PERIODICAL AND CONTINUOUS EVALUATION IN BIOLOGY CLASSES FOR THE XI TH FORM AS MEANS OF IMPROVING SCHOOL PERFORMANCE AND THE SELF-EVALUATION SKILL

Georgeta GUG[1] & Sabin BURCĂ[2]

[1] "Vasile Voiculescu" School, Oradea
[2]University of Oradea, Faculty of Sciences, department of Biology, Oradea

"Human Anatomy and Physiology", as taught during the XI th form, is the Biology branch that constitutes one of the compulsory Baccalaureate subjects for Nature Science and Computer Science classes and an optional subject for the opposite field of study for all the other classes. This is why the students and teachers co-operate in order to assure increased school performance in this field.

This project aims at pointing the importance of formative and final assessment tests for the nutrition function (taught in the 2nd semester) as a result of the teaching – learning activity.

The "Nutrition Functions" unit is made up of the following themes (learning units): "Digestion and Intestinal Absorption", "Respiration", "The Blood and the Circulatory System", "Renal Excretion".

In order to increase the efficiency of the XI-form students, as a teacher, I set the following aims:

- the systematization of the information I had to teach, settling and revision;
- the improvement of the didactic strategy used and its correlation with the knowledge level of the students;
- the increase of objectivity in student marking
- the analysis of students' results and taking measures to repair the mistakes and fill in the information gaps which appeared in the learning process
- the stimulation of students' motivation to learn

In the teaching activity I used various didactic materials, such as: posters of organ systems; posters of physiological schemes; microscopic preparations and microscopes; guinea pigs and dissection kits; moulds of organs; a Donders device, spirometer, test-tubes with blood; frogs, anatomy atlases, independent work cards, evaluation tests. The following lab experiences were also carried out: guinea pig dissection; highlighting the digestive function of saliva; highlighting the diaphragm role in inspiration using the Donders device; measuring the vital capacity using the spirometer; making and performing the microscope analysis of a blood sample; highlighting blood clotting; mammal heart dissection (pig); highlighting cardiac automatism in frogs, mammal kidney dissection (pig).

The didactic and experiment materials got the students' attention and stimulated them in the learning process.

For the lessons I used methods which aim at increasing learning efficiency: directed observation, heuristic conversation, problem setting, moderating, learning through own discovery, experiments.

Docimologic (formative) tests were drafted for each theme (learning unit) and a summative test was made for all the nutrition functions.

Docimologic tests have certain characteristics such as:

- they are made up of sets of items, i.e. task units that make up a test;
- they offer the possibility of measuring more exactly students' performances in comparison with other tests;
- they have the characteristics of experimental investigation (the control of the application conditions, the possibility to repeat the test), which gives them higher precision;
- they allow the standardization of marking criteria, assuring an increased level of objectivity in giving a mark
- they allow the comparison between students' results.

The formative evaluation tests application at the end of a theme (learning unit) have the advantage of covering all the essential elements of that chapter and, at the same time, that of checking the carrying out of corresponding terminal competences.

At the same time, these tests allow students to perform self-evaluation. Their main role is not that of making a student classification after the marks they got, but that of offering the teacher information on the quality of the activity carried out and its effects expressed through the knowledge level of students. At the same time, they signal the situations in which some students did not assimilate the contents the tests aimed at, and thus render the catching up measures obligatory.

From a methodological point of view, the process of drafting a test has several stages:

1. Establishing the competences (knowledge, skills) from the chapter which is about to be assessed and their weight in the test.

2. Choosing the types of items (units of test tasks) and drafting them.

The types of items are chosen in connection with the provisions of the didactic objectives, of the learning contents.

The item succession in the text can be random or chosen in connection with their difficulty.

The number of items from a test varies in connection with the complexity of the didactic objectives (competences) and of the corresponding learning contents, the complexity of the used items.

The score given for each item can vary. The weight is made in accordance with the difficulty degree, students' effort, the abstract or application character, involvement of the abilities of recognition, understanding, comparison, analysis, synthesis, etc.

The marking of the correctly answered items was made in favor of the students, the latter also getting partial marks corresponding to a partly correct answer to items. Each test had 9 points plus one bonus point given by the teacher, that meaning a total of 10 points..

3. Establishing the time allotted to the test is made according to the nature of the problem, the difficulty of the questions, the number of explanations necessary for getting the answers. The time allotted for the tests was of one hour.

