

**SOFIA UNIVERSITY "ST. KLIMENT OHRIDSKI"**

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**FACULTY OF GEOLOGY AND GEOGRAPHY**

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**APPLICATION OF MARIA MONTESSORI METHODOLOGY IN  
GEOGRAPHY TEACHING**

**ABSTRACT**

**ON A DISSERTATION PAPER FOR THE AWARD OF EDUCATIONAL  
AND SCIENTIFIC DEGREE "DOCTOR" IN PROFESSIONAL FIELD**

**1.3. – PEDAGOGY OF TRAINING IN...**

**(METHODOLOGY OF GEOGRAPHY TEACHING)**

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The dissertation consists of an introduction, 3 chapters, a conclusion, sources used, 18 tables, 8 figures, 5 appendices, a summary of scientific contributions and a list of publications related to the topic of the dissertation. 159 sources of information were used, of which 68 in Bulgarian and Russian and 91 in Italian and English.

The total volume of work is 220 pages.

**English title:** Application of Maria Montessori's methodology in geography education

**Keywords:** Maria Montessori methodology, geography training, innovative learning, interactive teaching methods

The dissertation work was discussed and directed for public defense at an extended meeting of the "Regional Development" department at the Faculty of Geology and Geography of Sofia University "St. Kliment Ohridski", held on 30.11.2022.

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The public defense will take place on ..... at..... in room ..... of FGG.

## DECLARATION OF ORIGINALITY

I declare that the current dissertation work on the topic "Application of Maria Montessori's methodology in the teaching of geography" is an independent and original author's work, and the sources of scientific and empirical information used are correctly documented and cited according to the standards in force in the Republic of Bulgaria.

I guarantee that:

- Acknowledgment of the foreign authorship of the used texts, tables, diagrams, graphics, images and others is indicated according to the academic style of citation established in the scientific field.
- The bibliography at the end of the work includes all cited and used printed and electronic sources on the subject.

I hereby declare that I am familiar with the rules in the Code of Ethics of the academic community of Sofia University "St. Kliment Ohridski" for respect of authorship, foreign contributions and correct citation and for the inadmissibility of plagiarism.

Signature: .....

(Stanislava Misheva)

## **I. GENERAL CHARACTERISTICS OF THE DISSERTATION**

### **Timeliness of the problem**

Modern geographic education is faced with many challenges, different in nature and scale. A new educational environment with new requirements for the training of young people is being noticed. At the current stage, the free personality of the young person with his needs and interests is placed at the center of education. From this arises the question of the search for ways leading to the improvement of the educational process. Attempts to stimulate motivation in geography education and to maintain students' interest in the issues of geographical knowledge are associated with the study and testing of various models and methods, including Maria Montessori's method.

The studies conducted among the basic teachers with whom the Faculty of Geology and Geography of the SU "St. Kliment Ohridski" and their students demonstrate interest in the subject, but retention and a slight drop in student motivation in the learning process. The results of the student survey confirm a clear connection with the strict adherence to the curricula and the traditional approach in teaching geography. In this regard, it is considered that the search for methods that have proven to be highly motivating for students in the learning process would have a significant place in the Bulgarian secondary school.

Maria Montessori's methodology is very relevant today not only in the field of education. This is connected with its opportunities for developing a number of competencies sought by the modern student - activity, creativity, creativity, multi-perspective, criticality and self-criticism, self-evaluation. The application of this type of methodology in geographical education in Bulgaria in this sense could be very valuable against the background of the changes that should be dealt with and against the background of the introduction of new educational documentation on the subject.

The current dissertation has a theoretical and practical-applied nature and is directly related to the problems, the solutions of which are sought by modern geography education in secondary schools in Bulgaria. At a time of implementation of the new educational documentation in the Bulgarian school and new educational standards and curricula in geography and economics, the present study acquires an increasingly relevant sound. The main idea of the dissertation work is to prove the systematic nature of geographical education in the country and, analyzing the private didactic and methodical heritage in geography, to upgrade it with separate current scientific productions derived from the methodology of Maria Montessori. For this purpose,

education in geography and economics in secondary school in Bulgaria is accepted as a single social system "education in geography and economics", which consists of separate elements united in educational degrees, stages and classes. Each element has specific main characteristics (attributes): learning objectives, learning content, educational process. Their identification is based on the trinity of pedagogy - psychology - private didactics, considered from a different perspective. (Vasileva, 2018a, 2018b; Gaitandzhieva, 2000; Tsankova, 2005)

The dissertation consists of three chapters.

The first chapter explores technology as a theory and methodology, on the basis of which its main characteristics are derived as a key category in the dissertation research for the construction of a conceptual model of general subject educational technology.

The second chapter presents a didactic interpretation of Maria Montessori's methodology. All the attributes of the methodology are characterized and the possibilities for its application in the general subject technology of geography education in the Bulgarian secondary school at the junior high school stage are outlined.

In the third chapter, concrete opportunities for the application of Maria Montessori's methodology in geographical education in the Bulgarian secondary school at the junior high school stage are presented. Specific scientific workshops are offered, considered as a basis for constructing the technology of self-development in geography education in Bulgaria.

## SETTING OF THE RESEARCH

**The object of research** is the system of geographical education in secondary school, in its junior high school stage, under the new realities.

**The subject of research** is the design of a variant for the functioning of the general subject technology of geography education by applying the methodology of Maria Montessori, with a view to increasing the efficiency and motivation in the learning process of geography and economics.

**The aim of the research** is to develop specific possibilities for the application of Maria Montessori's methodology in geographical education, which will serve as a basis for constructing a technology for self-development in geography education.

## MAIN TASKS OF THE RESEARCH

**Task One:** To explore technology as a theory and methodology, on the basis of which to derive its main characteristics as a key category in the dissertation research for the construction of a conceptual model of general subject educational technology.

**Second task:** to make a private didactic interpretation of the methodology of Maria Montessori, characterizing all the attributes of the methodology and outlining the possibilities for its application in the general subject technology of teaching geography in the Bulgarian secondary school at the junior high school stage.

**Third task:** To develop specific scientific workshops, as a basis for constructing the technology of self-development in the teaching of geography in Bulgaria, on the example of the 5th grade.

## HYPOTHESIS TO THE MAIN TASKS

Modern geographical education in Bulgaria is aimed at the search for high quality and efficiency, which is directly related to increasing the motivation of students in the learning process. If the Montessori methodology is adapted in the practice of teaching geography in Bulgaria, this will stimulate students' interests in the problems of geography and will significantly increase the students' motivation for learning in the learning process.

## RESEARCH METHODS

**The analysis** occupies a central place in the present dissertation work. Depending on the sources of information used, it is presented in three versions:

- **theoretical analysis** of literary sources, which helps to build the theoretical and methodological foundations of the research;
- **empirical analysis**, which is based on the results of a study of educational practice and the subjects of education;
- **a mathematical-statistical analysis** of data established by empirical research that notes problems, trends, and the current state of the problem.

**Surveying and observation** that complement the analysis and help to enrich the understanding of the problem under consideration.

**Modeling** which unites the abstract-logical, sensory, theoretical and empirical propositions derived from the research.

The expectations for scientific contribution are in two directions: firstly in the direction of enriching the didactics of geography by laying the foundations for constructing a technology of self-development in geography education, and secondly – in the direction of enriching the methodology of geography education by implementing specific ideas from Maria Montessori's methodology in practice.



## II. STRUCTURE AND CONTENT OF THE DISSERTATION

### CHAPTER ONE. THEORETICAL FOUNDATIONS OF THE PROBLEM OF EDUCATIONAL TECHNOLOGIES IN TEACHING

**In the first chapter**, a thorough description of the concepts "technology", "pedagogical technology", "teaching technology", "school technologies", "learning strategies and techniques" is made. It is based on a number of studies on the issue (Азаров, Ю. 1985; Кларин, М. по Г. Селевко, 1998; Селевко, 1998, Беспалько, В. 1999; Пидкасистый; Тыщенко, 2000; Петров и Атанасова, 2001 и др.). **Pedagogical technology** is considered to be "a type of social technology that revises, modifies, models, constructs one or other theories, principles, approaches and methods, integrates knowledge from various fields of science and practice, in order to provide an optimally effective solution to educational and educational purposes" (Petrov and Atanasova, 2001). This view is accepted despite possible criticisms of it regarding "*the unclear distinction between learning objectives and educational objectives*" (Radev, Pl. 2014).

#### 1. Technology, pedagogical technology, learning technology

**Learning technology**, also called didactic technology or educational technology, is one of the most developed areas of pedagogical technology. In the USA and in a number of other countries, the most popular term is "learning technology". Although conditional, some forms of manifestation are distinguished in this direction:

- Classical or traditional form of education, in which modern technical means and new didactic materials are not applied. Such training is considered to be the foundation of modern learning technology. The concept of "manual training" is used for it (Беспалько, 1989)
- Technology of preparation and use of traditional didactic materials and teaching aids.
- Technology of the use of modern technical means, which is considered a particularly promising form given its importance for the rationalization of the activities of teachers and learners. For the purposes of education, this form opens up wide possibilities for individualization and differentiation of training, as well as for new forms of its technology. In practice, an increasingly successful combination of modern and classical training tools is observed.

