METHODICAL ASPECTS OF THE USE OF COMBINED EMPIRIO-SOCIOCENTRIC AND EMPIRIO-PSYCHOCENTRIC MODELS OF EDUCATION WITHIN THE BIOLOGY LESSONS

ASPECTE METODICE PRIVIND FOLOSIREA MODELELOR COMBINATE EMPIRIO-SOCIOCENTRIC ŞI EMPIRIO - PSIHOCENTRIC DE INSTRUIRE, LA LECȚIILE DE BIOLOGIE

PETRUȚA GABRIELA PAULA
University of Piteşti

Abstract. *For teaching biology, within the preuniversitary education, not exclusively a single model of education is used, but rather a combination of models, such being valorized the positive aspects of each of them. Both in gymnasium and high school, for teaching biology, the empiriocentric model can be correlated with the sociocentric model, but also with the psychocentric model, in both cases being stimulated the student's research activity, who is therefore directly participating to the knowledge of scientific truth. If in the first case of correlation, the activity carried out within groups of students is promoting development of interaction between them, in the second case, the autonomous work of the student is stimulated, in accordance with the individual particularities of each one.*

Rezumat. *În predarea biologiei, în învățământul preuniversitar, nu se foloseşte exclusiv un singur model de instruire, ci o combinare a acestora, valorificându-se aspectele pozitive ale fiecăruia în parte. În predarea biologiei, atât la gimnaziu cât şi la liceu, modelul empiriocentric poate fi corelat cu modelul sociocentric, dar şi cu modelul psihocentric de instruire, în ambele cazuri fiind stimulată activitatea de cercetare a elevului, care participă direct la cunoaşterea adevărului ştiinţific. Dacă în primul caz de corelare, activitatea desfăşurată pe grupe contribuie la dezvoltarea interacțiunilor între elevi, a cooperării, a spiritului de echipă şi competitivității, în cel de-al doilea este stimulată munca autonomă a elevului, având-se în vedere particularitățile individuale ale acestuia.*

The lesson, as the basic form of organizing the education process, allows the leading role of the teacher as planner, organizer and coordinator of this school activity. Depending of the content of theme which should be teached within a lesson, the abstraction level of the new knowledge, but also considering the need of active participation of the students in learning, for planning and carrying out the lesson, the teacher can choose one of the education models (Cerghit, I., 1983, 2002; Ciobanu, M., 2006), corresponding to the main directions of approaching the didactical process: 1) the logocentric model, either explanatory-reproducible or explanatory-responsive; 2) empiriocentric model; 3) technocentric model; 4) sociocentric model; 5) psychocentric model.

Most often, in teaching the notions of plant, animal and human anatomy and physiology, as well as botany and ecology, within gymnasium and high school, due to the fact that rediscovery of the scientific truth can be achieved by observation and experimentation with natural biologic material, the teacher is choosing either the empiriocentric model or a combination of the empirio-sociocentric and empirio-psychocentric models.

When the empiriocentric model is used, the emphasis is laid on the student's learning activity, who is stimulated by the teacher to research, findings, attempts, and own experiments, to the rediscovery of the surrounding world, to which comes in direct contact, by its own effort. This education model is based on the idea of student's effort, promoting "*learning by direct action, experimental-investigative, on the reality's objects and phenomena, a learning which is, in the same time, knowledge and action*" (Cerghit, I., 1983).

By choosing for the combined empirio-psychocentric model, the teacher is considering both the use of heuristical, active-participative methods, within the lesson (Cerghit, I., 1980; Ciurchea, M., et *al*.,1983; Iordache, I., et *al*., 2004), and focussing the activity on the student, being given priority to the individualized education and independent work. By the individualized education, an differentiated treatment of the students is realized, according to their individual particularities, working rhytm, and aptitudes. The teacher is guiding at minimum the activity of the student, who is thus transformed from an object to an subject of the education.

To exemplify the use of the empirio-psychocentric model we have choose the planning of the theme "The river crayfish", from the chapter "Arthropods" (Biology, 6th class), aiming the formation to the students of the concept of shell fish and understanding the general characters of an crustacean.

During the first part of the lesson, the didactical activity will be foccussed on the student, being used an individual working sheet, containing three items of the type "incomplete phrases" and an item of the type "mute drawing".

