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**THEORETICAL AND METHODOLOGICAL FRAMEWORK FOR
DEVELOPMENT OF CLIMATE RESILIENCE COMPETENCE
IN ADOLESCENTS**

ABSTRACT

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The abstract and doctoral thesis can be found on the web page of the State University of Moldova (www.usm.md) and web page of ANACEC (www.cnaa.md).

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CONCEPTUAL FUNDAMENTALS OF THE RESEARCH

The relevance and importance of the topic is determined by the new global realities and current educational requirements promoted both nationally and internationally and is supported by three categories of arguments: normative, theoretical and practical. The world is subject to hazard, whether it is natural disasters and catastrophes, simple accidents or exceptional events, they represent a threat primarily to humankind and their activities, to the environment, to the local and global economy. It is known that the environment and human society often endure the action of extremely dangerous phenomena of different origin, natural or anthropogenic, which can cause destructive, even radical disorders, in certain systems or predetermined situations. These exceptional events (earthquakes, storms, floods, droughts, landslides, fires, technological accidents, conflict situations, pandemics etc.) occur unexpectedly and can cause human casualties, material damage, ecological imbalance and even mental and moral disturbances of the population, that falls under the incidence of that phenomenon. The effects of climate change, characterized by extreme natural phenomena of increased intensity and frequency are part of those exceptional events.

The European Parliament notes that climate change exacerbates gender discrimination, in addition to its other disastrous effects, and stresses that climate change and its negative effects should also be considered a development issue with gender implications, affecting all sectors including social, cultural, economical and political, from the local to the global level, and that joined effort is needed from all parties involved to ensure that measures to reduce climate change and disaster risks are gender-sensitive and mindful of indigenous population and human rights [7].

Climate change has a direct connection with education: children are the most affected by natural or man-made disasters. Learning and education systems are disrupted, affecting their right to education and inducing stressful situations. Development gains in education are reversed with damage to or destruction of school facilities or the use of school facilities as shelters, prolonged disruption of education and limited access to learning opportunities [70].

Respectively, there is a need to transform the education system in order to be able to engage it effectively as a tool to address climate change. Traditional education is discussed from the perspective that it is limited to rigid subjects and teaching methods, unable to effectively address the complexities society is facing in relation to climate change and other problems in the 21st century. The role of evidence-based thinking and decision-making is highlighted by many scientists as critical to this goal [72].

The research is based on theories, concepts, principles, ideas in the field of life skills education, pedagogy, psychology, environmental education, as well as on EU documents, including: Recommendation of the European Parliament and of the Council of the European Union on key competences from a lifelong learning perspective 2006, Life Skills 2010 UNESCO, Agenda 2030 for Sustainable Goals Development etc. Moreover, the epistemological value of national conceptual and normative documents was taken into account such as: the Education Code 2014, the Education Strategy - 2020, etc.

In order to ensure the implementation of the provisions of the national and international policy framework, and taking into account the alarming statistics, it becomes a priority to educate the population in order to increase adaptability and human resilience in the context of climate imbalance. The earlier the formal and non-formal educational approach is initiated in order to cultivate adaptability and resilience, the greater the chances of population survival. The effort must be directed towards educating the new generation to be more informed and prudent, not to be guided only by economic considerations and show a prompt attitude towards danger. Also, the creation and free access to an effective disaster and emergency management system for the country is extremely important to reduce the vulnerability of the population.

Situation description in the field of research and identification of the research problem

Due to the fact that the research covers several concepts, such as: competencies for life, climate change, adaptability, climate resilience and others, we analyzed different bibliographic sources. The issue of *competences* was addressed by Guțu V. [25], Guțu V., Muraru E., Dandara O.

[26], Șevciuc M. [42], Goraș-Postică V. [24], Darii L. [22], Semionov S. [40], Chiriac A. [11], Mihnea L. [64] and others. *Life competencies* have been reflected from multilateral perspectives in the work of the following researchers: Guțu V. (competencies in general) [25], Cuznețov L. [17] (parenting competencies), Bodrug-Lungu V. [6] (with emphasis on gender issues and the development of family competencies), Goraș-Postică V. (communication and negotiation competencies) [24], Repida T. (social competencies) [36], Sadovei L. (communication competence) [38], Kononova T. (socio-cultural competence) [29] and others.

Ecological competencies were researched by Cojocaru S. [12] and Mihăilescu C. [30] (development of ecological competence), Arhip A. (ecological education) [3], Roșcovan D. and Andon C. (education related to environment) [37], Fonari E. (formation of ecological culture) [23], Teleman A. (competence to explore ecological processes) [44], Ionescu A., Nicolae I., Udrescu S. (green competencies) [28].

The *didactics of competencies development* was researched by Vințanu N. [45] Copilu D. and Crosman D. [62], Sarivan L. [39], Ardelean A. and Mândruț O. [2], Singer M. [41], Costea O. [13], Negovan V. [31], Cerghit I. [10], Cucuș C. [16], Potolea D. and Neacșu I. [35]. The topic of *developing skills for an independent life* was researched by Mitulescu S. and Pârvu D. [65], Belciu M.E., Demenenco D., Hintș S. [4].

Furthermore, the issue of *developing life competencies* in terms of managing emotions and stress, developing healthy adaptation / coping mechanisms, increasing self-esteem, personal effectiveness, social intelligence, locus of control were elucidated by the following national scientists: Cuznetsov L. [17], Tolstaia S. [61], Platon C., Turchină T. [33], Anțibor L., Tolstaia S. [1], Potâng A., Saenco A. [34], Bucun N., Pliciev M. [9]. Researchers focusing on the concept of adolescents coping with stressful situations are Малкина-Пых И. [60], Александрова Л. [67], Анцыферова Л. [58], Денисова Ю. [59].

Internationally, *life competencies to meet existential challenges and psychological resilience* have been elucidated by Hobbs N. [53], Rotter J. [57], Bandura A. [47], Lazarus R.S. and Folkman S. [66], Egan K., Adkin J. and Host M. [63], Miller G.A. [56], Carver C.S. [48], Cohen S. and Edwards J. R. [49], who proposed various psychoeducational models for increasing personal potential through assigning value and continuous development of human resilience. Researchers Siebert Al. [43], Borysenko J. [8], Berndt Ch. [5] illustrated *the survivor personality and the profile of a resilient personality*.

From the undertaken investigation, it was deduced that although the concept of competencies was frequently addressed, this available research mostly focuses on the *cognitive dimension* (knowledge, cognitive intelligence), *applicative dimension* (practical skills) and less on the *affective dimension* (emotional intelligence, soft skills, affective dispositions, attitudes and values), which according to UNICEF ensure young people's success in life [69] and which is necessary for maintaining mental health, as a result of undergoing difficult life experiences and situations of crisis and stress.

