ION CREANGĂ STATE PEDAGOGICAL UNIVERSITY CHISINAU

Manuscript:
U.D.C.: 37.091:911(043. 2) = 111

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DEVELOPING SPECIFIC GEOGRAPHY COMPETENCES THROUGH PRACTICAL ACTIVITIES IN HIGH SCHOOL STUDENTS

532.02. School Didactics
by educational levels and disciplines (Geography)

ABSTRACT

of the PhD thesis in Education Sciences

CHISINAU, 2025

The thesis was elaborated within the Doctoral School "Education Sciences","Ion Creangă" State Pedagogical University, Chișinău, Republic of Moldova.

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The public defense will take place on 22.10.2025, at 02:00 p.m., in „Ion Creanga" State Pedagogical University of Chisinau, study building no 2, Senate Hall, at no. 1, I. Creanga Street, MD-2069.

The PhD thesis and its abstract can be found at the Scientific Library of the "Ion Creangă" State Pedagogical University, Chișinău (www.upsc.md) and on the ANACEC website (www.anacec.md).
The abstract was sent on 19.09.2025.

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CONCEPTUAL BENCHMARKS OF THE RESEARCH

The topicality and importance of the research theme results from the increased, fast, and permanent changes taking place in today's society "generated by the phenomenon of globalization, by the transition from the Information Society to the Knowledge Society" [11, p. 95], and also stems from a solid connection with the contemporary curricular paradigm oriented towards the modernization of education through competence development and the improvement of the quality of Geography learning. For the subject of Geography, since the textbook content is extensive, the time resource is limited, and practical activities (PA) are not available to the teacher, practical skills are poorly developed. To this are added the results of PISA assessments, which highlight the presence of functional illiteracy among students, despite theoretical preparation, but with deficiencies in applying the acquired knowledge to carry out specific practical activities. In view of recent findings in the field of education sciences, starting from the 1990s, a major interest in competence formation has been observed. A large number of countries worldwide are undertaking numerous changes in the field of education, focusing especially on the formation and development of competences, which bring multiple benefits to the individual and the social environment in which they are part, depending on the current economic field [10]. In this context, arguments regarding the topicality of the research arise from the content of official (conceptual and normative) documents, taking into account the epistemological aspects, developed:

- *at the level of international organizations*, which directly or indirectly support learning through competence formation, such as the Council of Europe- Department for Education and Training, or the Official Journal of the European Union, etc.
- *at the level of the Republic of Moldova*: the Education Law, the Education Code no. 152 of 2014 and of 2016, the National Curriculum Reference Framework [3], the Geography Curriculum, the Strategy on the Development of Education for 2021–2030 "Education – 2030" and its implementation through the Program, elaborated according to the provisions of the draft National Development Strategy "MOLDOVA 2030", aim in the field of education at providing all citizens of the Republic of Moldova with opportunities to form and develop, starting from an early age, their easy adaptability to the demands of everyday life as well as useful competences for social, professional, family, and personal life.
- *at the level of Romania*: the National Education Law no. 1/2011 partially replaced by the Law on Pre-university Education no. 198/2023, Geography Curriculum for the 9th and 10th grades (lower secondary education), Geography Curriculum for the 11th and 12th grades (upper secondary education), Benchmarks for designing, updating, and evaluating the national curriculum, Methodological benchmarks for the application of the Geography curriculum - high school education, as well as the reform program "Educated Romania".

In both countries, in the field of Geography, the *specific competences of geography/SCG* are clearly defined (called subject-specific competences in the Republic of Moldova, general competences in Romania, and subject-specific competences at the general level for any school subject) that the student must build based on the key/transversal competences, to form and develop them throughout the entire schooling period (at the end of each school year or at the end of a school cycle, or at the end of the compulsory education period).

Description of the situation in the field of research. According to the Education Code of the Republic of Moldova, Article 11 (1) of 2014, it is mentioned (as in the National Education Law 1/2011 of Romania) that education aims, besides developing the student's honesty, at forming a broad system of competences. A particular interest for scientific research regarding the definition of the concept of competence and/or school competence (SC) is presented by:

- *in the international context*, the groundbreaking studies of experts such as N. Chomsky, McClelland-the author of competence assessment, R. M. Gagne-who highlights the need for building competences indirectly (through the theory on the necessary conditions for learning and its outcomes), J. Cardinet, V. De Landsheere, R. Brien, B. Merene-Schoumaker, R. E. Boyatzis-the proposer of a competence model based on empirical research, and Ph. Zarifian who approaches competence by emphasizing the applied/practical intelligence of the situation for task-solving so that the student learns and develops professional practical skills. Later, experts such as J. Delors and collaborators, X. Roegiers, M. Minder [13], D. Dubois and W. Rothwell, B. Rey, A. Defrance, Șt. Pacearcă and S. Kahn, D. Masciotra [22], Ph. Jonnaert, M. Ettayebi and R. Defise (who mention the presence of three different interconnected directions related to curriculum, learning, and situation), Ph. Perrenoud (who emphasizes the theory of transversal competences), F. M. Gerard and X. Roegiers (who argue that the formation and development of competence is the result of all actions of training, activation, integration, and transfer of a complex set of resources for successfully addressing specific situations). The French scholar and associate professor at the University of Sherbrooke, Canada, Guy Le Boterf [16] expert in competence management and creator of the methodology "Agir et interagir avec compétence en situation"-classifies the knowledge underlying competence formation into: theoretical, procedural, and professional knowledge. Somewhat later, competence becomes a construct associated with a system of knowledge and resources (documents, data, and various tools) mobilized and intertwined with capacities, skills, attitudes, and values.
- *In the Republic of Moldova*, studies on the formation of competences and school competences from a conceptual perspective belong to researchers such as V. Cabac [20], L. Sclifos (investigative competence), L. Sadovei (communication competence) (2008), V. Guțu, M. Vicol and V. Guțu, R. Dumbraveanu, V. Pâslaru and V. Cabac—who view competence as a fundamental quality of the individual [11], I. Botgros, L. Franțuzan and C. Simion (knowledge competence based on the principles of science), V. Bîlici, T. Callo and M. Hadîrcă (communicative and literary competence), L. Lașcu and S. Gorea, etc.
- *In Romania*, the research on the concept of competence, school competence, and the didactics of its formation is reflected in the importance of the statements made by researchers such as D. Salade, L. Șoițu, and R. D. Cherciu, S. Cristea [6], C. Cucoș [7, p. 85], M. Manolescu, D. Potolea, I. Neacșu, R. Iucu, and I. Pânișoară- who highlight the three types of learning outcomes defining competence (knowledge, skills, and attitudes), D. Copilu and D. Crosman. A significant contribution to the study of didactic competence as a student's capacity to act and react with the required relevance to perform an activity in a given situation has been made by authors such as I. Cerghit [4], M. E. Dulamă, C. Bârzea [19], A. Ardelean, L. Catană, D. Badea and O. Mândruț [18], A. Ardelean and O. Mândruț, M. Niculescu, M. Manolescu and I. Negreț-Dobridor, I. Vlașin, N. Ilinca, N. Ilinca and O. Mândruț, I. Neacșu [14], A. Paniș [15], and T. Șova, who emphasize the formation and assessment of competences, as well as others. For some researchers, school/didactic competence (SC) assumes characteristics such as: educational value acquired by the learner at the end of schooling; the presence of three different yet interconnected directions relating to curriculum, learning, and situation; the student's ability; the interaction of the three elements: knowledge, capacities, and behavior; a set of declarative, procedural, and attitudinal knowledge activated for the purpose of performing tasks; children's resources stemming from their foundation; the learner's personality, and others. In other words, numerous researchers highlight the importance of forming competences as the foundation of current educational systems. Consequently, learning and developing them through practical activities would be the solution for the evolution of the current educational

system, enabling direct experience acquisition, the consolidation of skills, knowledge, and abilities, critical thinking, the depth and transfer of competences into "real" life. From this perspective, Geography, through its vision, specific content, and intellectual features [6], deepens certain aspects of education, and through ***practical activities***, contributes to transferring the abundance of theoretical details of the discipline into practice, following the model of authors from the community:

- *International*, where the approaches of researchers focusing on the analysis of practical activities (PA) are extremely relevant, as highlighted in their publications: the Italian pedagogue and physician M. Montessori emphasizes self-directed, active learning through PA; the American pedagogue and philosopher J. Dewey promotes learning through experience and PA; D. Kolb supports experiential learning; J. Piaget highlights the importance of PA, practical experimentation, and play [17]; C. Freinet stresses education through PA and work by introducing project-based learning; Ph. Perrenoud, J. Delors, and their collaborators, etc.
- *Republic of Moldova and Romania*: [1], [5], [9], I. Botgros, L. Franţuzan and C. Simion; L. Franţuzan [21]; [23], [24], [25], as well as B. Vulcu and L. Vulcu, M. Ionescu and I. Radu (the importance of practical exercises and active learning), I. Bontaș [2], I. Nicola (the formation of competences through active learning and PA, 1996), S. Cristea, I. Cerghit researching methods focused on discovery learning, PA, and the formation of practical competences [4], O. Mândruț, V. Ungureanu and I. Mierlă; I. Cucoș (the methodology of teaching and competence formation through PA) [7], M. Ielenicz and L. Comănescu (the importance of PA in geography), N. Ilinca and O. Mândruț, M. E. Dulamă [10] and N. Ilinca, highlighting the decisive role of PA in the formation of students' competences, as well as L. Ciascai who emphasizes project-based learning. The review of recent pedagogical studies concerning the topic of forming geography-specific competences (GSC) shows that a high level of competence development is linked to the quality of geographical preparation of high school students. However, the issue of GSC formed through PA as a component of school competence (SC) is little highlighted, allowing us to clarify the following **contradictions:** 1) between the needs of contemporary society and the low level of GSC formation in the teaching-learning process, due to the lack of a methodological framework for forming these competences through PA in high school students in the theoretical stream on the one hand, and on the other hand the low level of competences demonstrated in national and international PISA tests; 2) between the severe need for the training of teachers with deep preparation and high qualification for carrying out the educational process and the initial and continuous teacher training activities insufficiently oriented towards the formation of GSC through PA in high school students.

The investigated and solved scientific problem lies in determining the theoretical and methodological benchmarks that ensure the formation of GSC in high school students by optimizing and clarifying the needed PA.

The object of the research is *the process of forming* GSC in high school students through PA.

The aim of the research is *to establish the theoretical and methodological foundations* for the development and experimental validation of the Pedagogical Model and the methodology for forming GSC through PA. Thus, to achieve the proposed aim, the scientific approach has the following **operational objectives**: 1) to analyze the theoretical approaches to the concept of school competences in general, to GSC in high school students, and to PA in Geography in particular; 2) to identify the theories, principles, paradigms, and pedagogical models for forming specific competences through PA; 3) to diagnose the level of GSC formation through PA in high school students (the formative experiment); 4) to develop, theoretically conceptualize, and experimentally validate the Pedagogical Model and methodology for

forming GSC through PA.

Research hypothesis: The formation of GSC through PA in high school students will prove its effectiveness in the teaching–learning–assessment process of Geography if this formation is configured according to: 1) the Pedagogical Model for forming GSC based on the aspects of PA; 2) an authentically developed methodology focused on forming GSC through PA in Geography lessons; 3) the implementation of the Pedagogical Model and methodology for forming GSC through PA by Geography teachers, significantly improving the performance of high school students and the educational value as an effect of the experimental intervention at the three levels of GSC formation - knowledge and understanding, application, and integration. 4) the involvement of students in PA contributes to the transfer, consolidation, construction and application of geographical knowledge in various contexts. To conduct the research and achieve the stated objectives within the epistemological benchmarks, the following **methods** were applied: 1) theoretical-scientific documentation, analysis of pedagogical phenomena and regulatory documents, synthesis, comparison, correlation, deduction, generalization, systematization, classification, and theoretical modeling of schemes; 2) experimental-the pedagogical experiment with the following stages: initial and final questionnaires for assessing the GSC level in high school students, tests, observation of student behavior, analysis of student work products, evaluation and self-evaluation of performances; 3) interpretative/analysis, processing, and interpretation of data through their graphic representation (tables, charts, and diagrams).