The first working task is to rediscover the crayfish's life environment, size and color, making evident their role for animal living. This task is achieved by independent macroscopic observation on preserved crayfishes, drawing representing the crayfish in its life environment, and picture within the zoology atlas.

Based on putting up-to-date the knowledge acquired about the mollusca shell during the previous lessons, the students will work out the second task, inductively rediscovering the substances which form the shell of the crayfish (limestone and chitin), realizing the link between the shell and name of crustacean.

Each student's activity is continued with the macroscopic observation of preserved crayfishes and crabs, drawing from the manual presenting the dorsal of a crayfish body, as well as that presenting the dorsal of an cross-spider body. Following the analysis made, by analogy the students will discover the

component parts of the river crayfish body (cefalotorax and abdomen) and will note them on the "mute drawing", solving in this way the third working task.

The last working task, that of establishing the phylogenetic relationship between arthropods and annelids, will be solved by making actual again the knowledge acquired previously about the external and internal structure of annelids, as well as by the macroscopic observation of the crayfish abdomen, formed from many rings, as the worm's body.

Further on, the teacher is realizing an feed-back, by which the corect answers are established, along with the lesson's scheme on the blackboard.

During the next stage of the lesson, the teacher is presenting an overhead transparency showing the dorsal and ventral side of the river crayfish. The students will observe and rediscover inductively other elements of the river crayfish body, such as antenna, composed eyes, buccal apparatus, the five pairs of articulate legs, thus being established the membership of crustaceans to the class of arthropods, the seven segments of the abdomen and the telson (back swimmer), the last segment of the abdomen. The students coordinated by the teacher are establishing the meaning of the concept of crustacean: an animal having the body composed by the cefalotorax and abdomen, protected by an chitinous mail, impregnated with limestone, and which presents five pairs of articulated legs. The teacher is notating this in the lesson's scheme.

In the following stage, there are treated the relationship, nutrition and reproduction functions. If during the first part of the lesson predominated the independent, individual activity, during the second part the activity will be carried out frontal.

By heuristical conversation and macroscopic observation, the students will rediscover the organs involved in sensitivity of this animal predator – the antenna (for touching and smelling) and composed eyes (for seeing). The teacher will explain the structure of the composed eyes.

Further on, also by heuristical conversation, based on the knowledge about the external structure and life environment, using the plate showing the river crayfish in the environment and the picture from the zoology atlas, the students will rediscover the mode of movement and feeding of this animal. This is then noted in the lesson's scheme.

Also by heuristical conversation, using an overhead transparency, the students are rediscovering the placement of branchiae, the mode in which the respiration and reproduction is made, after which the teacher is explaining the mode in which the growing, shedding, and regeneration of crayfishes is realized.

At the end of the lesson, for the fixation of knowledge, each student will fill in an working sheet, including an item of type "at will" for establishing of the animals related with the river crayfish, and an item of type "incomplete sentences", for establishing the general characters of crustaceans. For their documentation, the students will use the pictures in the zoology atlas and the notes taken during the lesson, on the characterization of the animal type for crustaceans, respectively the river crayfish. The corect answers are established

following the discussion between teacher and students, the last having to self-correct the eventual mistakes or to complete their own knowledge, this assuring a better understanding and acquiring of it.

In carrying out the lesson, predominate the student's activity, rediscovery of the knowledge of biology being semiconducted by the teacher. The lesson's scheme is not exclusively realized by the teacher, but rather in cooperation with the students, the final conclusions being established by questions addressed to them.

Another combined model used currently for teaching biology is the empirio-sociocentric one. In this case, according to the sociocentric model, foccussed on the activity within a group, and also on the social organization of learning (in small groups or teams), the emphasis is put on the interdependent, rather than independent learning, on interactive rather than active learning, and on learning by cooperation rather than solitary learning. Working in teams during the lesson allows the confrontation of the initiatives and development of some interpersonal, social-affective relationships.

For the presentation of the theme "Influence of the environment factors on the photosynthesis intensity ans their practical importance. The influence of light and carbon dioxide", the teacher can choose for such an education model. The lesson begins by making actual again the knowledge about the mode by which the photosynthesizing plants realize the autotrophic nutrition. Bringing up to date the knowledge is carried out both by questions to which the students are asked by the teacher to answer, and by using didactic material, represented by a plate showing the exchanges of matter and energy between a green plant and its environment.