It was established that the ecological competencies mostly refer to the aspects of protection and conservation of the environment, air, water and soil pollution, etc. and do not focus on reducing climate-related risk situations and on the psychosocial adaptation of people to extreme natural phenomena, caused by affected ecological systems. Compared to ecological skills, the competence of climate resilience involves the development of a resilient, optimistic mindset, the mobilization of internal resources and the cultivation of adaptability, the formation of survivor behavior.

It was concluded that, although the training of life competencies in climate change context is a widely researched topic, it is not a component of formal and informal education in the Republic of Moldova. Although the need to train life competencies for coping with climate change impact is confirmed by national and international policy documents, the conceptual and methodological framework is lacking.

The contradictions mentioned and the analysis of bibliographic sources in the field of study led to the identification of **the research problem**: what are the opportunities for adolescents to adapt

to climate change and what are their manifestations in case of stress caused by extreme weather conditions, and what are the theoretical and methodological framework and approaches to develop the competence of climate resilience that would ensure an increased level of adaptability to climate change of adolescents?

The aim of the research resides in the theoretical and methodological argumentation for the development of climate resilience competence in adolescents.

To achieve this goal, the following **research objectives** have been set:

- diachronic and comparative analysis of the evolution of life competencies concept from various perspectives;
- exposition of theoretical references to the development of life competencies and resilience;
- conceptualization of the methodological approach and the psychopedagogical model for the development of the climate resilience competence in adolescents;
- designing a system of assessment indicators for measuring the climate resilience competence in adolescents;
- experimental validation of the psychopedagogical model for the development of climate resilience competence in adolescents.

The research methodology involved theoretical research methods: theoretical analysis and synthesis, typological analysis, systematization and classification of theoretical concepts; empirical research methods: observation, testing, application of questionnaires, pedagogical experiment (diagnostic and formative); statistical-mathematical methods of data processing.

The thesis is based on the constructivist, experiential and integrative learning theories (Piaget J., Bruner J., Dewey J., Bandura A., Kolb D., Awbrey S.), task-based learning theory (Ellis R.), motivation theory (Maslow A.), theories of gender differences and social roles (Eagly A., Wood W., Maccoby E.), theories of positive psychology, resilience and learned optimism (Siebert Al., Berndt Ch., Leppert K., Seligman M.), humanistic approach to human-nature relationship (Cassirer E., Дерябо С.Д., Вернадский В., Гумилев Л.) as well as ecological and sustainable development theories (Mihăilescu C., Fonari E., Arhip A., Roșcovan D., Andon C., Teleanu A., Odoleanu N.).

Climate resilience training methodology includes development activities, methods and techniques, used to guide the process of clarifying and determining behaviors, attitudes and personal values in climate risk situations. The research harnesses learner-centered educational strategies, social and experiential learning, task-based / mini-project learning, integrative learning, cooperative learning and learning by discovery and reflection.

The theoretical research and realization of the experiment aimed to verify the **research hypothesis**, namely that: the climate resilience competence can be developed by applying the psychopedagogical model, designed and implemented according to a set of requirements aimed at:

- maximizing knowledge and attitudes to reduce climate risks;
- promoting a sustainable lifestyle;
- capitalizing the potential of adolescents and increasing self-efficacy;
- facilitating the development of coping mechanisms;
- fostering partnerships between girls and boys;
- increasing optimism and overcoming stressful situations related to climate change;
- capitalizing the gender and family factor in adaptation to climate change;
- encouraging students to adopt empathic, tolerant, objective and non-discriminatory attitudes to peers in the event of a climate disaster;
- cultivating climate resilience in adolescents.

Scientific novelty and originality of the thesis is ensured by linking present research to the growing global and national concerns with climate change (Agenda 2030, etc.), by advancing a definition for life skills in context of climate change, in particular the climate resilience competence; establishing a reference framework for the formation of climate resilience skills in adolescents, as a learning objective, which involves activating functional knowledge in case of extreme weather events, mobilizing internal resources for their own survival and support, involvement in collective

survival and empathy; conceptualization of the psycho-pedagogical model for the formation of the competence of climate resilience from a psychological, pedagogical, sociocultural, philosophical, legal and socio-economic perspectives; elaboration and implementation of the climate resilience competence training program; establishing and validating progress indicators for assessing the level of climate resilience competence in adolescents.

The scientific problem solved by the research resides in the theoretical and methodological development of a psychopedagogical model designed to ensure the increase of adaptability and climate resilience competence in adolescents, which contributes to their personal development and preparedness for life.

Theoretical significance of the investigation. The theory of education was developed by:

- defining the concept of life competences in the context of climate change, particularly climate resilience, which involves the ability to cope with natural disasters, manifesting decisiveness, calmness, agility of mind, optimism and acting effectively to maintain physical and mental safety of oneself and others;
- establishing a frame of reference on the development of climate resilience competence in adolescents, as a learning objective, which involves activating functional knowledge in case of extreme weather phenomena, mobilizing internal resources for one's own survival as well as support, empathy, involvement in collective survival;
- conceptualizing the psychopedagogical model for the development of climate resilience competence from a psychological, pedagogical, sociocultural, philosophical, legal and socio-economic perspectives;
- developing the progress indicators that would measure manifestation of the climate resilience competence in adolescents.

Praxiological value of the research paper consists in:

- interdisciplinary and multiaspectual approach to the concept of resilience;
- study of advanced experiences in home country and abroad with the purpose to promote the concept of climate resilience in the Republic of Moldova and formulate the theoretical and methodological framework for the development of the climate resilience competence;
- determining the possibilities of boosting and optimizing the process of training competencies for life in adolescents;
- experimental validation of the psychopedagogical model for the development of the climate resilience competence within the framework of the national education system;
- development and application of the climate resilience competence training program, its primary objective being promotion of the concept of climate resilience, materialized in the development and manifestation of adolescents' adaptation skills to climate change impact at school, community and individual level;
- implementing and validating the progress indicators of the climate resilience competence in adolescents.

The main scientific results submitted for defence:

1. Training *life competencies in the context of climate change* is part of personal development, which involves the acquisition of cognitive, social and psychoemotional adaptation skills, with focus on reducing vulnerability and developing adaptability and climate resilience competence through application of the psychopedagogical model for climate resilience training.
2. The *climate-resilient adolescent* is prepared to face the challenges of life and provide the necessary support to his peers in crisis situations. He/she has the decisive factors for survival: the ability to manage stress in critical situations, to mobilize mental energy, concentration and dynamism in decision making, psychosocial adaptability. He/she understands his/her role in the world, the premises of a sustainable lifestyle, the types of connections he/she needs

to establish in order to have a quality life and has the social tools to help him/her overcome the intense flow of information, natural disasters and social crises of today's world.

