The Hourglass Race (ages 3-4)

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Summary: Over the course of the 8 sessions hereafter, the children, study, use, produce and compared hourglasses. They broach the concepts of time and speed.

Objective: I am familiar with and have a feeling for the concepts of "faster than", "slower than", "first-place finisher", "last-place finisher", "at the same time as".

Target concepts: Learning about the world of objects: using various technical objects in functional situations.

Duration: 145 minutes in 9 sessions

Materials:

Learning About Hourglasses:

1) Introduction to the concept of flow

For the class:

- punched bottles,
- water
- hand rags.

2) The hourglass as an object

For the class:

- an hourglass made with two plastic bottles filled with semolina,
- an hourglass identical to that above, but with non-punched caps

Compare the two hourglass' flow time

For each child:

- two hourglasses per child:
- one red with a lot of semolina,
- one green with a little semolina,
- two boxes symbolising the two hourglasses

Compare the time required for the sand to run out in the three hourglasses

For each child:

- 3 hourglasses and 3 symbol boxes:

How can the time required for the sand to run out be changed?

For each child:

- 3 hourglasses for the 4-year-olds, 2 hourglasses for the 3-year-olds,
- a worksheet to record the final order

How are hourglasses filled?

For the class:

- semolina, empty hourglasses, funnels

For each child:

- 3 hourglasses for the 4-year-olds,
- 2 hourglasses for the 3-year-olds,
- a results chart

Predict the order in which the hourglasses will finish the race, in accordance with semolina volumes

For each child:

- 3 hourglasses,
- semolina,
- funnels,
- small jars,
- filling cards,
- results charts.

Set up three hourglasses, comparing them two by two.

For each child:

- 3 hourglasses containing nearly-identical sand volumes
- a results chart.

Animals at the Racecourse

Duration: 20 minutes

Objective: I am familiar with and have a feeling for the concepts of "faster than", "slower than", "first-place finisher", "last-place finisher", "at the same time as".

Class Organisation:

Game in game room

Four groups of children mime four different types of animals: rabbits, snakes, monkeys and frogs. Instruction: "When I sound the signal, each animal will move as quickly as possible to the river, moving like real animals".

At the finishing line, the first-, second-, third- and last-place finishers are recorded.

An explanation is given as to why the monkeys are always the fastest and the snakes the slowest: the former run, while the latter crawl.

The same game is repeated, but all of the animals have to reach the river at the same time.

Learning about the Hourglass as an Object

Pedagogical approach:

1) Broaching the concept of flow

Non-directed play in the water tank with punctured bottles.

Duration: 10 min in very small groups

Materials for the class:

- punctured bottles
- water
- and hand rags.

2)The hourglass as an object

The teacher shows an hourglass to the students, who watch and comment.

Duration: 15 min - group –

Materials for the class:

- an hourglass made with two semolina-filled plastic bottles,
- an hourglass identical to the previous one, but with a non-punctured cap

What is happening? Why does the sand flow in one and not the other?

Comments:

- for the 3-year-olds, use small mineral water bottles
- semolina flows more steadily than sand

3) Undirected handling of several hourglasses filled to different levels

Duration: 10 min -

Class organisation: small groups

Materials for the class:

- hourglasses

4) Observation and Drawing

Duration: 5 min

Class organisation: individual work

What can I do while the sand runs out in the hourglass?

Concept: the time required for the sand to run out (T) can be a duration that I can measure intuitively.

1) Racing for Rings

Duration: 15 min

Class Organisation: group

Instruction: pick up as many rings as possible during allotted time (T)

The person with the greatest number of rings is the winner.

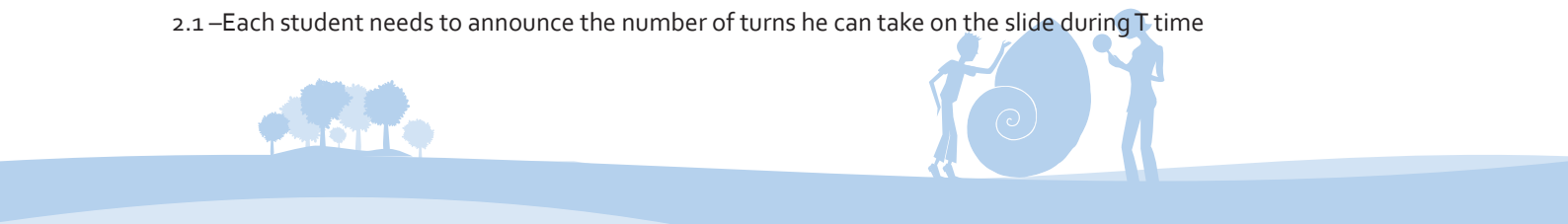
2) the slide

How many times can I go down the slide during the allotted time (T)?

Duration: 15 min

Class organisation: small groups -

2.1 –Each student needs to announce the number of turns he can take on the slide during T time



The purpose is to anticipate the result.

