knowledge can be activated in museum exhibitions to support learning conversations that include ecological and evolutionary relationships.

Research on early childhood expertise has found that child experts distinguish themselves from novices in their ability to organize dinosaur knowledge, reason hierarchically, generate inferences about behaviors, and categorize novel dinosaur examples (Chi, Hutchinson, and Robin, 1989; Gobbo & Chi, 1986). The *islands of expertise* concept suggests that this level of childhood knowledge can emerge through the convergence of parent child activity and engagement with learning resources around a topic like dinosaurs (Crowley & Jacobs, 2002). Parents are often well positioned to provide explanations during conversations with their children across contexts that have the potential to support early science learning and the development of scientific literacy (Callanan & Jipson, 2001; Callanan & Oakes, 1992; Crowley et. al, 2001). Museums provide opportunities for intergenerational learning through conversation where children and adults are more equitably empowered to adopt the roles of knowledge presentation and reception (Hilke, 1989). Child experts in museums have demonstrated their ability to rehearse well organized dinosaur knowledge in conversation with their parents that distinguishes them from novice children and parents (Palmquist & Crowley, 2007). This study considered whether parents and children in a dinosaur exhibition could use islands of expertise as a knowledge resource to support learning conversations that include ecological and evolutionary relationships. This analysis describes patterns of parent-child learning conversations observed among expert and novice families and considers the implications for disciplinary engagement and the design of learning environments.

Research Context

The redesigned *Dinosaur in Their Time* exhibition highlights the Carnegie collection of Mesozoic fossils. Dinosaurs are displayed in ecological and temporal contexts that suggest a narrative of interactions that may have occurred between different species including pterosaurs, early mammals, and birds. The layout and design of the information mediation (printed labels, touch screen labels, videos, and murals) was intended to support conversations about ecological and evolutionary relationships.

Methods

A total of 50 families with children between the ages of 5-8 years old participated in this study. Target children included 30 boys and 20 girls with a mean age of 6 years, 9 months. A dinosaur knowledge assessment was completed by all children that measured ability to identify dinosaurs, familiarity with causal relationship between features and behaviors, awareness of extinction theories, familiarity with paleontology practices, and temporal relationships between dinosaurs. Parents and children completed a pre and post visit task in which they discussed images of the exhibition and were encouraged to engage with ecological and evolutionary themes.

Through a combination of emergent and deductive approaches, three coding categories were developed to explore patterns of topic and thematic engagement in parent-child conversations: object focused talk, ecology talk, and evolutionary talk. Object focused talk captured four types of conversations about the specimens and features of the exhibition. These include: identification, dinosaur comparisons, form & function, and affective talk. Ecology talk captured levels of connection between species that parents and children noticed and discussed. Evolution talk captured the themes of change over time and common ancestry.

Preliminary Findings

Novice and expert children and their families produced different patterns of learning during visits to this exhibition. Consistent with previous research, expert children consistently labeled species with their scientific names (both dinosaur and non dinosaur), made comparisons between dinosaurs, highlighted examples of form and function and often commented on their favorite species and features. Novice children also engaged in conversations across these categories but more often referred to dinosaurs through descriptive labels and followed the lead of their parents when they engaged in dinosaur comparisons and recognized form and function relationships between dinosaur features. Patterns of disciplinary talk captured by ecological and evolutionary coding categories suggested that experts and their parents engaged in more explanatory depth than novices.

Conclusions

This study builds on research about parent-child learning conversations and considers the potential opportunities made possible when prior knowledge can be activated in museum exhibitions. Examining how islands of expertise in a topic like dinosaurs might facilitate early engagement with disciplinary thinking and reasoning providesa model for exploring this kind of interest driven learning pathway across contexts.

References

Callanan, M. A., & Jipson, J. (2001). Explanatory conversations and young children's developing scientific literacy. In K. Crowley, C. D. Schunn, & T. Okada (Eds.), *Designing for science: Implications from everyday, classroom, and professional science.* Mahwah, NJ: Lawrence Erlbaum Associates.

Callanan, M. A., & Oakes, L. A. (1992). Preschoolers' questions and parent's explanations: Causal thinking in everyday activity. *Cognitive Development, 7*, 231-233.

Chi, M.T.H., Hutchinson, J. & Robin, A. F. (1989) How inferences about novel domain-related concepts can be constrained by structural knowledge. *Merrill-Palmer Quarterly* 35, 27-62.

Crowley, K., Callanan, M., Jipson, J., Galco, J., Topping, K., & Shrager, J. (2001). Shared scientific thinking in everyday parent-child activity. *Science Education,* 85*, 712-732.*

Crowley, K. & Jacobs, M. (2002). Islands of expertise and the development of family scientific literacy. In G. Leinhardt, K. Crowley, & K. Knutson (Eds.) *Learning conversations in museums* (pp. 333-356). Mahwah, NJ: Lawrence Erlbaum Associates.

Gobbo, C., & Chi, M. T. H. (1986). How knowledge is structured and used by expert and novice children. *Cognitive Development*, 1, 221-237

Palmquist, S. & Crowley, K. (2007). From teachers to testers: How parents talk to novice and expert children in a natural history museum. *Science Education*, 91(5), 783-804.