EXPLORE, EXPERIMENT AND ENRICH WITH INQUIRY-BASED SCIENCE ACTIVITIES FOR YOUNG LEARNER

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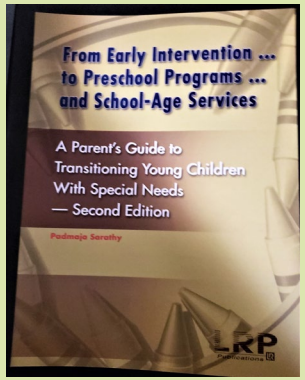
Learning Objectives

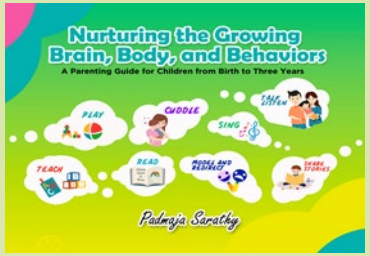
- **This session will discuss how to create a learning environment that promotes curiosity, investigation, problem-solving and concept development in young children.**

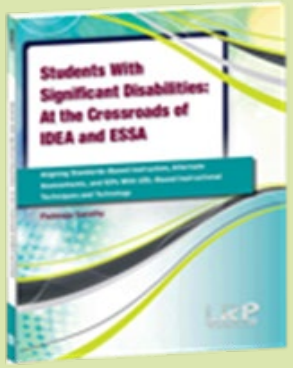
  - How to embed opportunities throughout the day as part of the daily routine to encourage children's questioning, exploration and to think critically.

  - How to integrate UDL strategies so that all children, including those with cognitive and communication needs can benefit and gain skills.

  - Use a variety of popular and colorful picture books to teach science and math concepts and engage children in hands-on activities.

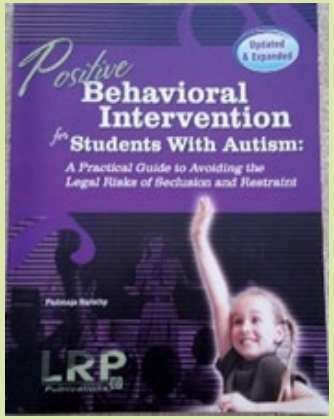


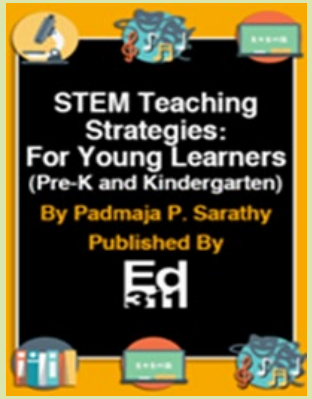




Padmaja's Sarathy' Books and Publications

- ***Autism: Support Strategies & Interventions, Autism Seven Steps of Support; Music CD – Transitions***
- ***Behavior Guide (Preventive and Positive Approaches), Mindfulness Guide***
- ***Early Childhood: Transition; Parenting Guide; Executive Function - Early Years; and STEM Teaching Strategies***
- ***Paraeducator Training Guide and DVD***
- ***Severe and Multiple Disabilities; Significant Disabilities and ESSA***





Cultivating Inquiry-based Thinking

Investigate

Imagination

CRITICAL THINKING

Explore

Problem Solving

Asking Questions

Finding Answers

Discovery

Curiosity

Creativity

CREATIVE THINKING

Science is Inquiry, Problem-Solving and Discovery

- Science "happens' all around us every day and you have endless opportunities to invite children into the wonders of science.
- Science is a systematic study of the structure and behavior of the physical and natural world through observation and experiment." i.e. how stuff works.
- Science involves:
  - Observing what's happening;
  - Classifying or organizing information;
  - Predicting what will happen;
  - Testing predictions under controlled conditions to see if they are correct; and
  - Drawing conclusions
- Children are natural learners—inquisitive, energetic, curious.
- Increase their thirst, curiosity and enjoyment related to discovery. Encourage love of exploration and experimentation.