- Didactic communication technology, which is conditionally defined as an independent form of educational technology. It is based on the possibilities of various mediators to increase the effectiveness of pedagogical communication.
- Ontodidactic form of learning technology, which covers all procedures and mechanisms for transforming and reducing the latest knowledge of individual sciences for didactic purposes. The ontodidactic approach allows modern scientific knowledge to be revised not only in a form accessible to learners, but also as a means of maximum development of their cognitive and personal abilities and qualities. (Petrov, Atanasova, 2001).

The modern pedagogical literature contains many different concepts and approaches regarding the problems of the technologization of the educational process in secondary and higher education. Both in theory and in practical application, there are many options for conducting an educational process. Despite the wide variety, many technologies, having common characteristics, can be classified and summarized in groups. On the basis of various classification parameters and a selected framework for analysis and description, Petrov and Atanasova (2001) study and present in a summarized form the following **school pedagogical technologies**:

1. Modern traditional education;
2. Pedagogy of cooperation;
3. Human-personal technology (на Амонашвили, 2000);
4. Game technologies;
5. Problem-based learning;
6. Technology for intensification of learning based on schemes and sign models of the learning material (V. F. Shatolov);
7. *Pedagogical technologies based on the effective management of the learning process*:
  - 7.1. Technologies of planar differentiation;
  - 7.2. Cultural-educational technology of differentiated education according to children's interests (I. N. Zakatova);
  - 7.3. Technology for individualization of learning (Инге Унт; А. С. Границка; В. Д. Шадриков);
  - 7.4. Technology of programmed learning;
  - 7.5. Collective way of learning (А. Г. Ривин, В. К. Дяченко);
  - 7.6. Group technologies;
  - 7.7. Computer (new information technologies);

8. *Pedagogical technologies based on the didactic improvement of the material:*

8.1. „Ecology and dialectics“ (L. V. Terasov);

8.2. „The dialogue of cultures“ (B. C. Библиер, С. Ю. Курганов);

9. *Alternative technologies:*

9.1. Waldorf pedagogy (P. Шайнер);

9.2. Free labor technology (C. Френе);

9.3. Workshop technology;

10. *Nature-friendly technologies:*

10.1. Technology of self-development (M. Montessori);

11. *Developmental learning technologies:*

11.1. System of developmental education by L. V. Zankov;

11.2. Technology of the developmental training by D. B. Elkonin - V. V. Davidov;

11.3. Person-oriented developmental training (I. S. Yakimanska);

11.4. Technology of self-development training (G. K. Selevko);

12. *Author's pedagogical technologies:*

12.1. The School of Adaptive Pedagogy (E. A. Ямбург, Б. А. Бройде);

12.2. Technology of the author's school of self-determination (A. H. Тубелски);

12.3. School - park (M. A. Balaban);

12.4. The School of Tomorrow (D. Howard).

Of the listed, the technology of self-development is of interest, which generally affects the following:

- realization of comprehensive development of each child;
- stimulation of children's independence; instead of traditional training - providing an opportunity for self-development of the principle: help me do this myself;
- the idea of the educational (cultural-developing) pedagogical environment and of Montessori - the materials.

For the purposes of the dissertation research, the technology of self-development is explored in more depth in Chapter Two.

## 2. School technologies. Learning strategies and techniques

The concept of "**strategy**" is most often associated with the art of leading or with the skill and expertise to achieve certain goals. A learning strategy is defined as an individual way of organizing and using a certain number of skills or techniques in order to more rationally master certain information or solve a given problem. It can be considered to be a combination of skills or a set of procedures that the learner consciously uses according to the requirements of the particular situation. In this sense, according to the specifics of the tasks to be solved, the strategies can vary, and each student can store in his memory one or another certain number of strategies to use in different situations. Three groups of factors influencing the choice of **learning strategies** are conditionally inferred: the knowledge base available to students; their understanding of knowledge; their experience in implementing different strategies. Learners can use effective strategies when they have relatively good knowledge of the topic or problem at hand. When the long-term memory contains information relevant to the studied topic, to the problem under consideration, meaningful learning, the process of further development of the educational content, the interrelationship between the available knowledge and the new information is facilitated.

Depending on the generalization of actions, three types of strategies can be distinguished (Riding&Rayner, 1998):

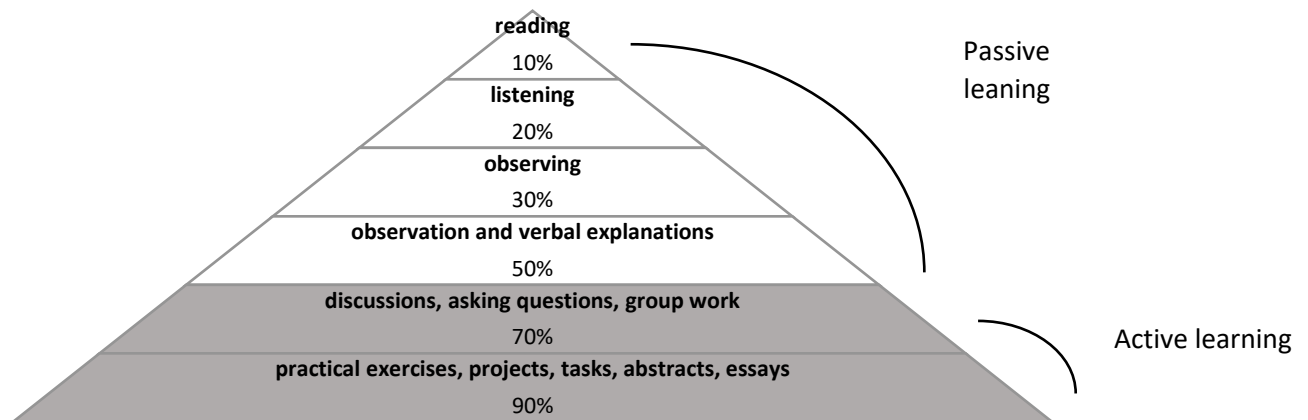
A research (search) strategy in which actions are aimed at defining the specifics of a new problem with the help of already accumulated knowledge.

- Analyzing strategy, where actions are aimed at analyzing the task and understanding it into smaller parts (subtasks).
- A control strategy in which the actions are aimed at controlling (monitoring) and evaluating the given answers in order to achieve a better solution to the task.

For the purposes of the present study, the following cognitive learning strategies are of interest: *Identification of essential information; Updating relevant prior knowledge; Visualization; Further development and expansion of the text; Summing up; Monitoring and controlling understanding.*

At the heart of the technology of self-development is the process of learning. The construction of the technology of self-development is based precisely on learning: by watching, listening, real, mental actions, by logical reasoning or by the way of guesswork and intuition. In this

sense, the learning-experimental cone, through which the fields of active and passive learning are defined, is of interest (Dale, 1969), (Fig. 1).



**Figure 1.** *Learning-experimental cone (Dale, 1969)*

Depending on the learning styles, there are very large individual differences in the assimilation of new information. A learning style can be defined as the persistent way in which new information is perceived and processed.

For the purposes of this dissertation research, the following summaries and conclusions are outlined:

- The technological approach in the pedagogical reality and in education as a whole requires a rethinking of its realities, targeting insufficiently known connections and relationships between them. Therefore, the technologization in pedagogy and didactics reflects the aspiration for scientifically-based transformation at the practical-applied level of its system of views, ideas and regularities.
- The technological process is generally characterized by the presence of a certain goal; structuring the activity into stages and operations to achieve the goal; existence of a program that determines the sequence in performing operations; feedback for step-by-step monitoring and correction if necessary.
- In essence, educational technology characterizes the modern technological paradigm, which is distinguished by its person-oriented focus and does not make a division between learning, education and development.
- Educational technologies are based on the regularities of the educational process as a result of their scientific study. The technological design of this process requires precise

and definite setting of the planned results, availability of criteria for their achievement, formalized structure of the activity of its main subjects.

### **3. General subject technology of geography education**

The development of **general subject technology** as the main task in the present study is based on the derived basic theoretical propositions about pedagogical technologies, learning technologies, school technologies, learning strategies and techniques. Certain difficulties in its construction are caused by the fact that Bulgarian education and in particular geographical education are in a period of changes with a view to adapting to the requirements of the European educational space.

The organization of the subject education system is regulated according to the current normative documents (see MES, Curriculum and programs by classes..., pass.). It is prepared according to hierarchical organizational units (levels of study, stages, classes), as well as according to content (cultural-educational areas, cycles, subjects) with a corresponding timetable. The subject learning knowledge and cognition can be present in the curriculum in different varieties when distinguishing the learning subjects. Attendance can be integrated with other subject areas – implicitly or differentiated into a relatively independent subject (explicitly). In this way, the peculiarities in the very structure of the subject education system are formed.

Each component of the subject educational system (level of study, cycle, class) can be considered as a subsystem with all the resulting signs and a specific manifestation of the attributes of education (goals, educational content, educational process, control) of the principles of coordination and subordination that ensure integrity. This necessitates a comprehensive planning of the system, reflecting its state at the given stage of its development. Moreover, the quality of this planning largely determines the effectiveness of its functioning. This is how we arrive at the philosophy of learning technology, the need for subject technology of learning.

