Language and Learning Lab Newsletter

Volume 1, Issue 5, May 2021

Dear Parents,

We greatly appreciate you and your child's participation in our research projects. Over the past year, the Language and Learning Lab has shifted to conducting online research in these unprecedented times. We have successfully completed several new projects, which would not be possible without your dedication and commitment!

In this newsletter, we would like to share more information about our work as well as what we have discovered from the studies you may have participated in. We have also included some related at-home activities that you can try with your child!

If you would like to update your contact information with us or tell us about any new additions to the family, please send us an e-mail (languageandlearninglab@gmail.com). If you know of any friends or family members who might be interested in participating, we would appreciate your help in passing our information on to them. They can sign up on our lab's website using the "Web Volunteer Form" under "For Families". We are always looking for new 'child scientists' to help us with our studies, and could not do our work without the generous support of parents like you.

Sincerely,

Language and Learning Lab Team
The University of Toronto

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Inside this Issue

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Lab News!

April 2019

Congratulations to our senior lab members, Aryana Chakravarty, Hilary Sweatman, Lynn Nguyen, and Salima Hackeek for graduating! It's been a privilege to work with you and we wish you the best of luck on your next adventures!

May 2019

Professor Ganea has been appointed the new Director of the R.G.N. Laidlaw Research Centre for the next three years!

Congratulations to our former research assistant, Abdullah Malik, who has been admitted to the Doctor of Medicine program at the University of Toronto!

June 2019

Congratulations to senior lab member, Lynn Nguyen, who won a poster award in the Guided Playful Learning Workshop at the 2019 Cognitive Science Society Conference in Montreal!

July 2019

Postdoctoral Fellow, Dr. Angela Nyhout, and Professor Ganea receive SSHRC Insight Development Grant: Spontaneous counterfactual thinking in development.

Professor Ganea and Postdoctoral Fellow, Dr. Myrto Grigoroglou, receive SSHRC Insight Development Grant: Motivational and cognitive aspects of common ground in collaborative communication.

October 2019

Former research assistant Shahbano Mustafa has accepted a full-time position at the Princess Margaret Cancer Center as a research clerk within the Radiation Program. Congrats Shahbano!

June 2020

Congratulations to our undergraduate lab members, Ariel Chiao and Livia Isnar for graduating! We are grateful for their contributions to our lab and we wish them the best of luck on their future endeavours!

July 2020

Congratulations to our research assistants Livia Isnar and Shona Mistry for getting admitted into their graduate programs! Livia will pursue a Master of Health Science degree at UofT with the goal of becoming a Speech Language Pathologist. Shona will pursue a Master of Arts degree in Developmental Psychology and Education right here at OISE.

Congratulations to Dr. Angela Nyhout, postdoctoral fellow in our lab, who accepted a faculty position at the University of Kent. We wish her all the best. We know she will continue to do amazing work!

September 2020

Congratulations to Dr. Myrto Grigoroglou, postdoctoral fellow in our lab, who accepted an Assistant Professor position right here at the University of Toronto. We wish her continued success!

A heart filled congratulations to Begüm Özdemir for successfully defending her PhD dissertation and becoming Dr. Begüm Özdemir! We are extremely proud and wish her all the best in her academic career.

March 2021

Congratulations to our former research assistants, Arijit De and Shona Mistry, for getting into their programs! Arijit will pursue a PhD program at UofT under the Perception, Cognition and Cognitive Neuroscience area of study. Shona, who has been admitted to the School & Clinical Child Psychology, will pursue a MA Program right here at OISE. We wish them the very best!

April 2021

Congratulations to our research assistant Marnie Wang, who has been admitted to the Masters of Public Health Epidemiology Program at the University of Alberta!

Learn More About our Studies!

Do children use language in their logical reasoning?

