

## A Visit to the Lab With your Child Scientist!

The teddy bear is wearing a blindfold, so it's up to the 2-year-old "scientist" sitting across the table with mom to figure out what toys the bear wants to play with and just how many. "Can you tell Teddy to get the two ducks?" the graduate student experimenter says to the toddler.



It may not sound like science, but it surely is. Delving into the minds of children, finding out how they distinguish the singular noun from the plural, examines how and when that level of language recognition develops. In the end, the results may bring an understanding of language development that could help children who are slow to learn to speak.

There are no electrodes, no beakers and magical fluids, no scary machines involved in this simple experiment at Indiana University's Cognitive Development Laboratory. Just an ever-curious 2-year-old, some toys, a student experimenter and a video camera that captures the research for later study. In this experiment, seeking to determine how children learn about plurals, playing with ducks matters. And there are no right or wrong answers. "We are interested in what the child says," explained Jennifer Zapf, a third-year graduate student in IU's Psychological & Brain Sciences Department. "They could say ducks, two ducks, two duck, duck, two, lots, or yellow. Ten trials are done just like this, but with different objects. In four of the trials the singular is asked for and in six of the trials two objects are asked for." The children are playing. Zapf is gathering data.



"We test a lot of children," said Linda B. Smith, a longtime IU psychology professor who is the director of the Cognitive Development Lab, where research is funded by the National Institute of Health and National Institute of Mental Health. "Our results are published in the top journals in the field. We communicate what we find to other researchers. We also try to communicate to parents and have had stories about our work on the BBC, Discovery channel, and in Popular Science magazine.

Our findings are genuinely interesting." And the test subjects are, well, unpredictable. Most are Monroe County infants and toddlers, who are among the most studied children in the world. "There they are - three, six, nine months, a year, - and they start talking and adding words," Smith said. "Somewhere, overnight, you have a child who has a whole lot of words. It's the transition, from slower to faster learning that we are interested in. The big idea is that children learn how to learn language as they learn it. It's snowballing, each step determining what you learn next. We want to know what they expect words to mean and how those expectations make them such fast word learners."

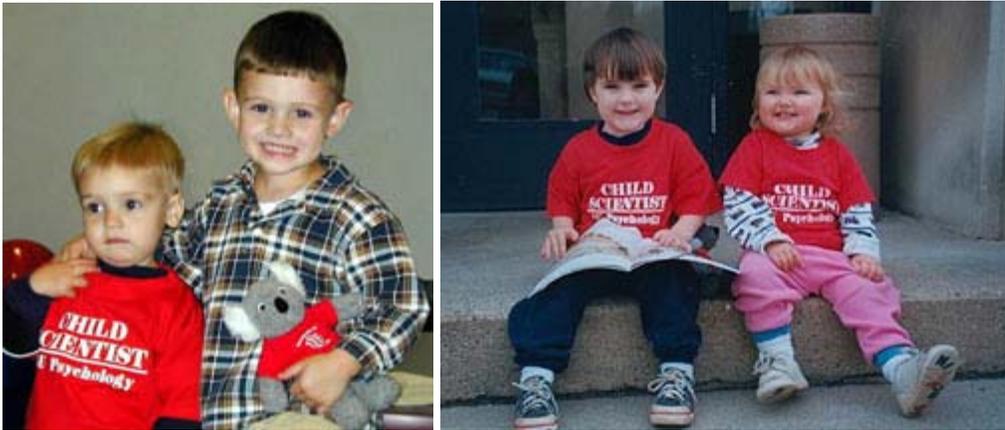
She explained that the lab's interest is the process of learning how a child's mind works when they can't articulate the process themselves. "These tests don't have a right or wrong response. We are not trying to assess them, we are trying

to see how they are doing, what they do," Smith said. "I know that from a parents' point of view, they want their own children to excel and they want to know that they compare favorably to other children. But we are not so much interested in comparing children as in understanding how each one learns language."

Various studies combine to create a more complete picture of the process. "No one thing we are studying is the whole story. It's how it all fits together in the end. We look at the early conceptual process, from 15 months to three years. We hope to weave it all together. Language is like a sport. There are a lot of fundamentals to learn."

### **Enter the scientists**

Every week, about 30 youngsters come to the lab and for 20 minutes or so, take on the role of little scientists. "They come in and they have fun and are the center of attention," Smith said. "And they are, in their own little way, contributing to science." There's no other direct benefit to the child, except maybe a T-shirt with "Child Scientist" on the front, or a book or a stuffed animal or a red rubber ball small enough for grasping by tiny hands.



Brochures left in pediatricians' offices and preschools, informational newspaper ads, the lab's Web site and people telling friends about their children's cognitive development lab experiences bring in the children. "Bloomington is a small enough town that we have become a known entity by word of mouth." Smith said. The test subjects are identified by an assigned number and their birthdates. Data gathered usually is published in a scholarly paper within two years of the research. It's kept in the lab's records for five years, then discarded.

