

## Laboratory experiment - active method of learning and evaluation

"What I hear, forget, What I see, I remember, What I do, I understand." (Confucius)

The chemist can enjoy just as much a beautiful experience ... as the sculptor in front of the executed work "(Costin D. Neni escu)

Chemistry, being an experimental science that is based on the theoretical process and finds its applicability in practice in laboratory tests, is based on the experiment both as a method of scientific investigation and as a method of learning and evaluation.

Having an experimental character, chemistry cannot be taught, learned and evaluated without resorting to experimentation.

### EXPERIMENT

- method of direct exploration of reality widely used in the teaching of chemistry, biology, physics, technical sciences, consisting of an observation provoked and guided by certain hypotheses, to be tested experimentally.

The experiment is the didactic method by which students are put in the situation to intentionally provoke a chemical or physical process or phenomenon, or to modify the normal conditions of their development by introducing new variables, in order to study them.

The method implies cooperation and joint activity on the part of the students, in order to solve some common training tasks that involve activities of reconstitution and modification of some processes and phenomena.

Fixing and consolidating some knowledge previously acquired by students;

Acquiring new knowledge based on one's own observations;

Training of skills and abilities to handle instruments, devices and materials specific to the laboratory

### TYPES OF EXPERIMENTS

- The demonstration experiment
- qualitative
- quantitative
  - Application experiment
  - The experiment for the formation of practical / motor skills
  - Research experiment
  - The frontal experiment
  - The experiment performed in groups
  - Simulation-based experiment
  - The experiment performed individually

### FACTORS THAT CONDITION THE LABORATORY EXPERIMENT

The choice of a certain form of experiment is conditioned by several factors:

- the existence of the equipment and materials needed to carry out the experiment,
- what is intended to be achieved by performing the experiment in the lesson,
- individual and age characteristics of the students,
- the interest shown for the research of the physical and chemical phenomena, the desire for collaboration and cooperation of the students.

EXPLICIT LEARNING MODELS “direct or explicit learning” model, “Evocation-Realization of meaning-Reflection” model, “I know-I want to know-I learned” model, “Learning through exploration and discovery” model;

TECHNIQUES OF EVOCATION OF PREVIOUS KNOWLEDGE AND EXPERIENCES (Brainstrming; Think-Work in pairs-Communicate; Chain of ideas; Round table; Circle, Graffiti, Find someone who knows);

STRATEGIES AND TECHNIQUES FOR MAKING SENSE BASED ON INDIVIDUAL STUDY AND WRITING (Sinelg, R.A.F.T., Logical Schemes, Essay, Essay, Bibliography, Study Sheets);

DISCUSSION-BASED SENSE STRATEGIES (Mosaic, Cube, Pencils in the middle, Leave me the last word, Double diary, Mutual teaching, Class challenge, Guided discussion, Blind hand, Image analysis and interpretation, Panel discussion, etc. )

STRATEGIES AND TECHNIQUES OF MEANING AND REFLECTION BASED ON ARGUMENT AND DEBATES

(Arguments on cards, Table T, Corners, Arguments-Counterarguments, etc.);  
Interactive, student-centered methods:

STRATEGIES AND TECHNIQUES FOR MAKING SENSE BASED ON INVESTIGATION AND SITUATION RESOLUTION - THE PROBLEM

(Project, Interview, Interdisciplinary Explanation, Pyramid, Support Partner, Synectics, Rotary Communication, Experiment, Group Investigation, Case Study, etc.);

TECHNIQUES OF GRAPHIC ORGANIZATION OF INFORMATION

(Venn Diagram, SWOT Analysis, Bunches, Poster, Dials, Event Sequence Determination, Double Bubble, Feature Graphic Organizer, Comparative Table, Figure Map, etc.)

REFLECTION TECHNIQUES

(The five-minute essay, the essay with pros and cons, the colored cards, the small advertisement, the photolanguage technique, the gallery tour, etc.);

GAME-BASED STRATEGIES

(Role play, Puzzle, Divided squares, Comics, etc.);

EVALUATION METHODS AND PROCEDURES

(Examination of the explanation, Examination by homework, Portfolio, Writing and inter-evaluation in small groups, examination by control works and knowledge tests, Examination of the demonstration, explanation, etc.).

The use of the laboratory experiment as an interactive method of teaching-learning in the didactic activity contributes to the improvement of the quality of the instructive-educational process, having an active-participatory character and a real active-formative value on the student's personality.

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In organizing a child-centered education, the teacher becomes a co-participant with the student in the activities carried out.

A modern, well-designed education allows the initiative, spontaneity and creativity of children, but also their direction, guidance, the role of the teacher acquiring new values, overcoming the traditional perspective through which he was a provider of information.

Using the laboratory experiment helps teachers to guide students in the learning process, because it creates a favorable context for:

- motivation and active involvement of students in learning;
- facilitating students' thinking, especially the critical and creative ones;
- processing information by students by practicing thinking operations both by students and by the teacher;
- designing activities to help achieve these goals; interdisciplinary approach to content;
- offering a discussion material;
- engaging students in a permanent discourse which allows monitoring the understanding;
- stimulating change and personal reflection;
- encouraging the free and safe expression of all opinions; confronting ideas and opinions in conditions of respect;
- supporting students in producing opinions, questions and looking for their own answers; teaching organization;
- establishing goals for learning and satisfying certain individual needs;

Within the analogical teaching strategy, teaching - learning is carried out exclusively with the help of material models and symbolic models.

- Practical applications in CHEMISTRY represent the quintessence of the conscious and efficient acquisition of the notions from the disciplines that compose the mentioned field.
- Practical laboratory work, for chemistry-physics is not only useful, but also aims to attract students to nature, causing them to know and understand the physical and chemical phenomena that take place.

#### Integration of the laboratory experiment

As a teaching method, the laboratory experiment can be used in any type of lesson and can be included in any stage of the lesson:

- For checking knowledge;
- To capture attention;
- For the transmission of new knowledge;
- For consolidating knowledge;
- For the evaluation of knowledge.

The laboratory experiment combined with a modern didactic methodology acts formatively on the students' thinking, stimulating their creativity, the ability to restructure and redefine the content.

In conclusion, modern education envisages a methodology focused on action, operation, so on the promotion of active-participatory methods that require the mechanisms of thinking, intelligence, imagination and creativity. research and rediscovery of truths, elaboration of new knowledge.

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