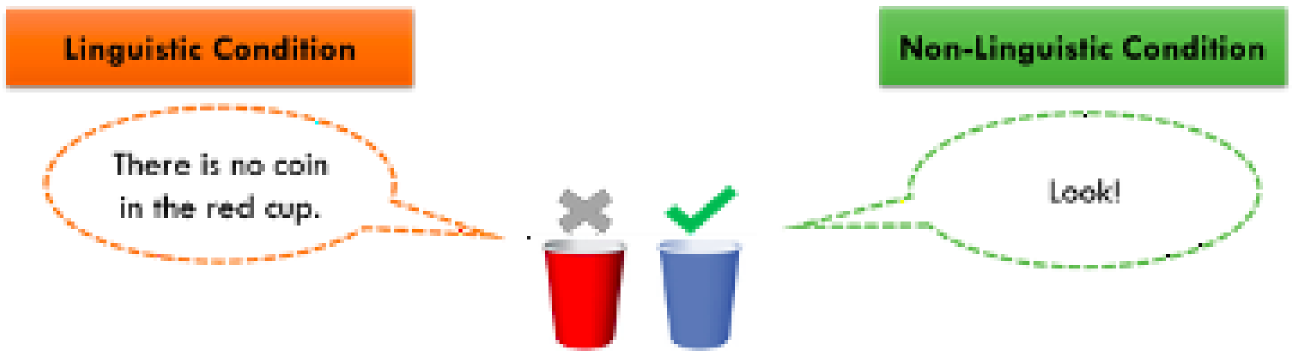
Researchers are interested in understanding how children develop reasoning skills. Specifically, they wonder whether young children can reason logically without the use of language, or whether language is crucial for the development of this type of thought. Previous research has shown mixed findings. To test children's logical reasoning abilities, scientists often use a process called a "disjunctive syllogism".

How the syllogism works

If you have two locations (A and B) and you hide a reward in one location OR the other, then children need to represent (imagine) the logical relation of disjunction (A OR B). Then, you show children that location A is empty and they need to represent the logical relation of negation (NOT A). Finally, they need to combine these two pieces of information to create a NEW piece of information, the logical conclusion that the reward must be in location B. This is a very easy reasoning process for adults, however, it is unclear whether young children may effectively complete this task. In previous work, some studies show success in children as young as age 3, while others show success only after age 5.

Our Studies

We created a linguistic version of the disjunctive syllogism task, where we expressed a negative sentence (e.g., there is no coin in the red cup), instead of simply showing children that one location was empty. Unlike prior studies, we found successful reasoning even among 2.5-year-olds! To be certain that it was the presence of language (linguistic negation) that made younger children in our study succeed on this task, we have begun assigning our participants to two groups: a group that receives training trials with linguistic negation (e.g., there is no coin in the red cup) and a group that receives training trials with visual negation (i.e., showing them that the red cup is empty). After the short training both groups perform a non-linguistic version of the disjunctive syllogism task. Preliminary results show that 2.5-year-olds who receive the linguistic training are more likely to pass the task than those who receive the visual training.



Guided activities and explanations are important for science learning!

Learning science can be fun, but it can also be a challenging process! This is because adults and children alike have many misconceptions about science, which could interfere with their learning. In a series of studies, we examined how the role of explanations and guidance can help children revise science misconceptions.

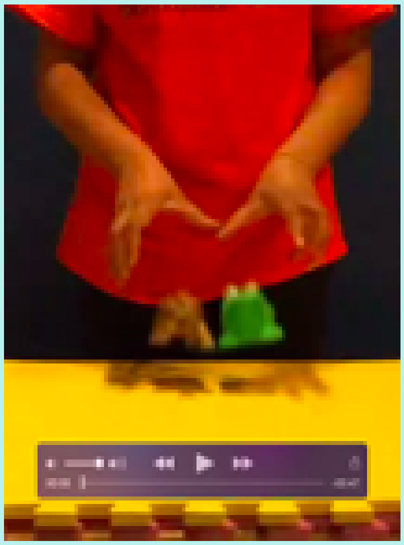
Studies 1 & 2: How important are explanations in guided activities?

We explored how 4- and 5-year-old children revise their misconception that heavier objects fall faster in two studies. According to Newton's law, all objects fall at the same rate due to gravity unless, of course, the objects are air-resistant, like a feather or flat piece of paper. We made this concept appropriate for kindergarteners by ensuring all objects they interacted with were similar in shape. This permitted children to discount the effects of air-resistance. Some of the guided activities also included the delivery of a conceptual explanation of what makes objects fall.

