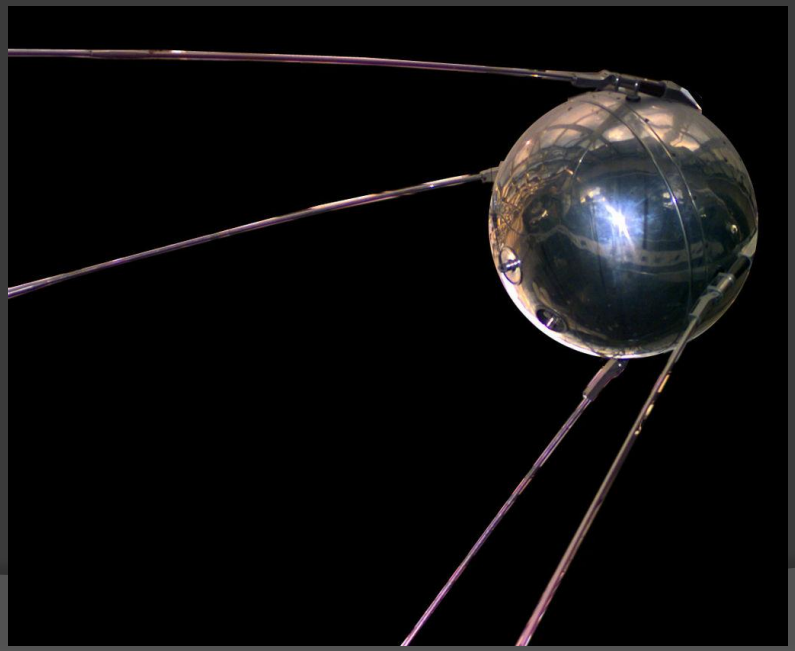
TEACHING ASTRONOMY IN KINDERGARTEN

DR. AYALA RAVIV

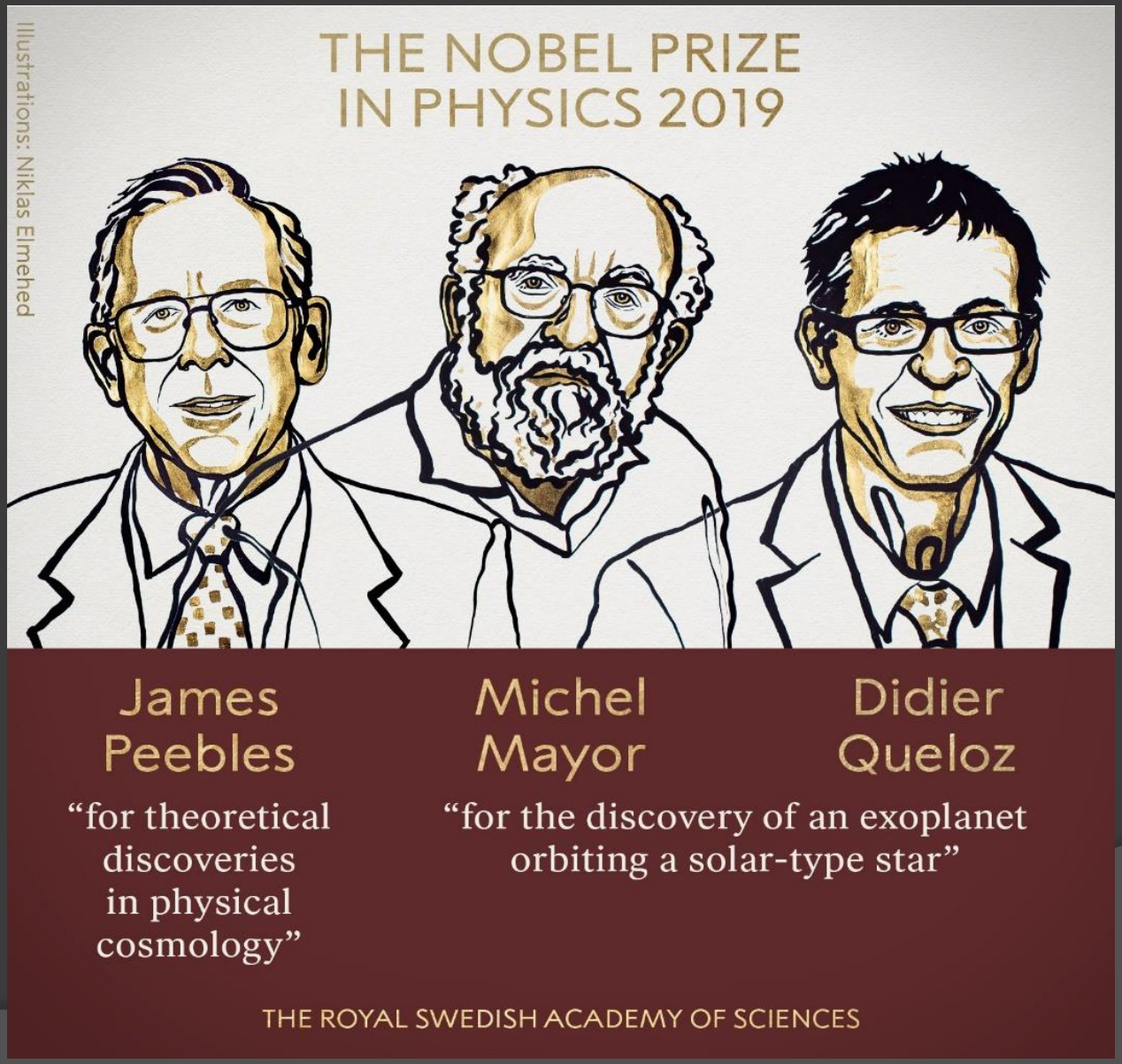
HEMDAT HADAROM COLLEGE OF EDUCATION, ISRAEL