The scientific novelty and originality of this research lie in the development and validation of the Pedagogical Model and Methodology, based on the current relevance of the topic, aimed at building GSC through PA within the STEM/STE(A)M project, adapted to the modern school setting; the operational structure of the proposed Model, as it does not remain at the theoretical level but is practically applicable, involving the active participation of high school students; the step-by-step organization of PA and their use as the main method for forming GSC in high school learners; the integration of the stages of GSC formation into a unified pedagogical model; collaborative learning and the fostering of autonomy in the educational process; mixed assessment (observation, questionnaires, tests, project outputs) designed to provide a broader and clearer picture of the learning process.

The theoretical significance of this research highlights importance and enriches brought to Geography Didactics through: the analysis of theoretical approaches to SC in general, as well as to GSC and PA in particular, from both a structural and methodological view; the development of taxonomic features of competences in the Republic of Moldova and Romania; the description of the curricular status of GSC and PA at the high school level in both countries; the emphasis on the role of PA in forming SC at the high school stage; the design of an applicable Pedagogical Model, validated together with the methodology for forming GSC through PA in high school students; the blending of modern teaching tools (field-based, cartographic, digital) with interactive assessment methods tailored to the nature of geography and aimed at providing a broader and more objective picture of students' growth; the presentation of different task types; the openness to innovation through a modern orientation, aligned with the STEM/STE(A)M paradigm and European educational trends, thereby contributing to the modernization of pre-university geography teaching. All these aspects of the research can be applied in school practice, integrating PA to increase high school students' interest in studying geography and to enhance the use of mixed assessment methodologies; they can serve as methodological support for the professional growth of geography teachers; and they can be used in curriculum development and in interdisciplinary educational projects,

supporting the modernization of Geography teaching.

The applied value of this research is reflected in: the practical implementation of the Pedagogical Model and methodology for forming GSC in high school students through PA in the study of Geography; the use of the results obtained, of the design and the tools applied in forming GSC through PA in high school students, which can shape the formative process in building their competences closely tied to the stages of development and the levels of progress assessment; the improvement of school performance and the fostering of student autonomy through the effective use of PA; the enhancement of Geography teaching by the teachers involved in the educational process.

The main scientific results obtained and submitted for defense, which have helped clarify the scientific problem are linked to: the development and validation of the Pedagogical Model for forming GSC through PA in high school students; the creation of conditions for covering the stages of GSC formation through PA aligned with the levels of assessment and performance; the validation through statistical methods of the impact of PA on forming GSC; the modernization of Geography Didactics through the integration of the stages of SC formation in line with the current educational demands and the requirements of today's educational reform, focused on competences and the integration of interactive and interdisciplinary methods.

The implementation of the scientific results was carried out through the pedagogical experiment conducted at "Alexandru Odobescu" National College, Pitești, and "Ion C. Brătianu" National College, Pitești, Romania, as well as through the dissemination of findings at specialized scientific events.

CONTENTS OF THE THESIS

The **Introduction** argues the topicality and relevance of the research theme, formulates the investigated problem, and outlines possible directions for its solution. It also defines the aim, objectives, and research hypothesis, while the theoretical, conceptual, and methodological foundations are carefully explained and proved.

Chapter 1 "PEDAGOGICAL BENCHMARKS OF FORMING SCHOOL COMPETENCES THROUGH PRACTICAL ACTIVITIES" was defined and analyzes

1.1. The epistemological and theoretical foundations necessary for the scientific approach to the concept of SC, GSC, and PA, as well as the benchmarks supporting the proposed pedagogical model, in line with current research directions in geographical education. Moreover, the formation and development of competences represent a complex process aimed at transferring them from the classroom into everyday life, unfolding across various informal, formal, and non-formal contexts. Serving as an indicator of an individual's evolution and prospects of success in future professional activity, according to C. Bârzea [19] and other Romanian researchers, competence develops considering the student's potential to successfully manage a given situation. It relies on the skills and knowledge acquired in the past through learning processes that help the student solve problems and highlight their potential in the present. Analyzing the definitions and interpretations regarding the concept of competence, we note the complexity of achieving [23] a unanimous definition both internationally and within Romanian-speaking countries, where over the last 15 years it has been extensively debated.

1.2. The particularities of geography-specific competences in high school education, starting from the changes recorded (especially in the last 25 years in education), along with the evolution and development of multiple types of curricula over time, have led to the elaboration of the current curriculum. Regardless of the approach to curriculum development, it ultimately reflects the epistemological paradigm of knowledge and relies on a concept that defines and clarifies its three dimensions, according to R. Dumbrăveanu, V. Pâslaru, and V. Cabac (2014) [11]: the

teleological (projective) dimension, the technological (operative) dimension**,** the material (substantial) dimension. Consequently, the concept of school competence, which we have focused on, represents, according to the *National Curriculum Reference Framework* of the Republic of Moldova (2017), "a transferable package" with multiple uses of knowledge, skills, abilities, capacities, behaviors, and values that encourage the student to achieve professional fulfillment regardless of the field [3, p. 18]. The European Parliament in 2006 recommended eight groups of key competences on which the National Curriculum for primary, lower-secondary, and upper-secondary education can be based (the latter also focusing on the development and diversification of school competences). For the subject **Geography**, in the upper-secondary education system of the Republic of Moldova and Romania, the taxonomy of curricular competences shows certain differences, presented in Table 1.1**:**

Table 1.1. The Taxonomy of Competences in the Republic of Moldova and Romania for the Subject Geography

No. crt.	Republic of Moldova	Romania
1.	Competence - key/transversal (in no. 8)	Key competence - (in no. of 8)
2.	Transdisciplinary/Transferable Competences (by educational levels, until 2019)	
3.	Subject-Specific Competences / GSC / by School Subjects (consisting of 5 for each educational level) [28, pp. 4–6], common to both general education (Grades I–IX) and upper-secondary education (Grades X–XII).	General competences, common to both the lower-secondary cycle (Grades IX–X) and the upper-secondary cycle (Grades XI–XII): 6 for the upper-secondary cycle (Grades IX–XII) and 4 for SAM.
4.	Competence Units / Pre-Acquisitions / Specific Competences (SC) of the Learning Unit (12 for each grade [28, p. 4]), designed so that the level of complexity increases at each stage of learning.	The specific competences (SC) are individualized by chapters and by the content of school geography according to the methodological benchmarks for Grades IX–XII and differ in number for each school year [32]: 28 for Grade IX, 22 for Grade X, 17 for Grade XI, and 15 for Grade XII.

The formation and development of geography-specific competences (GSC) in school, assessed at the end of the learning period, require the creation of learning situations (experiments, exercises, measurements, etc.) and tasks, since each subject-specific competence is formed/developed within learning activities [1, p. 81], [10] throughout the entire schooling period. This leads pupils to find different answers when trying to solve various problems through in-depth analysis, requiring the gathering of relevant knowledge, its development, the skills needed to solve the identified problem situations, as well as the acquisition of values and attitudes useful for reaching performance.

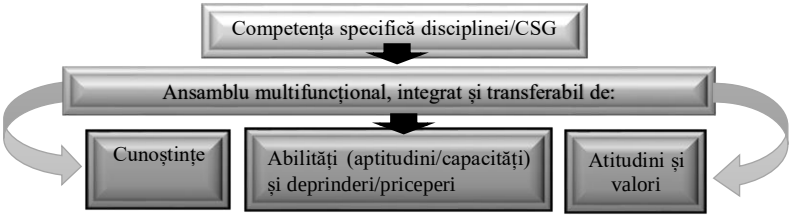

Figure 1.1. Structure of Subject-Specific Competences / GSC / General Competences

For this reason, (Figure 1.1) the attributes/dimensions of GSC in the simplest possible way, thus deducing the "triadic structure" [11, p. 66] of the competence. Sometimes the mentioned attributes may acquire different meanings depending on the context and can be assessed according to the levels of competence (knowledge and understanding, application, and integration) specific to each educational stage, the quality of intellectual actions performed, the way information is organized, processed, synthesized and the *manner of presenting the product either in written or oral form.*

1.3. The methodology for developing geography-specific competences through practical activities for high school students. Aiming to achieve the current educational goal of preparing students for adult life through practical activities (PA), we move from theoretical knowledge to practical skills and then to the formation of geography-specific competences (GSC) by directly involving high school students in carrying out PA and in the investigative analysis of problem situations within projects, using a STEM/STE(A)M approach aligned with the current learning orientation, while emphasizing their imagination and creativity.

Chapter 2. "THE PEDAGOGICAL MODEL AND METHODOLOGY FOR FORMING GEOGRAPHY-SPECIFIC COMPETENCES THROUGH PRACTICAL ACTIVITIES" Relevant pedagogical models were identified and applied as the foundation for developing our own methodological proposal.

2.1. Learning Models that facilitate the formation of school competences. Each model presents valuable aspects that we analyzed to identify the most suitable approach for facilitating the process of forming school competences, so that it can be successfully applied at the high school level to develop geography-specific competences (GSC). These include: the experiential learning model; the problem-based learning model; the practical work learning model, and the project-based learning model (with emphasis on STEM/STE(A)M project-based learning). The applicability of these models depends on the educational context and reflects contemporary approaches to education that emphasize active learning, interdisciplinarity, contextualization, and the development of GSC through practical activities (PA). Our approach was therefore based on scientifically validated principles, adapted to the specific context of geographical education. By combining elements of the selected learning models, we aimed to ensure a higher level of GSC development, which led to the creation of a pedagogical model for forming GSC.

2.2. Designing the Pedagogical Model for forming geography-specific competences through practical activities in high school students. Analyzing the specific realities of the Romanian educational system including its organizational framework, objectives, resources, and new working conditions faced by geography teachers we identified several challenges aligned with current societal expectations, as reflected in the questionnaire addressed to geography teachers (CDG). Among these are: the increasing demands each year for education quality despite the limited weekly hours allocated to Geography (as discussed in the previous chapter); the need for individualized approaches to students in the context of applying new educational technologies; the requirement to propose innovative, original concepts that can bring meaningful change to general education;society's demand for preparing students with free, independent, creative personalities, initiative, responsibility, and well-developed practical skills and abilities, despite the evident demotivation toward learning Geography (caused by its replacement as a compulsory baccalaureate subject with an optional one); the excessive curriculum load; the lack of dedicated hours for PA across all units and levels of education, etc. These considerations, together with a detailed analysis of the learning models, stimulated the idea of designing and implementing a Pedagogical Model for forming GSC through PA for use by geography teachers in pre-university education.