The subject educational system functions in certain realities (cultural-educational environment), which are in one-way and two-way relations with it and therefore become peculiar factors. These are objects, processes, information and facts that can be different in nature and mechanisms of influence. In a broader plan, they could originate from the cultural environment (from science, art, traditions, relationships, etc.), and in a narrower one - from the educational environment (normative documents, means, etc.) depending on the nature of the impact , R. Gaitandzhieva distinguishes between external and internal environment.

(Gaitandzhieva , 2000) The external environment (information, educational policy, new information and communication technologies, etc.) has an impact on trends and development opportunities. The internal environment influences the making of more specific decisions that explain and ensure the functioning of the system as a kind of resources. For such, normative (standards and programs), informational and methodological (textbooks, electronic media), human resources (both teachers and students), educational practice (mass experience) are indicated. The local environment influences the implementation of the learning process itself in specific conditions. Its degree of influence is determined by the competence of the pedagogical council and the teacher. Since the cultural-educational environment of the subject education system is dynamic, flexible and adequate response to changes implies the design of relevant subject educational technologies and specific learning technologies. In this way, the following is achieved:

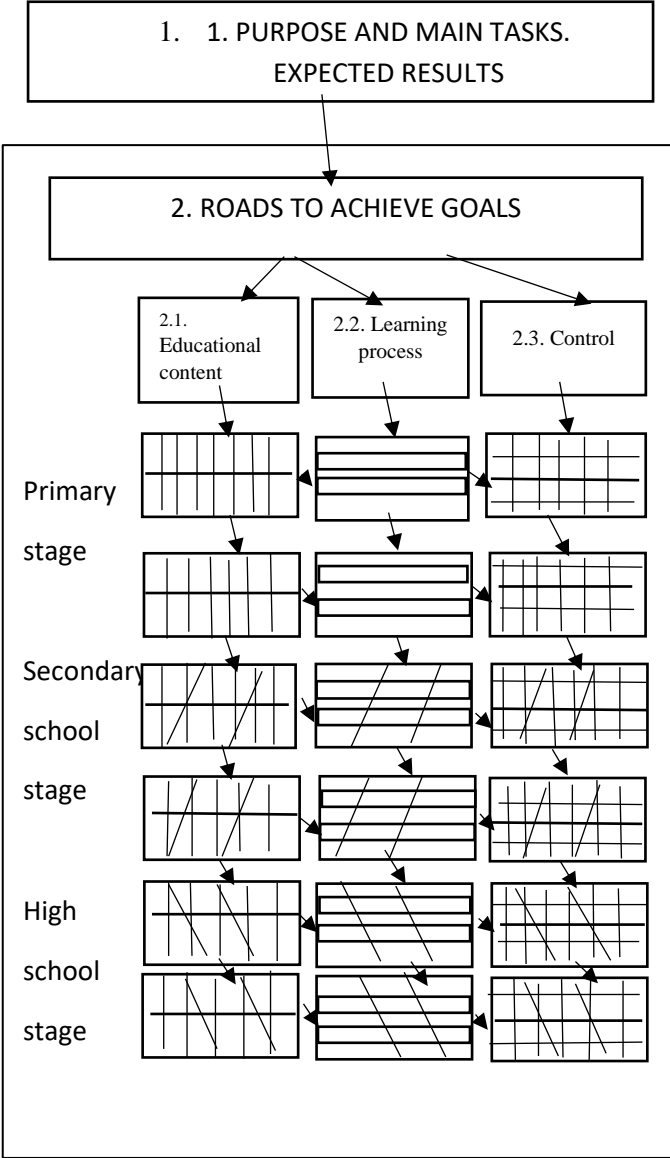
- a broader and more holistic understanding of subject learning. Another achievement is achieved for the subject itself, resulting from the new principles of organization of general secondary education according to the curriculum (see MES, Curricula and programs by classes..., pass.)
- the presence of relevant subject knowledge and knowledge (geographical) in different subjects is deduced depending on the way in which the educational content is organized.
- the need to plan technology as a means of responding to the dynamic cultural and educational environment is substantiated.

The subject education system functions in the time in which the learning process takes place. The learning process can be constructed, presented and studied on the one hand statically (as a "step-by-step" movement from one goal to another, from one learning content to another, etc.), and on the other hand as a real act of interaction between the two the subject in specific conditions, which can be called a learning (educational) process, with movement from a learning problem to a solved learning problem.

The general subject technology of education in a generalized form presents the fundamental aspects and statements of the overall concept. (Dictionary, 1984). It is presented in three relatively independent parts, each with its own place and purpose. The first part reveals the understanding of the essence of the general subject technology of education as a kind of set of solutions. (see Figure 2)

The role of a normative resource is played by the curriculum, state educational standards or requirements, the curriculum, regulations and instructions that are mandatory. On this basis and in accordance with the specifics of the local environment, the general school plan is drawn up.

For informational and methodological resources of the general subject technology of education, some of the classic and modern means related to the two subjects of education can be accepted - the textbook, the geographical map, the educational and methodological literature, the new informational communication technologies (Baltakov, Mihova, 1997) , (Gaitandzhieva, 2000), (Manoilova, 1998), (Pavlov, Churovski, Varbanov, 1988), (Pavlov, 1998). The specified means as a resource acquire a new purpose - they are no longer just means, but also a necessary base, source, starting material, without which it is difficult or impossible to achieve the goals. The question of the quality of the resource and its adequacy to the purpose comes to the fore.





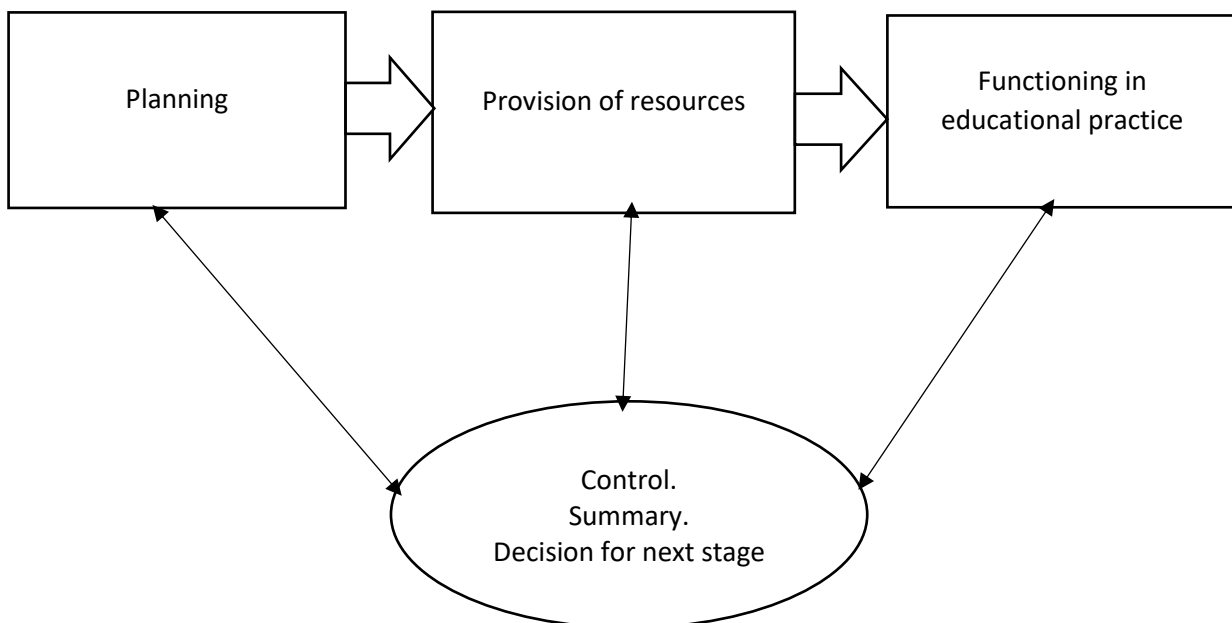
**Figure 2.** *The essence and features of the general subject technology of education*

An extremely important resource is the human one. In the face of teachers and students, the general subject technology of education is put into action, it is breathed into life.

Viewing the general subject technology of education as a certain number of solutions directs attention in several directions:

- it is a means of long-term planning of the functioning of the subject education system;
- through it, a different attitude to the classical attributes of learning is confirmed, which are considered in a new context;
- the decisions taken are mutually conditioned with a large horizon of impact, towards a long-term vision, which a priori implies efficiency.