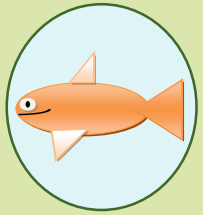
Embed Science into Daily Routines

- Make science exciting! Create hands-on science lessons so concepts come to life.
  - Provide objects for students to observe, conduct experiments and discover how things work. Make available magnets, bubbles, magnifying glass, Seeds, leaves and twigs and plants growing
- **Circle-Time:** Integrate science with literacy activities. Build vocabulary skills and science knowledge.
- **Center-time:** Embed science into centers. Have children involved in conducting experiments. Set up a science discovery center. Showcase weekly displays of science information.
- **Recess-time:**
- **Movement-time:**
- Get parents involved (to pursue activities at home).

Universal Design for Learning Framework

- Ensure application of UDL in into your design of the environment and delivery of instruction to promote Access, Action and Expression and Engagement of learners with diverse needs (http://www.udlcenter.org/):
  - **Provide multiple, flexible methods of presentation.** Information is presented in variety of formats, at different complexity levels and to address different learning styles.
  - **Provide multiple, flexible methods of action and expression.** Offer a variety of formats - flexible methods - for student to respond, navigate through information and activities and demonstrate what he/she knows.
  - **Provide multiple, flexible options for engagement.** Various opportunities are provided to engage student's interest, offer appropriate challenges, increase motivation and gain student response.

Enrich & Explore: Build Science Knowledge
Let's Begin with Animals – A Natural Draw for Kids

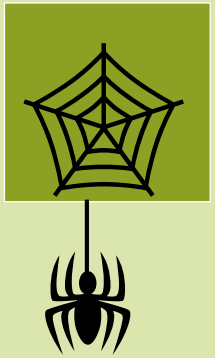


- ❑ **Learn about animal characteristics.**
  - ❑ **Physical and behavioral characteristics.**
- ❑ **Learn about Classification of Animals.**
  - ❑ **Mammals, Reptiles, Birds, Insects, Fish and Amphibians**
  - ❑ **Marsupials and Echidna**
- ❑ **Numerous books (fiction & nonfiction) are available to assist with the theme.**
  - ❑ **Get children involved through questioning about their prior knowledge about animals. Provide props with photos, videos, models and puppets.**
  - ❑ **Frame your questions from simple (yes/no or right/wrong responses) to complex (open-ended) questions to give every student to participate and respond (**UDL framework**).**
  - ❑ **Engage them in a discussion that builds their science knowledge and relates to their own personal experiences with animals.**

Animal Pictures : Motivate and Capture Student Attention to Stimulate their Thinking

Easy to Complex **(Classification)**

Animal Names, Characteristics, Habitat, Classification (mammal, reptile, bird, etc.)



Enrich & Explore: Build Science Knowledge

- Rapidly name several animals or one in each category:
  - Mammals, Reptiles, Amphibians, Insects, Fish & Birds.
- Where do the animals live? How do the animals move? What do the animals eat?
  - Discuss food chain concept (as appropriate for age/grade level).
- Talk about how the dogs (or birds or cats) that you see are alike and different. Read stories that portray a dog, a cat, and a bird.
- Observe pigeons, squirrels, butterflies, ants or spider webs during recess.
- Have children play the charades game, role-playing different animals.
- Where do you find penguins? *(Moderately challenging)*
- Which are the two animals (mammals) that lay eggs? *(Challenge question)*
- Set up a animal facts discovery display. Have students select an animal of the week and display animal facts and student items.

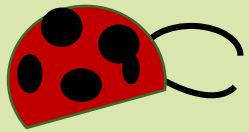
The Grouchy Ladybug by Eric Carle

- ❑ As you read the story, pause, to ask questions. Which animal is bigger – the ladybug or the other animals (praying mantis or hyena or sparrow or whale?)
- ❑ Discuss the characteristics of the various animals from the story.
- ❑ Classify the animals into 4 categories as a follow-up activity.
- ❑ Role-play the animal characters from the story for your Movement time.

Mammals	Reptiles	Birds	Insects	Crustacean
Skunk	**Boa Constrictor**	**Sparrow**	**Ladybug**	**Lobster**
Hyena			**Stag beetle**	
Gorilla			**Praying Mantis**	
Rhinoceros			**Aphids**	
Elephant				
Blue Whale (Marine mammal)				

Challenge Question: Which animal is in the endangered species (list)?