3. The *epistemological basis of the climate resilience competence* consists of constructivist, social, experiential and integrative learning theories, motivation theory, theories of gender differences and social roles, theories of positive psychology, resilience and learned optimism, ecological and sustainable development theories, which converge and substantiate the original concept approached in the research.
4. The *methodology for training climate resilience competence* includes development activities, materials and techniques, which are used to model behaviors, attitudes and personal values in case of extreme weather phenomena. It is based on the didactic strategies of social and experiential learning, task-based learning, cooperative learning, integrative learning and elements of neurolinguistic programming. This, in addition to the traditional components (principles, methods-procedures / techniques and means-forms), includes educational strategies concerning student-teacher interaction, and functional mechanisms for planning, implementation and evaluation of results.
5. The *main purpose of the methodology* is the transformation of the human personality and educational innovation, generated by the application of the climate resilience competence training program as part of the personal development process of adolescents by strengthening knowledge, skills and attitudes, mobilized and directed towards constructive coping with risk-prone natural phenomena and adaptation to the climate shift, in order to develop educational theory and practice, ensure the quality of the teaching-learning process, prepare adolescents for life and promote their well-being, confidence and optimism.

Implementation of the scientific results was carried out in three secondary education institutions from municipalities of Chisinau, Balti and Orhei - Vocational School no. 7, Gymnasium „A. I. Cuza”, Theoretical High School I. L. Caragiale”. The experiment was conducted with 106 subjects aged 14-17 years. The experimental training program was applied on a sample of 66 students, the control group consisted of 40 students. The main objective pursued in the experimental activity was the application and validation of the psychopedagogical model for the development of climate resilience competence and assessment tools.

Thesis publications. The research results are reflected in 14 scientific publications: 5 articles and 9 papers presented at national and international scientific forums and conferences.

The length and structure of the thesis. The paper consists of introduction, three chapters, general conclusions and recommendations, bibliography of 202 titles, 4 annexes. The thesis has 126 pages of basic text, 15 figures and 28 tables.

Keywords: life competencies, climate change, gender-based, psychopedagogical and socio-cultural principles, psycho-social resilience, climate resilience, environmental challenges, psychopedagogical model for development of climate resilience competence, climate-resilient adolescent, experiential learning, integrative learning, climate-related attitudes, values, behaviors.

THESIS CONTENT

The **Introduction** presents the relevance and importance of the topic, outlines the research problem, formulates the main purpose and objectives of the paper; the scientific novelty of the results is laid out, the theoretical importance and the formative value of the research are argued, the main investigative results are specified. Introduction ends with the summary of the thesis chapters.

Chapter 1 "Theoretical foundations of the climate resilience competence development" presents the evolution of the concepts of competencies for life, climate change and psychosocial resilience, presents the typologies accepted worldwide, makes a theoretical foray into the essence and role of education for life, all being analyzed in national and international context. At the same time, it capitalizes on the cultural approach to the perception of natural risks associated with climate change to explain the multitude of reactions and actions taken by various individuals and communities globally when faced with extreme natural phenomena caused by climate change and highlights the nexus of climate change - gender equality, promoting gender analysis and a gender

mainstreaming approach as key dimensions of actions to adapt communities and individuals to the consequences of global warming. It addresses psycho-social resilience as a key competence in the context of climate change, presents relevant psychopedagogical theories and emphasizes the need to educate resilience in adolescents, who by age, environment and socio-economic conditions are more vulnerable to extreme weather conditions than adults and need more counseling and support in coping with climate change effects and the stress related to them.

Even though the subject is of high and continuous interest to society in general and to education in particular, especially in the context of the Agenda-2030 achievement, the term *life competencies* has only emerged in the last decades and the literature review has shown an insufficient number of scientific research, monographs and collections, specifically focused on the development of life competencies, most of which are policy documents adopted by international organizations and working materials generated by development and cooperation initiatives.

Present research considers competencies for life as the defining conceptual framework for the climate resilience competence.

The epistemology of the life competencies concept was based on ideas, terms and theories that demonstrate their positive impact on the development of personality from a holistic point of view, a state of facts that has always concerned researchers in education, psychology and sociology such as: Guțu V., Dandara O., Șevciuc M., Paiu M., Cuznețov L., Goraș-Postică V., Bodrug-Lungu V., Repida T., Bucun N., Hobbs N., Rotter J., Bandura A., Lazarus R.S., Egan K., Adkin J. and Host M., Miller G.A., Carver CS, Cohen S. and Edwards J.R., Brown E. etc.

From the historical perspective: the concept of life competencies has passed through several stages, evolving from life skills in the context of responsible decisions and good practices for a healthy lifestyle, to later, outlining key competencies in the context of lifelong learning and finally, qualifying life competencies as necessary conditions for personal and professional development.

Competencies reflect the ability to effectively use personal, social and technical knowledge, skills and attitudes in different life situations: work, study or leisure. The structure of competence includes: *the cognitive dimension* (what the subject knows), *the affective dimension* (the attitude towards reality and the subject's context), *the behavioral dimension* (what the subject does) [62].

Competencies for life according to the European Commission represent a system of knowledge, skills and attitudes, which support individuals in gaining knowledge, development, self-realization, in finding a job and active participation in society throughout their lifetime. [73].

Development of competencies for life supports adolescents to acquire information and capitalize on the opportunities offered by everyday life, take initiatives and responsibilities for their own lives, think critically and creatively, be oriented on solutions versus problems, develop a tolerant and empathetic attitude towards people, easier establish friendships, based on trust and mutual help, communicate effectively with peers and develop psycho-emotional immunity to stress and social pressures.

In conclusion, competencies for life represent a framework of cognitive and socio-emotional resources, which is the foundation for a balanced, efficient and prosperous lifestyle; they increase resilience to stress in crisis situations and adaptability to climate, social, economic, technological transformations.

Further, this research focuses on the evolution of the human-nature relationship in the context of climate change, it reflects the evolvement of the philosophical schools of thought, concerned with the individual-environment rapport, the relationship between these two being fundamental, decisive, as it is based on interdependence and mutual influence.

Several fundamental theories that define the individual-environment union were analyzed. *The biocentric theory* places at its center all life forms, all the species of plants and animals on the planet, because they cannot defend themselves, as the human species does, considering man as a factor of the natural environment, which must obey the laws of nature, which he is not allowed to transform, only to cohabit with nature. *The anthropocentric conception* places man at the center of nature (and universe), everything being dependent on the ever-increasing different needs of the

humankind. Man is the master of nature, and for his own benefit, man can use anything and everything in nature, without boundaries and compensation.

From these two approaches, the humanistic perspective emerged, which combines the two extreme forms of the human-nature relationship, so as to create the foundation for the philosophy of a new balanced ecological reality. Socrates believed that man can be described only in terms of his consciousness, that in nature the inner attitude of the soul matters. His belief was that he who lives in harmony with himself - lives in harmony with nature. Man understands nature only if his gaze is directed to his inner universe, the knowledge of which is then supplemented by the knowledge of the outer universe.

