

Iulia-Cristina Bărbos (Kiss), PhD Student
Tiraspol State University

CHARACTERISTICS OF ATTAINING MATHEMATICAL AND ENVIRONMENTAL EXPLORATION COMPETENCES

Introduction

Solving specific issues in the everyday life, regardless of their degree of complexity, involves using knowledge, skills and competences that cannot be separated in the scope of one subject of study or another. This aspect entitles us to the problematic approach from the integrated perspective of ‘Mathematics and Environmental Exploration’.

The main reasons for the integrated approach of mathematics and some elements of natural sciences in primary education are the following:

- Integrated learning at this age is more likely to be interesting to students, as it is closer to their sphere of knowledge.
- The contextualization of learning through references of their surroundings increases the depth of understanding the concepts and procedures used.
- The harmonization of the two fields, mathematics and science, allow more efficient use of teaching time and increases the flexibility of interactions [4].

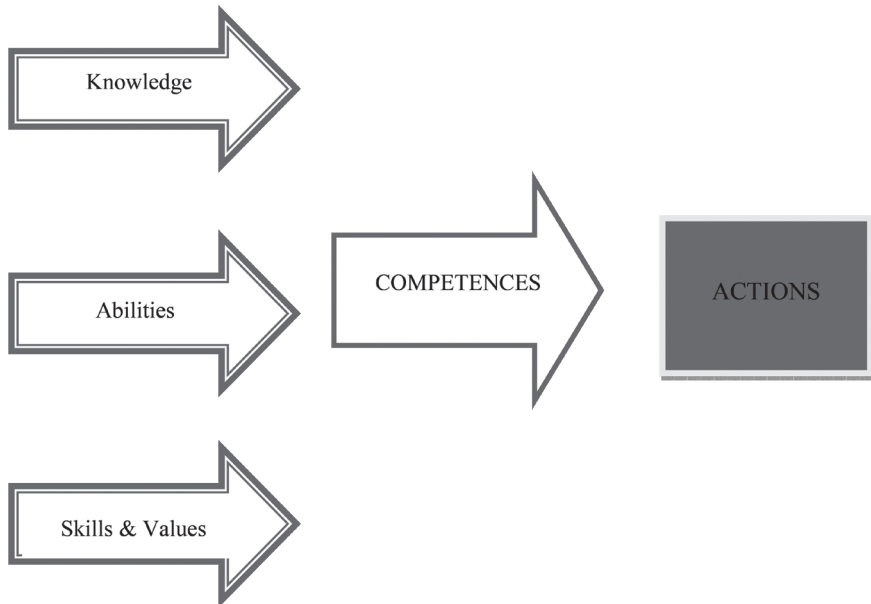
The Concept of Competence

The concept of competence was introduced in the literature related to human resource development through the competing works of two psychologists in 1959, Robert White and David C. McClelland. In addition to intelligence, a number of personality characteristics such as motivation, self-image and attitude can make

a difference between success and failure, between performance and stagnation. In the Republic of Moldova, the concept of 'competence' has been used since 1996 due to the implementation of the 'Pre-University Education Reform', which was provided for the development of the National Curriculum at the level of knowledge, skills or competences, and attitudes [5, p. 11].

Figure 1 shows the dynamic structure of the competence, which is the basis of the school programmes, curriculum and textbooks.

Figure 1. Dynamic structure of competence



Source: own study.

Competence itself is defined by the following basic features:

- Mobilization of a system of resources. It calls for the mobilization of a set of resources, such as knowledge, experiences, schemes and automation. This feature alone is not enough to make difference between ability and competence.
- Another feature of competence is that the mobilization of all resources is not done by chance. Competence is completed through resources that are used consciously by the competence carrier and became functional.

- The third feature is that resources are mobilized in a number of real-world situations and in the context of solving real life problems.
- The disciplinary feature is closely related to the previous one. If skills are cross-cutting, competences are disciplinary in nature. This feature derives from the fact that competence is often defined by a category of situations corresponding to specific problems of the discipline, which is also derived directly from the requirements of the discipline. Undoubtedly, certain competences belonging to different disciplines are sometimes close, and are therefore more easily transferable.
- The competence is evaluable, as it can be measured by the quality of fulfilling the task and by the quality of the result [2, p. 10].

Acquisition of Competences

Building a school competence is a long process that can be separated in conventionally distinct stages with common elements of transition, which can be seen below:

- The child must know. This involves the acquisition of basic knowledge;
- The learner must apply. This involves the transformation of basic knowledge into a functional one;
- The student knows how to be him/herself, i.e. he/she internalizes the knowledge and forms his/her attitudes;
- He/she knows how to become, so he/she externalizes the knowledge. This stage traditionally refers to the scientific skills that, in the light of the modernized curriculum, become a part of the school activity.

To advance the performance of children, different methods, forms and means of education are used to foster the building of school competence. In designing the educational content oriented to competence building, several conditions shall be taken into account:

- Observance of the system of principles specific to scientific knowledge, taking into account the features of age;
- Organizing the educational process based on theories of scientific knowledge;
- Accomplishing the stages of competence building: fundamental, functional, internalized, and externalized knowledge, but the use of traditional means of learning is not excluded.

The correct and balanced use of learning means it highlights the following features of the educational process:

- The ability to select from the many resources and devices that are most appropriate to the situation at a particular moment.
- The ability to encode the transmitted messages in different forms, so that several reception systems are involved at the same time.
- The ability of using the same resources simultaneously for several purposes or by several users at the same time.
- Competence-based education involves the emphasis on the supervision of the way the objectives set are achieved at the end of the school year, or at the end of compulsory education, giving a new meaning to the learning process and certification of training outcomes.