Concept Map



Life Cycle

Basic Needs

Organisms

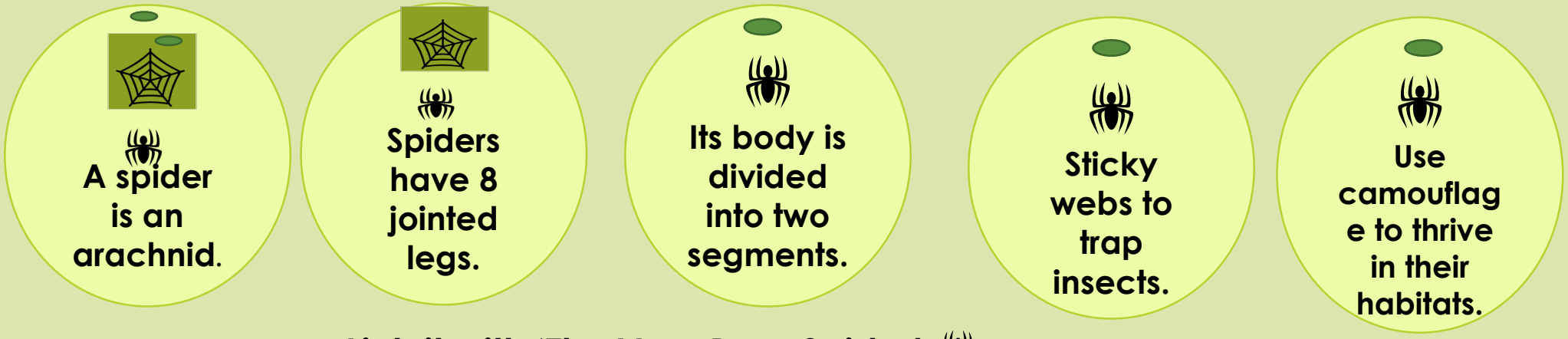
Habitats

Insects

Physical Characteristics

Get Children Exploring and Researching.

- Let each student choose an animal to do further research: its characteristics, its structural and behavior adaptations to fit into the environment (at a higher complexity level), etc.
  - Adapt it to the student grade level, functioning level. Provide props.
  - Facilitate a diversity of approaches and products corresponding to the student functioning level – One animal picture with one detail about it to creating a book or a power point with multiple details. Provide a template and an example.



Link it with 'The Very Busy Spider'

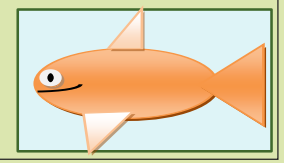
Animals - Inquiry-based Questioning

Jump Frog, Jump by Robert Kalan serves as an example.

- Ask multi-level questions to offer opportunities for all children to be included and feel successful in the story-discussion. Sample questions to provoke thinking:
- Have you ever seen a frog? Where would you see a frog? Where else can you see a frog?
- Is the frog a big animal or a small animal? In comparison to what other animal?
- Think of some other animals that live in water?
- Why is frog an amphibian? How is it different from a reptile?
- Can you have a frog as a pet? Why not?

Make A Movement Poem

Jump, Frog Jump!
Swim, Fish, Swim!
Slither, Snake, Slither!
Crawl, Turtle, Crawl!



Animal Theme and Science Focus Picture Books

Books for literacy lessons and to grow science knowledge

- **Brown Bear, Brown Bear** by Bill Martin (animal names, animal facts)
- **The Mitten** by Jan Brett (animal names, animal facts, winter and also seasons, weather, etc.)
- **Are You My Mother?** by P.D. Eastman (birds and other animals)
- **Jump Frog, Jump!** by Robert Kalan (animals – reptiles, amphibians, fish, and animal movement)
- **The Very Busy Spider** by Eric Carle (Arachnid, farm animals)
- **The Grouchy Ladybug** by Eric Carle (animals, animal classification, Emotions-feelings)
- **Swimmy** by Leo Lionni (Fish, animal facts, problem solving,)
- **The Wide-Mouthed Frog** by Keith Faulkner
- **Barnyard Dance** by Sandra Boynton
- **Aesop's fables** by Aesop (Retold by number of authors)
- **Clifford** by Don Freeman (several books)
- **National Geographic Kids** (Multiple picture books): Ants, Butterflies, Baby Animals, & many more.
- ***Bugs are Insects*** by Anne Rockwell (Let's Read and Find Out Science Series)

