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MONITORING, EXAMINING AND ASSESSING STUDENTS' ACHIEVEMENTS IN MATHEMATICS*

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The system of monitoring, examining and assessing students' achievements in mathematics is treated in this study, which as a part of the curriculum should be done in a planned and systematic manner. This means that conducting of the mathematics curriculum and system of monitoring, checking and assessing are activities, which are interrelated.

In this study general components of monitoring, examining and assessing students success in mathematics are concretized, as well as parts of the results of one research which proves that behind the same numerous grades in different schools and different teachers there are not identical values (knowledge, skills, interests, working habits etc.).

Introduction. Monitoring, examination and assessment of the extent, type and expected quality of students' activities play an important role in teachers preparations for proactive curriculum, which is called active, because includes a mechanism for students active position and role. Very often it is named contemporary curriculum and it is different from the traditional one. These are two curriculum models, a model in which the learning process is discovered, and the model where the learning process is transmitted. Each of them builds its own method of monitoring, examination, and assessment of the students' achievements, adequate to the curriculum core features. However, nowadays there are attempts for curriculum improvements by using many intermediate forms or combinations of traditional with contemporary elements, moving from current toward expected, from the ones we already have and know, towards desirable.

The characteristics of the system of monitoring, examination and assessment in the contemporary curriculum are the following:

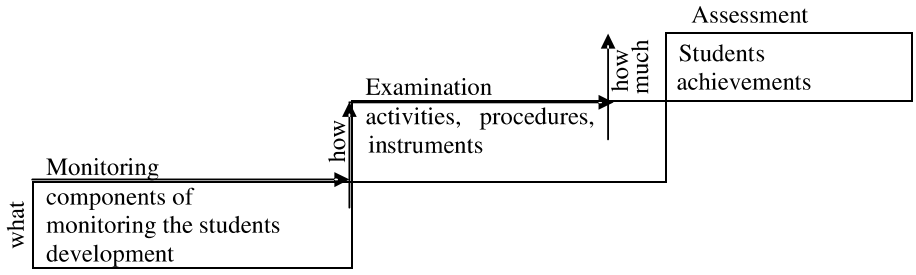
- ☐ it is directed toward the learning process;
- ☐ the quality of knowledge is pointed-out;
- ☐ presence of diagnostic and formative examination and assessment;
- ☐ different procedures and instruments are applied;
- ☐ regularity;
- ☐ it is directed towards knowledge requirements.

The characteristics of the system of monitoring, examination and assessment in the traditional curriculum are the following:

*Key words:** monitoring, examining, assessing, evaluation criterion

• directed toward learning results;
• the quality of knowledge is pointed-out;
• completion with summary of examination and assessment;
• mainly oral and written examination and assessment;
• irregularity;
• directed towards mistakes and lack of knowledge hinting.

From the point of view of the teachers working occupation, the system of monitoring, examination and assessment takes a long period of time, as it is an activity which should be achieved and realized from the beginning of each lesson. This means that running the curriculum process and system of monitoring, examination and assessment are activities that interfere each other. In the proactive curriculum they should not have a treatment of two parallel processes. They are two aspects of the same process and reflect the curriculum activities. Also, that is one of the reasons that make teachers' activity difficult during the lesson.



Scheme 1. System of Monitoring, Examination and Assessment

The system of monitoring, examination and assessment should be build up on certain scientific principles, technically enabled, even it should be simply enough and economical. The basic principles of monitoring the students developments in our schools should be the following: **diversity, continuity, steps of assessment, difference between measurement and evaluation, economically and transparency**.

1. Monitoring the students' achievements. Monitoring components. In the broadest sense of the term, students' monitoring can be considered as marking and registration of the diversify changes of the students. As far as the monitoring of students' development is concerned, the accent of this topic would be put on the changes under influence of math's lesson education.

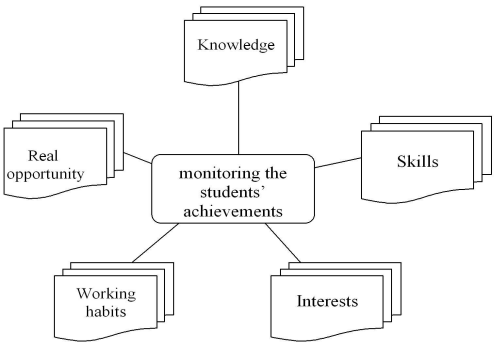
Monitoring students' development is a practical activity, limitation of which depends on educational objectives and tasks of the math's curriculum.

Is the knowledge acquirement a sole objective of nowadays math's curriculum? Certainly, it isn't. Knowledge is, however, the most important component in the math's curriculum process, which should be put on the top. But, we should always take into consideration that math's curriculum objectives are not only knowledge.

Therefore, monitoring the students' achievements should not refer only to the knowledge acquired, but to the ability for practical application of that knowledge, to register their attitudes, capabilities and what are the working real abilities of the student. The students' development is monitored by certain components, important for subject success.