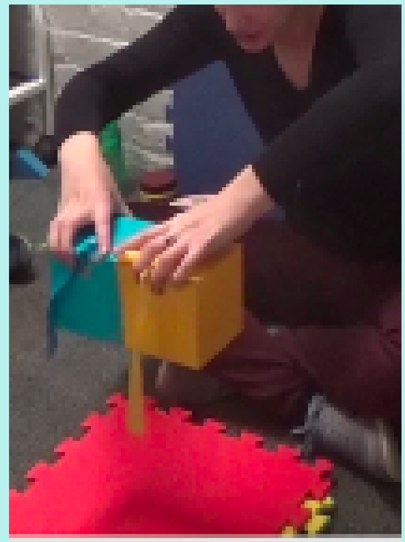
We designed two similar activities where children engaged in three examples of heavy and light objects falling at the same rate (see Box 1). In these activities, we guided children through the learning process. We helped them conduct adequately controlled experiments and ensured they made the correct observations. In each study, a child only participated in one type of activity. Our results showed no learning differences between the two activities.

Box 1: Two Guided Science Activities

Film and Drop



Fill and Drop



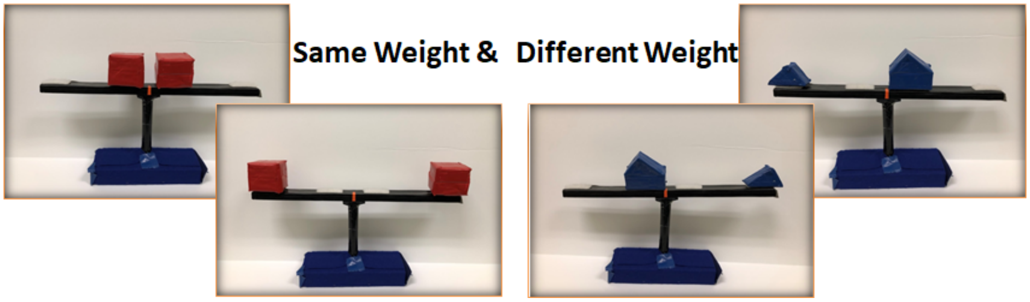
In the Film and Drop activity, children made and recorded their prediction about how a pair of differently weighted objects would fall when dropped. Next, we helped children conduct the experiment, followed by a pre-recorded slow-motion video showing the objects falling at the same rate. Finally, they recorded their findings on the prediction sheet.

In the Fill and Drop activity, children were given pairs of containers that were the same size. They filled one container of each pair with heavy objects, like rocks, and the second container with light objects, like feathers. Then we helped children drop the containers, so they could observe them dropping at the same time.

The results of these two studies showed that children as young as 4 can revise the misconception that objects of different weights fall at different rates. Guidance helped children create controlled experiments and make accurate observations, lending to more accurate predictions. When children also heard an explanation about gravity, they revised their misconception immediately and retained the new information. Some children came back to the lab for a second session of testing with different materials, wherein those who received an explanation with the guided activity showed improved performance. Therefore, guidance can help children make correct observations and explanations are critical for fostering long-term understanding of physical concepts.

Study 3: Does the approach for providing explanations matter?

To further investigate the role of explanations in science learning, we created an additional study examining children's understanding of the concept of balance. We tested 5-year-old children on their knowledge of balance principles. Children were provided with examples of how to correctly balance objects and an explanation of the principles of balance, either through a picture book or guided activity. We found that children as young as 5 years of age were able to learn how to balance objects. In fact, children learned equally well from both sources!



Children's science learning can be supported through reading books *or* completing activities - as long as accurate information and explanations are offered!

Helping children to design experiments by having them think “what if?”