Participant Poll with Detailed Questions

- ❑ Do you incorporate science activities into your daily routine?
- ❑ Do you have a science center with activities for children to investigate and explore?
- ❑ Do you perform hands-on science experiments with your students regularly, say weekly or bi-weekly?
- ❑ Do you integrate science into your language lessons?
- ❑ Do you play science vocabulary games?
- ❑ Do you blend movement activities with science concepts?

Our Natural World - Inquiry

Tree Life Cycle:
How do trees grow (how do they begin)?
- **Seed**
-

Kinds of Trees:
What kind of trees are there?
- **Banana**
- **Apple**
-

Tree Products:
What do we get from trees?
- ***Wood***
-
-

Tree

Trees and Children
How do trees help children?
- Play in the shade
- Swing
- Tree-house

Trees are home to…?
- **Birds**
- **Insects**
-
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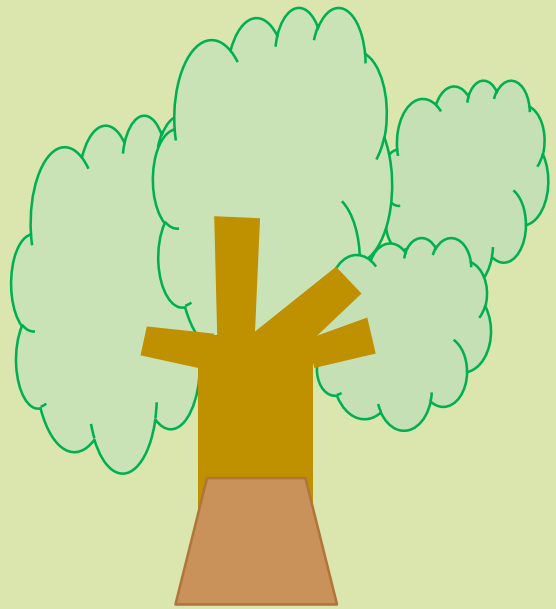
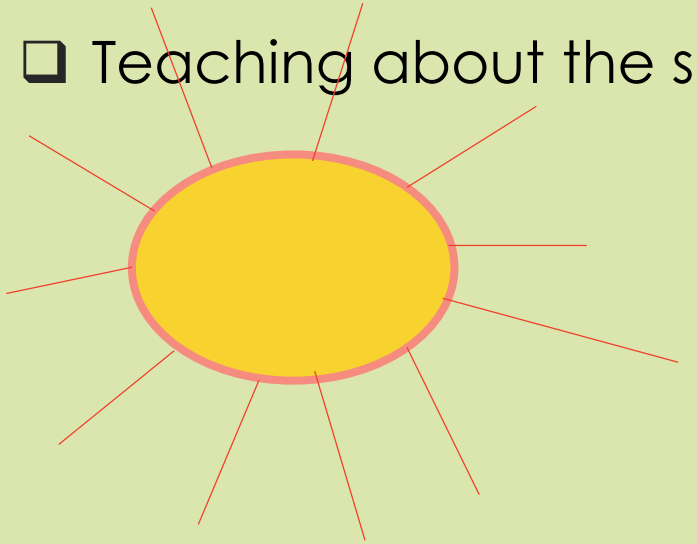
Connect it with the story of **'The Giving Tree'** By Shel Silverstein



A Seed Is a Promise by Claire Merrill
Another book suggestion

Enrich & Explore: Build Science Knowledge
The Solar System – Sun, Moon, Earth, Planets and the Stars

- Teaching about the solar system and earth's place.



Helpful resource- Planet for kids:
https://www.planetsforkids.org/how-hot-is-the-sun.html

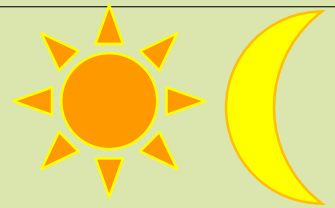
- **Sun is at the center of the solar system.**
- **Sun is extremely hot.**
- **Sun gives us our light and heat.**
- **Eight planets orbit around the sun.**

A good rhyme to help you **remember** planets is: **My Very Enthusiastic Mother Just Served Us Noodles**!