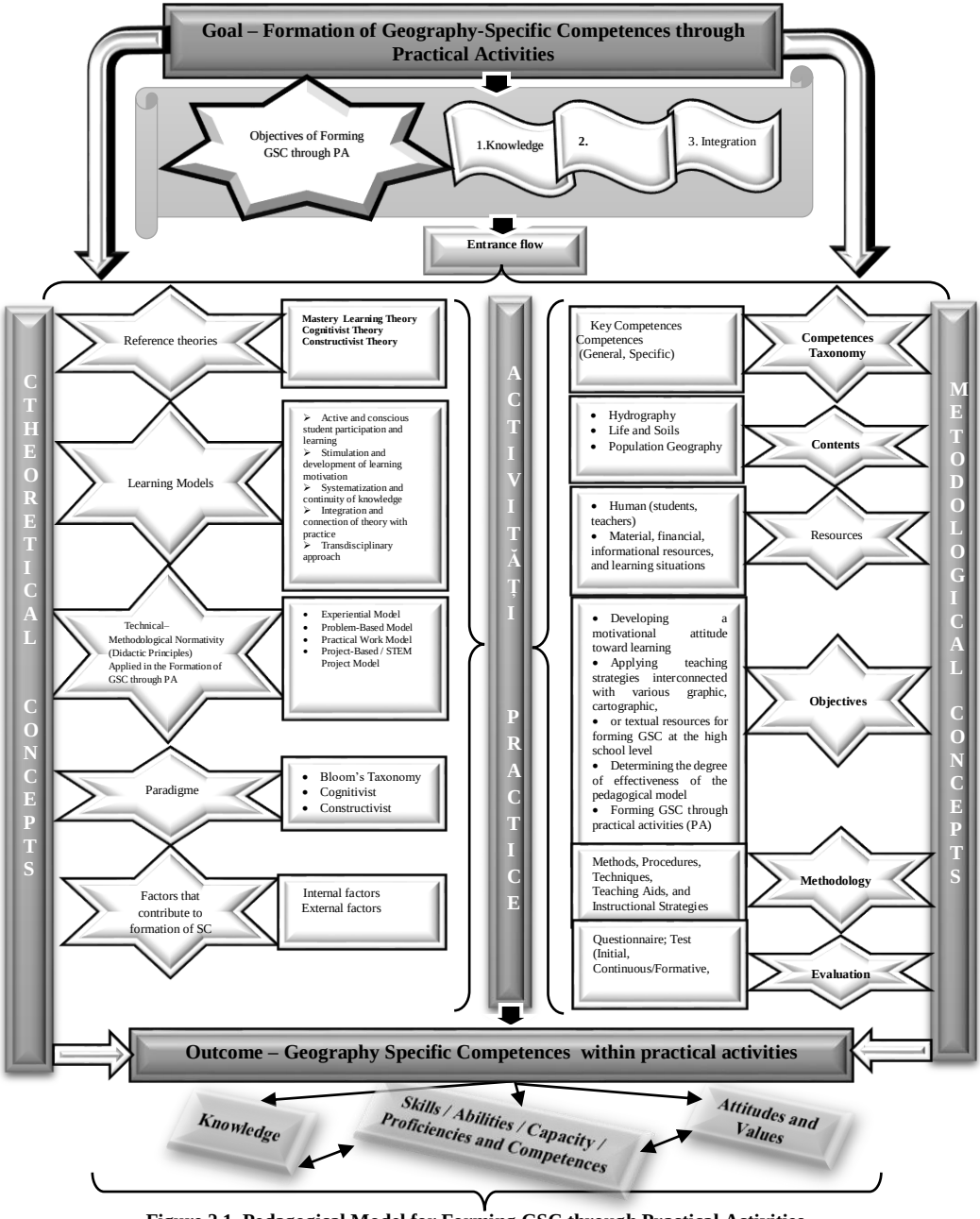

Figure 2.1. Pedagogical Model for Forming GSC through Practical Activities

This model is proposed as an optimal and effective strategy for current Geography teaching and for increasing students' motivation to study the subject. The developed model (Figure 2.1) was conceived as a phased pedagogical framework to help us understand the real learning process [11], aiming to increase the effectiveness of Geography learning for high school students and to adapt them to contemporary societal demands. It is viewed as a general and schematic representation that includes in its structure two types of concepts, each with distinct features, shaping the organization and design of teaching activities that contribute to students' education: theoretical and methodological concepts through which the pedagogical model is constructed. The theoretical concepts underlying the formation of GSC include various educational trends and perspectives connected to learning theories, through which we highlight the didactic principles applied in developing competences through PA. These are based on paradigms, learning models, and factors that support the formation of GSC in high school students through PA.

1. In designing the pedagogical model for forming GSC through PA, we selected three ***learning theories*** (Mastery Learning Theory, Cognitivist Theory, and Constructivist Theory) because they can be applied and developed, within certain limits, in the educational process. At their foundation stand regulatory documents guiding geography teachers in their professional activity, such as: the Recommendation of the Council of the European Union, the Education Code of the Republic of Moldova 2014, amended 2016 [26], the Education Development Strategy "Education 2020" [28]. J. Delors and his collaborators state that theories, at a general level, define the learning process or are parts of paradigms-verbalized frameworks that can be articulated, debated with arguments and counterarguments-as also noted by E. Joiță, who treats the Constructivist Theory as a theory of scientific knowledge, extending learning theory where the student focuses on practice while the teacher handles other tasks, less focused on direct instruction [12].

2. ***The didactic principles*** necessary for teaching and learning geography, which underlie the development of the Pedagogical Model for forming GSC through PA, are rooted in international and national legislation in line with current educational policies. They have a general character, being considered broad educational goals guiding teachers' activities or rules structuring the learning process, as described by A. Ardelean and O. Mândruț. These principles can be harmoniously combined in competence-based learning, adapted, and applied in various teaching contexts depending on the teacher. After analyzing the content, meaning, and classification of general didactic principles found in educational research literature and Geographywe described those considered fundamental in building the normative framework of the Pedagogical Model that supports GSC formation in high school students: Principle of students' active and conscious participation in learning; Principle of stimulating and developing motivation for learning; Principle of systematization and continuity of knowledge; Principle of integrating theory with practice; Principle of transdisciplinary approaches; Principle of thorough mastery of knowledge, skills, and abilities; Principle of accessibility of knowledge; Principle of localization, etc.

3. All these learning theories and principles, whose value is widely recognized and interconnected, lead to the development of ***learning models*** (mentioned earlier in section 2.1) focused on cognition and on forming and developing competences through PA. Students receive, process, and apply information appropriately so that learning occurs in a faster, simpler, and much more efficient way. In the learning models developed and structured by researchers, later adapted and used as theoretical and methodological benchmarks for designing school activities, PA are highlighted as essential for forming students' practical skills, without which

GSC cannot be effectively developed.

4. In the process aimed at forming high school students' aptitudes, abilities, and practical skills to prepare them for real-life challenges, three ***paradigms*** were analyzed as applicable, fundamental, and functional in geography learning: *the paradigm of Bloom's Taxonomy, the Cognitivist Paradigm, and the Constructivist Paradigm*. These involve a specific worldview shaping the set of theoretical values developed in high school students. We note that the key term representing the paradigms lies in mental processes for Cognitivism and in the theorization and construction of knowledge for Constructivism, both closely linked to Bloom's Taxonomy Paradigm.

5. ***The factors*** on which learning for forming GSC through PA depends were grouped into two categories: Internal factors: perceptions, thinking, memory, attention, imagination, motivation, willpower, intelligence, mental representations, students' concentration levels, behavior, knowledge, discipline, attitudes, habits, and abilities. External factors: family, friends, peers, teachers, living environment, healthcare and education systems, technical-material resources, and interactive methods proportionally applied by geography teachers.

2.3. Methodology for Forming Geography-Specific Competences through Practical Activities The methodology for forming GSC in high school students involves:

❖ *Curricular methodological guidelines* for grades IX–XII in the Republic of Moldova [26, 27] and Romania, especially Geography [28].

❖ *Academic content* from the geography curriculum for grade IX, continuing with grade X.

❖ *Resources allocated* for PA, distributed strategically to achieve maximum effectiveness and desired learning outcomes.

❖ *Objectives* of implementing the methodology for forming GSC through PA: a) Developing a motivational attitude toward learning by supporting active learning; b) Applying teaching strategies interconnected with various visual, cartographic, and textual resources for forming GSC at the high school level; c) Progressive and multiple planning of learning tasks through a STEM/STE(A)M project, structured by stages; d) Monitoring, synthesizing, and validating learning outcomes; e) Determining the effectiveness of the proposed pedagogical model; f) Forming GSC through PA.

❖ *Assessment* (initial, continuous, summative, cumulative) used in the educational process to collect, investigate, and analyze real data relevant to the research theme.

❖ *Teaching technologies* (strategies, methods, procedures, instruments, and pedagogical research techniques):

Strategies: Based on the combination and application of interactive strategies frequently used in research, we believe a balanced and effective educational pathway for forming GSC can be achieved through: cognitive-behavioral strategies (data collection and interpretation, analysis and understanding of natural/human relationships, drawing logical conclusions, assimilating knowledge), metacognitive strategies (planning STEM/STE(A)M projects, critical and creative thinking), psychomotor or action strategies (direct/indirect observation, practical application of theoretical knowledge, map work, problem-solving), affective-attitudinal strategies (project responsibilities, shaping environmental awareness and attitudes).

Methods: According to professor M. Ielenicz, methods highlight the pathway, the way research is carried out, and results are applied. From the variety of existing teaching methods classified by various authors according to numerous criteria, we selected only those considered priority, useful, and applicable for forming GSC, implementing them in a combined manner:

communication methods, methods of exploring reality/observation, learning-by-doing methods, and methods for rationalizing teaching and learning.

***Procedures**:* sequences, details, and methodological features [2] that make teaching methods more efficient or action techniques of the methods at the secondary level were combined and applied to implement and optimize the STEM/STE(A)M project method in learning contexts.

Instruments/Teaching Aids - these are the means that make investigative activities possible or the tools necessary for carrying out a scientific activity aimed at obtaining the desired result. The instruments used in the research include: questionnaires, tests, worksheets, group research, independent study, supporting materials, and homework tasks.

Techniques-specific forms that methods take, combining procedures (sometimes accompanied by instruments) for the optimal implementation of teaching–learning–assessment activities [2]. The most effective techniques integrated and implemented in the methodology for forming GSC, through which we created efficient learning situations for competence development, include: the practical project and experiment, solving a problem situation, the field trip or practical presentation, technology (IAC), the project presentation, or the artistic exhibition. We note that within a geography lesson or a practical activity, **strategies** may incorporate certain methods, procedures, and teaching aids. Methods may incorporate specific procedures, instruments/teaching aids, and organizational forms, while procedures may include particular teaching aids and methods. A method may serve as a procedure for another method, and a procedure may serve as a method or teaching aid for a given method. Procedures (as ways of proceeding) and teaching aids may function as techniques within the learning process, and all these components of the current methodology may together constitute the technology for forming SGC through PA, within which it is difficult to maintain the purity or autonomy of a single method (Fig. 2.2).

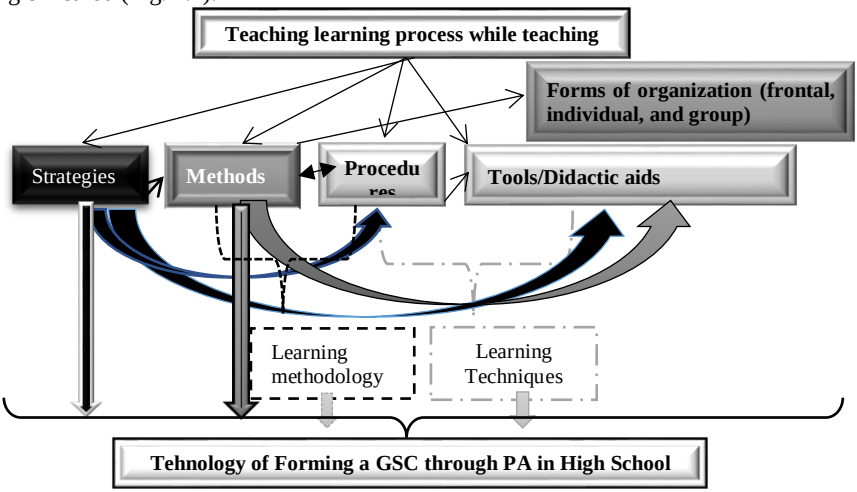

Figure 2.2. Components of the Technology for Forming GSC in High School Students

By approaching and integrating into a single coherent unit the theories, principles, paradigms, strategies, methods, procedures, instruments, techniques, objectives, resources, and didactic tactics for teaching–learning–assessment, we contribute effectively to the development of the methodology of *the Pedagogical Model for forming GSC*, a **model** oriented toward

implementing new didactic approaches, specifically through an integrative STEM/STE(A)M project. Through this model, we demonstrate that what we teach and the practical activities (PA) we apply with students are meaningful and in their best interest (not merely abstract discussions without practical outcomes), with the primary aim of acquiring and building knowledge, developing practical skills, and promoting competence-centered learning.