"We are never trying to determine if Johnny is learning better than Fred," Smith explained. "Children do it differently. The pathways might be different, but we are looking at how they move in pathways A, B, C and D. We are very interested in that. For instance, not all children learn to walk in the same way. Some walk at eight months and some cruise for months longer." The crux of her lab's research is how development makes itself happen. "If we can determine that, then we can go in and affect change in a slow talker, for instance. The challenge is to develop ways of how to discern what they know and have to learn, so we have to engage them," she said. "We develop these tasks, which is a big deal of what we do. It takes work." Zapf knows the challenge of coming up with an experiment that will explore how children's learning processes develop. "We are always coming up with new studies and manipulations to tease out exactly how children go about acquiring, for instance, the regular English plural."

Smith oversees four PhD level post doctoral students, five graduate students and a team of a dozen or so undergraduates who contact parents and are trained to test the children. "Tax dollars are being used to learn real things that may make a difference in people's lives," Smith said. "Parents raise these children; they see development happen right before their eyes, and it's just plain interesting how what every little bit you know leads to the next thing you will learn."

Tony and Angela Grimes of Bloomington have watched their 2-year-old son, Joshua, evolve from a non-verbal baby into a babbling toddler. He's been a Cognitive Development Lab visitor four times so far in his young life. "The first time was actually when he was about a year old," Tony Grimes recalled. "They called us and asked if we wanted to bring him in for a study and we thought it sounded like a good thing." Joshua likes being around new people, so his

parents thought he would enjoy his time at the lab. It turned out to be true. "He did enjoy it like we thought he would," Joshua's dad said. "Every time we take him, he looks forward to it. He's participated in different experiments every time, and they were very good about telling me on the phone ahead of time what the study was, so I knew what they were going to do. And they gave me an in-depth paper about what they were going to do when I got there."



He has been part of Zapf's plurals study - the teddy bear component and two others, a puzzle study and a child play study. "I never worry if he will do the right or wrong thing," Tony Grimes said. "I personally think it's a good thing for us to do as they look at the development of children. This kind of research is helping them figure out how to deal with development issues."

One visit, he and Joshua played together just like at home. "He just played with toys. They gave him different kinds to see how he would react and use them. First a doll and bottle, comb and doll bed. It was the two of us interacting together to see how we play together. Then there was a Fisher Price garage and wrench and cars and they wanted to see what he did."

### What's it all about?

Smith said studies about the use of nouns, verbs and plurals all go together, fall from one another. "You can pour milk and water, but not cats," she said. "Some studies look at what they know about specific words or classes of words. For instance, if a child knows a lot of animal names then he/she should be good at learning new animal words because he/she knows a lot about animals."

Her lab is involved in cross-language studies, looking at children learning two languages. One large study - of local children and of about 100 in nursery schools in Niigata, Japan - explores the differences in language development in noun-heavy English vs. verb-heavy Japanese. The two languages are vastly different in structure and the study shows some clear differences when parents play with their children.



Playing together for a minute or so with goblets, coffee cups and assorted dishes, a Japanese mother used 13 verbs and eight nouns. The English mother used seven verbs and 16 nouns. "What we see on these videotapes illustrates different entry points into language," Smith said. Her lab just completed a four-year grant project for that study and has received another five-year grant - \$200,000 each year - from the National Institute of Mental Health.

"We keep publishing studies along the way, and have published eight papers so far comparing English-speaking and Japanese-speaking children," Smith said. "Many verbs in Japanese are animate or inanimate. For instance, in English,

you can hold a baby or a radio. In Japanese, there would be different verbs for each. Do these differences in the verbs parents say influence what children learn about nouns? We want to know this because it will tell us how language builds on itself, how the pieces all fit together.

### Putting research to use

In the end, the research is used in studies looking at late-talking children, those that do not break into language well. "By understanding the process of how children learn language, we can help push these late talkers past obstacles," Smith said. "For example, we have learned that for learning object names (for example: cat, boat or toothbrush), children have to pay attention to shape.



Shape identification and object identification happen about the same time, and by getting them to pay attention to shape they can accelerate their language learning. By shifting their attention to shape, we push them forward."

Studying the process of language development does benefit children. "I know it seems like a little thing, that learning one thing sets the stage for learning the next thing, but it does end up having real world consequences as children go from almost not talking to arguing with you fluently." The research is used to help children who struggle with learning language find the pathway there. "We know that of late talkers, 50 to 70 percent catch up and have no long term effects," Smith said. "But another 30 to 50 percent do go on to have language problems later."

**Does your child talk less than other children of the same age?** As was stated, most children who are late talkers catch up and we are very interested in studying these children. If you think this describes your child and your child is between 18 and 30 months of age, please contact Char Wozniak by calling 855-8256, or by emailing her at [chwoznia@indiana.edu](mailto:chwoznia@indiana.edu).