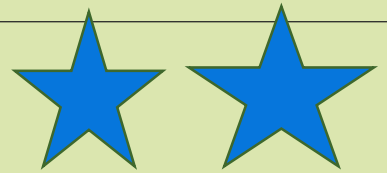
Mercury
Venus
Earth
Mars
Jupiter
Saturn
Uranus
Neptune

Milky Way galaxy

- **Earth is a the third planet from the sun.**
- **From space it looks mostly blue.**
- **Oceans cover 71%.**
- **93 million miles from the sun.**
- **Moon is the earth's only satellite.**



Act it to Make Drama



Drama Integrated with Science and Literacy: The Concept of "Orbit"
Combine it with the story of 'Papa, Please Get the Moon for Me' by E. Carle

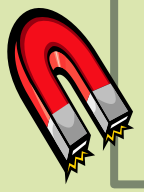
- Assign different roles to students: Playing the roles of Sun, Earth and Moon.
- Give each character (the students) a prop representing their role (Sun, Earth and Moon). Students can make props out of paper plates and paint them with different colors to represent Sun, Earth and Moon.
- Act out the "Orbit" by having Earth orbiting (circling) around the Sun and the Moon orbiting (circling) around the Earth to demonstrate the concept of "Orbit" and the relationship between Sun, Earth and Moon. A non-ambulatory student could play the Sun. Others can activate a device to play the script or play a theme music. Some can be stars in the sky and another can be the sky. Rotate roles.
- Use **AT voice output devices and props** to aid the 'role play & drama' presentation.

Connect it with the book,

Experiment - Make Predictions

- **Create a ramp** with a cardboard box or wooden board. Place objects with different shapes and materials at the top. Have students make a prediction about each object.
  - What will happen? What they do on the ramp?
  - Some might roll. Some might slide. Some might not move at all!
  - Talk about the attributes of objects that roll and those that slide.
- **Magnet Activity:**

  Have your students experiment with a number of items – paper clips, scissors, pencil/crayon, a metal spoon, a plastic spoon, etc. to see if the magnet will attract or repel the item.



Magnet Attracts	**Magnet Repels**
Magnet attracts paperclip because it contains iron.	Magnet repels paper because it does not contain iron.

Experiment - Make Predictions

- Make a barge with a 6-inch square of tinfoil. Fold up the edges on all 4 sides and pinch the corners to make a good seal.

  Place the boat in water to see if it stays floating.

- Conduct an experiment to find out which objects float and which sink and find out why.
  - What happens…if paper is put in water; metal spoon is put in water; sugar is put in water.
- Ask questions about their observations.
  - Can you explain what happened?
  - What do you think caused that to happen?

Ask… What If Questions.

Cause and Effect and Making Predictions

- What will happen if you add a drop green food coloring to a glass of water?
- What will happen to a balloon if we poke it with a pin?
- What will happen to yellow paint if we mix it with red?
- What could happen if it did not rain for a month?
- What could happen if it rained heavily for a whole week?
- What if all the water dried up in the lakes, rivers and oceans…
- What if the temperature increased and the world got hotter…

