

Educational-didactic introduction

The educational concept of Experimento | 8+ is based on the educational principles of Experimento | 4+, the Experimento module for the age group from 4 to 7 years.

Children and teachers define the learning process together:

- Children create their own picture of the world. Educational staff accompany them along the way.
- Good learning guides enable the children to gather a wide variety of experience and support the children in their cognitive process.
- Children also learn with each other and from each other and exchange ideas with each other.
- Children grapple with selected values, learn to understand various points of view, and see things from different perspectives.

Children realize *that* they are learning something:

- Together, educational experts and children not only address content and activities, but also reflect on the learning process and thus related values.
- The documentation of experimentation activities through drawings, photos, video recordings, and similar tools supports the children's learning process.

Experimento | 4+ enables the children to gain initial basic experiences on the topics of energy, the environment, and health. Appropriate to the students' further cognitive development, Experimento | 8+ deepens these experiences in one way by continuing individual experiments from Experimento | 4+.

Because the learning settings in day care centers and schools differ, for Experimento | 8+, theory-oriented, formal learning (instruction) must be taken into account in addition to experience-oriented, informal learning (co-construction).

Especially in the school context, it is often difficult to keep the balance between instruction and construction. For high learning achievements, it is important to maintain a balanced ratio between the two forms. How does this fit in with the educational approach of Experimento?

To support you as the teacher, we selected the structure of the student instructions so that they can assist you in integrating the experiments into your lessons.

The student instructions are designed to establish the balance between experience-oriented/informal learning (co-construction) and theory-oriented/formal learning (instruction). The topic is first presented with a theoretical introduction and specific instructions. However, the students are given the opportunity at the end to work independently based on experiments. In this way, they discover facts for themselves and simultaneously actively gain new experiences.

The student instructions give you, as the teacher, the opportunity to introduce a topic and simultaneously support the students during the experimentation phase, during reflection, and during repetition of the individual experiments. The layout of the student instructions has been intentionally selected so that it facilitates the students' path toward science-oriented thinking and behavior. Just like the "great scientists," they are encouraged to formulate ideas and theories, conduct an experiment, describe their observations, and analyze their results.

The student instructions enable you to observe the students as they individually solidify the learning results. Did they understand and reflect on what they experienced? Did the experiments help expand their understanding of the concept? The information that the students write on the student instructions gives you some indication of this.

In order for you to use the student instructions effectively, we have developed certain symbols that represent the steps of the research cycle. The symbols are described in detail below:



The puzzle piece represents a problem or phenomenon that must be recognized at the beginning of an experiment. This usually provides the starting point of the experiment: The problem is solved, or the phenomenon is understood by means of the experiment. It is important that the problem or phenomenon stem from the students' lifeworld to provide a link to the students' experiences and prior knowledge.



After an introductory text in the student instructions, the actual research question is asked. The question mark consolidates the introductory text and thus represents the initial research question.

As the teacher, talk about the students' ideas and guesses at this point. How would they proceed and resolve the issue? During this exchange, you will learn a lot about their prior knowledge and can (if necessary) provide appropriate assistance. This is important, because only when you are aware of the students' concepts can you give specific ideas to ensure that the students expand their knowledge as much as possible through experimentation. For this purpose, also use the figures in the student instructions. These can aid you in starting conversations with the students or encouraging the students to talk among themselves.



The thought bubble represents the students' thought process as they grapple with the research question. Encouraging students to speculate and formulate initial hypotheses activates their prior knowledge on the particular topic. The exchange of ideas about possible solutions has a motivating effect.



The beaker is shown twice and stands for the experiment setup (first beaker) and for conducting the experiment (second beaker). It describes exactly what steps are to be followed for the experiment. The beaker symbol thus represents specific actions that are required to conduct the experiment. The beaker is an instructive aspect and ensures that all students work on the same experiment. The instructions are written so that the students can work independently. Nevertheless, as the teacher, you should always be available for support.



The magnifying glass provides information on what is to be observed. The requirement to record their measurements in tables supports the process. By means of specific questions, this part focuses the students' view on the experiment's outcome and gives them their first opportunity to transfer the results. The students are challenged to look very closely; if necessary, important observations can be pointed out to them. Their actions during the experiment are slowly redirected back to the actual "issue" (research question).



The speech bubble symbol tells the students to reflect on the results and leads them very specifically back to the initial question. The reflection phase is the most important element for checking whether there is a balance between action and understanding and whether the students were able to work out the experiment and the underlying content for themselves. As the teacher, you can now collect the instructions and draw individual conclusions for the students or talk about the results together with the entire class.



This symbol represents further research assignments and ideas on the subject of the experiment. The students are encouraged to make further discoveries, whereby this part can also be viewed as a more detailed additional assignment.



This symbol indicates an idea that enables the students to take a technical look at the previous research question. Specific thinking, observation, or research assignments are presented here as well.



This compass symbol indicates the reference to values. This part is suitable for establishing references to values from content and ideas for teaching. Specific methodological components that can be conveniently integrated into the experiment put the didactic focus on the values. In the student instructions, the reference to values is implemented exclusively via dilemma stories.

An additional worksheet describing the flow of the research cycle is stored on the Siemens Stiftung Media Portal.