4. Drafting the exact and detailed marking schemes.

5. Result processing in order to get a general appreciation.

The types of items used in test elaboration were:

1. Multiple choice type items: choosing one or more correct answers by ticking them from more answers, some of which were wrong – the so-called distracters. These items test knowledge, understanding, application or interpretation of factual data.

2. Match or association type items: they test the ability to identify the relation between pairs of elements, such as: structures – description, structures – functions, terms, laws – definitions, etc.

3. Fill-in type items: they are incomplete enunciations which require filling blanks with 1-2 words which match the given context.

4. Structured questions type items: they comprise several sub-questions connected through a common system. They test various behaviors, such as: defining, recognizing, drawing a hierarchy, describing, putting parts together, interpreting, comparing, representing schematically, formulating hypotheses, giving arguments.

5. Drawings which need annotation: they allow checking the extent to which the students acquired the scientific terminology and recognize certain anatomic structures.

6. Problem-solving type items: they are a new activity, different from the regular ones, meant to solve a problem-situation: they test higher level varied behaviors, such as: exploring, investigating, capacity of applying knowledge, the ability of generalization and transfer of problem-solving techniques.

7. Structured essay type items: they represent the elaboration of a coherent text in accordance with a set of requirements. They test the students' ability to evoke, organize and integrate ideas, to interpret and apply data.

The study was carried out on three classes (XIth form): two experimental classes I teach and a witness-class taught by another Biology teacher. All the classes are heterogeneous from the point of view of the school results. The experimental plan had 5 docimologic tests: one formative test for each of the following themes: "Digestion and Intestinal Absorption", "Respiration", "The Blood and the Circulatory System", "Renal Excretion", as well as a final evaluation test: "Revision – Nutrition Functions".

The results for the 5 tests, as well as their interpretation, were rendered in charts, and then represented in graphs.

Example: XI th form B – experimental class: data presented in 3 charts

Results for test no. 1 (T): "Digestion and Intestinal Absorption"

MARK	10	9	8	7	6	5	4	3	2	1
Number of present students (16)	-	-	2	2	2	3	4	3	-	-
Percentage	0%		25%		31,25%		43,75%			
i_e per class	50,93%									
Average per class	5,12									

Table 1: Marking of the results for the XI th form B

$i_e = \frac{\text{sum of the points got by students}}{\text{maximum points x number of students}} \times 100$

Item		i_1	i_2	i_3	i_4	i_5	i_6	i_7	i_8	i_9	i_{10}	i_{11}	i_{12}	i_{13}	Points
No. of students who answered correctly	partially	4	1	9	4	3	2	5	9	13	12	6	13	7	80,5
	in whole	10	15	1	-	7	8	7	5	1	-	9	1	2	

Table 2: Item solving

Types of items	i_1	i_2	i_3	i_4	i_5	i_6	i_7	i_8	i_9	i_{10}	i_{11}	i_{12}	i_{13}	Skills
Association	X X	X X												Identifying the relation
Multiple choice			X x	X x	X x	X x	X X							- knowledge - application - interpretation
Structured question								X x	X x	X X				- definition - description - interpretation
Structured essay											X x	X x	X x	- evocation - organization - integration - interpretation

Table 3: Group of items from table 1 organized in accordance with testing types and skills

Mark dynamics for the 3 classes after the 5 tests

No. of students/marks	1	2	3	4	5	6	7	8	9	10	No of present students	Class average	i_e
Initial test			3	4	3	2	2	2			16	5.12	50.93%
Test no. 2				1	3	8	4	1			17	6.05	59.17%
Test no. 3					6	4	5	2	1		18	6.33	60.80%
Test no. 4					2	1	8	4	1		16	7.06	67.96%
Final test					1	4	7	3	41		19	7.26	72.05%

Table. Mark dynamics for the students of experimental class XI th B

No. of students/marks	1	2	3	4	5	6	7	8	9	10	No of present students	Class average	i_e
Initial test				6	4		3	5	2		16	5.68	55.93%
Test no. 2					3	6	2	4	2		14	6.05	63.25%
Test no. 3					1	4	6	1	2	2	16	7.13	72.59%
Test no. 4						2	4	2	2	2	14	7.85	76.46%
Final test						1	4	1	2	3	15	8.13	80.70%