In modern times, the human-nature interaction is mostly explored through the negative impact of civilization and technological progress on the environment, promoting recent concepts of environmental protection and ecological education, ecological culture, ecological awareness supported by researchers such as Sadovei L., Ursul L., Fonari E., Saranciu-Gordea L., Pâslaru V., Cojocaru S., Drăgăcescu D., Дерябо С. Д., Вернадский В., Гумилев Л., Ясвин А., Голд Дж. etc.

Ecological education is perceived as one of the most important reactions that humanity can have to environmental problems. Alongside, the concept of ecological culture is promoted, which refers to the degree of conscious human conception of coexistence with nature. Ecological culture presumes spirituality and creative activity, responsible both for the destinies of society and of the environment.

The human-nature relationship through the psycho-pedagogical perspective is studied in three directions: 1) research of ecological awareness and subjective attitude towards nature, 2) study of human safety in difficult and extreme situations of professional activity / life, 3) analysis of psycho-emotional consequences as a result of natural, technogenic and ecological calamities.

In the context of climate change, the individual-environment interaction has evolved from an attitude of human superiority to one full of responsibility and ethics. It is an attitude that truly reflects the role of the individual in society, that of reconciling human with nature and himself, and that of creating a better world for all.

The thesis examines the gender, sociocultural and psycho-pedagogical values as part of climate change analysis. We find that climate change threatens not only to widen the gap between poor and rich, but also to widen inequities between women and men, as women, especially those in developing countries, will be affected differently, more severely, compared to men. The impact of climate change addresses the combined factors of natural hazards and human vulnerability [71]. For women the level of risk is different than for men, including resilience capabilities are different. When capitalizing on the gender dimension in the context of climate change, we refer to the theories of gender differences and social roles, developed by Eagly A., Kite M., Wood W., Deaux K., Diekmann A., Saarni C., Maccoby E.

The concept of risk is defined from several perspectives, emphasizing its objective and real character, at the same time accepting its subjective dimension, perceived at individual and community level. Risk estimation and risk quantification are individual and unique experiences. For this reason, differentiated risk perceptions between individuals and communities is what often leads to disagreements over climate change and its consequences.

Referring to the cultural theory of risk perception (Douglas M. and Wildavsky A.), sociocultural differences are identified in terms of climate risk assessment according to the type of community. The central idea of the theory is that the way risks are perceived and ranked is closely related to the way people see themselves in relation to other people and to nature, which obviously affects their visions of the world, values, attitudes and lifestyle [Apud 14].

Analyzing the psychopedagogical bibliography sources, we concluded that education and self-education is an effective method of coping with climate fluctuations. Climate education is the solution to increase human adaptability and resilience in situations of risk [50]. The education-based strategy is all the more appropriate for vulnerable communities who have less access to technology,

less bargaining power, less funds to adapt their economic and social structures to the effects of climate change.

Climate change education should not be seen as a new autonomous discipline, but as a cross-cutting issue, which the different actors from formal, non-formal and informal education can integrate into curricula for greater outreach and impact. This type of education contributes to better human adaptation to the realities of present times and the challenges that are to follow.

We identified and outlined the relevance in the context of climate change of the main psychopedagogical theories that serve as theoretical benchmarks for conceptualizing the climate resilience competence: constructivist and experiential learning theories (Piaget J., Bruner J., Dewey J., Bandura A., Kolb D.), integrative learning theory (Awbrey S.), theory of social learning (Bandura A.), human motivation theory (Maslow A.), theories of positive psychology, resilience and learned optimism (Siebert Al., Berndt Ch., Leppert K., Seligman M.), theories of education for environment (Mihăilescu C., Fonari E., Arhip A., Roșcovan D., Andon C., Teleman A., Odoleanu N.).

Further, the research covers human adaptability to climate change, it conceptualizes the dichotomy of concerns, actions and responsibilities of modern civilization to enhance climate adaptability and resilience, which would lead to a sustainable lifestyle and increase the chances of survival in the event of natural disasters.

We pointed out that adapting to the effects of climate change is a complex and multilateral process, which takes place on several dimensions. Adaptation is defined as the process of adjusting natural and anthropogenic systems to current climate variability or future climate change, in order to moderate harm and explore benefit opportunities. Adaptation capacity is mainly treated from a pragmatic point of view and refers to all the instruments, resources and institutional structures necessary for the effective implementation of adaptation measures at community level [68, p. 4].

The main concern is that the countries focused on mitigating the consequences of climate change lack in their legal framework the part on the population preparedness to face environmental challenges, at the individual level, to adapt effectively to the climate shift and enable them to live a quality life with low risks.

Thus, present research introduces a paradigm for individual adaptation to climate change:

- *Cognitive adaptation* is related to assimilation, application and capitalization of knowledge.
- *Affective adaptation* aims at shaping beliefs, attitudes, feelings, values in relation to climate change.
- *Physical adaptation* refers to the ability to objectively assess own physiological condition and take into account personal and age characteristics in the adaptation actions undertaken.

These three dimensions of adaptation mould the *behavioral adaptation* of the person.

We concluded that adaptability is possible only in the presence of a set of competencies for life, which provides the individual with the cognitive and psychological tools necessary not only to survive change, but also to embrace it in a flexible and constructive way [51].

Further, the thesis focuses on the multidisciplinary approach to the concept of resilience. It analyzes the evolution of the term *resilience* from its origin and significance in physics, economics, ecology to the connotations of the concept in the social, psychological, educational fields.

Definitions of resilience were identified in the works of researchers Radu N., Ionescu Ș., Siebert Al., Borysenko J., Leppert K., Berndt Ch., Cyrulnik B., Pfeffer J., Southwick S., Coutu D., their visions being unified by the argument that resilience, besides the genetic component and the influence of lived circumstances, has a major learning component.

From the structural point of view, resilience in its broader scope converges a number of important qualities and skills: adaptability, mental agility, acceptance of reality, optimism and deep belief that life has meaning, the ability to improvise etc., all these being a guide to healthy thinking and useful for stress reduction and creation of well-being.

The specific properties of resilience were deduced:

- *freewilled* (resilience increases only in the presence of a clear intention to change and the effort made to materialize self-change);

- *temporal* (resilience is intermittent, it is increased in certain stages of life, and in others it is reduced, if not cultivated and maintained by optimism, hope and confidence in the future, self-knowledge and self-esteem, freedom to be yourself, etc.);

- *heterogeneous* (resilience will manifest itself in the face of certain challenges, while in the face of other challenges it will be lower, due to mental associations, stress, trauma, depression etc).

These findings confirmed the need to promote resilience as a solution in times of personal and social crisis, the usefulness of developing it from an early age and nurturing it throughout life, along with practicing positive thinking and a healthy lifestyle for mind and body.

The chapter ends with an overview of the theoretical and praxiological aspects of the concepts studied. The epistemological overview in Chapter 1 laid the basis for the theoretical and methodological conceptualization of the climate resilience competence.