In this respect, we have chosen the learning model based on the Cognitivist and Constructivist Paradigms, which can be applied to any topic, to each or multiple learning units, depending on the curriculum at the high school level. This model supports the formation of school competences through PA within an integrative STEM/STE(A)M project, which has the advantage of allowing the same problem to be observed from different angles and perspectives, using the skills and knowledge acquired from multiple disciplines. For designing the project, we started from the idea that learning through a STEM/STE(A)M approach leads to quality education, aiming to: support learning through PA, thus creating flexibility in their implementation; develop students' logical and creative thinking; foster collaboration [24]; connect learning with the real world and encourage effective communication; solve complex problems; increase students' engagement in geography classes (both in school and beyond); capture students' interest in their living environment through learning situations that capitalize on their own experiences. The project's reference framework will be provided by the domains of STEM/STE(A)M key competences: Science (Physics, Biology, Chemistry), Technology, Engineering, Art, and Mathematics, fostering knowledge transfer and generating new learning outcomes. Within this framework, the proposed topic addresses a problem situation specific to the local context, identified by students as they progress through the project stages (Figure 2.3).

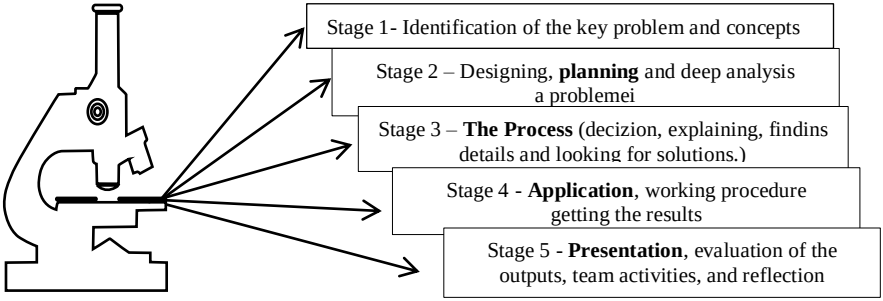

Figure 2.3. Stages of the Learning Project through a STEM/STE(A)M Approach

The model and methodology for forming GSC through PA allow us to balance and assess more effectively the formation of school competences (SC) in Geography and create the premises for integrating PA and forming GSC through PA at all educational levels, with their effectiveness being validated within the pedagogical experiment.

In Chapter 3 "EXPERIMENTAL VALIDATION OF THE EFFECTIVENESS OF THE PEDAGOGICAL MODEL AND METHODOLOGY FOR FORMING GEOGRAPHY-SPECIFIC COMPETENCES THROUGH PRACTICAL ACTIVITIES", the experimental study includes: the research variables (independent, factor, and dependent), the hypothesis, the research methodology (interpretation of instruments – questionnaires addressed to geography teachers (CDG) and high school students, tests, activity sheets – design, and the sample of participants).

3.1. ***The Initial Assessment Study of the Geography-Specific Competences in High School***

Students covers: *Independent variables* or the manipulated component, introduced into the

training or intervention program by the teacher conducting the experiment, namely: the two student samples (experimental and control), the curriculum plan, the implementation of the intervention program for forming GSC; the high school level (Grades IX–X); the national Geography curriculum for high school; the students' level of preparation; the evaluation methods (initial, continuous, and final testing) and the STEM/STE(A)M-based project. *Factor variable* introduced into the training program by the teacher conducting the experiment only for the experimental sample, closely linked to educational technologies and PA. *Dependent variables*: the performance of the students in the two samples, whose progress is directly observed, measured, and tested at the beginning and end of the experiment; the teacher's training program; **performance** demonstrated through: geographical knowledge, ability to carry out PA and complete tasks, capacity and skills to use various geographical tools and materials, conducting field observations and beyond, curiosity and interest in learning through discovery and investigation, and awareness of the necessity of learning. These variables aim at testing the research ***hypothesis*** formulated, expressed through both the main hypothesis and the null hypothesis (where the two samples exhibit homogeneity).The preliminary evaluation and assessment of the basic elements of competence proposed (knowledge – capacities, skills, abilities, proficiencies – attitudes and values) can be carried out through: Questionnaires – including a set of open-ended questions; Tests (initial and final) – clarifying specific aspects of the research methodology; Monitoring and evaluation sheets for high school students in the experimental sample – used throughout the pedagogical experiment and at its conclusion. The design of the pedagogical experiment in this research unfolds in four stages, each characterized by: time frame, purpose, objectives, activities and essential notes (the strategy for verifying and evaluating the results obtained by participants, the methodology for processing research data), and research methods/instruments (Table 3.1)

Table 3.1. Stages of the Experimental Design of the Pedagogical Research

Stage	Time	Goal	Objectiv	Activities and essential information	Methods, Instruments, Data Processing Methodology, and Evaluation
I.	**I. Control experiment**				
	Semester I, Academic Year 2021–2022	1.Outlining the Prescriptive Framework for Analyzing the Needs for Forming GSC and Identifying the Necessity of PA in High School Education	• Demonstrating the existence of a problem. • Highlighting possible solutions required for the continuous education of students and the formation of GSC. • Developing and administering instruments in the form of questionnaires to a representative sample of teachers and students for conducting a pedagogical opinion survey based on these instruments. 3.a. Analyzing the current situation using the data obtained to evaluate the degree of appreciation of PA by both geography teachers (CDG) and high school students in the formation of GSC. 3.b. Identifying and comparing the difficulties faced by geography teachers (CDG) and high school students in the process of forming GSC.	- Survey application	• **Questionnaire Method** • **Statistical Method** for collecting and processing data both quantitatively and qualitatively • **Qualitative and Quantitative Interpretation** of the questionnaire results
II.	**II. Pedagogical experiment - pre-experimental stage**				
	II. Pre-Experimental Pedagogical Phase Semester II, Academic	Diagnosing the level of GSC formation through PA in high school students, theoretical track	evaluating the level of GSC formation in high school students through PA, prior to the formative pedagogical intervention	-Establishing two samples (Experimental – EE and Control – EM) -Conducting the initial test -Administering the initial test to both samples	Methods and Tools Used: •Test Method (initial summative test) for the learning unit "The Earth's Atmosphere" •Test Evaluation Method •Statistical Method •Qualitative and Quantitative Interpretation of the initial test results

	Year 2021–2022				
III.	**III. Formative Experiment**				
	Semester II, Academic Year 2021–2022 and Module I, Academic Year 2022–2023	1.Implementation of the Pedagogical Model for forming GSC through PA in high school students and validation of the effectiveness and efficiency of the educational process based on the model	1. Experimental implementation of the pedagogical intervention and validation of the authenticity of the Pedagogical Model for forming GSC through PA. 2. Defining the independent, factor, and dependent variables involved in optimizing the formation of the targeted competences.	• Presentation of the concept and the Pedagogical Model for forming GSC through PA • Practical Activities (PA) carried out by high school students within the STEM/STE(A)M project	**Methods and Tools Used**: •STEM/STE(A)M Pedagogical Project Method •Worksheet for Recapitulation STEM/STE(A)M Project Worksheet •Monitoring and Evaluation Worksheet for High School Students •Self- Assessment Worksheet for Student Activities
IV.	**IV. Validation experiment**				
	Module II, Academic Year 2022–2023	1. Measuring the dependent variable of the two samples by determining the competence level of high school students based on similar evidence (final test)	1. Establishing the final level of GSC formation after completing the formative experiment 2. Determining the progress achieved by students in the Experimental Sample (EE) and the Control Sample (EM) in forming GSC through PA 3. Confirming the effectiveness of the Pedagogical Model for forming GSC through PA by comparing the initial assessment stage with the formative stage 4. Identifying the attitudes and values of students in the Experimental Sample (EE) 5. Reassessing students' opinions regarding the formation of GSC through PA	**Activities:** •Conducting the final test •Administering the final test to both samples (EE and EM)	**Methods and Tools Used:** Test Method (final test "Population Geography") Test Evaluation Method Statistical Method for collecting and processing data quantitatively and qualitatively Quantitative and Qualitative Interpretation of the final test results Questionnaire Method (addressed to students in EE and EM at the end of the pedagogical experiment) SPSS Software

1st stage of ascertaining experiment. The study begins with a preliminary investigation aimed at reviewing the curricular frameworks of educational policy regarding the formation of GSC, as well as the theoretical and methodological details from the didactics of Sciences and Geography related to PA in the high school environment. It concludes with two questionnaires: one addressed to geography teachers (CDG) in pre-university education, both from Argeș County and across the country, and another addressed to high school students for assessing opinions and knowledge regarding competence formation and the role of PA in this process. These were designed as tools for measuring the views of both CDG and high school students involved in the research, thereby demonstrating the existence of a problem.

Research Problem **(O.1)** arises from the comprehensive and detailed analysis of curricular frameworks and regulatory documents related to the research topic, as well as from processing the responses of participants involved in the study. It highlights the need for thorough preparation of students in forming GSC by defining theoretical and methodological benchmarks for streamlining and clarifying PA that enable the formation of GSC in high school students. As a result, the following aspects emerged as causes underlying the research problem:

a) In the Republic of Moldova, there is an approach to PA aligned with all levels of the high school cycle, covering appropriate topics through the content of practical works, which are applied in nature and mandatory [8, p. 8]; b) In Romania, at the high school level, the analyzed curriculum does not fully integrate PA into GSC formation but rather recommends that CDG conduct "practical applications," with only some teaching methods and school programs suggesting their implementation. They are included as teaching–learning methods or proposed learning activities under the format of "PA in nature" in the national program "School Otherwise" (according to the Methodological Guidelines for Grade XI [28, p. 60]); c) The multifaceted and dynamic nature of the researched reality required analyzing both the study

methods (qualitative analysis of documents and questionnaires) and the sources (students and teachers) to capture a complete and authentic picture of the researched issue; d) The need to conduct learning activities based on the following attributes/components of SGC formation: knowledge – capacities, skills, abilities – attitudes and values. Thus, as **a solution (O.2)** to improve the efficiency of the GSC formation process and to ensure genuine progress throughout learning, we considered it necessary, in this context, to reconceptualize and revise the Geography curricular frameworks and regulatory documents, aligning them with the current needs of high school students, as well as to optimize learning by: applying PA more frequently; increasing the attention given to these activities; so that students build knowledge starting from PA and active learning to reach understanding valid interpretation of current theoretical and general aspects.

Processing the responses of the participants involved in the research. The experimental validation focused on studying the following components: theoretical (documentation, observation, comparison, analysis of questionnaires, and examination of students' work products), experimental (initial assessment, formative, and control stages), and statistical (statistical–mathematical processing and interpretation of the collected experimental data and research results). In the current stage of initial assessment, for achieving **O.3**, two questionnaires were developed in online format using the Google Forms platform-one addressed to geography teachers (CDG) and the other to high school students. These instruments allowed us to evaluate the proposed variables, identify the current situation in Romanian high schools regarding the role of PA in Geography education in forming school competences (SC), and identify various obstacles or challenges in the researched domain.

