

Universidade de Lisboa Faculdade de Psicologia e de Ciências de Educação

Coordinators

Ana Margarida Veiga Simão Belmiro Cabrito Elisabete Rodrigues



Socrates- programme Comenius 2.1

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TESTING MATERIALS

BUILD A BOAT

Participation of the 2nd year Students of the Sciences of Education Course Faculdade de Psicologia e de Ciências da Educação da Universidade de Lisboa

TL.1	1 st cycle of	A.T.L.*	6 – 10 years
	Basic School	Private	

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	Kindergarten	Kindergarten	
	and 1 st cycle	and A.T.L.*	
KTL	of Basic	Private	0 -10 years
	School		

* A.T.L. Free Time Activities (after classes)

1- Groups

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2- Institutions

Code	Level of scholarship	Type of Institution	Age range
EB.1	1 st cycle of Basic School	Public School	6 -12 years
EB.2	1 st cycle of Basic School	Public School	6 – 10 years
EB.3	2 nd , 3 rd cycles of Basic School	Public School	10 – 17 years

Code of	Code of the	Level of	Number of pupils	Age range	Activities
the group	school	scholarship		Average Age	tested
A.1	EB.1	2 nd year of	19 (divided into 2	7-8 years	a1, a2, a3,
		Basic School	groups)	-	a4, a5
			10boys&9girls		
A.3	EB.3	5 th year of	11	10-15 years	a1, a2, a3,
		Basic School	5 boys and 6 girls		a4
A.4	KTL	Kindergarten	11	4 – 5	a1, a2, a3,
			8 girls	5 years	a4
			3 boys		
B.1	TL.1	1 st cycle of	16	6 – 9	a1, a2,
		Basic School		7 years	a3,a4, a5
B.2	EB.2	1 st year of	20 (divided into 2	6-7 years	a1, a2,
		Basic School	groups)		a3,a4
			10boys&10girls		

a1 – What Floats; a2– Oil and detergent;

a3 – Magnet; a4 – Air; a5 – Heat and steam

3- Methodology used 3.1. General

Every group had established a first contact with the principals of the institution and with people who work directly with children (teachers and social servants). This being in the touch with schools has had different objectives, namely to present themselves to the schools, to present the Early Technical Education Project (its assumptions, aims, objectives and development) and ask for permission to and to negotiate the necessary conditions to conduct the experiments as well as to context the materials needed and the activities that will take place. To test the materials the students had prepared themselves, in several axes:

• Studying the theoretical frame of the experiments, including subjects related to the project – early technical education; scientific and technical education in the curricular guidelines and explicit curricula; mainstream; research methodologies.

• Learning about the scientific and the technological concepts related to the understanding of the experiments.

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- Characterization of each institution and group of pupils. This study had included indicators such as the economical, cultural and social environment of the institution, of the pupils and their parents.
- Global planning and schedule of all the activities to be developed and a specific planning of each experiment.
- Selection, preparation and building the materials needed to promote the experiments of technical and scientific nature.
- Previous realisation of the activities, in order to preview some difficulties and to assure the best conditions to do the experiment with children.

Instruments of collecting data

Every group had done an interview to the teacher or instructor of children at the end of the experiment. In order to do that, they had elaborated a guideline of the interview, which includes the explanation of the interview and thanks to the interviewed, the objectives and some subjects elected to be developed. They also had applied questionnaires to the pupils at the end of each activity. To build those two instruments of analysis (the interview and the questionnaire) some evaluation indicators had been taking account which had already been previously decided in the Project ETE (ex: annexe 3).

The students had also done the minutes of each meeting with children, where they had done the analysis of their work with children, the way how the experiment had happened and had indicated the results, conclusions, the most positive and negative aspects of the activity and some suggestions.

Data analysis

In order to analyse the contents of the interviews, of the naturalistic observations and the questionnaires, the used technique had been the content analysis. Simultaneously, the synthesis of the interviews and of the observations had been done in order to stress the more important ideas for a further global analysis and comparative analysis of collected data by other instruments and from other sources.

To present and to analyse statistical data it was been used the SPSS.

3.2. Specific

Beyond the referred methodologies that were applied by all the groups, some features that differentiate each group, are:

Code of the	Methodologies	Techniques	Instruments/Moments	
group				
A.1	Quasi-	Participated		
	experimental*	observation		
A.3			Diagnostic	Before
			test to the	each
			pupils	activity
A.4			Diagnostic	Before
			test to the	each
			pupils	activity
B.1		Participating	Questionnaire	After each
		observation	to the teacher	activity
B.2	Quasi		Diagnostic	Before
	-experimental**		test to the	each
			pupils	activity

* Children were divided into 2 groups - one that had developed the experience as it was prescribed and the other had assisted to a preliminary theoretic explanation and after this

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then they had applied it in the practical experiencing work.

** Children were divided into 2 groups – one that had developed the experience as it was prescribed in activities 1, 3 and that had assisted to a preliminary theoretic explanation and then applied it in the practical experiencing work, for the activities 2, 4; and the other did the reverse: Theory for the activities 1, 3, 5 and only practice for the activities 2, 4.

4- Innovating and adapting

a) The A4 group had introduced each activity through a story for children supported by some BD done and written by the group (NOTE: the story line has been given to Christine at Volkse meeting)

b) It must be given attention and seen the texts to support the Activity 1 (What floats?) elaborated by the group B.1

c) In Activity 2 - Oil and detergent - some student groups had built little fishes in cardboard to replace the corks (ex. A.1 and A.4) (annexe 2)

d) It must be seen the examples presented in annexe 2.

e) It must be seen the examples of the used tests presented in the annexe 3.