Chapter 2 "Psychopedagogical conditions for the development of climate resilience competence in adolescents" identifies and defines a new competence, of both personal and social nature – *the climate resilience competence* and highlights its constitutive dimensions. The role and necessary training of the teacher to develop the climate resilience competence in adolescents is defined. Preconditions for efficient development of this competence through student-centered teaching strategies are argued. The psychopedagogical model for development of climate resilience competence is theoretically and methodologically conceptualized; its end result is to ensure through formal and informal learning activities an increase in the adaptability level and resilience of adolescents to climate change effects that would contribute to their self-confidence, personal growth and better preparedness for life.

Climate resilience competence involves a set of functional knowledge, values, attitudes and behavioral patterns, aimed at (1) activating functional knowledge in case of natural disasters; (2) mobilization of internal resources for own survival; (3) proactivity, peer support, tolerance, empathy and involvement in collective survival actions.

Climate resilience differs from *psychological resilience* in that it emphasizes collectivity and solidarity, extreme environment phenomena being collective experiences and having individual along with community impact, while *psychological resilience* confers the person a more individualistic character, focused on own physical and mental well-being.

Given the fact that life competencies and resilience are approached multidimensionally, we defined *the climate resilience competence* as a system of knowledge, skills and attitudes applied for cognitive, psycho-emotional and social adaptation and resilience in dealing with environmental challenges, with focus on reducing vulnerability and increasing stress resistance as well as promoting proactive behavior, natural disaster prevention and environmental protection (table.2.1).

Tabel 2.1 Climate resilience competence components

Knowledge – to know	
<ul style="list-style-type: none"> - Climate change phenomenon and its influence on the natural and socio-economic systems - Rules of conduct, values, principles and ethics during natural disasters, pre-crisis and post-crisis actions - Community services in the event of natural disasters - Individual's role in community resilience 	<ul style="list-style-type: none"> - Theories and techniques for self efficacy and management, including effective stress management - Techniques, methods and exercises for cultivating positive thinking and optimism - Techniques for developing adaptability and behavioral flexibility - Resilient person profile
Skills – to do	Attitudes, values, behavior – to be
<ul style="list-style-type: none"> - Providing information - Mobilization of internal resources - Generating ideas, solutions - Prioritization of actions - Decision making - Prompt and efficient action taking 	<ul style="list-style-type: none"> - Cognitive and emotional flexibility - Adaptability to change / unpredictable circumstances - Personal efficiency - Empathy - Altruism

<ul style="list-style-type: none"> - Problem solving - Control of emotions - Self-reflection - Self-development, self-organization - Multitasking ability - Intercultural communication 	<ul style="list-style-type: none"> - Cooperation and teamwork - Positive thinking - Optimism and love for life - Positive self-image - Critical thinking - Responsibility and commitment - Tolerance and non-discrimination
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The research introduces the multiple dimensions of the *climate resilience competence* (fig. 2.1):

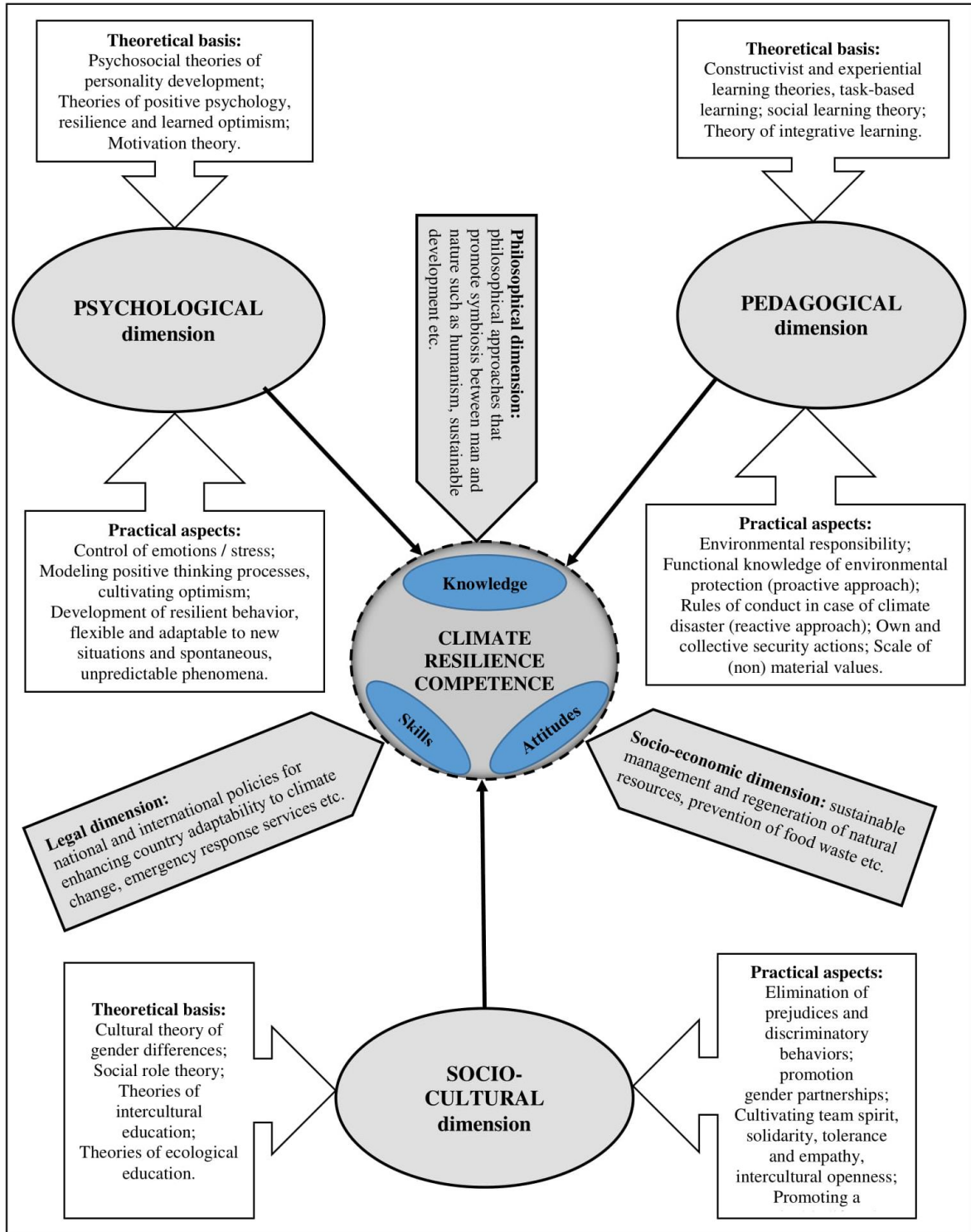


Fig. 2.1 Hexadimensional structure of the climate resilience competence

The role of the teacher in the development of the climate resilience competence is of a trainer, counselor, moderator of the cognitive, moral and behavioral transformations of the students. In order to be able to support development of climate resilience in adolescents, teachers should possess this competence themselves and nurture it throughout their personal and professional lives.