Counterfactual reasoning is the ability to think how an event could have happened differently, by wondering *“what if?”*. To do this, we think about how an outcome would be different by changing a single cause, while keeping everything else in the situation the same. For example, we may think that if we had remembered to set an alarm, we wouldn’t have been late for school or work. This is the same strategy scientists use when conducting experiments, and it is called the control-of-variables strategy. In an experiment, scientists usually change one variable, and hold everything else constant. Although children develop the ability to think counterfactually before they begin school, they struggle with conducting controlled experiments until they are teenagers. In this study we explored whether we could connect these abilities. We asked whether giving 7–10-year-old children counterfactual prompts would help them to control variables during scientific inquiry.

To do this, we conducted an experiment with 3 phases:

1.Pre-test:

The children were asked to show an experimenter how to find out if a variable (the surface or of a ramp or the starting position of a ball) matters for how far a ball goes down a ramp. Children had to set up the ramps before launching the balls down. This gave us an idea of whether children already knew how to design a controlled experiment (most did not!).

2.Scaffolding:

In the second phase, children watched two videos of an actor altering the same variables from phase one. Participants in the counterfactual condition were asked to imagine the outcome if the variables were different (e.g., “What if she had used the rough surface on this ramp?”). For example, if the actor had set the ramp to a smooth surface, the children would be asked to imagine how far the ball would have travelled if the ramp was set to a rough surface. Participants in the control condition were asked to recall what had happened in the videos.

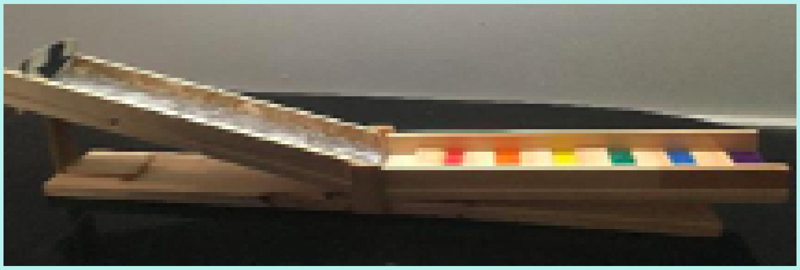
3.Post-Test:

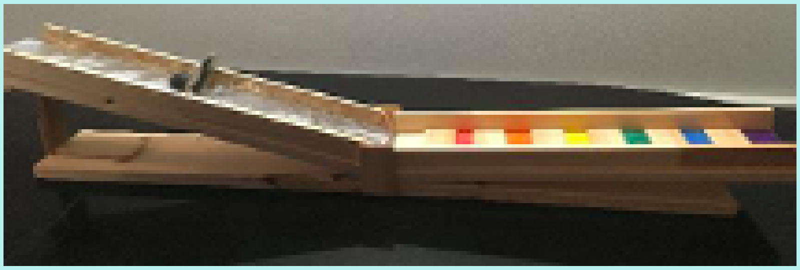
In the final phase, the experimenter asked children to set up the ramps again, both with the variables they had already encountered (the surface of the ramp and the starting position of the ball) and with two new variables (ramp height and ball size).

The results showed that children who were asked counterfactual questions performed better in the post-test compared to the children who were only required to recall the events of the videos. This was especially the case when they set up the ramps using the two new variables, suggesting they had a more generalized understanding of the control-of-variables strategy. This study shows that counterfactual prompts can be used as a tool while teaching children scientific reasoning skills. Through a simple counterfactual question, children were prompted to conduct a controlled test.