2.2 – The game is played again several times. The number of turns is always around the same for a single student.

3) The children watch how far the "seconds" hand on the clock can go as the hour-glass runs out.

Comparing the time required for the sand to run out in two hourglasses

Duration: 20 min

Classroom organisation: individual work –

Materials:

For each child:

two hourglasses per child:

- one red with a large amount of semolina,
- one green with a small amount of semolina

Two boxes symbolising the two hourglasses

Instruction: "Which hourglass empties the quickest?"

Comment: all of the hourglasses used have a hole of approximately the same diameter.

Written record: group results chart

1	2

1 = hourglass that runs out first

2 = hourglass that runs out second

Why is the red hourglass the fastest?

What happened in the third experiment?

The experiment is repeated as a group.

Conclusion

To compare the two hourglasses, they need to be turned over at the same time.

This is a difficult concept to understand, even for 4-year-olds

Compare the time required for three hourglasses to run out

For the 4-year-olds only -

Duration: 20 min

Class organisation: small groups of four students –

Materials:

For each child:

3 hourglasses and 3 symbol boxes:

Instruction: arrange the glasses in order, from fastest to slowest.

Three students each have an hourglass and must turn it over.

The fourth child writes down the results.

The experiment is repeated three times, with the students changing roles.

Written record: example – per group of four children

1	2	3

Why did the red hourglass not always empty out first?

- Because they do not all run out the same.
- 'Cuz I'm the fastest.
- Because there was no more

Conclusion: the 3 hourglasses have to be turned over at the same time

Group summary

The group decides to always use the same method to compare the hourglasses:

- one "measuring" student with no hourglass counts to 3.
- on 3, the other students in the group turn over the hourglasses.
- when one hourglass has run out, the person who turned it over raises his hand and says "Stop!", along with the name of the his hourglass' colour, for instance: "Stop! Red!"
- the "measurer" notes the order in which the hourglasses come in.

The experiment is repeated.

Is this finishing order always the same?

How can the time required for an hourglass to run out be modified?

Class organisation: Small groups

Materials:

For each child:

- 3 hourglasses for the 4-year-olds, 2 hourglasses for the 3-year-olds,

A sheet to record the finishing order

Instruction 1: Arrange the hourglasses from fastest to slowest.

Instruction 2: I want the slowest one to become the fastest.

All together, the suggestions from the various groups are studied.

"we can take semolina from the slowest hourglass so that it runs out more quickly".

In very small groups, the suggestion is tested and results recorded.

As a group, it is concluded that:

"The more semolina there is, the slower the hourglass empties out."

VII – How is an hourglass filled?

Materials for the class:

Semolina, empty hourglasses, funnels

1) how can an hourglass be filled?

Individual undirected trial. Assistance from instructor.

Group sharing: the children dictate to the instructor how he should fill the hourglass.

To fill an hourglass, you need to:

1. open the two bottles
2. fill one bottle with the funnel
3. screw on the cap
4. screw the cap on the second bottle

2) How can an hourglass be filled so that it empties out more slowly or more quickly?

Duration: 20 min

Class organisation: small groups

Materials:

For each child:

- 3 hourglasses for the 4-year-olds,
- 2 hourglasses for the 3-year-olds,
- a results chart

Instruction: Fill up the 2 or 3 hourglasses to achieve the results provided in the chart.

Check and record the results.

Sample chart provided for "4-year-olds"

1	2	3

Predicting order of hourglass finish according to semolina volumes

Duration: 20 min

Class organisation: Small groups – 4-year-olds only

Materials for each child:

- 3 hourglasses,
- semolina ,
- funnels ,
- small jars,
- filling level instructions,
- results charts

Instruction: Fill the hourglasses as indicated on the filling level instructions (1, 2 or 3 jars of semolina) O = one jar of semolina

- Example:

oo >	ooo >	o >

Write down the results you think you will achieve on the worksheet. Se sample below.

Perform the experiment.

Write down the actual results.

Compare the expected results with those on the worksheet.

Comment: one group ended up with different results. The experiment was repeated with the entire class. It turned out that the hourglasses had not been properly filled.

Sample worksheet

Group: Chloé, Marion and Maureen

I fill all of the hourglasses correctly and arrange them from the fastest to the slowest

The results I expect:

1st	2nd	3rd
O	o o	o o o

The actual results

1st	2nd	3rd
-	-	-

Arrange three hourglasses and compare them two by two

Duration: 15 min

Class organisation: Individual work

Materials for each child:

- 3 hourglasses containing nearly-identical semolina volumes
- A results chart

Instruction: "You have three hourglasses. You are allowed to turn over two at a time".

Put them in order, from the fastest to the slowest!"

Sharing and Conclusion

If the red hourglass runs out more quickly than the blue one,
and if the green one runs out more quickly than the red one,

then the white hourglass runs out more quickly than the blue one.