MATHEMATICS, THE INSTRUMENT WE USE IN TEACHING ECOLOGY

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Abstract

By thinking interdisciplinarity and multidisciplinarity either in theory or in practice we can approach the real facet, of natural phenomena, where we find all the elements blending toghether to make an intercorelated whole.

Interdisciplinarity was chosen as a method of absortion of knowledge due to all the more intense tendency of science to assert itself but also because of the crossing over from one discipline/subject matter science to another, because of obvious connexions between them, logically speaking, for science has a systematic working pattern. It is when the interdiscyiplinarity correlation enters the teaching process submitting itself to didactic logics , that we can discuss interconnection among various subject matters included in the educational process. Thus, the interdisciplinary connection becomes an issue of didactic methodology.

The present paper underlines a few problems specific to Ecology as subject matter, where matematics, in an interdisciplinary way, is used as an indispensabil working instrument.

Key words: *mathematics, ecology, tool, teaching*

MATERIALS AND METHODS OF WORK / RESULTS

Established connections between mathematics and other disciplines of learning the following rules Didactic Action:

- the transfer of information from an area of study or scientific discipline in the mathematics lesson to help explaining some events.
- use in the teaching of specific methods or specific methods of other education subjects.
- the call for values and models offered by other disciplines.
- use of language classes with other disciplines in order, to integrate the knowledge into larger informational assemblies and in the unit systems of knowledge.

Each of this linking mathematics with other disciplines is obeying to didactic logic rules designed to make a optimization of the connection in the methodology of teaching.

a) Elements of education in lessons of applied mathematics

Students' education for the surrounding environment can not be realized without the mutual effort of the teachers, parents and authorities. The curricular resources concerning ecological education are mentioned in the Mathematics school curriculum for the primary and secondary classes, together with the interdisciplinary and transdisciplinary approach of CDS.

We will present a series of examples in the hypothesis that the concerned educational unit is part of the Global Program "Eco - School"or is carring out other environmental projects.

In the Algebra handbook for 6th grade, chapter "Direct ratio sets" students can show in charts the relationship between the quantities of recyclable waste collected through selection and the score obtained by each class of the school. Also, in the Algebra class, during the lesson "Representations of functional dependencies by means of tables, diagrams and charts" belonging to the chapter "Elements of data organization", the students are asked to draw tables and charts for certain data regarding the influence of the environment on people's health.

In the Geometry handbook for the 7th grade, chapter "Area for some geometrical figures", students can measure the surface of the playground in the lesson "Areas (triangles, square)"; the calculation of surfaces by means cuts, pavements, networks, using formulas. Within the same theme, students cansolve different problems regarding the optimal use of the playground area so as to create park (till and flower planting, etc.) Also, we can request the decision of a plain surface in parcels of different regular forms.

The periodical analysis of air quality parameters can be carried out during the Mathematics lessons in the 10th grade (the most specialties of humanities and sciences, the theoretical field). The data can be collected by means of the air quality monitoring stations located in the main quarters of Romania's major cities. The chemical pollutants monitored are related to the speed of the wind, temperature, pressure, sub radiations and relative humidity. Their interpretation, by statistical can be carried out in the following lessons: "Statistical data collection, classification and work, chart representation of statistical data", "Statistical data interpretation by position parameters: average, dispersion, medium, average exceptions" (we gave examples for sciences, specialty Mathematics – Computer Science).

In mathematical analysis, in the 11th grade of sciences, examples real number sets can be given, as a measure of some reality measures. On this occasion, the extinction of some flora or fauna species under the impact of pollutants may be studied, together with the life expectancy of a radioactive nucleus or the coming into being of mammal populations if the natural balance is damaged (for instance, by respecting the Fibonacci number $u_n = u_{n-1} + u_{n-2}, u_0 = u_1 = 1$).

The negative impact of radioactive substances on the environment is well known. The nuclear security and protection against radiations is one of the fields of community acquisition.

The radioactive elements are unstable and have the tendency to disintegrate. We take a mass of radioactive nuclei and time T, acer which half of the initial nuclei are disintegrating. No is the number of nuclei at the moment t = 0. We have the following sets: Avem urmatoarele şiruri:

1) The number of nuclei remained at moment t is: N_0 (for t = 0), $\frac{N_0}{2}$ (for t = 1T), $\frac{N_0}{2^2}$ (for t = 2T), $\frac{N_0}{2^3}$ (for t = 3T), $\frac{N_0}{2^4}$ (for t = 4T), $\frac{N_0}{2^5}$ (or t = 5T);