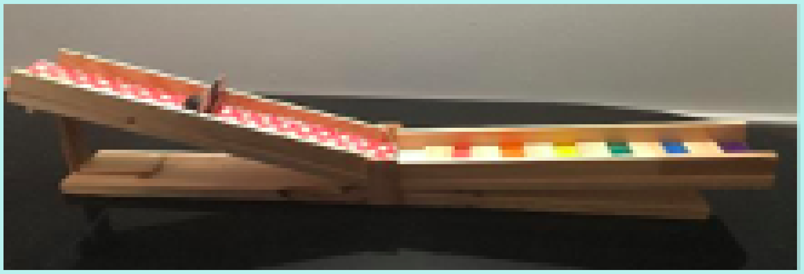
Box 2: Ramps Used in this Study

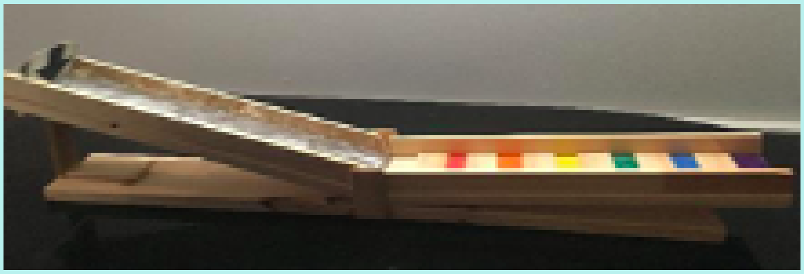
An example of a **controlled** test, in which a child has only changed one variable (starting point of the ball) and kept the other constant (ramp surface).





An example of a **confounded** test, in which a child has changed both variables (starting point of the ball and ramp surface).

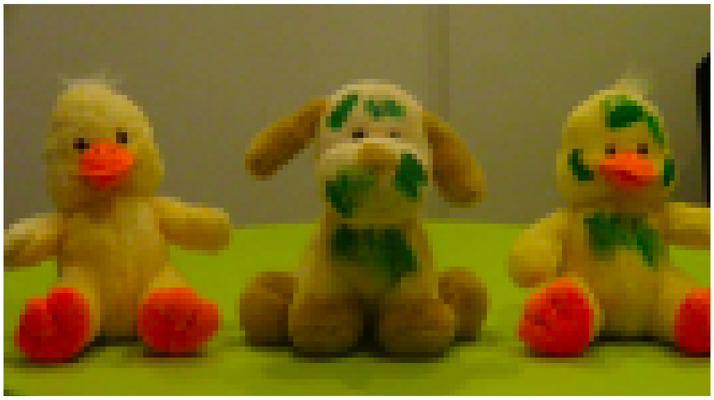




Flexibility and skepticism: Two facets of children's reasoning during knowledge revision

Our existing beliefs about the world are subject to change as we receive new information. Language is one unique human capacity that helps us to keep our beliefs up to date in a dynamically changing world. In our lab, we are investigating how children at various time points in development form and revise their beliefs about the world.

We examine young children's knowledge revision in terms of how they reason between their own observations and verbal testimony they receive from others. One major challenge for young children is understanding that verbal testimony can provide information about the current state of the world even when it defies their own prior observations.



Our research has shown that children's ability to revise their existing beliefs about an object based on what others tell them is still developing over the course of their third year, and subject to variability depending on the context. When young 2-year-old children are told about a change in an object's property they have previously observed (e.g., "Max is all green now"), they can easily identify the green painted stuff animal among others.

However, when children at this age are told about a change in the object's location, (e.g., "Now the alligator is in the box"), they search for the toy where they have observed it being hidden previously (e.g., drawer) rather than in the new location. Starting around 2.5 years of age, children develop the ability to change their beliefs about an object's location upon linguistic information equally well.

As older children master using verbal information to revise their representations of the world, the intriguing question becomes whether some beliefs have privileged status in children's representation of the world, therefore making them more resistant to revision than others.

Our studies with older children showed that 4- to 7-year-old children understand that beliefs about essential properties of a category (e.g., "Dogs bark") outweigh beliefs about accidental properties of a category (e.g., "Dogs wear collars").

Currently, we are further investigating the differential weight children attribute to various beliefs during knowledge revision. We believe this line of research helps us better understand the balance between children's flexibility and skepticism during knowledge acquisition.

Moving Our Research Online!

On March 13th of 2020, U of T President Meric Gertler announced the cancellation of in-person classes and closure of all buildings to the general public. It meant that appointments were cancelled, lab members went home, and research in many labs came to a grinding halt. However, we did not let this stop us for long!

Virtual Zoom Studies

As many of you may know, or have even experienced, our lab is now offering online studies! These studies are conducted using online video conferencing software (Zoom) so you can do them right from the comfort of your own home!

Each online study generally takes about 30 minutes and is presented as a fun activity that your child can do, such as listening to a story, watching a video, or playing games to answer questions about their experience.