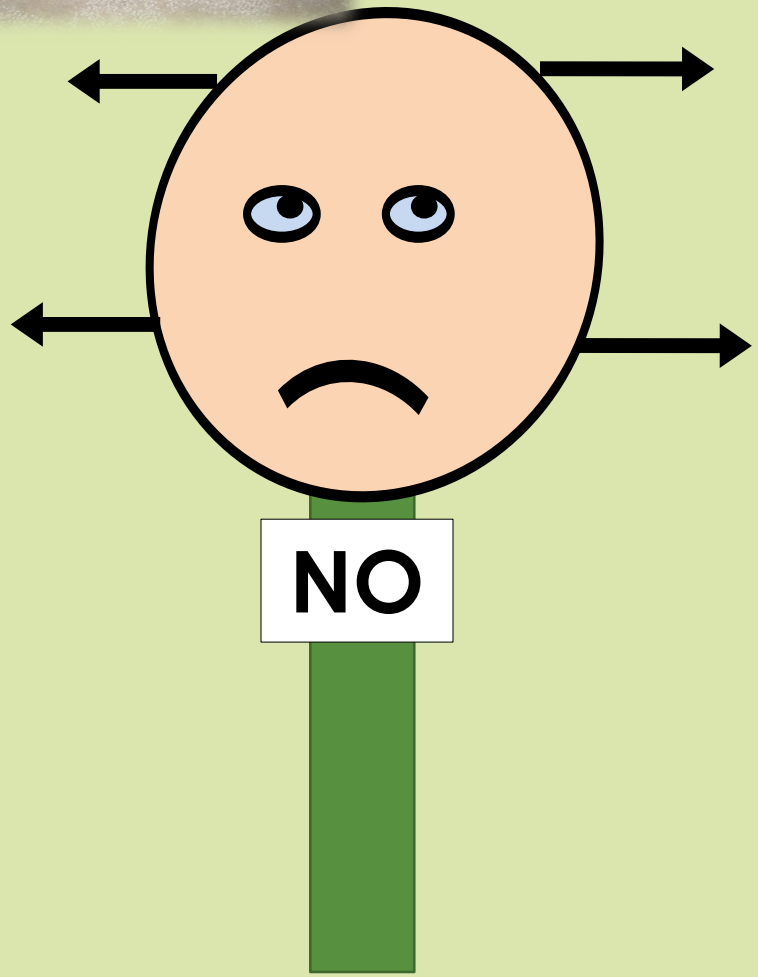
Experiment and Explore

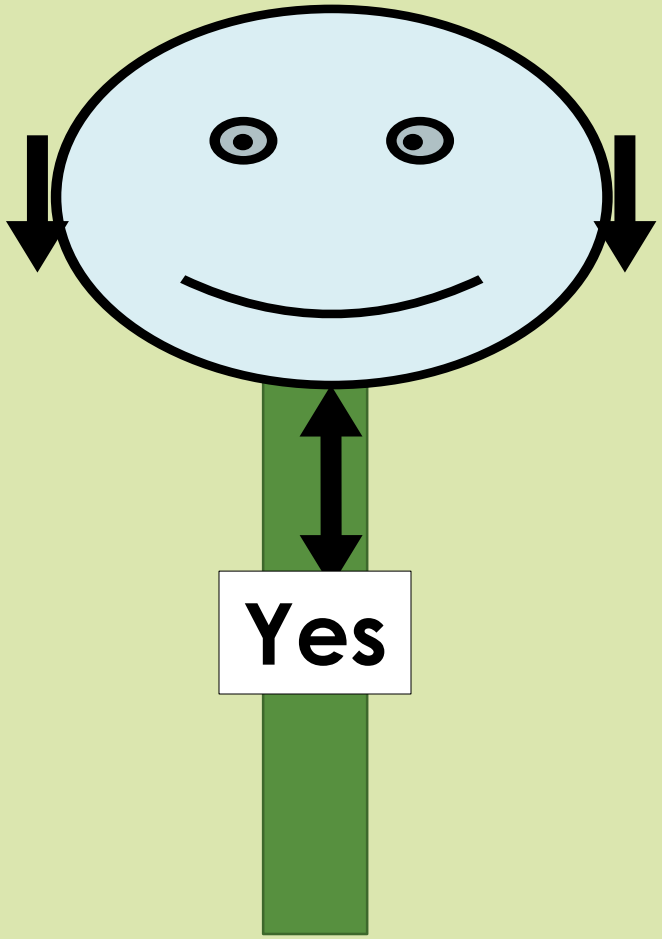
- **Learn about a volcano:** Discuss the appearance and color of the volcano. Show images of a volcano and how it erupts and the lava flows from it. (Explain that when a volcano erupts, it has hot lava flowing)).
- For good sources of photo images and videos of volcanoes, go to: National Geographic for Kids website at http://kids.nationalgeographic.com//
- Another website focusing on weather concepts is: www.weatherwizkids.com. YouTube videos of volcanoes are also available besides colorful science books focusing exclusively on volcanoes.
- **Make a volcanic eruption:** Make a make-believe volcano adding baking soda and vinegar to a cup of water.
  - Students will observe that it bubbles-up (fizzles).
  - Give each one of them to conduct the fun experiment.