The second part or the "life" of the general subject technology of learning shows the stages through which its existence passes and the activities related to this. Four main points are revealed: technology planning; provision of resources; technology operation and control. (see Figure 3)



**Figure 3.** *The life of the general subject technology of learning*

Planning as the main management function is based on preliminary studies at the national level, on the basis of which all decisions are made, normatively regulating the desired development

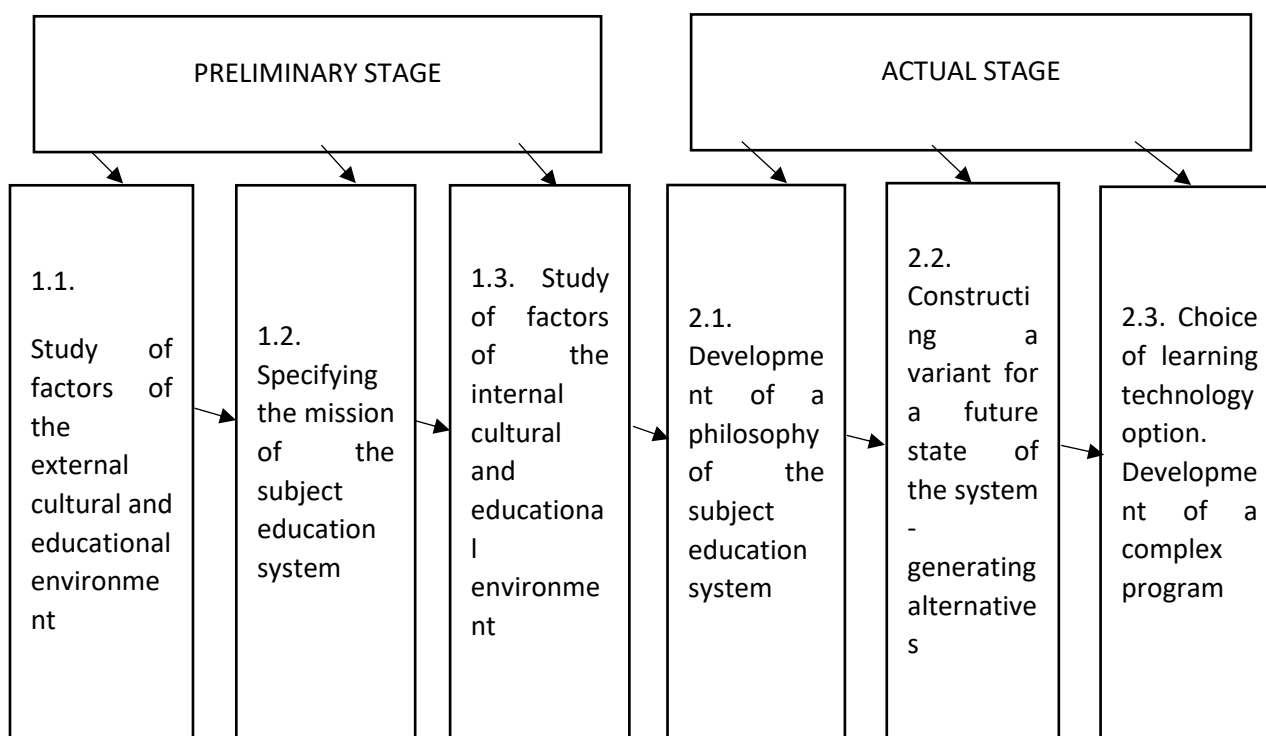
of the subject system in the new conditions of the environment and with a view to the successful implementation of its mission.

Provision of resources is the next stage in the life of learning technologies, closely related to the previous one and a prerequisite for the next one. Here, the focus is on the preliminary preparation of the resources, long before their implementation in the technology, and their quality. Of particular importance is their adequacy for the purposes of practice.

Everything so far affects the functioning of the general subject technology of education. It is determined not only by the quality of the planning, by the provided resources and by the overall organization of its implementation, but also by the created atmosphere, which is based on the formed motives, attitudes, knowledge, the conscious responsibility of all subjects, among which the decisive role to the teachers. They are also the main technology implementers.

Control as a management function and as an activity is present in all stages with a precisely defined purpose. Of particular importance is the so-called final control (exit control, at the end of each school year, in the last class of training), the results of which are actually the main criterion for evaluating the technology in use.

The third part - the development of a general subject technology of education is a matter of fundamental importance for the implementation of the other tasks in the present dissertation research. It stems from both the planning methodology and the specifics of the subject education system. Two stages are distinguished - preparatory and actual, in which separate procedures stand out, marking the content and logic of planning. Arriving at the final version is done through a series of steps. (see Figure 4)



**Figure 4.** *Development of general subject technology of education*

The purpose of the preparatory stage is to provide the initial information about the state of the system, as one of the main requirements in planning, without which optimal decisions cannot be made.

The study of factors of the external cultural and educational environment is the first procedure of the preliminary stage, which has a key importance in planning. It provides information necessary both for subsequent planning procedures and for decisions in the actual stage.

Specifying the task of the subject education system is an essential procedure in the development of the general subject technology of education. It derives from the functions of the system, from the current trends and interpretations in the scientific field, related to the social order, to the educational policy and more specifically to the national strategy for the development of Bulgarian education, i.e. to factors of the external cultural and educational environment. (see MES, Strategic documents... pass.)

The factors of the internal cultural and educational environment explain and ensure the functioning of the subject education system as an effective model. Their analysis makes it possible on the one hand to explain the achievements and on the other hand to identify the problems. Among them, the most important are normative resources (curriculum, DOI);

informational and methodological (textbooks, methodological literature for the teacher); the material and technical base, the human resources and the teaching practice of the subject.

The construction of options for the future state of the system places emphasis on new moments - ideas, productions, situations, principles, dominants, methods, etc. The implementation of this procedure implies extensive prognostic and constructive activity, which is realized as a series of steps and with the use of different methodologies and techniques.

### ***Summary and conclusions***

For the purposes of this dissertation research, it is necessary to outline the following more significant conclusions:

- The general subject technology of education consists of three interdependent parts, which reveal its essence in terms of content, functionality and methodology. In this way, the adequacy of the technological approach in the field of education is substantiated.
- The general technology of learning justifies another educational paradigm, which is based on a new interpretation of classic didactic concepts, on the examination of established didactic concepts in a new context, as well as on the introduction of new concepts. In this sense, new opportunities are revealed for making decisions with a new quality in planning.
- The implementation of the general subject technology of education, among other things, implies the corresponding additional professional training of personnel in the field of education.

With the above for the general subject technology of education, with the outlined ideas and statements, the first task of the dissertation research is solved.

## **CHAPTER TWO. THE MONTESSORI METHOD – TECHNOLOGY OF SELF-DEVELOPMENT**

### **1. General scientific pedagogical and psychological foundations of Maria Montessori's methodology**

In the **second chapter**, attention is paid to the general scientific pedagogical and psychological foundations of Maria Montessori's methodology.

For Montessori, the idea of education is directly related to the trust that the adult places in the child's learning and in its ability to acquire new knowledge. It is necessary for the adult to guarantee the child an intelligently organized environment in which it can move freely, as well as choose its activities, following the nature of its interests and respecting its specific evolutionary stage. In this context, freedom is proposed as a real educational environment through which the adult, thanks to careful observation, can come closer to understanding the true essence of the child, who, moving freely, reveals what in the surrounding environment attracts its interest and attention more. (Montessori, 1935); (Montessori, 2007)

According to Maria Montessori, the child (the student) should be the basis of the educational process, which is a leading idea in the modern didactics of geography in our country. (see Dermendzhieva et al., 2010; Vasileva, 2018a, 2018b; Vladeva, 2016; Sabeva, 2014; Tabakova, 2013; Tsankova, 2005 et al.). This justifies the choice of the Montessori methodology as a conceptual basis for the construction of the subject technology of geography education.

Montessori understands education as a process in which the child has the leading active role. Emphasis is placed on self-education and the use of didactic materials leading to learning and self-correction. This once again substantiates the adaptability of Maria Montessori's methodology in the field of geographic education given the real possibility of operationalizing the principle of self-activity in the geography education process. (Rinschede, 2007, 156)

The purpose of teaching according to Maria Montessori's methodology is to provide the child with an ideal environment for his development. In this environment, it will be able to obtain freedom to act in accordance with natural behavioral traditions. The environment must be different for each development plan, as well as the role of the teacher working on it. (Montessori, 2018); (Montessori, 2019)

The most common examples of the Montessori methodology are for children in the age group of 3 to 6 years. Practice shows that it can be skillfully applied to children from junior high school and high school. Its applicability is absolutely adequate for geography and economics classes in secondary school.

The main place in the educational process is occupied by the child, with his development, mind and improvement of his personality. Maria Montessori also supports these ideas. Her views were largely inspired by the French physicians and psychologists Jean-Marc Gaspard Itard (1774-1838) and Edouard Seguin (1812-1880), as well as the famous Swiss pedagogue Johann Heinrich Pestalozzi (1746-1827). . The many experiments in her work with children, as well as

her experience as a doctor, are a prerequisite for the emergence of the revolutionary Montessori methodology.

### ***Summary and conclusions***

For the purposes of the present dissertation study, the following general pedagogical and psychological fundamentals are outlined:

- The learning process is a complex phenomenon that represents the interrelated activity of the teacher and the student.
- Training is an interactive activity and a way to exchange activities and information through different levels among the training participants: communication, communication, problem solving, constructive independent activity, etc.
- Education is considered from different perspectives: as a systemic form, as a technological form, as a communicative form, as a spiritual form and as a cultural form.
- The various nuances in the interpretation of learning justify its complex nature.
- The main place in the educational process is occupied by the child with his development, mind and improvement of his personality.
- The areas of greatest application in teaching and learning at school are: cognition and learning, motivation, social context and emotional dimensions, environment, assessment. They can be designed into twenty basic principles of educational psychology.
- The application of Maria Montessori's methodology in geographic education is an opportunity to operationalize the principles in the practice of education.

## **2. Main attributes of Maria Montessori's methodology**

In the **second chapter**, a general description of all the main attributes of Maria Montessori's methodology is made: work materials, Montessori teachers, lessons (the educational process), assessment, freedom and discipline, the natural environment, "educazione cosmica".