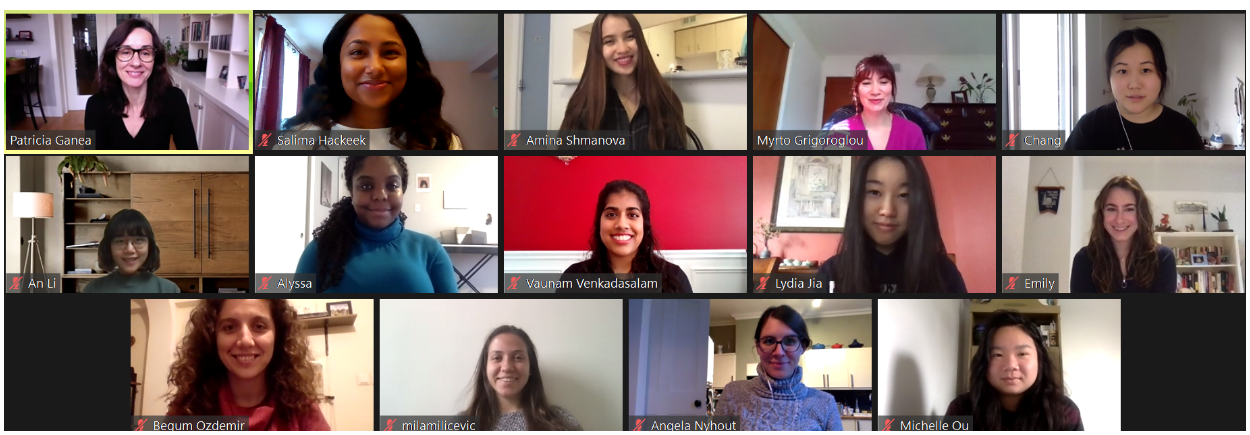
Find the link to sign-up for one of our studies on page 17!

Virtual Lab Meetings and Socials

Our lab has always been a tight-knit group. We looked forward to our lab meetings where we hosted presentations, journal clubs, guest speakers, and holiday parties. As with everyone else during this time, we missed interacting with our colleagues in-person and keeping up with everyone's latest news. For some of our lab members, this past year will also be their last with us as they are moving on to their next great adventure.

While our biweekly meetings have not been the same without our classic meeting biscuits, we have continued to develop ideas and are staying up to date with the newest literature.

A silver lining of our remote work experience has been the discovery of new virtual team bonding experiences that we have never tried before; Skribbl.io was a blast!



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Current Studies!

Thinking "what if?"

Ages: 6 - 7 years old

In this study, we are interested in the most effective ways to teach children a concept about planets and astronomy through picture books. Children will look at and listen to a short book about our solar system on the computer. After reading the book, we will then ask your child some questions to find out what he or she has learned from our book.

Ages: 2.5 - 4 years old

In this study, we are interested in how children reason logically about alternative possibilities. For this study, a reward will be hidden and your child will have to guess the location of the reward by using a logical syllogism. Then, your child will have to decide which is the best path for cartoon characters to follow in different scenarios. The study questions are presented as fun games with famous cartoon characters even our youngest participants will enjoy!

Logical Inference Study

If you and your child are interested in participating in these studies, click here!

Fun At-Home Activities!

Have at go at some simplified versions of our studies at home with your children!

Activity 1: Where is the Toy? (2 - 3 years)

Materials

- Box
- Bowl
- Cup
- Small toy

Procedure

- When your child(ren) are not looking, hide the toy in the box.
- Show them that there is no toy under the bowl and tell them that it is not under the cup.
- Place all three containers in front of your child and ask them to find the toy.

Theory

Although it seems very basic, identifying the location of the hidden toy in this activity requires children to use visual and verbal information and make abstract logical inferences. This ability undergoes significant development until age 5.

Activity 2: How Does Your Child use Imagination and Reasoning? (3 - 6 years)

Materials

- Storybooks

Procedure

- Part 1: Ask your child(ren) to imagine "what could have happened differently" in their favourite books. How might these changes in events lead to different outcomes?
- Part 2: Discuss with your child(ren) an event that happened in real life, which you both remember; take turns adding to the memory. Next, think about "what could have happened differently" before or during this past event, and potential resulting outcomes.