Mankind conquers the outer space

- 4.10.1957 – First earth satellite (Russian) – Sputnik 1
- 12.4.1961 – Yuri Gagarin - first human to journey into outer space
- 20.7.1969 - Apolo 11- Neil Armstrong - first person to walk on the Moon



2019 Nobel prize Winners in Physics



Pale blue dot 1990

0.12 pixel / 640,000 pixels. Voyager 1 /6.4 billion kilometers from Earth / 32º above the ecliptic

How early is it recommended to start teaching children about space?

- Young children are able to understand scientific concepts, even complex ones, and have the ability to engage in scientific thinking (Eshach, 2006).
- Children's ideas and beliefs, based on their experiences, are converted to cognitive structures. If unexplained or poorly processed, they might be developed into misconceptions (Türkmen, 2015)

What about teachers?

- **Teachers** are concerned about the teaching of scientific subjects in general (Spektor-Levy, et al., 2011) and astronomy and space in particular (Kallery, 2011), because these subjects are abstract and difficult to understand.
- These and other difficulties like lack of time and educational programs cause many elementary school and kindergarten teachers to avoid teaching topics related to astronomy and space.

Aim of study

- To examine the ability of kindergaten children to learn and understand astronomical concepts and processes,
- To explore whether those children changed previously held misconceptions about astronomy and space,
- To examine their experiences while studying about astronomy and space.

Research questions

- 1. To what extent was there an increase in the level of knowledge and understanding of astronomical concepts and processes among kindergarten children, following the implementation of an educational intervention program?
- 2. To what extent did the children change their previously held conceptions about astronomy and space?
- 3. What do the children express, through their own words and their creative works, about the nature of their experiences in studying the topics of astronomy and space?

Methodology

- Empirical study used qualitative and quantitative methods
- 32 kindergarten students, 14 boys and 18 girls, two age groups in the kindergarten: 12 children ages 4-5 and 20 children aged 5-6 years old.
- An intervention program developed for the purpose of this study. The three main study topics covered in the program were:

Program topics

- The Sun and the solar system: the properties of the Sun, the structure and components of the solar system, the planets, interactions between the Sun and the Earth, the rotation and revolution (orbit) of the Earth.
- The Earth: its attributes and structure, gravity, movement.
- The Moon: its properties and motion in space, interactions with the Earth.

Research tools and process

- **Intervention program consisted of nine sessions of 20 min. each, over seven months.**
- **Scientific explanations were presented with the assistance of videos and animations regarding astronomical events such as the rising and setting of the Sun, Moon, and stars; gravity; and the phases of the Moon.**
- **In each session, the children did creative projects (drawing, cutting, and pasting) related to the learned topics, and presented them to the class.**
- **Knowledge questionnaire**
- **Did you enjoy learning about the subject? Why?**