For the purposes of this dissertation research, it is necessary to outline some basic points regarding the above mentioned attributes of Maria Montessori's methodology:

- At the center of the educational process is the child, and his curiosity is the "engine" of learning.

- The educational process is an integrated and comprehensive process, which leads to the development of the potential, as well as to the development of the student's personality.
- In the learning process, the student passes through four levels of development on the way to "maturity": development of the child as an independent being; development as a social being; strengthening as a mature person with formed research skills; overall growth as an adult.
- The main characteristics of the Montessori methodology are the following:
  - the working materials, which are an essential component in the Montessori environment. They perform complex functions for the formation of the child's cognitive, sensory and motor development in the form of analytical material, self-correction material and attractive material;
  - the teacher is the most important resource in the learning process. His main role is to monitor, guide children towards their physiological and mental development, guide them in their self-improvement;
  - the learning process itself takes place in two main forms: "presentation" and "big lesson". The presentation directs the students' attention to the upcoming work and to the didactic materials that will be used (technological motivation). The big lesson fulfills three main didactic tasks: first - sensory perception, second - recognition and third - association;
  - assessment has a specific key meaning and performs specific cognitive, corrective, regulatory and motivational functions;
  - the effective learning process is achieved through active discipline, without "coercion and inaction". In the learning process, the student should be engaged in an activity that is of interest to him. In this way, his ability to self-control is also stimulated;
  - a key element in the learning process is the contact with nature and, more specifically, the student's adaptation to it. In the process of learning, the student acquires not only human abilities, intelligence, language, but also adapts his being to the environmental conditions. The "absorbing mind" of the student is constantly absorbing the stimuli offered by the environment, ie. from external and internal, natural and anthropogenic stimuli;
  - the educational content studied at school should be of a clearly integrative nature. It is constructed based on the combined deductive-inductive approach. Starting from the whole and reaching the particular and then back again - from the particular to the whole, the student develops a philosophy that allows him to discover only the universe.

(Tornar, 2007); (Montessori in Cives, 2008); (Montessori, 1970a); (Montessori, 1970b); (Montessori, 2018); (Montessori, 2019); (Montessori, 1992)

The adaptability of Maria Montessori's methodology in the general subject technology of geography education is studied after a thorough analysis of the factors of the external and internal educational environment.

### **3. Factors of the external and internal educational environment for the application of the Montessori methodology in geography education**

#### **3.1. Factors of the external educational environment**

The study of the factors of the external cultural and educational environment of the system of geographical education in Bulgaria is the first procedure of the preliminary stage in the development of the general subject technology of education (see the first chapter). This procedure has a specific purpose, as its results provide information for subsequent procedures and for the actual stage of development of the learning technology. The factors of the external cultural and educational environment are different in nature and mechanisms of influence (informational, scientific-theoretical factors, trends in the development of modern geographical science, etc.). Attention is directed to those that have the greatest significance in the development of the general subject technology of education, first of all the educational policy and the educational situation in the country.

Educational policy as a product of socio-political and socio-economic conditions determines the "choice of education". (UNESCO, 1996) At this stage, it finds expression in the relevant normative documents: Law on preschool and school education and the Law on its amendment and supplement (see MES, Laws...pass.). The main provisions in these documents clearly define the direction towards approaching the European dimensions in terms of orientation and content, which is fully explained by the fact that our country is part of the European educational space.

Within the European Union, there are various strategies and programs that directly or indirectly affect the issues related to the application of the technological approach in the education system. At the regional level, efforts are mainly aimed at turning the European Union into a competitive knowledge-based economy. The Lisbon Strategy, the 2020 Strategy and programs such as "Lifelong Learning", as well as their accompanying sub-programmes, including the created coherent national strategies reflecting the individual specifics of the education systems of the member countries, direct attention in the same direction - improving the quality of education in



The European Union. In general, they aim to improve the quality and synchronize the levels of knowledge, as well as the acquisition and improvement of key competences. For the purposes of this dissertation research, the reference framework for key competences prepared by the European Commission is of interest. In the context of the research, an application of the technological approach is found regarding the realization of all the set key competencies for the learning process. (see MES, Competency approach... pass.) The national strategies for lifelong learning for the period 2014-2020 generally specify the priorities of the state policy regarding increasing the quality of education and training. As a priority, it is defined "*the implementation of an educational approach that supports the development of all learners and contributes to the building of thinking, capable and proactive individuals, able to cope with changes and uncertainty*" (see Lifelong Learning Strategy, EC... pass.). Support for the acquisition and continuous development of key competences for lifelong learning is outlined in the document as an area of impact for achieving the strategic goal. For the purposes of this dissertation research, point 3.3.4 is of interest, referring to Improving the quality of school education and training for the acquisition of key competencies, improving student achievement and personality development. The specific goals set in the strategy of the above-mentioned point, which are also of interest for the present study, are:

- changing the learning process, promoting the development and acquisition of key competences and their orientation towards provoking independent and critical thinking, independence, towards the formation of practical skills and towards the intellectual development of a personality;
- creating favorable conditions for learning and development in the school education system by building a modern educational environment based on modern technologies...
- **improving the technology of education with alternative forms and methods of work...**

According to the aforementioned in the normative documents, there is a reason to seek realization of the key competences through the application of Maria Montessori's methodology, which in turn is a reason for its implementation in the general subject technology in geography education.

### **3.2. Factors of the internal educational environment**

The studies of the internal cultural and educational environment provide the most general information about the factors that ensure the modern functioning of geographical education in

Bulgaria. This information makes it possible to outline its achievements and highlight its problems. As factors influencing more specific decisions on the functioning of geographic education, the normative (DOI and curricula), the informational-methodological (textbooks), human resources and good practices are indicated. In addition to these factors, the material base and the qualifications of the teachers are defined as factors of the local environment, having an impact on the implementation of the educational process in practice. Extensive studies of the above-mentioned factors have already been carried out in our country (e.g. Gaitandzhieva, 2000, Vasileva, 2015). They focus on some main aspects:

- lack of unity in the planning of the entire training process;
- lack of complete author's concepts and reliability of the procedure for their evaluation;
- dominance of the traditional learning style and hesitant entry of innovations into it.

Solving these problems presupposes *"above all else, unifying the efforts of the geographic community around common goals and tasks, as well as its creative interaction with other communities."* (Gaitandzhieva, 2000, 111)

For the purposes of the present research, extensive studies related to the internal cultural and educational environment have been carried out (see the third chapter). Based on the results of these studies and their analysis, real possibilities for applying Maria Montessori's methodology in geography education technology are sought.

#### **4. Adaptability of Maria Montessori's methodology in the general subject technology of geography education**

**Adaptability** is assessed on the basis of a comparative analysis of all its main attributes with those of the geography teaching methodology, partially presented in tabular form.

<b>Attribute</b>	<b>Maria Montessori's methodology</b>	<b>geography education methodology</b>	<b>Adaptability</b>
<b>Goals</b>	To form an all-round development of the student's personality by stimulating his independence.	To form the geographical culture of students as part of their general culture for understanding and reasonable activity in the geographical space.	Geographical culture is an essential part and stage of the all-round development of the student's personality.
<b>Educational content</b>	A set of knowledge, skills, competencies and models of behavior and	A set of knowledge, skills, competences and models of behavior and	Enrichment of the normatively regulated educational content based

	value orientations that students acquire in the learning process based on their own interests, personal freedom and choice.	value orientations that students acquire in the learning process, having a generally mandatory nature.	on the interests and personal choices of the students.
<b>Educational process</b>	It is done through a Big Lesson and a Presentation.	It is carried out through the geography lesson, in accordance with the new realities.	
1. Subjects	Equality between subjects with an emphasis on the main actor role of the student.	Equality between subjects with an emphasis on the main acting role of the teacher.	Equality between subjects with a non-significant difference in perception.
2. Learning principles	Independence, activity, individual approach, visibility, relevance, proximity to the surrounding space. Creativity and creative approach, environmental education, "educazione cosmica".	Self-activity, activity and awareness, individual approach, clarity, complex thinking and structuring, relevance, local lore principle, global education, ecological education.	Almost complete adaptability of training principles.
3. Teaching methods	Enhanced interactive approach.	Introduction of new teaching methods.	
4. Didactic means	A mandatory component in the learning process, developing the mind and intellect.	Mandatory component in geography education (geographical map, globe), developing specific competence.	High degree of compliance regarding interactivity in the learning process.  General mandatory character. Specific application.

<b>Control</b>	Cognitive, relational and motivational in nature with an emphasis on self-esteem.	A main unit and an irrevocable component in the learning process with a regulating and motivating effect.	Correspondence concerning the regulating and motivating character.
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**Table 1.3.** *Adaptability of Maria Montessori's methodology in the general subject technology of geography education*

What is indicated in the table marks a clear closeness in the two methodologies, which is a reason to integrate the main ideas from Maria Montessori's methodology into the general subject technology in geography education. This solves the second task of the dissertation research.

For the purposes of the study, the adaptation of the methodology is tentatively designated as a technology of self-development in geography education.