The research material consists of the teachers' and students' responses to the questionnaire items, statistically processed using docs.google.com/forms. Each question was analyzed separately; the data collected were centralized, reported as percentages out of 100%, and interpreted using successful quantitative and qualitative methods. The insights gained justified and guided specific decisions regarding the development of the research strategies.

The first experimental instrument-the questionnaire for CDG-was extensively developed in the academic year 2021–2022, Semester II, to meet the objectives of demonstrating the existence of a problem, identifying possible solutions for continuous student training and GSC formation, and highlighting the effectiveness of PA in forming GSC. It included 20 questions administered to 223 CDG from Romania (80.60%) and the Republic of Moldova (10.40%), teaching in both rural (41%) and urban (59%) environments at the secondary and high school levels. The questionnaire was structured in two parts: a) The first part provided teachers and students with: an explanation of the purpose of the questionnaire, a clear presentation of the research objectives, identification of the teacher who designed the questionnaire, recommendations, and instructions for completion, emphasizing the importance of honesty in responses. b) The second part consisted of the actual questionnaire items.

The second experimental instrument/questionnaire was also developed in the academic year 2021–2022, Semester II, and assessed the satisfaction level of high school students regarding the role of PA in forming GSC. It was distributed to several high schools in Romania (C.N. "Alexandru Odobescu" and C.N. "Ion C. Brătianu", Pitești) and in the Republic of Moldova (Theoretical High School "Evrika", Rîbnița), which expressed interest in participating in the study on forming GSC and the role of PA. It was administered to 244 students in the academic year 2021–2022, Semester I, representing diverse social backgrounds. According to the content, the 15 questionnaire items included: a) Administrative/factual items (first 4 questions): schooling level/grade (IX, X, XI, XII), school location/environment (urban/rural), country

(Republic of Moldova, Romania), and Geography study areas; b) Opinion items (3 questions): usefulness of PA for in-depth knowledge acquisition; the role of PA in Geography learning and career preparation; time resources allocated to Geography studies; c) Items assessing the cultural and intellectual interests of students in Geography: awareness of competence attributes/components; types of activities used in Geography lessons that best support competence formation; practical activities in Geography; the effectiveness of learning methods for acquiring new knowledge; encountered difficulties and their frequency in implementing PA (8 questions). Based on the results of the questionnaires administered to CDG and students, the following conclusions emerged: understanding the status and value of PA for applying learned knowledge to solve real-world problems; insufficient development in teaching practice of the interconnection between real life and school; lack of a methodological framework for forming GSC through PA in high school students; teaching activities by CDG insufficiently focused on competence formation through PA; fragmented student learning in applying and integrating geographical knowledge; requests for extending the time resource for implementing PA regardless of context; the need for frequent use of PA as a means for forming knowledge, skills, practical abilities, attitudes, and human values using cartographic and graphic materials. The geographical globe and other pedagogical resources specific to the Geography discipline, provided by specialists, as well as the awareness that learning efficiency is strongly influenced by the nature of tasks, encountered situations, objectives, and students' personality traits, summarize the opinions expressed by students. We note the depth of their judgments regarding individual needs and goals. Focusing on these aspects, we conclude that the research results confirm and validate the research hypothesis. Therefore, we recommend increasing the efficiency of forming GSC in high school students in the teaching–learning process of Geography, the application of the Pedagogical Model, and the Methodology for Forming GSC.

II. Pre-Experimental / Pilot Pedagogical Stage

In an effort to diagnose the initial level of GSC formation through PA (O.1) in high school students and to ensure that the proposed solution produces a positive effect, we administered to students the initial test as an evaluation tool at this stage of the research, following the recommendations of the Geography Methodological Guidelines and taking advantage of the perspective offered by the practitioner-teacher status, which allows testing the research proposals directly with students while combining teaching with pure research.

The entire pedagogical experiment was conducted over a period of two academic years (2021-2022; 2022-2023), involving 173 students from two high schools, theoretical track, Grades IX A, B, and C from C.N. "Alexandru Odobescu" and Grades IX B, C, and H from C.N. "Ion C. Brătianu", both located in Pitești Municipality, Argeș County, Romania.

The student classes involved in the experiment were not identical but were similar in terms of age, intellectual level, sociability, type of reaction, profile (real sciences and philology), and theoretical track.For conducting the pedagogical experiment, it was necessary and useful to group the students from the involved classes into two samples: ES - Experimental Sample; CS - Control Sample (as shown in Table 3.3).

Table 3.2. Distribution of High School Students Involved in the Pedagogical Experiment

Academic Year / Stage / Period / Hours	Experimental Sample (No. of Students, School)	Control Sample (No. of Students, School)

2021–2022, Semester II (Initial Assessment Stage – Initial Test), 1h/week for each class	86 students, Grade IX A, B, and C-C.N. "Alexandru Odobescu"	87 students, Grade IX B, C, and H-*C.N. "Ion C. Brătianu"*
2021–2022, Semester II and 2022–2023 (Structured by Modules), Module I (Formative Stage), 28h	86 students, Grade IX A, B, and C- C.N. "Alexandru Odobescu"	
2022–2023, Module II (Validation Stage – Final Test), 1h/week for each class	86 students, Grade IX A, B, and C-C.N. "Alexandru Odobescu"	87 students, Grade IX B, C, and H-*C.N. "Ion C. Brătianu"*
Total	86 students	87 students

For the making of the initial test, we went through the following stages: a) setting and stating the specific skills to be assessed; b) building the specification matrix; c) carrying out the test tasks; d) drawing up the scheme for the analysis and assessment of the learners' knowledge; e) shaping the marking scale.

To show the level of preparation reached by the high-school learner in building CSG (Table 3.3), the initial test is used as follows: a) the items are made and grouped according to the skill aimed at (C1 shows the level of knowledge/understanding and groups the first three items; C2 points out the level of applying knowledge and groups the next three items; for C3 the level of integration-attitudes and values-is noted, for which the last two items of the test are grouped); b) the given assessment tasks are solved; c) the points gained for the grouped items are summed; d) those situations or levels of content that do or do not need a certain further teaching-learning-assessment step are found; e) the points are turned into marks by using the marking scale and the score scheme.

III. The Experimental Stage / the formative pedagogical experiment began in the school year 2021-2022, semester II, applied to the experimental sample (ES) made up of 86 pupils, grade IX A, B, and C, and was then carried on in the following school year, 2022-2023, modules I, II, III, and IV with the same number of pupils from the same classes according to the school year (grades X A, B, and C) within the "Alexandru Odobescu" National College, Pitești, Romania. It included many learning situations carried out during the learning activities (LA) by the ES pupils within the STEM/STE(A)M learning project.

For reaching **O.1** of the current stage, the instructional design of the STEM/STE(A)M project was shaped, focused on achieving a system of key competences suggested by the European Commission as well as subject-specific competences, so that pupils go through five stages (problem, planning, process, product, and presentation). The teacher, like a designer, manages to pass on to pupils, through processing and assembling operations, a complex technical system which includes as premises: declarative knowledge from each learning unit (theoretical knowledge-savoir dire), according to the school curriculum; procedural knowledge; contextual/strategic knowledge; attitudes and values.

O.2 *refers to the outlining of the variables involved in making the formation of the studied competences more efficient*. It assumes the use of two samples, where the experimental sample benefits from the independent variable, the factor variable, while the dependent variable is monitored since the experimental stimulus (the factor variant/PA within the STEM/STE(A)M project) was applied to it. The control sample, with which one works in the traditional way, as usual, does not benefit from the factor variable, but the dependent variable is still monitored. By applying the factor variable, it is identified to what extent the carried-out PA can determine the pupils' progress in gaining geographic knowledge, as well as in applying and integrating it

it into new contexts for the formation of SGC.

The pupils' application of what they learn and the correction of mistakes appearing during the experiment is carried out by each pupil at his or her own pace throughout the PA and assessed through the final test.

The formative stage ends with the teacher's reasoning on how (in relation to the competence units, contents, and resources) the objectives were set. Based on these objectives, the pupils carried out various PA in the field, the classroom, and/or the geography lab, which led to the building of knowledge, practical skills, attitudes, and values, that is, to the building of the targeted SGC, which in turn are linked to the European key competences. Toward the end of the stage, the high school pupils are given a questionnaire regarding the efficiency of learning through PA. Thus, we conclude the proof of the effective impact of the carried-out PA in the formative experiment, chiefly leading to the experimental validation of the research hypothesis regarding the significant improvement of high school pupils' performances and the value of training, showing, based on the results gained during this stage, the effectiveness of the **Pedagogical Model for forming the GSC** of high school pupils through PA, as well as the growth of their motivation for learning geography.

3.2. Experimental Arguments on the Efficiency of the Model for Building Subject-Specific Geographic Competences through Practical Activities

IV. The Post-Experimental Stage / The control/**validation pedagogical experiment** was carried out to show the impact of the formative pedagogical experiment on building SGC through PA, as well as on the attitudes and performances of high school pupils after the implementation of our pedagogical model. The research methods used in the control stage include: scientific observation; the design and use of the final assessment test; the processing, analysis, interpretation, and comparison of the statistical results obtained after the implementation of the pedagogical experiment, shown in tables; drawing conclusions confirming the efficiency of *the Pedagogical Model for building GSC through PA*; gathering various arguments for the acceptance of the research hypothesis put forward in the study; outlining the attitudes and values of the pupils from the ES, shown in graphs; reassessing the opinions of the pupils from the ES and CS on building GSC through PA by means of a questionnaire, the statistical method being used for gathering, interpreting, and processing the quantitative and qualitative data.

The control experiment was carried out during Module II, with 173 pupils, grade X, from the same school units ("Alexandru Odobescu" National College and "Ion C. Brătianu" National College), in the school year 2022–2023, on the two research samples (ES and CS), where: a) *The aim* lies in measuring the dependent variable by determining the level of building SGC through PA for high school pupils, based on evidence (the final summative test) with a structure similar to the finding experiment but with different content, the same assessment methodology being used, practically identical to the one applied in the finding study.

b) *The hypothesis* of the experimental study rests on the idea that, by using a methodological model shaped and aimed at building GSC through PA for high school pupils, the theoretical stream, one ensures a deeper grasp of knowledge, a much more qualitative and lasting building of practical skills among pupils, with a clear improvement in their performances and in the value of training. c) *The targeted objectives* are given in Table 3.1.

As a result, we point out the main aspects recorded by means of the SPSS software in applying the chi-square (χ^2) test, both **between the samples** and between **the initial and final tests for each sample**, which allows us to check and prove, based on a sample, conclusions about a population of pupils, as follows:

1. At the start, the samples were similar (test of homogeneity); the small existing differences are not essential, as they began at roughly the same level of building the subject-specific competences / SGC. 2. **At the end**, only the ES showed a significant improvement (the effect of the intervention). 3. **The testing of the specific hypotheses** within the study (the research hypothesis, the null hypothesis) was carried out and confirmed.