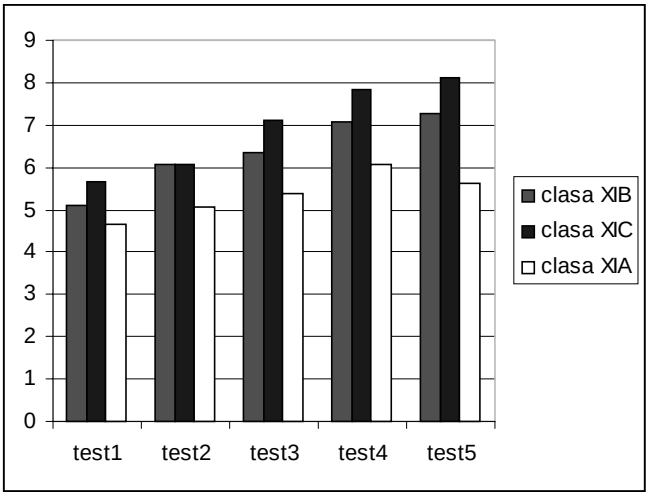
Table. Mark dynamics for the students of experimental class XI th C

No. of students/marks	1	2	3	4	5	6	7	8	9	10	No of present students	Class average	i_e
Initial test			3	6	4	4	1				18	4.66	45.83%
Test no. 2		1	2	5	5	3	2	2			20	5.05	49.05%
Test no. 3			1	4	3	6	1		1		16	5.37	51.70%
Test no. 4				2	6	2	4	2	1		17	6.05	57.88%
Final test				4	3	6	2		1		16	5.62	53.62%

Table. Mark dynamics for the students of witness class XI th A

Graphic representation of the tests

Achievement of school progress by means of using evaluation tests



It results from the analysis and interpretation of the test results that during the 4 chapters dealing with the nutrition functions when the activities of acquiring new knowledge, skills and competences, as well as the evaluation were made in an alert rhythm, the students constantly progressed.

For the final, final evaluation test the students from the experimental classes presented a certain progress in comparison with the results obtained by the students from the witness class for the 4 formative tests, and the witness class had a slight regression.

As a conclusion, administration of evaluation tests with various items, as those within this study, assures a higher level of objectivity in marking school performance. At the same time, the number of the tests allowed rhythmic marking of students. The accumulation of knowledge, intellectual skills is realized systematically, efficiently, and a healthy attitude towards the marks obtained, school efficiency in general is achieved.

I noticed that the administration of this type of evaluation instrument makes it possible to create a work atmosphere within the class, the active participation of students in the lesson, the development of the interest for competition. Last but not least, using these evaluation tests also contributes to making a hierarchy of students within the group.

As I analyzed each test I also noticed which are the errors and gaps from some students' knowledge and took the appropriate measures to minimize them for each student.

The students had the possibility to evaluate themselves and establish the efficiency of their own activity in achieving school progress.

The evaluation of results was made through the finding of the marks, as well as through the appreciation of the whole pedagogic act. The latter was aimed at the results of the pedagogic activity and also at the strategy applied, as evaluation is a constitutive part of the pedagogic activity, having its place as a system of ideas and techniques in the general theory of education.

All in all, the information I got through administration of the evaluation tests presented in this project were very useful in the didactic activity I have, helping me to continuously improve the didactic technology and the approach of the activity I have a s a teacher for my present and future activity.

Here's an example of a test:

Test no. 1 (T_1)

"Digestion and Intestinal Absorption"

Name: …….
Class: ……..

I. 1) In column B you will find names of enzymes, and in column A the digestive juices where these enzymes can be found. Write the association between each number form column A and the corresponding letter in column B

A	B
1. Saliva	a. Disaccharide
2. Gastric juice	b. Enterokinase
3. Pancreatic juice	c. Gelatinase
4. Intestinal juice	d. Ptyalin
(in the apical membrane of the enterocytes)	e. Tripsyn

2) In column B you will find names of components of the digestive tube, and in column A their characteristics. Write the association between each number form column A and the corresponding letter in column B

A	B
1. The most dilated "J" - shaped segment of the digestive tube	a. The oral cavity
2. The longest segment of the digestive tube placed between the pylor and the ileo-ceccal valve	b. The esophagus
3. It comprises specialized organs with a role in mastication	c. The pharynx
4. Muscular-fibrous conduct where digestive and respiratory tracts cross	d. The small intestine

0,80 points

II. Circle the correct answers:

1. The peristaltic moves :
   a. at the level of the stomach contribute to the mixture of the gastric juice with food
   b. are waves of circular contraction which propagate along the small intestine
   c. are circular contractions which appear at regular intervals along the small intestine
   d. are not present in the large intestine.
2. The regulation of the gastric secretion:
   a. in the cephalic phase, is realized through unconditioned reflexes demonstrated by Pavlov using the fictional lunch model
   b. is realized humorally through the secretine and pancreozimine hormones
   c. in the gastric phase is also realized through conditional reflexes triggered by the smell, sight or thought of food
   d. is realized when the duodenal mucous membrane meets certain (proteic) constituents of gastric juice