### **CHAPTER THREE. BASIS FOR CONSTRUCTING THE TECHNOLOGY OF SELF-DEVELOPMENT IN GEOGRAPHY EDUCATION. AUTHOR SCIENTIFIC WORKSHOPS BASED ON MARIA MONTESSORI METHODOLOGY**

In the third chapter, the basis for constructing a technology of self-development in geography education is presented. A set of author's scientific workshops is presented.

#### **1. Construction of self-development technology in geography education**

Crafting a technology of self-development in geography education concerns the last main task of the present research. It refers to the actual stage of the development of the general subject technology of geography education and, more precisely, to its design.

The technology of self-development can be developed on the basis of the presented statements and situations in the first and second chapters of the dissertation research. It is adaptable, both for the junior high school and high school stages, in their part for the general compulsory preparation, as well as for the profiled preparation. It contains up-to-date theoretical interpretations of basic issues related to the geography education system and outlines a macro-framework related to basic decisions for a qualitative change in its functioning with a view to stimulating motivation in the learning process. It can be developed on the basis of the tasks carried out so far, as well as on the basis of the philosophy of geographical education in the new realities, based on four pillars:

- Geography education must overcome its primarily informative and cumulative function and take another direction of development - to affirm a productive, formative function, to bring the student's personality to the fore. In this way, it will respond to the challenges and trends of the time in which we live, to the needs of young people, the state, society.
- In terms of content, the teaching of geography should be resolutely humanized. It is necessary to emphasize the ideas of sustainable development, the democratic idea and civil society necessary for understanding local, regional, global environments and events. On a personal level, the student's opportunities for choice in the educational process, for successful lifelong learning, for personal expression and progress should be expanded.
- Education in geography must combine traditions that have preserved their value with innovations, in order to preserve achievements and the feeling of national belonging on the one hand, and to integrate Bulgarians with European and world dimensions and standards in education, on the other. Important in this direction are the ideas laid down in the International Charter for Geographical Education (see International Charter for Geographical Education, "Geography"...pass.), in the report of the International Commission on Education to the United Nations (The learning generation, Education Commission...pass .), as well as the fact that this is one of the goals of our educational policy, which has been reflected in the relevant state documents (see Ministry of Education, Laws...pass.).
- Changes in geography education should be made based on developed scientifically based long-term strategies as a tool for high quality decision-making.

The technology of self-development as a sub-model in the general subject technology in geography education can be constructed in three dimensions:

- Theoretical foundations - part of the external educational environment and a necessary basis for reasoning on the generation of ideas and alternatives;
- Specific elements - basic guidelines and priorities for improving geography education, with a view to solving identified problems and upcoming tasks (ideas, approaches, content, methods);
- Resource provision – specified in the spirit of what was stated on this issue in the previous chapters.

In its unity, the technology of self-development as a sub-model of the general subject technology of geography education should lead to ideas for a qualitative change in the functioning of subject education in the new realities. The comparative characterization of the attributes of Maria Montessori's methodology with those of geographic education made in the second chapter once again substantiates the construction of a similar submodel. Given the impossibility in the current dissertation research to construct it in its entirety, specific scientific workshops are being developed here, as a basis for constructing the technology of self-development in the teaching of geography in Bulgaria, on the example of the 5th grade. This concludes the final task of the dissertation research.

## **2. Original scientific workshops based on Maria Montessori's methodology**

For the preparation of possible options for the application of the Montessori methodology in the teaching of geography, the following framework was applied to the structuring of each of the workshops:

<p><b>Title of the scientific workshop</b></p> <p><b>General performance:</b></p> <p><b>Duration:</b></p> <p><b>Location:</b></p> <p><b>Number of participants:</b></p> <p><b>Age restrictions:</b></p> <p><b>Teacher involvement:</b></p> <p><b>Pre-prep time:</b></p> <p><b>Preliminary preparation:</b></p> <p><b>Time to tidy up after the workshop:</b></p> <p><b>Tidying up after the workshop:</b></p>
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**Working materials:**

**Goals: 1. Knowledgeable:**

**2. Psychological:**

**3. Aesthetical:**

**Content**

**Plan scenario:**

**Consolidation:**

**Risks:**

**Table 2.** *An example framework for preparing a scientific workshop according to the methodology of Maria Montessori*

The developed workshops are adapted to STEAM<sup>1</sup> training in view of the current trends in the new state policy and the implementation of new STEAM technologies in the country. The main idea is to get the maximum applicability of the workshops presented.

The scientific workshops presented in the dissertation research are the following: **Workshop 1.** Construction of the Earth. Tectonics; **Workshop 2.** Relief - external forces; **Workshop 3.** Relief - internal forces.

### **3. Experimental study**

#### **3.1. Approbation and results**

A selected school in the city of Sofia - 93 SU "Alexander Teodorov-Balan" participated in the experimental study on the application of Maria Montessori's methodology in geography classes.

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<sup>1</sup> **STEAM (аиџ.)** - STEAM education is achieved by offering laboratory activities to children and youth in which all scientific disciplines included in the acronym (Science, Technology, Engineering, Art and Math) and many others are integrated in creating activities of all kinds involving visual methods and games.

In 93 SU "Alexander Teodorov-Balan" the children are of different ethnicities, as well as of diversified socio-economic origins.

One of the objectives of the implementation of the workshops on the methodology of the Italian scientist is to support the work of the geography teacher.

In the context of the work in the mentioned school, there was a need to answer the following questions:

1. Do the science workshops fully reflect the principles of Maria Montessori?
2. Is there achievement and interest among the children in the experimental classes and what is their level compared to the averages shown?
3. How is the application of the methodology perceived by the parents of the participating students?

*The initial phase* of the research involved the design and layout of the workshops. Their theoretical framework adheres entirely to the thought and concept of Maria Montessori. The main activity was following the directions of the teacher, which helped to identify the elements at the basis of her educational ideas. The collection of theoretical material and its shaping according to the Montessori methodology included the use of quality tools to complement and facilitate the learning environment in geography classes.

In the *second phase*, dedicated to the implementation of the scientific workshops, sample questionnaires were also included as a form of feedback, with the aim of tracking their perception by teachers, students, as well as their parents.

The second phase is based on the theory of self-efficacy according to Bandura (Bandura, 1995), with special attention being paid to the role of the teacher and the feeling of "well-being" or success of the students in the work process. (Ryan&Deci, 2000)

The results of the questionnaires used were excellent in a didactic context, given the students' free choice, the learning environment, the provided sensory materials inviting self-correction, the absence of tests and assessments, the feeling of success (by the students and their parents).

### **3.2. Participants**

The workshops were tested over the course of one academic year at the specified school. It was held in the morning and afternoon hours with an average duration of 40-80 minutes for each workshop.



The teacher self-efficacy scale was administered to the participating teachers. The questionnaire to identify the sense of achievement in school was given to the students and done on site in the classroom. It includes seventy answers. The total number of students in the three classes is seventy-three, but on the day of assessment three of the children were absent. Forty-eight parents responded and sent their question forms back on time. If we consider that of these seventy-three students, three are brothers, then we can say that 68% of the parents agreed to cooperate in the data collection phase.

### **3.3. Control group**

The matrix that gives an accurate answer to the effectiveness of classroom workshops is prepared specifically for the specific activity. Its purpose is to trace in detail the application of the Montessori methodology in the reality of the municipal school.

As a control group, it was decided to observe the fifth and sixth grades of 93 SU "Alexander Teodorov-Balan". Both classes adhere to the traditional teaching method. The children in the specified classes did not differ from the experimental classes in terms of age, origin and number.

### **3.4. Instrumentation and data collection**

The study used four main instruments: a checklist to guide classroom observations, a QBS questionnaire aimed at students, a QBS questionnaire aimed at parents, the self-efficacy scale aimed at investigating the perception of self-efficacy by teachers.

The following tools were used:

#### **Classroom observation. Observation checklist**

The checklist that supports the monitoring phase of the studied schools was specially built on the basis of the educational workshops. The observations aimed to find out the importance of the workshops and whether they are able to help teachers in geography classes.

The observations aimed to discover, as already mentioned, the adaptability of the principles of Maria Montessori in the practice of teaching geography in the secondary school and to reorient, in a possible second moment, the way of action of the teachers.

After the first phase of validation (mentioned above), the checklist was used during observation sessions in all participating classes, which were held regularly throughout the year of the study. Checklist items detect the presence or absence of the behavior that is the subject of the observation itself, and in many cases the intensity or frequency is also indicated by applying a

variable scale (definitely; no/never; no/rarely; enough/sometimes; yes/ often; definitely yes/always). The tool is organized into four main areas that represent essential variables and cannot be ignored in any learning context: the classroom environment, the student, the teacher and the material.

### **Perceived well-being and the QBS questionnaire**

The questionnaire on the quality of school well-being is the instrument that was chosen to deal with this phase of data collection, which is considered extremely sensitive, as it aims to explore the perspective directly of students and their parents. The QBS questionnaire was designed to explore children's subjective perspective on their school life and was therefore chosen as a data collection instrument to be administered to children from the experimental classes as well as their parents who are guaranteed anonymity. The QBS questionnaire in the children's version was used, which was administered at the end of the study.