Personalized Student-specific Supports

- Apply **Universal Design for Learning** principles.
- Use **object representations or picture cues as supports** to assist students with their responses.
- Ask questions ranging from **easy to higher complexity levels** to provide opportunities for all children to be able to respond.
- Provide **invisible support**.
- Enable students to **respond given 2 or 3 choices**.
- Build in **transition activities** (movement activities, games, songs, etc.) to sustain student motivation and attention.
- Offer additional **opportunities to take short breaks** for children who appear restless and fidgety.
- Stoke positively. Make **encouraging comments**
- Use **AT supports**.

Response Tool





Some may respond with a Response-Participation Tool.

Visuals and AT Supports

A 3-column chart

Select/Choose (A choice Board)		

Italk2 Communicator
Enable Choice-making.

Talking Brix
Labeling & sequencing

Step by step
Step by step directions for the science experiment

Magnet	Label
Microscope	Label
Object	Label
Object	Label

Science Vocabulary-building chart

Quick Talker and Super Talker
To promote communication, and group participation and response

Inquiry-based Science Learning in the Early Years

- **Brain grows at the fastest rate in the early years** - neural connections (synapses) develop very rapidly at a rate of 1 million synapses per second.
- Pursue Inquiry-based hands-on science activities to build the brain.

Foster Inquiry

Cultivate Curiosity

Promote Exploration

Strengthen Attention

Sustain Motivation

Build Love for Learning

Problem Solving Steps

Define the Problem

Explore Options

Take Action

Look back to check if the solution is working.

Science (STEM) - focused Books

Title	Author	Age Range
My Five Senses		
If You Want To See A Whale	Julie Fogliano	4-7
10 things I can do to help my world	Melanie Walsh	4-9
Little Owl's Night	Divya Srinivasan	4-8
What Lives In A Shell	Kathleen Weidner Zoehfeld	4-8
Running on Sunshine: How Does Solar Energy Work	Carolyn Cinami DeCristofano	4-8
The Doorbell Rang (mathematics)	Pat Hutchins	4-8
Robots (National Geographic Readers)	Melissa Stewart	
What Is The World Made of? All about solids, liquids, and gases	Kathleen Weidner	4-8
Awesome Engineering Activities for Kids	Christina Herkert Schul	5-10
Claws, Coats and Camouflage: The ways animals fit into their world	Susan Goodman	6-11
Asteroids, Comets, and Meteors	Robin Kerrod	6-11
Everything Kids Science Experiments Book	Tom Robinson	7-12

Resources

- Discover Engineering: http://www.discovere.org/ At the Discover Engineering site, children can view videos, play interactive games, and design "Cool Stuff."
- Engineering is Elementary developed by the Museum of Science, Boston: https://info.eie.org/eie-k
- National Science Teachers Association. (2014). *NSTA position statement: Early childhood science education*. http//www.nsta.org/about/positions/earlychildhood.aspx
- NASA for Kids: (http://www.nasa.gov/audience/forkids/home/index.html)
- National Geographic website http://kids.nationalgeographic.com/
  - Offers a variety of books and videos on animals, and diverse science topics.
  - Watch the Volcano video in National Geographic site. https://www.youtube.com/watch?v=Xtkys3-T-Y8

Resources

- Sarathy, P. (2017). STEM Teaching Strategies for Young Learners. Ed311, Austin, TX. (https://ed311.com/)
- ThinkFun: *www.thinkfun.com*
- The PBS site: http://pbskids.org/designsquad This PBS site, Design Squad, features creative activities, engaging video, interactive games, and exciting contests.
- The Khan Academy: https://www.khanacademy.org/ The Khan Academy website offers a variety of math and science activities.
- Tools of the Mind: *www.toolsofthemind.org*
- 25 Amazing Virtual Field Trips: https://www.weareteachers.com/best-virtual-field-trips/

T H A N K S.

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The next webinar will be on August 6th - Part 1

Positive Approaches to Addressing Problem Behaviors of Students with Severe Disabilities

September 29th - Part 2