A. **The Results of the Chi-Square (χ^2) Test for the Ascertainment Stage**

This statistical test aimed to check whether there are **significant differences** between the ES and the CS before the experimental intervention regarding the level of building SGC for high school pupils. This allows the establishment of the initial homogeneity of the two samples, an essential condition for the validity of the experiment.We applied the chi-square (χ^2) test to compare the distribution of pupils from the two groups across three levels of competence assessment (low, medium, high) according to the level of building competences: **knowledge, and understanding, application, and integration.**

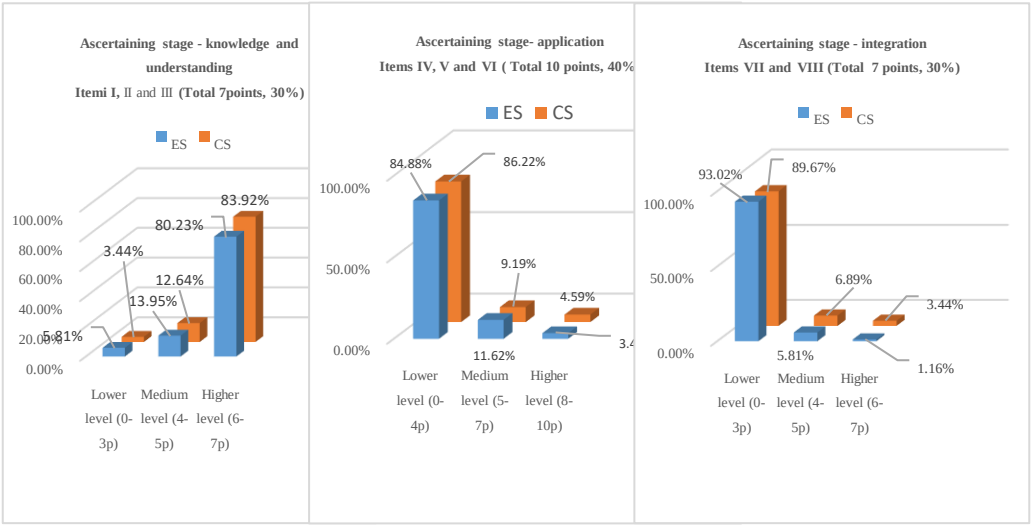

Figure 3.1. Results of the Initial Test between ES and CS by Levels of Building GSC (% of Pupils)

Table 3.3. Results of the Chi-Square (χ^2) Test for the Finding Stage

Level of Building GSC	Chi - Square (χ2)	p- Value
Knowledge	0.65	0.722
Application	0.39	0.824
Integration	1.11	0.574

Interpretation of the Results:

- The p-value for all three levels of building GSC is greater than 0.05 ($\alpha = 0.05$), which means there are **no significant differences** between ES and CS at the start of the study.
- These results **confirm the initial homogeneity** of the two samples, which suggests that any later differences appearing between ES and CS after the experimental intervention can be attributed to it and not to initial differences in competences.

• Specifically: In knowledge and understanding, the distributions are similar ($\chi^2 = 0.65$, $p = 0.722$), which shows that the initial level of knowledge was comparable between the two groups.

• In application, there are no significant differences ($\chi^2 = 0.39$, $p = 0.824$), showing that pupils in both groups had similar skills at the start.

• In integration (attitudes and values), likewise, the results do not show statistically relevant differences ($\chi^2 = 1.11$, $p = 0.574$), which means that both groups had comparable attitudes and values at the start of the study.

Conclusion. The results of the chi-square test show that there are no significant differences between ES and CS at the initial finding stage (confirmation of the null hypothesis). This validates the research premises and allows the attribution of any later improvements solely to the experimental intervention. The examined pupils showed clear shortcomings in the teaching approach to building GSC through PA, as they were oriented mostly toward the gathering of theoretical knowledge through traditional lessons. The difficulties faced by most pupils lie in the lack of ability or lack of knowledge regarding the way of applying and integrating the new knowledge. The results gained regarding the initial level of building SGC confirm the need and potential of using the Pedagogical Model for building GSC in high school pupils, the theoretical stream, by making use of real PA in learning situations and STEM/STE(A)M project work aimed at the efficiency of the studied topic.

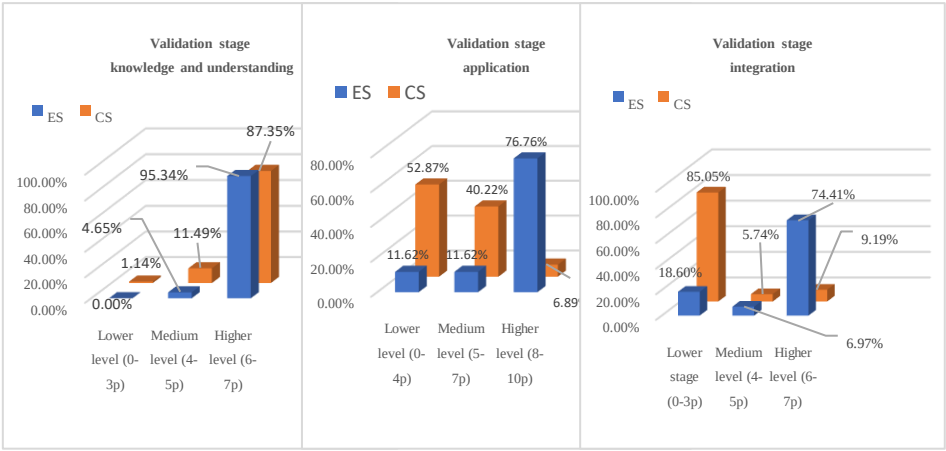

Figure 3.2. Comparison of the Final Test Results between ES and CS by Levels of Building GSC (% of Pupils)

B. The Results of the Chi-Square Test for the Final Stage (Control / Validation) for ES and CS. The aim of the chi-square (χ^2) test for the **post-experimental (control/validation) stage** was to find whether there are significant differences between the **experimental sample** (ES) and the **control sample** (CS) after applying the experimental intervention regarding the building of subject-specific geographic competences.

Table 3.4. Results of the Chi-Square (χ^2) Test for the Control / Validation Stage

Level of Building GSC	Chi - Square (χ2)	p- Value
Knowledge	3.794	0.150

Application	87.029	< 0.001
Integration	81.021	< 0.001

Interpretation of the Results. ***Knowledge and Understanding:*** The chi-square test result shows a difference between groups ($\chi^2 = 3.79$), but it is not statistically significant ($p = 0.150 > 0.05$). This means that although the experimental group performed better, the difference is not large enough to be considered significant. ***Application:*** The difference is extremely significant ($\chi^2 = 87.029$, $p < 0.001$), confirming that the intervention had a major effect on pupils' ability to apply knowledge. ***Integration (Attitudes and Values):*** The difference is also highly significant ($\chi^2 = 81.021$, $p < 0.001$), showing that pupils in the ES developed attitudes and values linked to geography much better than those in the CS.

Conclusion: The results of the chi-square test show that the experimental intervention had a significant effect on the pupils in the ES. No significant differences were observed in terms of knowledge and understanding. Extremely significant differences were identified in application and integration, where the ES showed considerable improvements.These findings support the research hypothesis that a methodology based on practical activities (PA) leads to improved pupil performance.

C. Results of the Chi-Square Test at the Global, Intra-Sample Level. We applied the global chi-square test, meaning we considered all categories together (across the entire assessment tool). In this case, the matrix of observed frequencies included all performance levels from the three dimensions for both the initial and final testing.

Table 3.5. Global Frequency Matrix - Experimental Sample (ES)

Level of GSC formation	Evaluation level	Initial testing (No. stud.)	Initial testing (%)	Final testing (No. stud.)	Final testing (%)
Knowledge and understanding	lower (0 - 3 p.)	5	5,81%	0	0%
	Medium (4 - 5 p.)	12	13,95%	4	4,65%
	Higher (6 - 7 p.)	69	80,23%	82	95,34%
Application	Lower (0 - 4 p.)	73	84,88%	10	11,62%
	Medium (5 - 7 p.)	10	11,62%	10	11,62%
	Higher (8 - 10p.)	3	3,48%	66	76,74%
Integration	Lower (0 - 3 p.)	80	93,02%	16	18,60%
	Medium (4 - 5 p.)	5	5,81%	6	6,97%
	Higher (6 - 7 p.)	1	1,16%	64	74,41%

Experimental Sample (ES) – Initial Testing vs. Final Testing: Chi-Square (χ^2) = 219.279

- P-value/Value p = < 0.001

Table 3.6. Global Frequency Matrix – Control Sample (CS)

Level of GSC formation	Evaluation level	Initial testing (No. stud.)	Initial testing (%)	Final testing (No.stud.)	Final testing (%)
Knowledge and understanding	Lower (0 - 3 p.)	3	3,44%	1	1,14%
	Medium (4 - 5 p.)	11	12,64%	10	11,49%
	Higher (6 - 7 p.)	73	83,92%	76	87,35%
Application	Lower (0 - 4 p.)	75	86,22%	46	52,87%
	Medium (5 - 7 p.)	8	9,19%	35	40,22%
	Higher (8 - 10 p.)	4	4,59%	6	6,89%
Integration	Lower (0 – 3 p.)	78	89,67%	74	85,05%
	Medium (4 - 5 p.)	6	6,89%	5	5,74%
	Higher (6 - 7 p.)	3	3,44%	8	9,19%

Control Sample (CS) - Initial Testing vs. Final Testing: Chi-Square (χ^2) = 27.881, p-value = < 0.001.

Interpretation:

1. **For the experimental sample (ES),** the p-value is extremely small ($p < 0.001$), which indicates significant differences between the initial and final testing. This confirms that the experimental intervention had a significant impact on building GSC in high school pupils.
2. **For the control sample (CS)**, likewise, the p-value is extremely small ($p < 0.001$), which suggests the existence of significant differences in this sample as well. However, the differences observed in the CS are most likely influenced by natural learning factors and not by any specific intervention.
3. **When comparing ES with CS**, the effects of the intervention are much more evident in the ES, confirming the research hypothesis that a methodology based on practical activities (PA) significantly improves pupils' performance. In short, the chi-square analysis supports the idea that the intervention had a significant impact on the ES, leading to relevant improvements in pupils' competences.

D. Results of the Intra-Group Chi-Square Test on the Three Levels

Table 3.7. Experimental Sample (ES): Initial Testing -Final Testing

Level of Building GSC	Chi - Square (χ2)	P-value
Knowledge and understanding	10.119	0.006
Application	105.341	< 0.001
Integration	103.819	< 0.001

Interpretation of the Results: Knowledge and Understanding: The chi-square test result shows a difference between the initial and final testing of the experimental group ($\chi^2 = 10.119$, $p = 0.006$), which is statistically significant. This means that the ES has better performance regarding pupils' knowledge and their ability to understand it.

Application: Between the initial and final testing of the ES, the difference is extremely significant ($\chi^2 = 105.341$, $p < 0.001$), confirming that the intervention had a major effect on pupils' ability to apply knowledge.

Integration (Attitudes and Values): Between the initial and final testing of the ES, the difference is also highly significant ($\chi^2 = 103.819$, $p < 0.001$), showing that pupils in the ES developed attitudes and values linked to geography much better by the end of the experiment.

Conclusions for the Experimental Sample:

At all three levels (Knowledge, Application, Integration), the chi-square test showed significant differences between the initial and final results. The chi-square value was significant in all cases ($p < 0.05$), supporting the research hypothesis that the experimental intervention had a significant impact on building the SGC of pupils in the ES. The data suggest that the ES recorded significant improvements regarding the knowledge, application, and integration of the studied concepts and skills.

Table 3.8. Control Sample (CS): Initial Testing - Final Testing

Level of Building GSC	Chi - Square (χ2)	P-value
Knowledge and understanding	1.108	0.574
Application	24.304	< 0.001
Integration	2.469	0.290

Interpretation of the Results: Knowledge and Understanding: The chi-square test result shows a difference between the initial and final testing of the CS ($\chi^2 = 1.108$, $p = 0.574$), which is not statistically significant. Application: Between the initial and final testing of the CS, the difference is significant ($\chi^2 = 24.304$, $p < 0.001$), confirming that CS pupils showed better ability to apply knowledge at the end of the experiment, most likely as a result of a natural maturation

effect within the group. Integration (Attitudes and Values): Between the initial and final testing of the CS, the difference is not significant ($\chi^2 = 2.469$, $p = 0.290$).

Conclusion. In the case of the CS, despite some improvements observed in the application of skills, these cannot be attributed to the intervention but rather to other factors that may have influenced the results (e.g., regular learning). It is important to further examine the factors that may have affected the performance of the control sample in order to better understand the recorded improvements.

