

Why do children explore? Uncertainty reduction and scientific curiosity in young children

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•Curiosity and Exploration

- Scientific Curiosity: a form of interest that leads to direct investigation of the natural world by means of physical, verbal or intellectual exploration.
- Research suggests that curiosity is more likely to lead to investigation in situations that contain ambiguous, incomplete, or conflicting information (Berlyne, 1960; Kreitler, Zigler & Kreitler, 1971; Malone, 1981; Day, 1982; Loewenstein, 1994; Litman & Jimmerson, 2004).

•Loewenstein (1994): Adults ranked their "Feeling-of-Knowing" (FOK) and curiosity level on several trivia questions.

- FOK has 3 levels: Know, Tip-of-tongue, Don't know.
- People were most curious during Tip-of-tongue state, suggesting that curiosity results from an optimal level of uncertainty.

•Litman & Jimmerson (2005): Replicated the Loewenstein (1994) study with adults, adding an exploration component after the trivia rating task.

- Same results as previous study: people report being most curious during Tip-of-tongue state.
- When people report they are very curious (during TOT state), they are more likely to explore to find the answer.

•Schulz & Bonawitz (2007): Compared children's relative amount of exploration in situations with and without causal ambiguity.

- Children displayed typical novelty preference when the familiar toy had no causal ambiguity, but they preferred the familiar over the novel toy when the familiar toy had causal ambiguity. *Interpretation: one aspect of curiosity is the tendency to resolve causal ambiguity.*

•NEW QUESTION: Do children prefer to resolve ambiguity, even when causality is not a factor?

•Hypothesis

- Children will explore most when there is an optimal level of ambiguity.
 - Optimal Level: enough partial or conflicting evidence is available for a child to make a reasonable guess or prediction, and the answer is not too easy or obvious. Children will prefer the optimal level, over more or less ambiguity.

•Participants

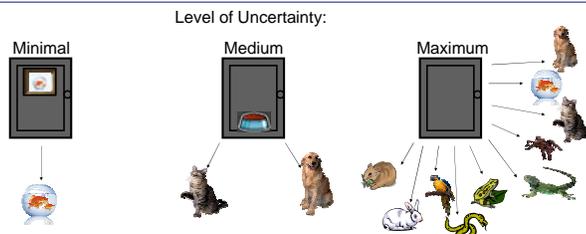
- 56 Preschool and Kindergarten children from 3 Pittsburgh schools.
- Students range from 53 to 75 months old, mean age of 66 months old.
- All students were tested individually in a quiet area close to their classroom, and the time of the task ranged from 6-10 minutes.

•Measures

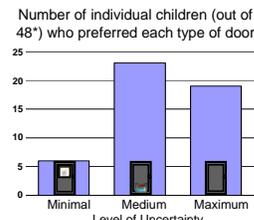
- Exploration: Children play a short game that gives them the opportunity to explore situations varying in level of uncertainty.
 - Primary measure is search preference under different levels of uncertainty.
 - Children choose to explore one of two levels on each trial.
 - After all trials, complete a "think-aloud" on each of the three items.
- Curiosity: Teachers rated their participating students from most to least curious using a method from Maw & Maw (1961).
 - Class sizes and participants varied, so the ranking scale was different for each class and scores were used to create low/high curious groups.

•Exploration Game: "Let's Explore the Neighborhood!"

- Children explore a "neighborhood" of 30 houses to learn what types of pets live in each house.
- All houses have two doors. A door can have one of three different levels of information about the pet behind it.
 - Houses with windows: Children can be certain what type of pet lives here, because they can see it in the window.
 - Houses with clues: Children can use a "clue chart" to decipher the clue and determine which two of all of the possible pets might live there.
 - Houses with solid doors: Children have no information about what type of pet might live behind a solid door.



What did children choose to explore?

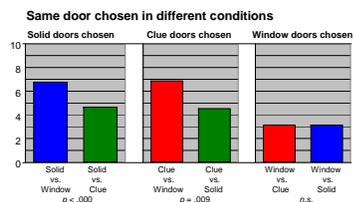


*Eight children were not included because they preferred two doors equally (3 preferred the window and clue door equally, and 5 preferred the clue and solid door equally).

Why did children choose to explore?

Reasons children give:

- Uncertainty Related (48% of all answers):
 - Information seeking: "Cuz I want to guess/learn";
 - Preference for challenge/ease: "Because the clue is too easy!"
 - Stimulation seeking: "It's a mystery/surprise what it is!"
 - Existing knowledge: "Cuz you don't know what it is"
- Other (52% of all answers): "Cuz I think they're fun!"
- On average, children give two responses for each of the three trials.
- Over 70% give at least one uncertainty-related answer.



Types of Uncertainty Related answers given:



•Results

Exploration:

- Most children prefer to explore uncertainty over certainty ($p < .001$).
- Only six out of 53 children preferentially chose the window door (minimal uncertainty).
- Children chose the window door about six out of the 20 opportunities; Chose uncertain doors 14 of the 20 opportunities each.
- The difference in preference between the two levels of uncertainty were not significant.
- The reason most reported by children as why they choose to explore one level of certainty over another involves interpreting available and/or unknown information.

Teacher Ratings:

- Low- and high-curious groups created using teacher ratings preferred to explore different levels of uncertainty ($p = .020$).
- Eight of the nine children who preferred low-uncertainty were rated as low-curious by teachers.
- Other differences observed between low-curious and high-curious children were not significant.

•Discussion:

- Our hypothesis is partially confirmed: Children do choose to explore more in uncertain situations than certain situations, however there is not a difference between choice of exploring our two uncertainty conditions. Possible reasons for this are:

- The two levels may not be different enough. Perhaps children should not be shown all of the possible choices in the maximum-uncertainty condition, making the possibilities infinite.
- Choice due to "favorite" animal may have influenced the choices.
 - If a child wants to see a dog, he or she may choose the clue door that has a high chance of being a dog. If a child wants to see a snake, he or she knows they will not find one behind a clue door.

•It is possible to use a Think Aloud method to investigate why children choose to explore.

•Implications:

- These findings are similar to those of past researchers who suggest that exploration is a result of an optimal level of conflicting or ambiguous information.
- Future research in this area might help to suggest ways for teachers to motivate children to explore topics by creating an optimal level of uncertainty.

•Limitations:

- Because the game involves animals, children's personal preferences played a large part in their explorations when a favorite animal was a possible choice. This introduced variance that could be minimized by a larger group of participants.
- Our teacher ratings were computed into low/high groups because there were different numbers of students in the three classes. These data were limited in two of the classrooms where less than half of the students participated, because teacher ratings were from "most" to "least". The measure would be more valid if each child was ranked individually instead of in relation to the other students.