The competence of climate resilience can be developed through training and counseling activities focused on facing unpredictable life situations, and consists of combining operational knowledge and skills acquired in the educational process, personal qualities and capitalizing on personal motivation and interests, blending in at various stages of the teacher-student relationship.

Further, the thesis introduces the psychopedagogical model for development of climate resilience competence. The substantiation of the concept for development the climate resilience competence in adolescents is a scientific-methodological act, rather challenging from several points of view: the lack of systemic research on this topic; the complexity and diversity of approaches to various aspects of the problem; the need for a transdisciplinary and cross-cutting approach to the problem; and, last but not least, identification of the potential for the integration of scientific, empirical knowledge and the axiological dimensions into a holistic approach.

Even so, based on the theoretical and methodological approaches outlined and taking into account the need to adapt the school to the transformations of modern society and to the lifestyle and learning styles of today's adolescents, we conceptualized the psychopedagogical model for development of climate resilience competence, a product linked scientifically to the Sustainable Development Goals 2030, which include quality education, gender equality and climate action to increase the resilience of communities and individuals.

The purpose of the psychopedagogical model is to develop the life competencies defining the climate-resilient person, a vital attribute in the context of ecological imbalance, thus familiarizing adolescents with models of sustainable relationship with the environment, endowing them with psychosocial immunity and resistance to stress and ensuring more chances of success in life.

The psychopedagogical model is a theoretical and methodological construct, which includes a system of interactional guidelines and values that are part of the general paradigm of training adolescents to reduce vulnerability, be better prepared for life, particularly for risk-prone situations associated with climate change effect.

The conceptual foundation of the psychopedagogical model resides primarily on the integration of constructivist theory (Piaget J., Bruner J., Dewey J.), social learning theory (Bandura A.), experiential learning (Kolb D.), task-based learning theory (Ellis R.), theory of integrative learning (Awbrey S.), theory of social roles (Eagly A., Wood W.), theory of gender differences (Maccoby E.), theories of positive psychology, resilience (Siebert Al., Berndt Ch.).

The psychopedagogical model involves the presence of two components: *the theoretical component and practical component*, which determines the development of the methodology for acquiring the competence of climate resilience, the design of the training program, which can be applied occasionally in relevant disciplines or as a separate training, including application of the training methodology and evaluation of results.

The functionality of the model is based on the following principles: the principle of student-centeredness, the principle of multifunctionality, the principle of eclecticism, the principle of co-creativity of the teacher and student in the educational process, the principle of functionality / social utility of the teaching process and the principle of interdisciplinary correlation [32].

The components of the model are mutually conditioned and constitute a continuous cycle which, through the use of different methods, means of learning, result in increased climate resilience. The learning activity should dwell on different pieces of knowledge, which carefully selected and correlated, will substantiate further training at a higher level, by operationalizing knowledge and skills acquisition, shaping specific attitudes and behavioral strategies, thus ensuring the formation of climate resilience in adolescents. The psychopedagogical model (figure 2.2) is based on the continuous change / transformation of the adolescents' personality, capitalizing on personal resources, endowing with abilities to cope with stress and triggering survival thinking patterns.

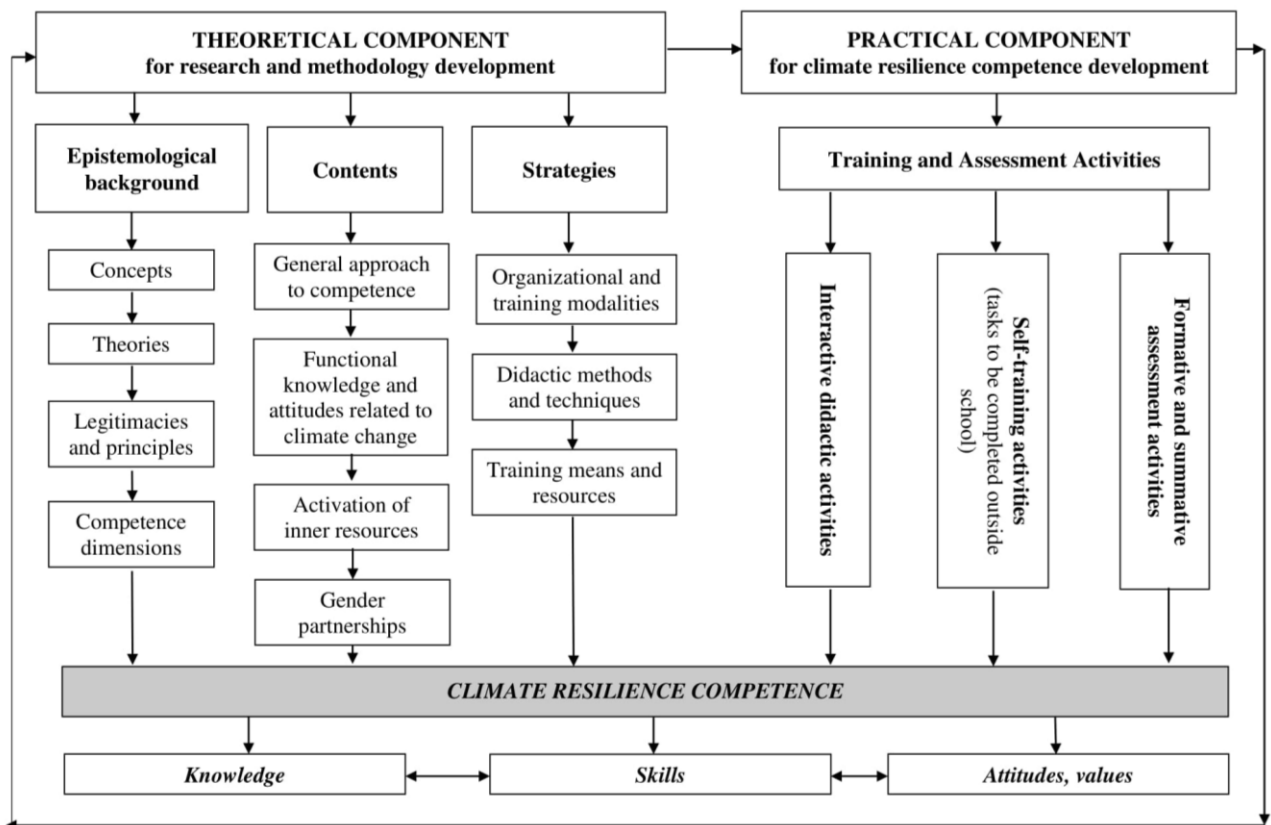


Fig. 2.2 Psychopedagogical model for development of the climate resilience competence

The practical application of the model involves a rigorous selection of training methods for all the dimensions of the climate resilience competence that would ensure efficient knowledge transfer and attitude formation in the context of climate change, would increase students' motivation, encourage involvement, critical thinking and free expression of perceptions, opinions and emotions.