5- Results

5.1. Pupils

Generally no differences were observed between boys and girls. Both groups learned the concepts with the experiences and both groups were equally curious, interested and motivated to the activities and the experiences. Nevertheless, some groups observed some behaviour differences: while the boys tended to be less attentive and patient, anxious to see more immediate results, the girls revealed to be more patient, more interactive with the tutors, more receptive to participate in new practical experiences.

The children developed technical competencies and logic and scientific reasoning. The activities contributed to stimulate the children's interactivity and creativity.

The opinion of one of the teachers is that entertaining activities could be particularly motivating to stimulate girls to the study of the Physics.

It has been possible to observe that first intuitions of children (alternative solutions) had developed and evolved, in a justified way to more correct conceptions in a scientific point of view. It must be taken into account the developed work of some groups through the comparison of the results observed between the initial and final diagnostic test for each activity.

When pupils have been divided into 2 groups, the best results, in generally, came from the pupils that had performed the practical activity. Pupils had liked more and had been more interested when this methodology has been used. We suggest that all activities must be object of a reflex ion about its results and underlying scientific principles.

Some ideas of the children:

"Water does much force up and doesn't let expanded polystyrene go down" (B.2- activity 1)

"It doesn't go down because water pulls it up" (B.2 – activity 1)

"Floating is to be over the water" (B.2 – activity 1)

"It is the magnet that makes the boat move" (B.2 – activity 3)

"The magnet pulled the iron that was in the boat" (B.2 – activity 3)

"(The red boat wins) because it has the bigger balloon" (B.2 – activity 4)

"Because red balloon had more air then the green one" (B.2 - activity 4)

5.2. Teachers

Once they use day by day materials (wasteful materials), they can repeat the experience anytime and at every school. Scientific concepts are easier and better learned.

5.3. Students

The students were more sensitised to:

- The need of early technical and scientific education.
- The importance of using "experimental" activities to develop in children the understanding of the technical and scientific phenomena.
- The pertinence of constructivism learning principles in active construction of scientific knowledge by children.

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Questions that relates mainstream with science and techniques.

The students had acquired:

• Knowledge in technical and scientific domains, in curricular development and in the Educational System.

The students had consolidated, deep and applied to real situations:

• Knowledge about pedagogy, planning, research methodologies, collecting, presenting and data analysis.

6- Conclusions 6.1. General

It is necessary to simulate experiences before trying to perform them with children.

The activities must be very accurately explained, namely the definition of the dimension of the objects used (the recipient, the boat,). The experience must be applied to children older then 5 years (6-7 years old), taking into account psychological theories about child cognitive development. The evaluation of the activities with children, that still don't read, must be continuing using drawings and pictorial language.

6.2. Specific

Activity 2 – It reveals particularly relevant in this activity to experiment the proposal before trying to experiment it with children, because the effect of the corks take some time, that is, it isn't immediate. It is important to take good care in the choice of dimensions of the corks and the holes.

Activity 5 – It was the most difficult activity to perform. It happens, inclusively, that some groups can't reach to develop it. In some cases, the experiment didn't go until the end because some technical problems (ex. B.1). On the other hand, group A.4 had decided to not perform it because the experiment may be dangerous for children of that age. One of the suggestions is to choose a material more warm resistant and to replace the grapefruit skin by a larger object in order to support the nightlight and the egg.

Annexes

Annexe1 - Photos





TESTING MATERIALS



Annexe 2 - Examples of materials constructed by the students



Materials constructed for the development of the activity 2 by the groups A.1 and A.4



Materials used for the presentation of the activity 1 by the groups A.3, A.4, and B.1 $\,$



Um barco em movimento

Materials used for the presentation of the experience by the group A.1



Materials used for the presentation of the activity 3 by the groups A.4

Annexe 3 - – Examples of pre and post evaluative testes

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Diagnostic test to Activity 1(Grupo B.2)

- 1. Do you know what floating is?
- 2. Do you know something that floats on the water?
- 3. And those things are made of what materials?
- 4. Which objects you think that float the best in the water?
 - Big _____or small _____
 - Heavy ____ or light______
 - Long ____or short_____
 - Broad _____or thin_____

5. Which objects do you think that float?

- A wood spoon
- A piece of expanded polysterene object
- A cork
- A stone
- A coin
- A piece of paper
- A piece of plastic

Final evaluation test to the Activity 1 (Grupo B.2)

- 1. And now, after our experience, tell us what things do you think that float.
- 2. Which objects do you think that float?
 - A wood spoon
 - A piece of expanded polysterene object
 - A cork
 - A stone
 - A coin
 - A piece of paper

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- A piece of plastic
- 3. Beyond the objects we play today, do youknow other objects that can float? Give some examples.
- 4. Did you learn anything today? What?
- 5. With these materials can you built something that floats?

The materials are the following:

- Candle
- Toothpick
- Cork
- Crown corks
- Plastic corks
- Wood clothespeg and plastyic clothespeg

Speacify the materials used by the children, what they intent to built, and if the object built floats or not.

6. Which part of the activity did you like the most? Why?

Diagnostic test to the Activity 1 (Group A.4)

I am

Diagnostic test to the 3rd activity "The Magnetism"

1. Do you know what a magnet is?

Yes So, what it is?

No "

2. Do you know what the word "metal", does mean?

Yes "So, what it is? _____

No ..

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3. Do you know what the word "magnetism", does mean?

Yes So, what it is?_____

Não

4. Which objects do you think that are better attracted by the magnet?

5. Among the following objects, which do you think that will be attracted by the magnet?