Further on, for studying the influence of ligth and CO_2 on the photosynthesis intensity, the teacher is organizing the activity within three groups (1, 2, and 3), having different working tasks. Each group will be divided in two subgroups (a and b), these having the same working task.

The first group will study the correlation existing between the photosynthesis intensity and the intensity of light, using the working sheet 1, the second group will study the correlation between the photosyntesis intensity and the type of light radiation, using the working sheet 2, while the third group will study the correlation between the intensity of photosynthesis and concentration of CO_2. The results obtained following setting up and carrying out the experiments mentioned in the working sheets will be noted by the students in a table, realizing then the graph corresponding to the observations made.

<u>The activity of subgroups 1a and 1b</u>

The students from these subgroups shall be working out the following tasks:

1. Obliquely cut off the *Elodea canadensis* shoot at the basal part.
2. Introduce the shoot with its tip down into the test tube filled with water, so that the surface of the cut off not to touch the test tube's wall.

3. Place the test tube on the stand at 10 cm distance from the light source and count the oxygen bubbles given off per minute, until their number becomes constant. Write down in a table what they observed.
4. Place the stand at successive distances of 20 cm, 40 cm, 60 cm, and 80 cm respectively, from the light source and, for each of this they count the oxygen bubbles given off per minute until their number becomes constant. Write down in the table what they observed.
5. Write down in the table what they observed.
6. Based on the data from the table, they draw the corresponding graph.

Activity of the subgroups 2a and 2b

The students from these subgroups shall be working out the following tasks:

1. Obliquely cut off the *Elodea canadensis* shoot at the basal part and introduce the shoot with its tip down into the test tube filled with water, so that the surface of the cut off not to touch the test tube's wall.
2. Place the test tube on the stand at 10 cm distance from the light source and count the oxygen bubbles given off per minute by the shoot, until their number becomes constant.
3. Place a blue color filter between the stand and light source, at 5 cm distance, and count the oxygen bubbles given off per minute, until their number becomes constant. Write down the results of their observation in a table.
4. remove the filter between the stand and the light source and count the oxygen bubbles given off by the shoot over a minute, untill their number becomes constant and identical with that determined initially.
5. Place an green color filter between the stand and the light, at 5 cm distance and, as in the case with the blue color filter, count the number of bubbles given off per minute. The results of observation are written down in the table.
6. Based on the data from the table, they draw the corresponding graph.

Activity of the subgroups 3a and 3b

The students from these subgroups shall be working out the following tasks:

1. Obliquely cut off the *Elodea canadensis* shoot at the basal part and introduce the shoot with its tip down into the test tube filled with a solution 0.1% of $NaHCO_3$.
2. Place the test tube on the stand at 20 cm distance from the light source and count the oxygen bubbles given off per minute by the shoot, until their number becomes constant The results of observation are written down in the table.
3. Remove the shoot from the test tube filled with water and introduce it into another test tube containing a solution 0.5% of $NaHCO_3$, then into a test tube containing a solution 1% of $NaHCO_3$, following the

same procedure as with the solution 0.1% of $NaHCO_3$. The results of observation are written down in the table.

4. Based on the data from the table, it is drawn the corresponding graph.

In the following sequence of didactic activity, each group shall present by an representative the obtained results. Since the working tasks required by the same working sheet have been solved by two subgroups, the teacher will nominate a student from the first subgroup to establish and write in the table on the blackboard the mean values obtained from the data recorded by the both groups, and a student from the second group to draw the corresponding graph. The students will have to write down the overall results in their booknotes. After discussing the results from each working sheet, with the help from students, the teacher will establish the conclusions and note them in the lesson's scheme.

At the end of lesson, by heurystic conversation, the teacher and students are establishing together the importance of plant cultivation in greenhouses, where the man can assure for them optimal conditions of growing, which are essential for increasing the yields.

The correlation of empiriocentric model of education with the sociocentric one, contributes to the development of interactions between students, cooperation, team spirit and competitiveness. The combined use of these education models, by selecting and joining the most efficient methods, procedures, education means, and forms of activity for treating the lesson's theme, contributes to the increase of activization level of students within the biology lesson.

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