To analyze the obtained data, we must link them to the initial research hypothesis, convincingly demonstrated, since it refers to the effect of the experimental intervention on pupils' performance at the three levels of building SGC: knowledge and understanding, application, and integration, leading to the following specific hypotheses:

Hypothesis 1. The experimental intervention will improve pupils' performance at the "Knowledge and Understanding" level in the ES compared to the CS. Hypothesis 1 cannot be confirmed. The experimental intervention led to a significant improvement in performance at the "Knowledge and Understanding" level in the ES, but compared to the CS this is not statistically significant ($p = 0.150 > 0.05$). This means that although the experimental sample performed better, the difference was not large enough to be considered statistically significant.

Hypothesis 2. The experimental intervention will improve pupils' performance at the "Application" level in the ES compared to the CS. Hypothesis 2 is confirmed. The experimental intervention led to a significant improvement in performance in applying knowledge in the ES, compared to the CS, where improvements were much more modest.

Hypothesis 3. The experimental intervention will improve pupils' performance at the "Integration" level in the ES compared to the CS. Hypothesis 3 is confirmed. The experimental intervention led to a significant improvement in performance in integrating knowledge in the ES, compared to the CS, where improvements were minimal.

Hypothesis 4. The difference between the ES and CS regarding overall performance (all three levels) is statistically significant. Hypothesis 4 is confirmed. The difference between the ES and CS is statistically significant, and the experimental intervention had a real effect on building GSC in high school pupils.

It was noted that pupils in the ES show clear capacities, aptitudes, and practical skills which they have built and developed, since through their involvement in PA they focus not only on carrying out tasks and producing project outcomes but also on overcoming their own limits in the learning process, the PA proving their effectiveness in building GSC. We note the existence of visible differences in the level of building GSC through PA between pupils who take part in the intervention program for building GSC through PA and those who do not take part in this program. Yet, through the participation of the ES in the intervention program aimed at building GSC through PA, a remarkable improvement is noted at the control stage regarding the level of building GSC in comparison with the finding stage. For achieving **O4** (Outlining the attitudes of pupils in the ES), a pupil monitoring and assessment sheet was used on the one hand, and a self-assessment sheet on the other. The results regarding the outlining of pupils' attitudes and values are reflected in the pupils' answers to the two questionnaires (from the finding stage and from the end of the experimental stage), as well as in the self-assessment sheet given only to the ES, where we note the prevalence of attitudes such as kindness, mutual support, solidarity, understanding, and encouragement, and values such as punctuality, mutual respect, responsibility, tolerance, trust, and friendship.

For achieving **O5** (Reassessing the opinions of high school pupils regarding the building of GSC through PA), a questionnaire consisting of 10 questions was used, similar in structure to

the one from the finding stage for both samples. The questioning was carried out after the participation of ES pupils in numerous PA within the STEM/STE(A)M projects, in comparison with the opinions of CS pupils who did not carry out PA at a deeper level, as well as to reveal the advantages and disadvantages of using PA in the teaching-learning-assessment process and in building SGC, with the following findings being noted, alongside the presence of a high degree of seriousness and responsibility among most high school pupils: Over 95% of ES pupils consider that PA are very useful in building SGC compared to over 77% of CS pupils; PA play a very important role for more than 93% of ES respondents in building critical thinking, creative thinking, and in describing and explaining facts observed in reality or identified in various contexts compared to 62% of CS respondents; 94% of ES pupils value the major contribution of PA to the accumulation of knowledge, the building of practical skills, and positive attitudes, compared to 75% of CS pupils; 94% of ES pupils appreciate the very high role of PA in the study of Geography, compared to only 48% of CS pupils.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

The review of the specialized literature regarding the theme and issue of the thesis "**Building Subject-Specific Geographic Competences through Practical Activities in High School Pupils**" allows us to conclude that the topic addressed has not been sufficiently analyzed or solved so far, especially in the Romanian-speaking area, at the high school level, within the field of Geography. The theoretical findings, the experimental findings, and the results obtained generate the approach to the research as a puzzle consisting of three parts (diagnosing the contradiction and the problem, identifying the solution to the problem, applying the solution), all confirming the research hypothesis. In this respect, the research carried out has a theoretical-applied nature and is timely since it targets one of the current issues of society, confirming the existence of a contradiction between the needs of society and the level of competence-building in the educational process, concluding with a general perspective on GSC at the high school level. As a result, we present the following findings, which reflect the achievement of the proposed objectives:

1.The systematic study of the ideas of SC and GSC (1.1) has shaped an overall view of the notion of skill, seen as a set of traits and parts that the learner gains step by step and uses in many everyday settings. The review of these ideas, linked with the study of PA and of learning through STEM/STE(A)M projects (1.3), has made it possible to show, to back up, and to strengthen the views, guesses, and findings set forth over time by many writers, thus giving a joined picture of the way the problem is found and set, laying the ground for the main line of thought in the research, and proving the key role of PA in building GSC in high school learners. Hence, the research has brought out the deep and linked nature of the ideas of SC, GSC, and PA, and has shown the need for a cross-field and hands-on way to renew geographic learning.

2. Definition of the theoretical constructs mentioned above, according to the educational legislative framework in the Republic of Moldova and Romania and the evolution of the official curriculum over time-different from earlier versions in the two Romanian-speaking states-and based on the analysis of the role of PAs in Geography, led to the argument for the importance of building GSC through Pas (1.2).

3. By combining the theoretical and practical aspects within learning models and following their comparative investigation, we opted for the STEM/STE(A)M project-based learning model, thus designing the **Pedagogical Model for Building GSC through PA**, structuring the reasoning of the research, and generating the correlation: objectives - geographic content - implementation technology - assessment (2.1).

4. The design of the **pedagogical model facilitated the development of a methodology for**

forming geographical competences. This contributes to creating an effective environment for acquiring geographical knowledge, applying it in new situations, and developing the practical skills of high school students. In this context, various methods of analysis and characterization of educational technologies focused on practical activities were utilized, as well as the identification of geographical theories, principles, and paradigms (2.2). These approaches allowed for outlining a solid conceptual framework, grounding the theoretical component of the pedagogical model and the associated teaching strategies. At the same time, these analyses provided the necessary arguments for selecting appropriate strategies and tools, including projects with the dynamic involvement of students and interactive activities, thus ensuring a well-structured educational process, organized in stages at the level of learning units and competence units. This progressively facilitated the formation of competences, strengthened the scientific foundation of the proposed pedagogical model, and guided the implementation of practical activities in the educational process (2.3).

5. Analysis of statistical data and the evaluative information obtained from the pedagogical experiment supports the following findings (3.3):

- Validation of the experimental study was carried out according to the descriptors of the level of building GSC through PAs, determined in relation to competence assessment indicators from the current assessment framework in the Republic of Moldova for Geography (this educational document does not exist in Romania), in line with the performance assessment levels.
- Both tests (initial and final) targeted the assessment of the same levels of building GSC through PA, having a similar structure, with confirmation performed using the statistical procedures of the SPSS software.
- The results recorded are significantly higher in the ES compared to those of the CS following the implementation of the developed methodology, indicating that the Pedagogical Model and methodology applied in the ES had a stronger impact on pupils engaged in PAs, contributing to building GSC through PAs as a core component of the high school Geography curriculum.
- Through the dynamic involvement of ES pupils in all formative activities-both as participants and receivers, as well as transmitters carrying out the SGC-building actions through PAs, they were able to express deliberately and communicatively their experiences, feelings, curiosities, and viewpoints, generating varied behaviors and attitudes reflected in the final results of the pedagogical experiment.
- Confirmation of the *general research hypothesis* and of the specific hypotheses regarding building GSC in high school pupils through PA demonstrated the model's effectiveness in: designing, finalizing, and deliberately validating the Pedagogical Model for Building GSC through PA in high school pupils; defining and determining the structure and specificity of a set of conceptual and methodological references for building GSC; developing strategies for applying PA in Geography lessons. Thus, the identified **problem** and the **research aim** were achieved.
- The identified contradictions justify all four objectives of the research, as they target both the theoretical understanding and the diagnosis of the real situation, as well as the development and implementation of a methodology that meets the needs of students and teachers, ensuring the formation of SGC through practical activities.

Despite offering an in-depth analysis and valuable insights into building SGC through PA, it is essential to acknowledge certain ***limitations*** that may affect the generalizability and comprehensiveness of the results:

a) The research focused on implementing PA within STEM/STE(A)M projects, analyzing data from a specific timeframe, and relying on the experience and training of the Geography teacher-researcher (CDG). These factors might limit the generalization of the findings and highlight the impossibility of viewing education as a process confined to space and time.

b) It is essential to acknowledge that factors involved in conducting this study (the number of pupils in the two samples, the number of schools, pupils' and teachers' cognitive particularities, learning styles and motivation, honesty and availability of pupils and teachers, limited time resources of one hour/week for theoretical high schools, most of them, as well as the insufficient infrastructure for implementing complex PA) reflect the conditions existing at the time of data collection but cannot be hypothetically extended nationwide and may influence the research activity.

Proposed Recommendations

❖ To the competent forums, especially in Romania: regulation of the operationalization of specific geographical competences at the high school level; reconceptualization of principles and strategies specific to authentic learning; allocation of European and national funds for the implementation of programs supporting STEM/STE(A)M education; application of continuous/formative and cumulative/summative assessment according to **clearly defined indicators**; optimization of the high school geography curriculum framework for both lower and upper secondary cycles, by introducing, in line with the practice in the Republic of Moldova, two compulsory hours/modules of practical activities (AP) on topics appropriate to the level of study. Students may be assessed with a final grade at the end of the school year, recorded in the gradebook, which will be used to calculate the annual average.

❖ To researchers: development and implementation of similar AP programs based on STEM/STE(A)M projects and within other school subjects to develop discipline-specific competences, as well as the development of methodological guides for this purpose.

❖ To geography teachers as well as teachers of other school subjects: adaptation and application of the developed questionnaires to assess the level of discipline-specific competence formation; correlation of content and methods from several subjects to provide a complex and practical approach to the phenomena studied; development of assessment tools for discipline-specific competences through worksheets, STEM/STE(A)M projects; active participation in training courses in the field to organize practical activities (AP); capitalization on the Pedagogical Model and the methodology for developing geographical competences (SCG) through AP, thus leading to a more efficient formation of school competences.

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ADNOTARE

Pătrașcu Alexandra, Formarea competențelor specifice geografiei prin activități practice la elevii liceeni. Teză de doctor în științe ale educației. Chișinău, 2025

Structura tezei: adnotări în limbile română și engleză, lista abrevierilor, introducere, trei capitole, concluzii generale și recomandări, bibliografie din 250 de titluri, 19 anexe, 150 pagini text de bază, 36 tabele, 37 de figuri.

Cuvinte-cheie: competență, competență școlară, competențe specifice disciplinei/CSG, activități practice, proiect de învățare STEM/STE(A)M, nivel liceal.

Domeniul de studiu: face referire la didactica școlară pe trepte și discipline de învățământ și abordează problema formării competențelor specifice geografiei la elevii liceeni prin activități practice.

Scopul cercetării: *stabilirea fundamentelor* teoretice și metodologice în vederea elaborării și validării experimentale a Modelului pedagogic și a metodologiei de formare CSG la elevii liceeni prin AP.

Obiectivele cercetării elaborate în baza scopului cercetării: 1) analiza abordărilor teoretice despre conceptul de CȘ la nivel general, a CSG la elevii liceeni și a AP la Geografie în special; 2) determinarea teoriilor, a principiilor, a paradigmelor și a modelelor pedagogice de formare a CSG prin AP; 3) diagnosticarea nivelului de formare a CSG prin AP la elevii liceeni; 4) conceptualizarea teoretică și validarea experimentală a Modelului pedagogic și a metodologiei de formare a CSG prin AP.