Findings

	Before Intervention				After Intervention		
	Correct answer	Partially correct answer	Incorrect answer	No answer	Correct answer	Partially correct answer	Incorrect answer
1. What is the name of the planet we live on?	8		6	18	31	0	1
2. What shape is the Earth? (cube / disk / sphere / ellipse)	26		6		31		1
3. What are the three parts of the Earth's structure?	1	1		30	18	14	
4. What is gravity?	5			27	22	7	3
5. How does the Earth move?	6		6	20	31		1
6. What is the Sun? (a star / a moon)	15		17		32		
7. Where is the Sun at night? (behind the Moon / covered in clouds / the Sun has gone to be with the other stars/ on the other side of the Earth)			32		30		2
8. What is the reason for the shift from day to night on Earth?		2	3	27	29	2	1
9. What is the Moon?	3		6	23	29		3
10. What is the orbit of the Moon? The Moon orbits the earth / The Moon orbits around the sun / The Moon does not orbit)	8		24		31		1
11. Does the Moon appear only at night Where is it during the day?	7		23	2	29		3
12. Which is bigger, the Earth or the Sun?	7		25		30		2

Table 1. *Comparison of Students' Responses to Astronomy-Knowledge Questionnaire, Before and After the Educational Intervention (N = 32)*

	Mean Score	SD	T-test
Before Study Program	19.73	12.23	-23.657
After Study Program	85.06	17.00	

Examples of incorrect answered prior to learning "What is the name of the planet we live on?"

"Israel"

"Be'er Sheva"

the name of their school

"the lesser light" (a biblical phrase for the Moon).

“How does the Earth move?”

Six children were able to describe the Earth’s rotation around its axis prior to the learning. Others said:

“It jumps.”

“It claps its hands.”

“The Earth does not move at all.”

“It rolls.”

“What is the reason for the shift from day to night?”

Before:

“**When the Sun is tired it sinks into the water.**”

“Sometimes the Sun leaves and the Moon comes.”

After:

“In our country it is night because the Earth is spinning and we do not see the Sun from here. Then it is on the other side, where there is light.”

“The Earth turns and then the Sun on another country.”

“Which is bigger, the Earth or the Sun?”

Before: 7 - the sun, 25 - earth

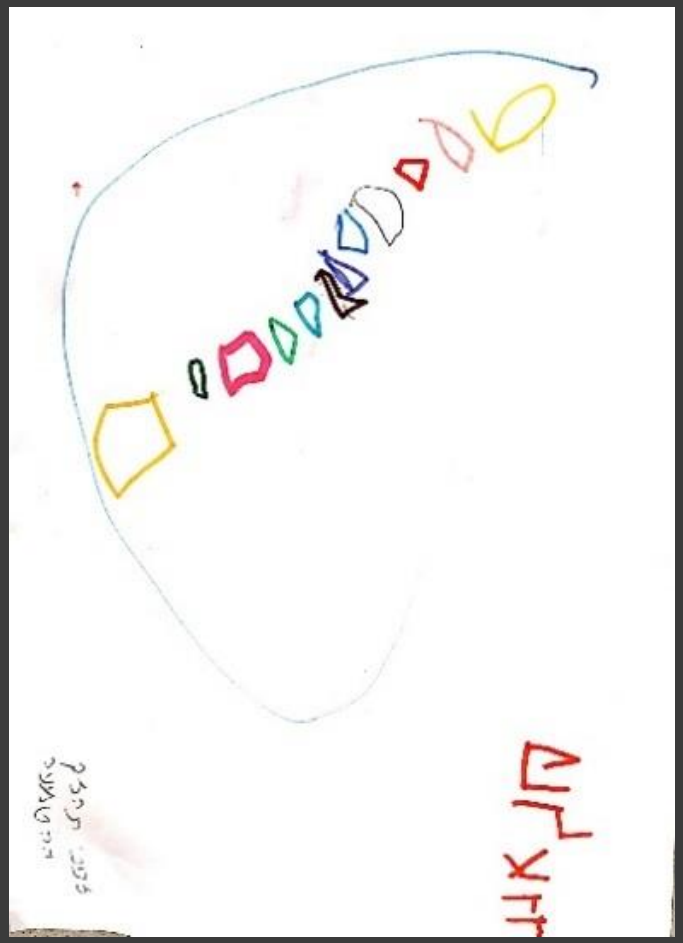
After: 30 - the sun, 2- earth

“The sun looks small due to its greater distance”.

“What is gravity?” (after)

- “Gravity causes us not to fly in the air like in the Moon, and we can stand on the ground.”
- “Thanks to this, we can stand.”
- “It holds us so we don’t fly.”
- “Gravity pulls us down.”