Further, the research elaborates on the strategies for development of the climate resilience competence in adolescents. It presents the theories and teaching approaches, methods and learning algorithms, recommended for the implementation of the psychopedagogical model.

In education for environment, particularly in the development of adaptability to climate change and climate resilience competence, emphasis should be placed on advanced methods of modern didactics, which aim less at acquiring knowledge and more on knowledge interpretation and application in various situations, so that the individual is better prepared (at first, only in theory) to face natural disasters and their consequences. Making use of the analyzed bibliography sources, the didactic strategies that correspond to these requirements were determined.

It was established that adaptability and climate resilience can be developed by applying:

1. *social and experiential learning approaches* (Bandura A., Kolb D.)

According to Bandura's theory of social learning, individuals learn by observing from others the behavior, attitudes and consequences that their peers face. The theory explains human behavior as representing a continuous interaction between cognitive, behavioral and environmental influences. It emphasizes the importance of observing and modeling the behaviors, attitudes, and emotional responses of others, indicating as fundamental processes attention, retention, motor reproduction, and motivation [47, p. 186].

Kolb D. highlights two aspects in his learning cycle. First: concrete and immediate experiences are valuable for creating meaning in learning and for validating the learning process. Second: Kolb's model is focused on action research and experimental teaching, for both processes feedback being an important characteristic. The information provided through feedback is the starting point of an ongoing process, consisting of goal-oriented actions and the assessment of the effect of these actions [55, pp. 154-155].

2. *task-based / cooperative learning approach* (Ellis R.)

The approach determines the student to make an effort to fulfill the task, not the teacher, and only the planning / organization and evaluation stages are done jointly with either the teacher-trainer or with colleagues in larger groups. Didactic tasks can be designed in order for students to solve problems that lead to something useful and meaningful. They explore different perspectives to find solutions and thus acquire the skills necessary for life [54].

3. *integrative learning* (Awbrey S.)

The approach describes the paradigm shift towards integrated training activities, through which students can make cross-curricular connections. It manifests itself in various forms: interconnecting knowledge and skills gained through multiple sources and experiences, applying acquired skills and practices in various training situations, using different and even contradictory points of view, contextualizing personal topics and opinions, creating links between theoretical knowledge and practical dimensions, practicing the meta perspective and the transdisciplinary approach to various thematic areas [46].

In conclusion, the proposed teaching strategies lead to effective and efficient implementation of the psychopedagogical model for development of climate resilience competence in adolescents, emphasizing the model's holistic nature and its property of being easily adaptable to changing conditions.

The chapter ends with a set of conclusions that reflect the main ideas associated with the conceptualization of climate resilience competence, the psychopedagogical model of climate resilience competence development and the methodology for training climate resilience competence through modern teaching strategies that allow the teacher and the student to lead the training process together, applying various methods and techniques of effective learning.

Chapter 3 "Experimental validation of the psychopedagogical model for the development of climate resilience competence" contains the pedagogical experiment organized in three stages: fact-finding/diagnostic stage, training implementation stage and assessment stage.

The chapter starts with exploring the manifestation of climate resilience competence in adolescents. This part describes the overall methodological framework for the psychopedagogical experiment and the diagnostic stage.

The experiment was designed and carried out in three secondary education institutions in Chisinau, Balti and Orhei - Vocational School no. 7, Gymnasium „A. I. Cuza ”, Theoretical High School I. L. Caragiale ”with 106 subjects, during 2016-2017. The age of the participants was 14-17 years.

The considerations for selecting this group of students were that they represent both urban and rural areas, are at an age when interest in personal development arises, have sufficient knowledge in physics, geography and chemistry to understand climate-related phenomena and are mature enough to manifest responsibility, involvement and social commitment at community level.

The purpose of the fact-finding stage was to establish the amount of knowledge and estimate the kind of perceptions and emotions adolescents have in relation to natural disasters. The investigative approach focused on analyzing the ability of adolescents to adapt to climate change in terms of their personality traits, in particular resilience and optimism. The process of adaptation of adolescents is a multidimensional one, subject to permanent change and influenced by a wide range of factors, especially psychosocial ones. The identification of individual and gender psychosocial peculiarities of adolescents' adaptation to climate change made it possible to develop an intervention program aimed at increasing climate resilience and initiating the process of psychosocial adaptation to extreme weather events.

The fact-finding stage was organized around the following operational hypotheses:

1. Boys have a higher level of survival-related knowledge in situations of climate calamity, while girls show more care for others and empathy.
2. Girls have more realistic apprehension of the climate-related risks than boys.

3. The attitude of adolescents towards the behavior of the other sex in case of natural disasters is tolerant, objective and non-discriminatory.
4. Resilient adolescents show a higher level of optimism.
5. Boys are more resilient and more optimistic than girls.
6. Adolescents from biparental families are more resilient than those from incomplete families.
7. Both girls and boys can increase their climate resilience through lifelong learning activities.

The research methodology included a self-made questionnaire to assess knowledge, perceptions, and emotions in adolescents in relation to climate change effects and two psychometric tests for resilience (BRS by Smith B.W.) and optimism (LOT-R by Carver C.S.).

The experimental data obtained were subject to processing, using the hypothetical-deductive theoretical method for interpreting and explaining the results as well as quantitative and qualitative interpretation methods for differentiating the characteristics for the experimental and control groups.

The validity of the results and conclusions of the fact-finding stage were ensured by the methods approved in psychology, and the accuracy of the results was guaranteed by using different methods of evaluation and statistical processing.

The findings indicate that the level of theoretical knowledge in the field of climate change and its effects is *average* among adolescents whereas the level of operational / functional knowledge such as risk reduction measures in the event of a natural disaster is *low*.

The results of the diagnostic study signal unrealistic perceptions regarding the incidence of natural disasters in Moldova, which leads to an underestimation of the risks associated with radical climate change affecting this country.

The prediction of the behavior of the other sex in case of natural disasters is mainly determined by the social roles assigned to girls and boys by the community, being deeply affected by stereotypes and gender prejudices.

We established that the solution to information gaps and the elimination of gender-related preconceptions is in the development of an intervention program for the development of the climate resilience competence among adolescents.

We concluded that among the operational hypotheses, at the fact-finding stage, hypotheses 1, 2, 4, 7 were fully confirmed. Working hypotheses 3 and 6 were disproved, and hypothesis 5 was partially confirmed: boys are more resilient as girls, but they are not more optimistic than girls.

The applicative component of the psychopedagogical model for the development of the climate resilience competence was capitalized by designing the experimental training program to acquire climate resilience, setting the *objectives* for the participants to:

- Get informed about the critical situation of the environment and the prevention and remedy actions undertaken at global, state and local level;
- Strengthen knowledge of personal protection rules and survival strategies in case of extreme weather phenomena;
- Improve adaptability, climate resilience and the ability to cope with the unknown / uncertainty related to environment;
- Know oneself better and get to know and understand peers better, learning to relate non-aggressively, harmoniously, constructively, particularly during a climate calamity;
- Form attitudes and values specific to a healthy, balanced and sustainable lifestyle, which would increase quality of life in unstable climate conditions.