2) The number of nuclei desintegred at the moment t is : 0 (for t = 0) , $\frac{N_0}{2}$ (for t = 1T), $\frac{N_0}{2}+\frac{N_0}{2^2}$ (for t = 2T) , $\frac{N_0}{2}+\frac{N_0}{2^2}+\frac{N_0}{2^3}$ (for t = 3T) , $\frac{N_0}{2}+\frac{N_0}{2^2}+\frac{N_0}{2^3}+\frac{N_0}{2^4}$ (for t = 4T), $\frac{N_0}{2}+\frac{N_0}{2^2}+\frac{N_0}{2^3}+\frac{N_0}{2^4}+\frac{N_0}{2^5}$ (for t = 5T)

a) The number of radioactive nuclei remained at moments t = 0 , t = T, t = 2T, …. T = n T forms geometrical progression $N_0, \frac{N_0}{2}, \frac{N_0}{2^2}, \frac{N_0}{2^3}, \frac{N_0}{2^4}, \frac{N_0}{2^5}$ with ratio $\frac{1}{2}$.

b) The total number of desintegred nuclei at the moment t = nT is:

$$\frac{N_0}{2}+\frac{N_0}{2^2}+\frac{N_0}{2^3}+..........+\frac{N_0}{2^n} = N_0\left(1-\frac{1}{2^n}\right)$$

Mathematical calculations can be applied to calculate the potential number of pairs of chromosomes form more combinations in the case of a the cells. In a species which has 3 pairs of chromosomes (2n = 6) can easily find the number of combinations from among the chromosomal recombination. Possibilities for a cell to be genetically different from another can be found by calculating the value of 2n (n = number of pairs of chromosomes) which means $2^3 = 8$.

Aplyng this formula, where the number of pairs of chromosomes is 23, it's obtained a number of cell combinations of $2^{23} = 8.388.608$.

Build –up the genetic map for three hypothetical genes A, B, C with them a, b, c. One genitor is phenotypically normal, as being in the phenotypically heterozygote (AaBbCc). The other type shows mutant genitors (aabbcc). These three genes are located on the same chromosome as a result of crossing-over between phenotype with normal bodies but heterozygote (AaBbCc), with the mutant type (aabbcc), the lineage is composed mostly of organisms similar with the parents bodies, being phenotypically ABC or abc. So genes that manifest linkage is placed in the same chromosome. In lineage appears all sow recombinant organisms by crossing-over in the following proportions:

- between gene c and b gene, the recombinant phenotype with Abc and ABC = 15%:

- between gene c and b gene, with the recombinant phenotype Abc and ABC = 8%;
- between gene c and c gene, the recombinant phenotype with ABC and ABC = 32%;

Place these genes in the linear chromosome, knowing that between the closest gene the crossing-over frequency map is smaller and more distant, and between the most distant genes it is higher.

Mendel had made a cross between two varieties of peas which are distinguished by two pairs of characters: grain smooth peas and yellow (AABB) and wrinkled pea grain and green (aabb). In the first hybrid generation (F1) all plants were beans smooth and pale yellow, showing phenotypically dominant characters, although in terms of genotypic were hybrid (AaBb).

By self from the hybrid plants of the first generation has been obtain the second generation (F2) which presents the total number of plants:

- 9 / 16 with two dominating characters (smooth and yellow beans)
- 3 / 16 with a dominant and one recessive (smooth and green beans)
- 3 / 16 with a dominant and one recessive (wrinkled and yellow beans)
- 1 / 16 with two characters recessive (wrinkled and green beans)

This segregation is explained by the fact that first generation of hybrids, from parents who are distinguished by two pairs of characters, forming four categories of cells, in which it is a single hereditary factor, from the initial pair (AB, Ab, aB, ab). Here are the 16 combinations that result from the probable combining of the cells.

♀ ♂	**AB**	**Ab**	**aB**	**ab**
AB	AABB	AABb	AaBB	AaBB
Ab	AABb	AAbb	AaBb	Aabb
aB	AaBB	AaBb	aaBB	AaBb
ab	AaBb	Aabb	aaBb	aabb

Based on the calculation of probabilities, the chance of simultaneous occurrence of two independent events is equal with the their separate probability.

In this way G. Mendel predicted that 9 / 16 (3 / 4 x 3 / 4) of grain will be smooth and yellow, and 3 / 16 (3 / 4 x 1 / 4) will be smooth and green, 3 / 16 (3 / 4 ¼ x) will be smooth and green and 1 / 16 (1 / 4 x 1 / 4) will be wrinkled and green. So, in the F2 the segregation it is in the report of 9:3:3:1.

CONCLUSIONS:

Due to the interference of different subject, of the conexion between them, from the logical point of view because of the science sistem character, it is required the effort of each teacher to overtake the strict bounderies of each discipline, to make a step to the simple corelation of the knowledge to a interdisciplinery approach of a task.

As ways of the didactical actions for the realization mathematics conexions with other disciplines:

- the knowledge transfer from one subject to another (scientific discipline) in order to facilitate the exploration of an event.
- the use of teaching of some specific methods of a subject
- other values and examples offered by other disciplines
- the use of a common language with other discipline in order to realise the integration of the knowledge in a large informational sistem

Each of these methods of corelation and collision of mathematics with other disciplines subdue to other logical didactical rulesment to make from the conexion a better methodology of teaching.

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