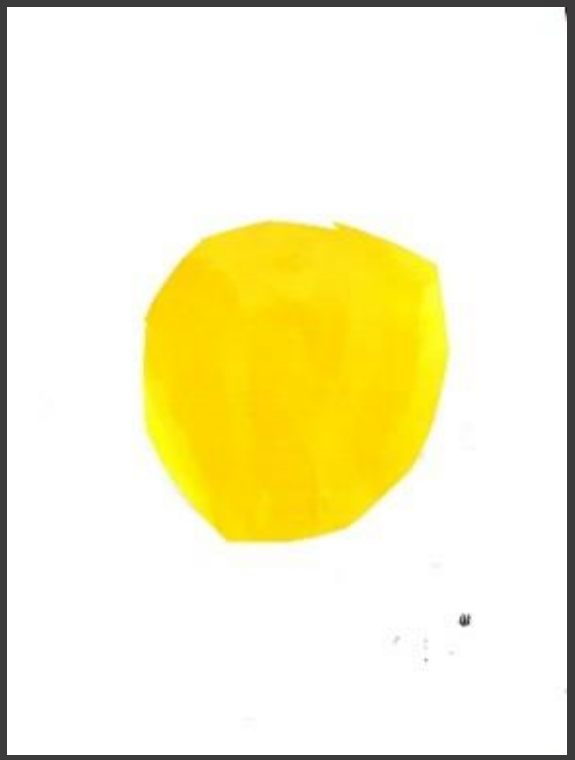
Children works



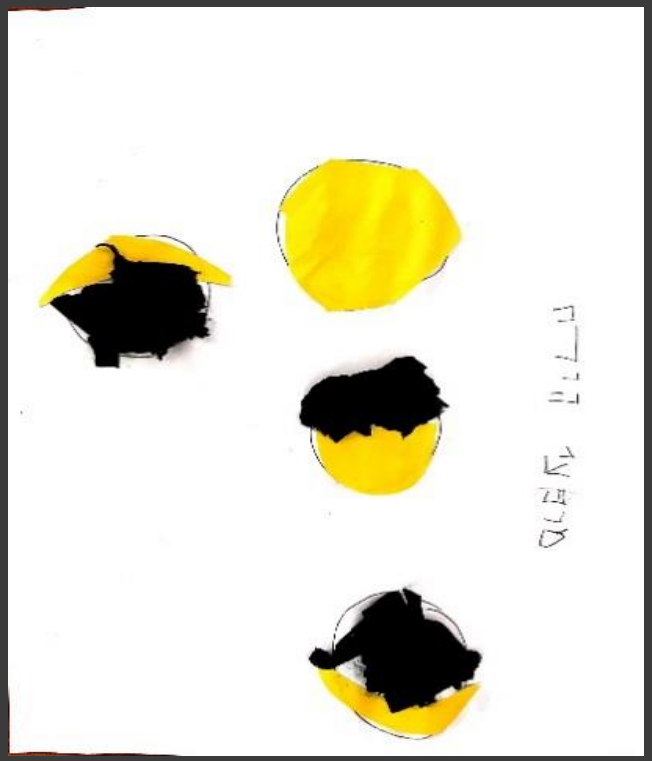
Before: Earth

After: The solar system

Moon



before



after

Selected Quotes -

- “... and only the Earth is right, where our water is good and we can drink it. This is because we are in exactly the right place”.

- “Because these planets (pointing to the Mercury and Venus on a poster) are too close to the Sun and the water all dried up, and these (pointing to the planets beyond the Earth) are too far from the Sun, and the water there has frozen, it turned into ice.”

Table 3. *Distribution of children's responses to question 14: Did you enjoy learning about this subject? Why?*

Number of children reporting "I had fun."	**Number of children reporting each impression of the astronomy lessons**					
	Interest	Desire to explore	Desire of adventure in space	Enjoyable creativity	Beauty and Importance of the Universe	Fear
29	**3**	**6**	**7**	**5**	**6**	**3**

Conclusions

- **Young children can understand both tangible and abstract concepts on Astronomy and space.**
- **Young children already posses misconceptions about astronomical phenomena which may be changed and corrected.**
- **Kindergarten teachers should be encouraged to become well acquainted with scientific information and pedagogical tools appropriate to teaching astronomy sciences to young children.**


THANK YOU!
ayalaraviv1@gmail.com