Noutatea și originalitatea științifică a cercetării constă în: elaborarea și validarea Modelului pedagogic și a metodologiei plecând de la actualitatea temei abordate în scopul formării CSG prin AP în baza proiectului STEM/STE(A)M, adaptat mediului școlar actual; structura operațională a Modelului propus deoarece nu rămâne la nivel teoretic fiind aplicabilă în circumstanțe reale, incluzând participarea activă a liceenilor; organizarea etapizată a AP și aplicarea acestora ca metodă principală pentru formarea CSG la elevii de liceu; integrarea nivelurilor de formare a CSG într-un model pedagogic unitar; învățarea colaborativă și stimularea autonomiei în procesul educational; evaluare mixtă (observație, chestionare, teste, produsele proiectului) destinată să reflecte o imagine mai complexă asupra procesului de învățare.

Rezultate științifice obținute, care au contribuit la clarificarea problemei investigate, se referă la: *acțiunea* cercetării, materializată în elaborarea și validarea unui model pedagogic centrat pe AP, având ca *rezultat* facilitarea formării CSG la elevii liceeni; *efectul* acestei abordări, reflectat în dezvoltarea gândirii critice și creative, precum și în îmbunătățirea performanței școlare; rezultatul obținut relevant în *contextul* reformei educaționale actuale, prin faptul că sprijină formarea competențelor și modernizarea predării geografiei prin integrarea nivelurilor de formare a CȘ, în acord cu cerințele reformei educaționale actuale, a societății și standardele internaționale.

Semnificația teoretică a cercetării prezintă importanță și îmbogățește Didactica geografiei prin: analiza abordărilor teoretice de CȘ în general, precum și de CSG, AP în special sub aspect structural și metodologic; elaborarea particularităților taxonomiei competențelor din Republica Modova și România; descrierea statutului curricular al CSG și al AP la nivel liceal în Republica Modova și România; evidențierea rolului AP în formarea CȘ la nivel liceal; proiectarea unui Model pedagogic aplicabil, validat ca și a metodologiei de formare a CSG prin AP la elevii liceeni; îmbinarea instrumentelor didactice moderne (de teren, cartografice, digitale) cu metode interactive de evaluare adaptate specificului geografiei și orientate spre măsurarea, apreciere mai complexă și obiectivă a dezvoltării elevilor; prezentarea unor tipuri de sarcini de lucru; deschiderea spre inovație prin orientare modernă, aliniată paradigmei STEM/STE(A)M și tendințelor educaționale europene, contribuind la modernizarea învățământului geografic preuniversitar. Aceste aspecte ale cercetării pot fi aplicate în practica școlară**,** integrand AP pentru creșterea interesului elevilor liceeni în studiul geografiei și valorificarea metodologiei mixte de evaluare; pot servi ca suport metodologic pentru perfecționarea CDG; pot fi utilizate în dezvoltarea curriculară și în proiecte educaționale interdisciplinare sprijinind modernizarea predării Geografiei.

Valoarea aplicativă a cercetării denotă posibilitatea: *aplicării* în practică a Modelului pedagogic și metodologiei de formare al CSG la elevii liceeni în procesul de studiere a disciplinei Geografie, axat pe AP; *valorificării* rezultatelor obținute, a designului și a instrumentelor utilizate în formarea CSG prin AP la elevii liceeni, putând influența demersul formativ al acestora în strânsă legătură cu nivelurilor sale de formare și de evaluare a progresului elevilor; *creșterii* performanței școlare și stimularea autonomiei elevilor prin eficiența AP; *perfecționării* predării Geografiei de către CDG implicate în actul educațional.

АННОТАЦИЯ

Пэтрашку Александра, Формирование географических компетенций посредством практической деятельности у учащихся старших классов : Диссертация на соискание ученой степени доктора педагогических наук, Кишинёв, 2025

Структура диссертации включает: аннотации на румынском, русском и английском языках, список сокращений, введение, три главы, общие выводы и рекомендации, библиографию из 250 наименований, 19 приложений, 150 страниц основного текста, 36 таблиц, 37 рисунков,

Публикации по теме диссертации: тема диссертации отражена в 23 научных статьях.

Цель исследования: создание теоретико-методологических основ для разработки и экспериментальной проверки педагогической модели и методики формирования географических компетенций посредством практических деятельностей (ПММ ФГК ППД).

Задачи исследования: 1. анализ теоретических подходов и понятий школьной компетенции (ШК), на общем уровне, и географических компетенций (ГК) учащихся старших классов и практических деятельностей (ПД) по предмету «География», в частности; 2. определение теорий, принципов, парадигм и педагогических моделей формирования ГК посредством ПД; 3. диагностика уровня сформированности ГК посредством ПД учащихся старших классов (констатирующий эксперимент); 4. разработка, теоретическое обоснование и экспериментальная проверка ПММ ФГК ППД.

Научная новизна и оригинальность исследования заключаются: в анализе теоретических подходов к ШК в целом, а также к ГК и ПД в частности, со структурно-методологи jческой точки зрения; в описании учебного статуса ГК в лицеях Республики Молдова и Румынии; в описании статуса ПД в системе образования Республики Молдова и Румынии; в разработке ПММ ФГК ППД, основанной на актуальности рассматриваемой темы, с целью формирования ГК посредством ПД в рамках проектов STEM/STE(A)M; в разработке инструментов обучения и оценки ГК; в разработке научных выводов и рекомендаций для учителей географии, а также для дальнейшего развития исследований в этой области.

Полученные результаты, внесшие значительный вклад в решение научной проблемы, включают в себя определение специфики и структуры ГК в старших класах, посредством ПД, ПММ ФГК ППД.

Теоретическая значимость исследования подтверждается: научным исследованием в образовательном контексте понятий «компетенции», «школьные компетенции», «географические компетенции» и «практическая деятельность»; определением и конкретизацией концептуальной основы школьной компетентности, понимаемой как многофункциональный, интегрированный и передаваемый набор знаний, умений (навыков/способностей), установок и ценностей; разработкой особенностей таксономии компетенций в Республике Молдова и Румынии; эволюцией куррикулума; выделением роли ПД в формировании школьных компетенций на уровне лицея; разработкой ПММ ФГК ППД для учащихся лицея; представлением уровней формирования ГК в рамках углубленного изучения (знание и понимание, применение и интеграция) в связи с уровнями оценки и успеваемости (высший, средний и низший); предоставлением примеров рабочих заданий, исследовательских проектов STEM/STE(A)M и инструментов оценки; обоснованием необходимости формирования ГК для старшеклассников посредством ПД в образовательном процессе; формулированием общих выводов и рекомендаций относительно будущих стратегий обучения для формирования ШК.

Прикладная ценность исследования заключается в возможности: практического применения ПММ ФГК ППД в рамках куррикулума в процессе изучения география с упором на ПД; использования полученных результатов, дизайна и инструментов в рамках формирования ГК посредством ПД, что может повлиять на подход к формированию компетенций у старшеклассников; в возможности совершенствования преподавания географии. Соответствующая ценность отражена в формировании ГК посредством представления уровней обучения посредством ПД и уровней оценки эффективности.

Внедрение научных результатов осуществлялось путем проведения педагогического эксперимента в C.N.E. „Al. Odobescu” и C.N.E. „Ion C. Brătianu” (г. Питешть) ; посредством публицистической и просветительской деятельности в рамках научных мероприятий.

ANNOTATION

Pătrașcu Alexandra, Building Subject-Specific Geographic Competences through Practical Activities in High School Pupils. Doctoral Thesis in Educational Sciences. Chișinău, 2025

Thesis structure: abstracts in Romanian and English, list of abbreviations, introduction, three chapters, general conclusions and recommendations, bibliography with 250 titles, 19 appendices, 150 pages of main text, 36 tables, 37 figures. ***Keywords:*** competence, school competence, subject-specific competences/ general competences, practical activities, STEM/STE(A)M learning project, high school level.

Field of study: refers to school didactics across levels and school subjects, and addresses the issue of building subject-specific geographic competences in high school pupils through practical activities.

The aim of the research is to establish the theoretical and methodological foundations for designing and experimentally validating the pedagogical model and methodology for building subject-specific geographic competences in high school pupils through practical activities.

Research objectives: 1) the analysis of theoretical approaches to the concept of SC at the general level, of SGC in high school students, and of PA in the subject of Geography in particular; 2) the identification of theories, principles, paradigms, and pedagogical models for developing SGC through PA; 3) the assessment of the level of SGC formation through PA in high school students; 4) the development, theoretical conceptualization, and experimental validation of the Pedagogical Model and the methodology for forming SGC through PA. **The scientific novelty and originality** of the research consist in: designing and validating the pedagogical model and methodology starting from the current relevance of the topic for building SGC through PA based on the STEM/STE(A)M project adapted to the present-day school environment; the operational structure of the proposed model, since it goes beyond theory, being applicable in real conditions and including the active participation of high school pupils; the staged organization of PA and their use as the main method for building SGC in high school pupils; the integration of the levels of building SGC into a unified pedagogical model; collaborative learning and the stimulation of autonomy in the educational process; mixed assessment (observation, questionnaires, tests, project outcomes) intended to provide a more complex image of the learning process. Results obtained that contributed to clarifying the scientific problem include: designing and validating the pedagogical model for building SGC through PA in high school pupils; creating the premises for covering the levels of building SGC through PA correlated with the levels of assessment and performance; statistically validating the impact of PA on building SGC; modernizing the Didactics of Geography through the integration of the levels of building school competences, in line with the current requirements of education and educational reform, oriented toward competences, and the integration of interactive and interdisciplinary methods. **The theoretical significance of the research** lies in its contribution to enriching the Didactics of Geography through: analyzing theoretical approaches to school competences in general, and to SGC and PA in particular, from a structural and methodological perspective; developing the taxonomy of competences in the Republic of Moldova and Romania; describing the curricular status of SGC and PA at the high school level in both countries; highlighting the role of PA in building school competences at the high school level; designing a validated pedagogical model and methodology for building SGC through PA in high school pupils; combining modern didactic tools (fieldwork, cartographic, digital) with interactive assessment methods adapted to the specificity of Geography and oriented toward more complex and objective measurement of pupil development;npresenting types of work tasks; promoting innovation through modern orientation aligned with the STEM/STE(A)M paradigm and European educational trends, contributing to the modernization of pre-university geographic education. All these aspects can be applied in school practice by integrating PA to increase high school pupils' interest in studying Geography and by implementing mixed assessment methodologies; they can serve as methodological support for improving Geography teachers' professional development; and they can be used in curriculum development and interdisciplinary educational projects supporting the modernization of Geography teaching. **The applied value of the research** highlights the possibility of: applying in practice the pedagogical model and methodology for building SGC in high school pupils in the study of Geography based on PA; capitalizing on the results obtained, the design, and the tools used for building SGC through PA in high school pupils, influencing their formative process in close connection with the levels of building and assessing pupil progress; increasing school performance andstimulating pupils' autonomy through the efficiency of PA; improving the teaching of Geography by teachers involved in the educational process.

PĂTRAȘCU ALEXANDRA

DEVELOPING SPECIFIC GEOGRAPHY COMPETENCES THROUGH PRACTICAL ACTIVITIES IN HIGH SCHOOL STUDENTS

532.02. School Didactics
by educational levels and disciplines (Geography)

ABSTRACT

of the PhD thesis in Education Sciences

Approved for printing: 10.09.2025

Paper format: 60x84 1/16

Offset paper. Offset printing.

Print run: 35 copies

Printing sheets: 2.1

Order no.: 89

Editorial and Printing Center of the Ion Creangă State Pedagogical University
Ion Creangă St., no. 1, MD - 2069, Chișinău