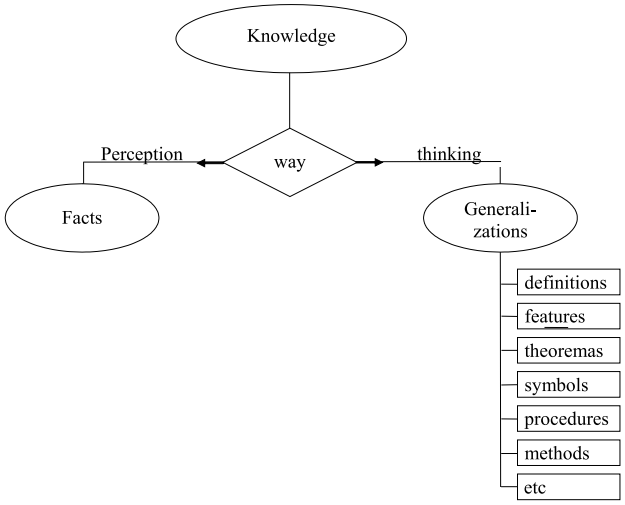
Determination of the components for monitoring the students development depends on several basic factors: educational objective of our school, development of school activities, material and human resources conditions in the school, society environment assistance, the type of that school, particularity of the school curriculum etc. It is obvious that determination of the components for monitoring students' development is exceptionally complex matter, full of different specifics (Scheme 2).

Knowledge is a system or logical review of facts and generalizations for reality, accepted and permanently retained in his/her conscious by student. The student realizes the facts by perception, and finds out generalization by thoughts. This can be shown on Scheme 2. Knowledge can have different qualities, depending on the level of acceptance of facts and generalizations. Therefore, according to the quality, we differentiate several levels: knowledge of recognition, knowledge of reproduction, operational knowledge and creative knowledge.



Scheme 2. Monitoring components

Skills (capabilities) are certain mental features of the student that allow him/her successful completion of certain activities. The skills are divided on general skills (for learning and working, depending on his/her productivity) and special skills (skill only for certain type of activity: music, art, literature etc.).

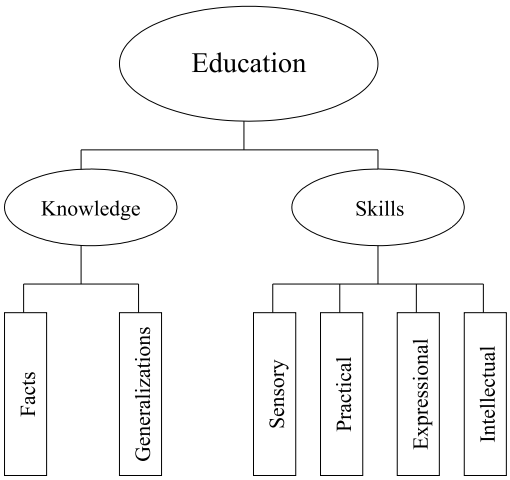


Scheme 3. Knowledge structure

According to its quality, skills are divided into:

- Sensory or perceptive;
- Practical skills;
- Expressing skills;
- Mental-intellectual skills.

Knowledge and skills belong to the school educational objectives. According to the above-mentioned, the education structure can be shown in Scheme 4.



Scheme 4. Education Structure

Knowledge is acquired and skills are developed by learning as they have a ground in genetic predisposition.

Interest means that the student regularly pay attention to the math's curriculum, has pro-active learning attitude, followed by pleasant feelings. The interest, as learning motive provides more active role of the student, thus easier knowledge adoption.

Working habits – can be acquired by longer doing certain activities. It is necessary for students to assign them many working duties and requirements, which will be regularly performed by students, so that establishing working habits, would be enabled. School and family participate in establishing working habits.

Real abilities – The acquaintance with the students' real abilities in achieving schools assignments has an important role for the success of the educational activity of math's teacher. However, acquainting with the students living conditions (home and material) the weaknesses can be compensated.

2. Assessment of students achievements. By determining the components of monitoring the students' development, we should determine the way of its assessment, as well. Assessing the way of students learning what they have learned, the teacher gets feed back information for the efficiency of his work with students, according to which information, as needed, he/she can correct and improve students performance. The assessment of students achievements in math's curriculum process should be **continually,**

timely, planned, carefully and psychologically proved and real. The ways of assessment of students' achievements may be different.

□ **Assessment by objective**

• ***Diagnostic assessment***

• ***Formative or current assessment***

• ***Summative assessment***.

□ **Examination according to the way it is performed**

• ***Verbal examination***.

• ***Written examination*** (ways of written examinations: written exams, short written exams, homework (math's exercises), knowledge tests)

• ***Practical examination***

• **Examination taking into account who is assessing.**

Despite internal examination of the student by the teacher, there are self-examinations of the students, interactive examination among students and external examination.