Currently, in pedagogical literature, competences are interpreted as learning outcomes and opposed to educational objectives. These competences are structured sets of knowledge, skills and values. It is estimated that there can be no equivalence between the formulations of competences and the different types of expression of objectives. They cannot be reduced or assimilated to each other. Competence is the student's ability to solve a certain situation based on the previously acquired skills and knowledge. There is also an opinion that components of a certain competence cannot be described, but certain levels of building it can be approximated. There are appreciations according to which competences can be transformed into 'learning situations' that are related to them, rather than into objectives, regardless of their degree of generality [3].

The key mathematical competence is the ability and the capacity to develop and apply critical mathematical thinking in order to solve problems in everyday situations. This competence is based on the importance of mathematics for society and for each person as a component part of society. Mathematical competence includes, to different degrees of comparison, the ability and desire to use mathematical concepts, representations and models to formulate ideas or theories and personal opinions. The mathematical representations referred to are various: formulas, models, constructions, graphs, maps, etc., in which we notice that knowledge is related to fundamental operations and understanding of mathematical terms and concepts. If the individual can apply mathematical principles and processes in everyday life, then he/she has built his/her skills. Skills are the ability to find arguments and to assess the situation at different times [3].

Based on the above paragraphs, it can be noted that there is no clear segregation between mathematical and environmental exploration competences;

they are intertwined and build a set of competences. Parallel and totally separate acquisition of competences in case of mathematical and environmental exploration competences cannot be discussed. At the same time, it can be observed that the acquisition of some competences entails the development of competences from another curricular area.

Along with the development of communication competences in the mother tongue, a component part of mathematical competences is called the ability to communicate using the mathematical language, which considers the following aspects: the correct use of mathematical language and mathematical terms, the selection of relevant information, the presentation of the solution or of the method applied in case of problem solving, and arguing the choice of a method. There are also specific competences related to the competence of learning to learn, which assumes taking on different learning roles within a group. Other components of the mathematical competence are developed in scientific and technological disciplines that explicitly or implicitly propose the development of this competence by solving problems, applying mathematical principles, methods or algorithms in everyday life, by using a mathematical or scientific language in communication, or by attitudes such as respect for the truth, perseverance or verification of arguments [1, p. 21].

Conclusion

In order to acquire and develop specific knowledge, skills and competences, the integrated approach of the MEE discipline proceeds from the idea that no educational discipline is a closed field, as it has many overlapping links. The integrated approach exists in the curricular area of 'Mathematics and Sciences', considering the direct practical applicability of biology, chemistry, physics and mathematics.

The acquisition of mathematical and environmental exploration competences in an integrated manner is aimed at forming modern personalities with critical, analytical and systemic thinking of deep understanding abilities and skills for modelling phenomena and processes around us, helping to create preconditions for awareness of the whole picture of the living world. The inter- and trans-disciplinary approach of the scientific contents of school curricula offers students the image of the same content (phenomenon) seen from the perspective of different disciplines and their relations. The student is put in the situation to think how connections are established between the aspects studied in each

discipline, and thus will no longer perceive the studied phenomenon separately, but together with what he/she knows about it from the point of view of different disciplines, which complete and influence each other. Proceeding from these realities, a reform of content was initiated in the Romanian education at the curricular level, defending the approach of learning content in interdisciplinary terms. Today, integrated teaching approaches bring students much closer to reality: developing flexible and creative thinking, able to offer solutions and to guide them to a school and professional career according to European standards, to take on roles and responsibilities, to make decisions for those around them, and to respond quickly and properly to various life challenges.

The logic of the integrated acquisition of mathematical and environmental exploration competences consists in the common aspects they have with each other. The child encounters all kinds of problems in the everyday life, and to solve them he/she uses the specifics, the basis for scientific concepts that will crystallize later. The two disciplines have many common aspects that can be understood and successfully assimilated in case of transposition into specific situations. Success depends on the quality, variety and relevance of the teaching material used, both individually and demonstratively.

In conclusion, mathematical and environmental exploration competences are naturally integrated, but proper management of integration is recommended, as it has its limits, which can lead to superficiality or the disappearance of specifics. The main features of the acquisition of mathematical and environmental exploration competences, which the teacher has in front, are: transferability, concretization-abstraction, flexibility of thinking, critical and analytical thinking, problematization, making connections and training children to answer the questions: *'What? Why? For what? How?'*

Abstract: The natural way for young school-aged children to learn about the environment is not an accumulation of knowledge in fields of science, but through integration of various information, skills and abilities related to topics that have sparked their interest or elements of their social life.

Mathematical competence is the ability to develop and apply mathematical thinking to solve different issues in everyday situations, emphasizing the process and the activity through which knowledge, skills, abilities and values are acquired. The basic competences of environmental exploration refer to the proficiency, use and application of knowledge and methodologies to explain the world around us.

They also include the understanding of the changes caused by human activity and the responsibility of each individual.

Being a current and relevant scientific issue, the concept of mathematical and environmental exploration competences and their learning features will be analysed. At the same time, the answer is sought to the question of whether it is possible to discuss the acquisition of mathematical and environmental exploration competences separately, or they are acquired and developed in an integrated way.

Keywords: mathematics and environmental exploration, competences, integrated learning

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