Special section: Microscale Science
Sección especial: ciencia en microescala

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Microscale science experimentation for Kindergarten children using packings

INTRODUCTION

"Microscale chemistry experimentation" was first introduced into teacher training of Ain Shams University Cairo / Egypt (EL-MARSAFY, 1989).

The following article will deal with science experimentation in preschool age tested with children in Germany, Egypt, Zimbabwe (SCHWARZ, 2001), Israel and Turkey.

German children are made familiar with science experimentation at an early age as most of them regularly watch two excellent TV programs dealing with this matter. Doing science experiments with materials in the size of a child's hand or smaller ("microscale") is suitable for didactic, ecological, economic and safety reasons.

The objectives of microscale science experimentation (MSE) are

- to develop creativity
- to train skills in experimentation
- to create an awareness of the environment
- to impart basic knowledge in biology, chemistry and physics.

The materials to be introduced in the following article will be a 5-mL injection bottle and a 1-mL insulin syringe (= packing for medicine). Both are cheap and worldwide available. Injection bottles may be re-used after proper cleaning, syringes always must be new.

EXPERIMENTS

1. Preparing used injection bottles

Injection bottles with fitting stoppers in two standard sizes can be bought on the market (SCHWARZ, 1998a, b). They also might be prepared from used ones by boiling, removing the closures and the labels and cleaning (SCHWARZ, 2000a, b, c).

2. Breading a plant or animals

Barley, wheat and rye can be germinated on wet cotton. As soon as the roots and the shoots have reached 2 cm length the plants can be fixed in 3-mL injection bottles.

Figure 1.
Injection bottles for biology (SCHWARZ 2000 d, e)

5-mL bottles with a wider mouth are suitable to observe how fruit flies hatch or how mosquito larvae change into pupae, males and females.

3. Measuring volumes

Matter is something that has a volume and a mass. Measuring volumes starts by introducing a syringe.

Step 1 = Eliminating the fear of being given an injection by playing doctor (SCHWARZ, 2003a).

Step 2 = The syringe as a measuring instrument: "Is your ´empty` syringe really empty?"

The answer will be obtained by pumping a syringe half full of air into an opened Tetra Pak® container with water. The children will then be asked to count the number of air bubbles in half a syringe (0.5 mL).

Figure 2.
Measuring the volume of a small bottle

Step 3 = Learning to fill the syringe with water free of air bubbles.

Step 4 = Asking the children: How many syringes full of water your small bottle can take up to the label? (figure 2).

Step 5 = Measuring how many small bottles of water (5 mL) a 50 mL bottle can take up a mark.

Step 6 = Transfering ten 50-mL bottles of water to an opened 1-L Tetra Pak® container.

Step 7 = Transfering water from cola cans and different 1-L bottles to an opened Tetra Pak® container.

RESULTS AND DICUSSION

Children of kindergarten age showed a great enthusiasm and care. Some of them insisted to go on working for an unusual long time.

The fear of the children after receiving their own syringe quickly disappeared when each of them had given an injection of medicine to a big doll

present in the room.

The experiment with the half "empty" syringe was very surprizing. They repeated several times counting up to ten bubbles while pumping the air int the container.

This was a useful training for the next step filling only water into the syringes and transferring five syringes into the small bottle.

Turning this bottle upwards down resulted in an unexpected observation: Water did not flow out and a detergent had to be added to make the liquid slippery.

In the next step 10 injection bottles with water were needed to fill one infusion bottle up to the mark.

For the introduction of the unit "litre" the great side of the 1-L Tetra Pak® container was cut off. 10 infusion bottles of water had to be added to have half a litre.

The experiment of transferring grown-up mosquito larvae ("fishes") into an injection bottle is not only another option to get familiar with a syringe: The following days the children will observe that the long larvae transform into pupae ("balls") and finally into (non biting) male and female mosquitoes (SCHWARZ, 2000e).

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