Both options have five scales. In the first case (QBS questionnaire for children), the scales are organized as follows: satisfaction and recognition, relationships with teachers, relationships with classmates, emotional attitude at school, sense of self-efficacy at school before and after the science workshops (children fill in the two times). In the second case (QBS questionnaire for parents), the scale is adjusted as follows: parents' personal experience, assessment of the child's learning, emotional experiences and awareness of the child, contact with teachers before and after the scientific workshops (parents fill in the questionnaires twice ). Versions of the questionnaire are available in the appendices.

### **Self-efficacy and the Teacher Evaluation Scale**

The beliefs that teachers have about their effectiveness directly influence the way they work and the learning process, as well as the building of children and young people's sense of self-efficacy. Teachers' persistence, enthusiasm, commitment, and behavior are strongly related to their sense of self-efficacy and can exert predictive value on student learning outcomes and motivation.

## **4. Data analysis**

Data analysis is carried out through the observation matrix of the different elements of the study. From it, a variable is taken, divided into the four conceptual categories, hypothesized on the basis of the main pedagogical principles of Montessori, deepened in the part dedicated to the theoretical frame of reference: environment (from 3C1 to 3C8), students (from Y1 to Y10),

materials (from PM1 to PM5), teacher (from XX1 to XX9). Each of these dependent variables is on a discrete interval scale. The time variable is also on a discrete interval scale and represents the months since the first observation (which takes the value 0). The class variable is a three-level factor on a nominal scale, one for each of the classes studied.

In addition, measures taken from the scale of the QBS questionnaires and the Teacher Self-Efficacy Scale were taken into account: according to the relevant standards, the first has five scales (for both parents and children), while the second (for teachers) has three. The values obtained by the participants in the scales are transformed into Z scores, taking into account the reference values specified in the standards.

The conversion to Z scores is necessary because it allows a better comparison between scales even on different questionnaires, bringing the values to a scale with a mean equal to 0 and a standard deviation equal to 1.

Statistical analyzes were performed with R software (R Core Team, 2016). The first analysis is aimed at checking whether there is a trend of improvement, traceable over time, in the different variables of the elements in the observation network. A series of analyzes were performed using the "gls" function, which estimates a linear model using generalized least squares.

The second analysis aims to investigate whether there are differences in the different scales with respect to the standards and with respect to the studied classes. The scales derived from the QBS questionnaires and the Teacher Self-Efficacy Scale were examined using three mixed analyzes of variance calculated with the "aov" function, one for each questionnaire. Scales derived from the questionnaires were represented by within-subjects factors (at 5 levels for the QBS and at 3 levels for the Teacher Self-Efficacy Scale), while class was a between-subjects factor (3 levels). As the values are already present in the previous analysis, descriptive analyzes of the questionnaire scale are not presented.

## **5. The results**

Tables 15 to 18 show the results of the GLS analyzes divided into 4 categories of observations. When the value of p. is less than 0.05, then there is a trend significantly dependent on Time for the variable in question. In case the statistics have a positive value, the trend is increasing. In case it has a negative value, then the trend is down. Corresponding plots are also reported for variables with  $p < 0.05$ .

## 5.1. ENVIRONMENT

Variable	Effect	Value	Statistical error	Value t.	Value p.
<b>ENVIRONMENT 1</b>	Scope	3,301	0,202	12,226	<0,001
	Time	0,031	0,015	1,923	0,066
<b>ENVIRONMENT 2</b>	Scope	2,700	0,194	13,798	0,000
	Time	0,061	0,014	4,118	<0,001
<b>ENVIRONMENT 3</b>	Scope	2,791	0,198	14,026	0,000
	Time	0,090	0,014	5,904	0,000
<b>ENVIRONMENT 4</b>	Scope	-0,008	0,235	-0,038	0,969
	Time	0,046	0,016	2,661	0,015
<b>ENVIRONMENT 5</b>	Scope	0,658	0,188	3,481	0,002
	Time	-0,011	0,013	-0,845	0,405
<b>ENVIRONMENT 6</b>	Scope	1,031	0,127	8,027	0,000
	Time	-0,002	0,008	-0,384	0,702
<b>ENVIRONMENT 7</b>	Scope	0,285	0,110	2,560	0,017
	Time	-0,006	0,007	-0,885	0,383
<b>ENVIRONMENT 8</b>	Scope	2,794	0,270	10,305	0,000
	Time	0,063	0,021	3,055	0,004

**Table 3. Survey-derived values are reported for each of the observations of the category "Environment"**

Items related to cleanliness (QC1), order (QC2), care of the environment by children (QC8) show a significant growth trend, as well as those related to the clarity with which classroom materials are organized (QC3) and the presence of new elements (CC4). The graph below shows the observational scales that achieved a significant trend with probability values lower than <0.05.

Figure 5. shows the graph of the aforementioned analyses.

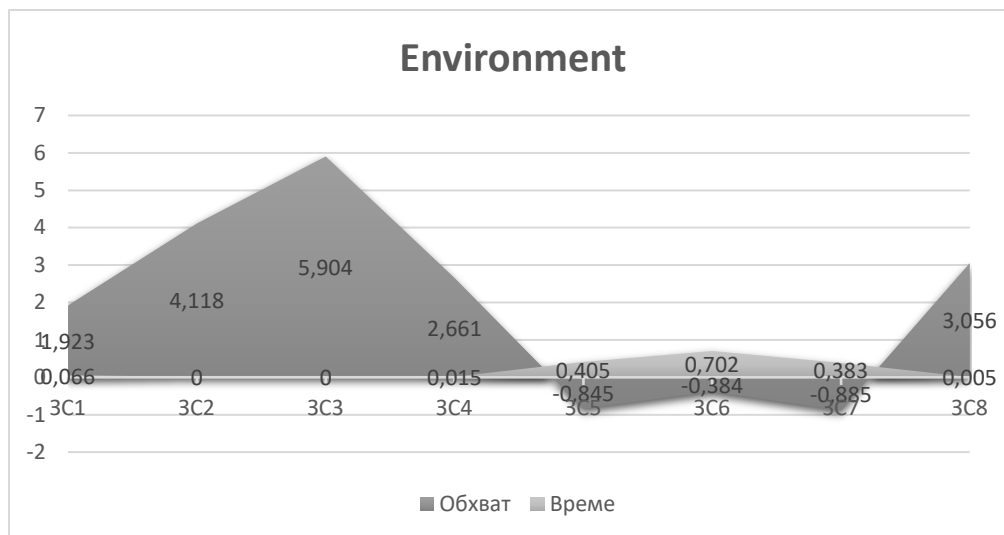


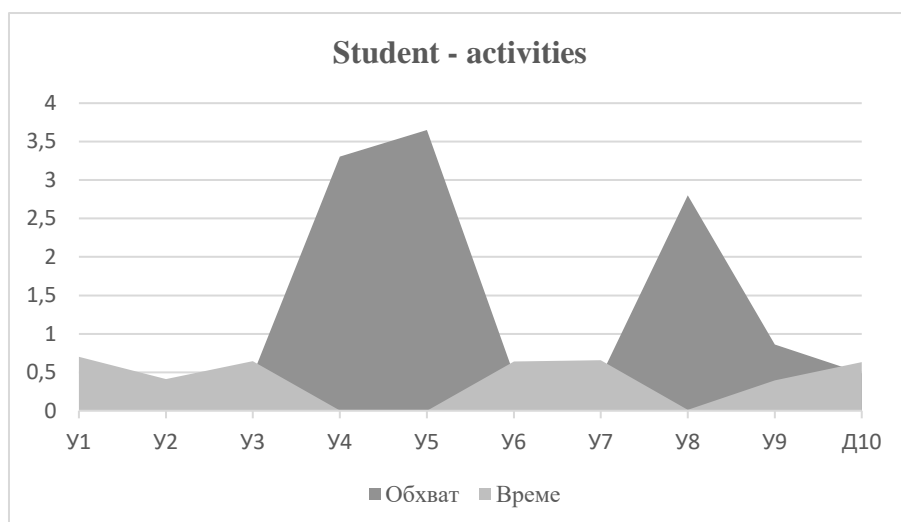
Figure 5. Predicted trend for the 'Environment' variable

## 5.2.Student

Variable	Effect	Value	Statistical error	Value t.	Value p.
Student 1	Scope	3,945	0,231	17,0	0,000
	Time	-	0,017	-	0,701
Student 2	Scope	3,070	0,336	9,132	0,000
	Time	-	0,026	-	0,411
Student 3	Scope	3,465	0,293	11,7	0,000
	Time	0,010	0,022	0,466	0,643
Student 4	Scope	4,328	0,209	20,5	0,000
	Time	0,053	0,016	3,303	0,002
Student 5	Scope	3,173	0,208	15,1	0,000
	Time	0,057	0,016	3,651	0,001
Student 6	Scope	4,050	0,200	20,0	0,000
	Time	0,006	0,015	0,468	0,642
Student 7	Scope	4,714	0,217	21,4	0,000
	Time	0,006	0,016	0,445	0,658
Student 8	Scope	3,218	0,246	13,0	0,000
	Time	0,053	0,018	2,803	0,010
Student 9	Scope	1,115	0,188	5,897	0,000
	Time	0,012	0,014	0,863	0,394
Student 10	Scope	4,347	0,302	14,2	0,000
	Time	0,010	0,022	0,485	0,631

Table 4. Survey-derived values are reported for each of the observations in the category "Student"

Table 16 shows how the items related to the diversification of activities carried out by students (Y4) and the favorite place to work, which can be different from the rank (Y5) or the classroom (Y8), show significant growth over time. Figure 6 shows the graph of the aforementioned analyses.