So, there are different techniques for checking knowledge and other achievements of the students in the math curriculum. The teacher decides which he will use. The choice of the techniques depends on ***the type of the contents that are examined and evaluated, the aim of the examination and evaluation, the level of reality, the age of the students and the technical and material conditions***. Then the teacher has an overview in the results of his own work, or the productivity of the class. Afterwards he can offer individual help for the curriculum, that the student did not receive quite well. The techniques for examination of the achievements in mathematics depends on few factors which can be divided in two groups: ***procedures and instruments for the result on the quantitative indicators of achievement*** (test of knowledge, interviews, check lists, inventory of personality, structured essay assignments, written and practical examinations) and ***procedures and instruments by which students' achievements are being evaluated*** (observation, non-structured essay and questions for solving problems, research and creativity).

3. Evaluation of students' achievements. Analyzing and examination are basic for the evaluation, which on the other hand, is their epilogue. If analyzing and examine finish without evaluation, than they have no sense. That's why it is good to finish them with a grade which has the aim to give impression about the difference between the expected and the actual and to initiate extra activities for possible corrections.

The evaluation of the knowledge and achievement of the math's students represents a sort of measuring by certain criteria, which have these components: subject of measurement, tool for measurement and technique of measurement.

During the direct or indirect evaluation of the knowledge, capabilities and other personal characteristics, there are rules that need to be followed which concern: the construction of the measuring instruments, deterring of the measuring instruments, grading the positive answers and giving points and interpreting, and the use of the measuring results.

The most important and the most complex problem in evaluation is the criterion. Regarding the evaluation criteria of the students' achievements two important questions can be raised: ***What the students are requested to know?*** And ***To what extend they should know something?*** First question refers to the structure of the criterion

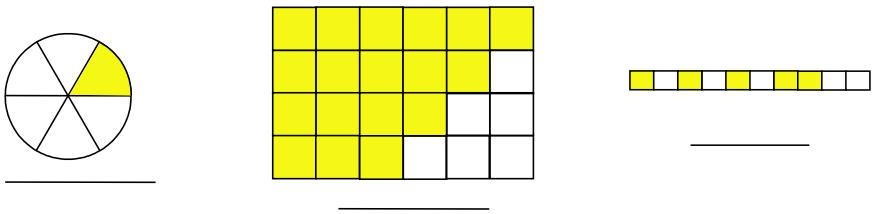
elements, and second question refers to the volume (quantity) and quality, which should be shown for each element separately. In this way the relation between the educational standards and evaluation criteria for their fulfillment can be provided.

Determining evaluation criteria for the students' successfulness is not easy, because we must provide situation where all relevant elements for students' evaluation in mathematics curriculum must be taken into consideration. In order to achieve this, criteria should be build in two phases: ***analyzing goals and contents which are included in the curriculum and determining concrete indicator by which the successfulness can be expressed***.

Conditions related to the criteria, which are used when evaluating students' knowledge can not be considered satisfactory or appropriate to the needs. Evaluation in the schools is done by the criteria formed by the teachers, and they are very subjective, and differ from teacher to teacher, so that the same teacher has different criteria in different periods of time and for different groups of students. Resulting from this, it is not strange why behind the same numerous grades in different schools and different teachers there are not identical values (knowledge, skills, interests, working habits etc.).

This can be proved by researching reality in math's evaluation in 25 primary schools in the Republic of Macedonia. In order to access teachers evaluation the check list with 10 math's exercise on different level (Scheme 5), which were solved by one student during one written exam was given to 55 teachers. Each of them should have individual approach of assessing check list and for each exam of the check list write maximum number of points that can be achieved by complete solving, the sum of the points of all exercise should be 100; for each exercise of the check list to write the points of the certain math's exercise (from 01 to max. points he has written previously); to determine range for transferring points in grades. Evaluation of student was from 3 to 5, and here different grading of one of the exams is given, as well as its certainty (Scheme 6).

Exercise: After each figure, show the colored part like $\frac{m}{n}$

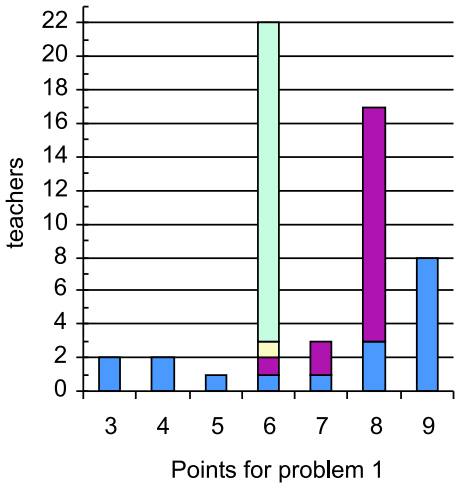


Scheme 5

Unfortunately, from the performed experiment we can see drastic difference, first of all in the value of the certain exercises and than in the assessment of its solution.

This is positive proof for the necessity of introducing criterion that will reduce differences to a great extent.

Max number of points	Teachers	%	Points for given solutions	Teachers	%
3	2	3.64	2	2	100.00
4	2	3.64	2	2	100.00
5	1	1.82	1	1	100.00
6	22	40.00	2	1	4.55
			4	1	4.55
			5	1	4.55
			6	19	86.36
7	3	5.45	5	1	66.37
			7	2	33.33
8	17	30.91	6	3	82.35
			8	14	17.65
9	8	14.55	9	8	100.00



Scheme 6

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