2 points

3. The pancreas
   a. is a mixed gland
   b. has a head, cervix and tail
   c. has a tubular-acinous structure, similar to saliva glands
   d. has an accessory pancreatic channel (Santorini) which opens in the duodenum together with the choledoch channel
4. The gall
   a. is produced by hepatocytes in a quantity of 1.5 – 2 liters a day
   b. through the biliary salts reduces the superficial tension and determines the emulsion of the fats
   c. is a green liquid – the hepatic gall and a yellow liquid – the colecistic gall
   d. forms together with fats mycelia which are hydro soluble and thus can be absorbed into the intestine

5. The small intestine:
   a. has a length of about 1.7 meters
   b. has a duodenum, the fixed initial part, horse-shoe shaped
   c. stretches from the cardia orifice to the pylor
   d. the intestinal mucous membrane has intestinal vilosities which increase its surface

2,20 points

III. The liver is an annex gland of the digestive tube.
   a. Present its location.
   b. Describe the two parts of the liver.
   c. Characterize the hepatic lobe.

IV. Write an essay with the theme: "Sugar digestion " after the following plan:
   a. Definition
   b. Enumeration of those digestive system components with the corresponding digestive juices and enzymes which have a role in the sugar digestion, pointing the action of each enzyme on blood sugar.
   c. Presenting the mechanism of intestinal absorption of the final sugar digestion products.

4 points

1 bonus point

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BIBLIOGRAPHY

Barna, A. Pop, I., State Confirmation Examination for Teachers, Casa Cărții de Știință, Cluj – Napoca, 2001;
Cerghit, I., et alii, Didactics, E.D.P., R.A., Bucureşti, 1993;
Cerghit, I., Lesson Improvement in Modern School, E.D.P., Bucureşti, 1983;
Ciurchea, M. et alii, Methodics of Biology Sciences Teaching, E.D.P., Bucureşti, 1983;
C.N.C., 2001, Training Program for Teachers in the Field of Didactics for Different Subjects - Support Material, Botoşani;
Cucoş, C., Pedagogy, Polirom Publishing House, Iaşi, 1996;
Cucoş, C (coordinator), Psychopedagogy for the State Confirmation Examination and Ist and 2nd Degrees Senior Teacher State Examinations, Polirom Publishing House, Iaşi, 1998;
Gostini, G., Heuristic Instruction through Didactic Units, E.D.P., Bucureşti, 1975;
Grigoriu, B., Safran, O., Teaching – Learning Coordinates from the Perspective of Modern Didactics, E.D.P., Bucureşti, 1976;
Hutan, E., Cerbu, V., Training Session for the Didactics of Biology - Additional Materials, Botoşani, 2001;
Ionescu, M., Radu, I. (coordinators), Modern Didactics, Dacia Publishing House, Cluj – Napoca, 2001;
Ionescu, M., Chiş, V., Teaching and Learning Strategies, Scientific publishing House, Bucureşti, 1992;
Jinga, I. et alii, School Performance Evaluation, Aferin Publishing House, Bucureşti, 1981;
Landsheere, G., Continuous Evaluation of Students and Examinations, E.D.P., Bucureşti, 1979;
Popescu, P., Current Examination and Marking, E.D.P., Bucureşti, 1978;
Radu, I.T.., Theory and Practice in the Evaluation of Education Efficiency, E.D.P., Bucureşti, 1981;
Radu, I.T.., Ionescu, M., Didactic Experience and Creativity, Dacia Publishing House, Cluj – Napoca, 1987;
Salade, D. , Didactics, ,E.D.P., Bucureşti, 1981;
Stoica, M., Mihăilescu, I., Practice in Animal Anatomy and Physiology, E.D.P., Bucureşti, 1981;
Teodor, V. (coordinator), Methodics of Biology Teaching, E.D.P., Bucureşti, 1982;
Țârcovnicu, V., Frontal Teaching, Individual Teaching, Group Teaching, E.D.P., Bucureşti, 1981;
The "Alexandru Ioan Cuza" University of Iași (coordinator), Psychopedagogy for State Confirmation Examination and 2nd Degree Senior Teacher Examinations, "Spiru Haret" Publishing House, Iaşi, 1994.