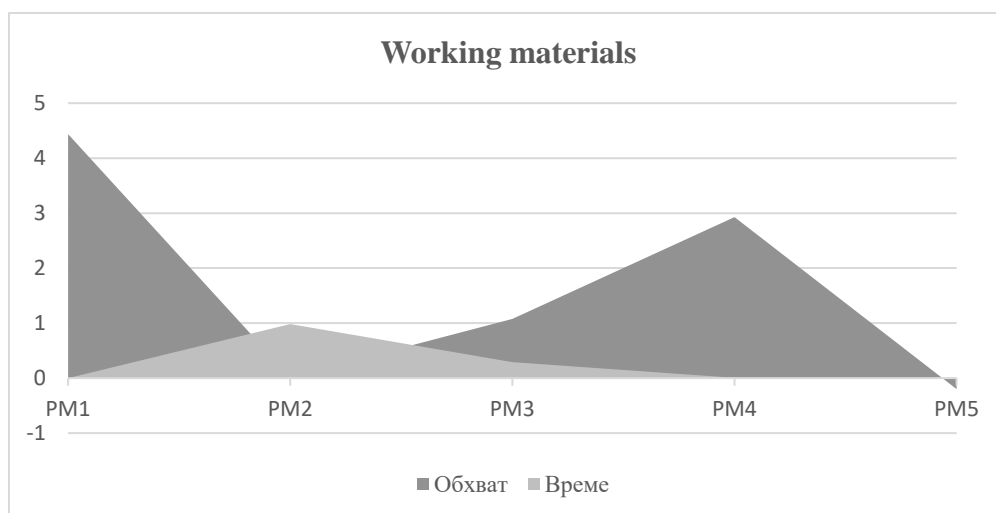
**Figure 6. Predicted trend for the variable "Student - Activities"**

### 5.3. Working materials

Variable	Effect	Value	Statistical error	Value	Value
Working materials 1	Scope	2,888	0,231	12,456	0,000
	Time	0,078	0,017	4,437	<0,001
Working materials 2	Scope	3,552	0,254	13,964	0,000
	Time	<0,001	0,018	0,018	0,983
Working materials 3	Scope	2,942	0,240	12,211	0,000
	Time	0,020	0,017	1,075	0,292
Working materials 4	Scope	2,873	0,271	10,544	0,000
	Time	0,060	0,021	2,926	0,008
Working materials 5	Scope	3,027	0,205	14,691	0,000
	Time	-0,004	0,017	-0,200	0,841

**Table 5.** The values obtained by the survey for each of the observations from the category "Working materials"

In the careful analysis of the values obtained based on the study of the Montessori materials used in the experimental classes, it can be noticed that they show less interest on the part of the students in the absence of them and more attention to them during the months of their use and diversification. Figure 7 shows the graph of the aforementioned analyses.



**Figure 7. Predicted trend for the variable "Work materials"**

#### 5.4. Teacher

Variable	Effect	Value	Statistical error	Value t.	Value p.
Teacher 1	Scope	3,159	0,351	8,985	0,000
	Time	-0,005	0,027	-0,210	0,833
Teacher 2	Scope	3,701	0,335	11,038	0,000
	Time	-0,017	0,026	-0,670	0,508
Teacher 3	Scope	2,614	0,314	8,323	0,000
	Time	-0,020	0,024	-0,835	0,410
Teacher 4	Scope	3,412	0,319	10,665	0,000
	Time	0,030	0,024	1,227	0,230
Teacher 5	Scope	1,891	0,328	5,761	0,000
	Time	-0,013	0,025	-0,532	0,597
Teacher 6	Scope	5,064	0,083	60,668	0,000
	Time	-0,007	0,006	-1,186	0,246
Teacher 7	Scope	2,336	0,193	12,072	0,000
	Time	-0,013	0,015	-0,912	0,370
Teacher 8	Scope	2,821	0,358	7,863	0,000
	Time	-0,018	0,027	-0,667	0,510
Teacher 9	Scope	3,315	0,182	18,129	0,000
	Time	0,042	0,014	2,961	0,006

**Table 6.** Survey-derived values are reported for each of the observations in the "Teacher" category

Table 18 shows how the observations of teacher behavior show that the variable related to informal communication between colleagues or between teacher and parents (C9 in Table 16) varies over time. Figure 8 shows the variable in question.

The observations were applied to more basic geography teachers, with whom SU "St. Kliment Ohridski" has a contract and who use some of Maria Montessori's ideas in their work. The reason we added more teachers is our desire to have a wider base of comparison.



**Figure 8.** Predicted trend for the “Teacher” variable



## CONCLUSION

The rapid development of information and communication technologies, taking place in the modern conditions of dynamically changing life, cannot automatically guarantee the improvement of education in general, nor of geography education in particular. Exactly the opposite. The quality and effectiveness of education and training in geography are to the greatest extent determined by the adequate application of the ideas of pedagogical technology. These ideas are based on the modern achievements of a number of sciences related to the optimization of teaching and learning. It is undeniable that new pedagogical technologies and interactive communication networks significantly increase cognitive abilities, provide unlimited opportunities for creativity, cooperative learning and collaboration. As carriers of individual and collective cognitive processes, on the one hand, they condition the manifestation of new ways of knowing and a new attitude towards knowledge, on the other hand, they significantly expand the possibilities of modern teaching and learning. In this regard, modern education requires changes in terms of:

- The content and structure of learning activities, which should be more diverse, more dynamic, with greater communication between subjects and maintaining high motivation in the learning process;
- The assessment of achievements, which should be aimed at performing complex cognitive procedures;
- Taking into account the personal experience of each learner, requiring to take into account the level of knowledge of the students, their experience and their own opinion;
- Using an individual and differentiated approach with a view to respecting the individual characteristics of students;
- Application of teaching strategies and techniques to motivate and facilitate learning, to use rational techniques with a view to better understanding of the content and its more successful assimilation;
- Creating conditions for effective interaction between the students themselves and between teacher-student by implementing more joint activities in the learning process;
- Increasing the relative share of self-directed and independent learning by creating conditions for students to rely on their own strengths and learn to learn on their own.
- More dynamics, variety and emotions during training and beyond;
- Systematic inclusion of students in meaningful for them cognitive and practical activities;

- Greater attention to the personal, and not only to the cognitive development of each student;
- More frequent use of interactive methods;
- Maintaining regular feedback between the teacher and students throughout the learning process. (by Petrov and Atanasova, 2001)

The development and application of rational teaching technologies and learning techniques favors the transition between the traditional and the modern, through which the four main principles raised in the report of the International Commission on Education in the 21st Century can be realized much more effectively: learning to learn, to learn to do, to learn to live together, to learn to be. (43) Concrete possibilities for realizing the above-mentioned principles can be found in Maria Montessori's methodology.

The above-mentioned challenges directly affect geography education at the current stage. As a factor and criterion for changes in its quality, they direct efforts to different research positions. This explains the choice of the topic of the present dissertation research. The fulfillment of the three main tasks confirmed the initial hypothesis, which made the research relevant and timely. Its results can be summarized in three directions:

- Technology as a theory and methodology is investigated, based on which its main characteristics of a key category in the dissertation research for the construction of a conceptual model of general subject educational technology were derived.
- A private didactic interpretation of the methodology of Maria Montessori was made, characterizing all the attributes of the methodology and outlining the possibilities for its application in the general subject technology of teaching geography in the Bulgarian secondary school at the junior high school stage.
- Specific scientific workshops were developed, as a basis for constructing the technology of self-development in the teaching of geography in Bulgaria, for example in the 5th grade.

The results of the conducted research in perspective suggest purposeful activity in three plans:

- Theoretical-methodological, related to the development of the main ideas of the research, with their concretization and realization;
- Resource-related, related to the search for solutions and real actions for the management of normative, informational-methodological and human resources with a view to

ensuring an adequate and sustainable cultural-educational environment for the geography education system;

- Organizational-management, related to the creation and implementation of a final version of the technology of self-development in the teaching of geography, based on the main ideas brought out in the research.

## **CONTRIBUTIONS OF THE DISSERTATION RESEARCH**

As a result of the conducted research, the following contributing points of the dissertation work can be considered:

1. The technology as a theory and methodology was researched, on the basis of which a conceptual model of general subject educational technology of geography education was derived.
2. A new approach to examining the Montessori methodology is proposed - as a technology of self-development in the teaching of geography, justified by the trends in the modern development of geography didactics.
3. Based on the ideas of the methodology of Maria Montessori, a new structure of methodological development of the geography lesson, applicable in the practice of education, was constructed.
4. Specific methodological developments of scientific workshops with up-to-date educational content from the geography and economics curricula for junior high school are proposed. Scientific workshops enable their adaptation to STEAM technology training as well.

## **PUBLICATIONS ON THE TOPIC OF THE DISSERTATION RESEARCH**

Мишева, Ст. (2020) Приложимост на метода Монтесори в географското образование, научно списание "Известия на Българското географско дружество", София, 2021

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Мишева, Ст. (2020) Природната среда – основен дидактически ресурс в методиката на Мария Монтесори, Изд. Фондация "ЛОПС", София

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