Theory

As children's cognitive development is facilitated by social interactions with their parents, we expect that they can learn to think counterfactually through talking with adults. Children may actually be developing their ability to learn from experiences when pondering these "what-ifs", especially when reflecting on negative or unexpected events.

Activity 3: Why do Things Sink or Float? (5 years)

Materials

- Clay
- Water bin
- Miscellaneous objects made of different materials
- Scale (optional)

Procedure

- Invite your child(ren) to test how they can make pieces of clay float or sink. Try different shapes and weights.
- Ask them to predict if certain objects will float or sink and explain why they think that.
- If your child(ren)'s answers include a misconception, try to present them with contradictory evidence and see how they explain it. Examples:
    - "Heavy sinks/light floats" → show large clay boat and a small clay ball
    - "Plastic floats/metals sink" → show a plastic die and metal ships

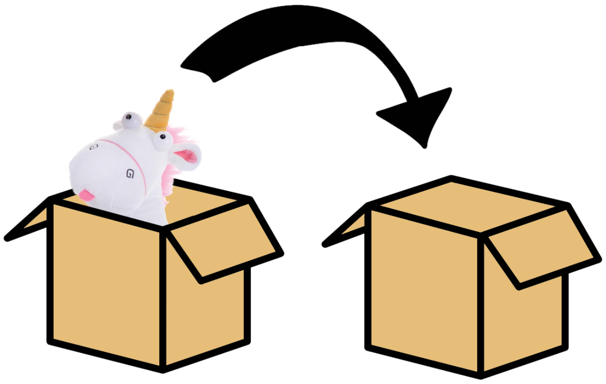
Theory

One of the most common misconceptions surrounding sinking or floating is that heavy objects sink while light objects float. Some children also ascribe buoyancy to certain materials. Findings currently indicate that when faced with disconfirming evidence, children tend to maintain their misconceptions and suggest hidden causes.

Activity 4: How Well Does Your Toddler Revise their Object Representations? (1.5 - 3 years)

Materials

- 2 buttons or other novelties (one painted, one unpainted)
- Any toy



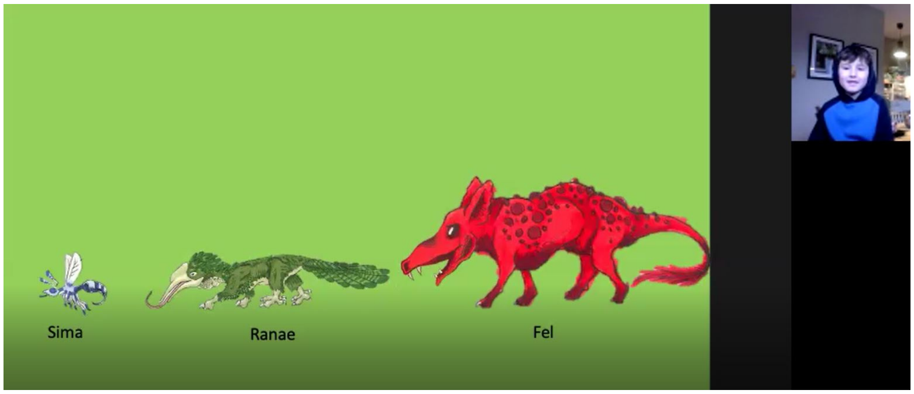
Procedure

- Part 1: show your child(ren) the unpainted button. Later, tell them that you have painted it. Place the two buttons side by side and ask them to point out where THE button is. Which do they point to? The unpainted button or the painted button?
- Part 2: hide a toy and show your child(ren) where it is. Have them leave the room and move it to a different location. When they come back, tell them that you have moved it to the new location. Where do they check? The old location or the new location?

Theory

There is evidence that children as young as 22 months can use language to learn about an object that undergoes a property change (part 1) out of their sight. However, if the verbal input describes a change in location (part 2), children who successfully use this information are typically 30 months old; the majority of younger children will continue to search in the old location.

Meet our Junior Scientists in Action!



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From All of Us at the
Language and Learning Lab....

Thank you for participating

...and See You Again Soon!

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