The program is a system of exercises and techniques, organized in the form of interactive sessions, aimed at understanding the environment, gain knowledge of extreme weather events and their consequences, learn the rules of civil protection, manage stress in situations with climate risk, develop flexibility and positive thinking in interpersonal relationships, enhance optimism and empathy. Based on the integrative learning approach, the training program includes notions and skills from geography, biology, socioeconomics, psychology and personal development subjects.

The program involves various interactive techniques and methods: brainstorming, role play, groupwork, academic controversy, simulations, case studies, thus combining the possibility of self-knowledge, analysis and reflection on the experiences and results.

The innovation of the program consists in combining didactic methods with psychological techniques, including neurolinguistic programming, such as social panorama, relaxation techniques by breathing and visualization, audit of beliefs, pyramid of values and suggestion techniques.

The program consists of 12 training sessions and 24 individual tasks / homework.

The training sessions topics are: (1) climate change, causes and associated risks; (2) global and local measures to reduce the impact of climate change; (3) safety and protection during natural disasters; (4) and (5) gender peculiarities during climate calamities (separately with girls and boys); (6) contributing to community resilience; (7) developing individual resilience; (8) stress management; (9) collaboration and teamwork; (10) flexibility and adaptability in thinking and action; (11) cultivating optimism; (12) fostering empathy.

Each training session has the following algorithm:

1st part. Introduction: greeting, energizing / “ice-breaker” exercises, creating a friendly / non-violent climate, collaboration, initiatives for psycho-emotional relaxation of the participants, in order to identify ways to build trust and create groupwork atmosphere;

2nd part. Exposition of the planned topic: presentation and debate on the topic, realization of the exercises that explore the subject dimensions in interactive ways;

3rd part. Reflection: consolidation of knowledge and information, reflection on knowledge, experience and feelings;

4th stage. Wrap-up and evaluation: formulating conclusions, providing feedback.

The training program is a valuable didactic support for the implementation of *personal development* subject, due to the fact that these two curricular products are comparable in intention, content and approach: developing self-acceptance, self-respect and respect for others, enhancing the responsibility to organize one’s personal life, to make decisions, to integrate harmoniously in society. Both the school subject and our training program are of immediate use, by means of which the adolescent will discover oneself, explore and experience familiar and new behaviors in contexts with different value intensity, learn how to develop independently, but also with others, identify internal resources, learn how to cope with stress, highlight one’s best qualities and overcome difficulties, including potential climate calamities.

The program although of limited duration, manages to influence attitudes, values, beliefs, to change behaviors related to climate change and initiate constructive thinking processes.

The experimental testing of the psychopedagogical model for the development of the climate resilience competence was the essential component of the research approach, thus validating the hypotheses of the research project. The process ended with the collection of assessment indicators for students included in the sample of the experimental program and in the control group. The selection in the experimental group was done on voluntary basis and required availability for full-time participation of the group members as well as genuine interest and motivation for the development of the competence targeted by the experimental model.

Researcher Cristea S. states that "The experiment involves the intentional introduction of certain variables, designed to change the behavior of subjects, to optimize their actions." [15, p. 21]. To validate the hypotheses it was necessary to estimate the quantitative and qualitative changes of the variables applied in the experiment.

The change in the behavior of the subjects relates to three areas of competence (cognitive, praxiological, affective), which are also the reference components of the training stage:

- identifying and developing the essential characteristics of the climate resilience competence: survival knowledge and skills, personal protection rules and safe behaviors, practices for a sustainable lifestyle etc.;
- experimenting and applying various teaching strategies, using a wide range of educational resources for the practical development of climate resilience competence;

- adopting an open-minded, cooperative and constructive attitude of empathy, tolerance, receptivity and involvement in the event of climate calamity.

The training program was conducted with 66 adolescents (32 girls and 34 boys) out of the 106 people (44 girls and 62 boys) that participated in the fact-finding stage. The control group consisted of 40 students (12 girls and 28 boys).

The experiment objective was to implement an educational program built on two dimensions: the first six sessions relate to the external dimension - environment and strategies for harmonious coexistence of human with nature, actions to overcome climate disasters, specific behaviors in climate risk situations, gender perspective included; the other six sessions refer to the inner dimension - individual feelings, perceptions and emotions, self-knowledge through reflection, sharing and counseling, personal development through stepping out of the comfort zone and seeking spiritual growth.

In order to assess the progress in development of climate resilience competence among program participants, the following actions were undertaken:

- the functional knowledge, perceptions and emotions questionnaire, the resilience test (BRS) and the optimism test (LOT-R) were applied repeatedly with the experimental group and the data obtained was collated with the results from the fact-finding stage;
 - assessment indicators were developed to measure the level of climate resilience competence in the experimental group and the control group for comparison and highlight of differences.
- As a result of the training program, *the following progress and findings were noted:*
1. Participants reached a higher level of awareness of the imminence of climate risks, so that the perception of the incidence and impact of climate disasters showed a trend of significant increase in adolescents (table 3.1).

Tabel 3.1 Perceptions of the incidence and impact of climate disasters at the pre- and post-training stage

Institution	Lyceum		Gymnasium		Vocational school	
	Community	Personal	Community	Personal	Community	Personal
Pre	40%	42,85%	40,4%	42,64%	40%	42,85%
Post	55%	68,5%	57%	66,8%	62%	73%
t		2,21		2,28	2,35	2,87
p		0,05		0,05	0,05	0,01

2. The objective level of functional knowledge held by adolescents has increased by about 20%, which indicates a better theoretical training of students in case of extreme climate situations and enhanced ability to cope with disasters by applying the rules of safe behavior (table 3.2).

Tabel 3.2 Comparative data for knowledge level at pre-and post-training stages, segregated by gender

Knowledge level total	Pre-training		Post-training		
	Girls	Boys	Knowledge level total	Girls	Boys
61,2%	55,8%	66,6%	83%	78,5%	87,5%

3. As a result of the experimental training program, gender-based attitudes and perceptions have become more objective and balanced (girls about boys) and more positive, more tolerant and less discriminatory (boys about girls), data is presented in tables 3.3 and 3.4.

Tabel 3.3 Girls' opinion about boys at pre- and post-training stages

Type of opinion	Description provided by the participants (quotations)	No. girls Pre	No. girls Post
Negative	"The boys react with fear, they show stress."	1 (2%)	2 (6%)

<i>Neutral</i>	"Boys are strong, but sometimes they live in fear and weakness, some do not stay calm and lose their temper, others are brave and act. We are all human beings and we could experience different emotions."	7 (16%)	18 (56%)
<i>Positive</i>	"The boys react calmly, have a pragmatic approach and leadership qualities, help the girls, do not show fear and are responsible."	36 (82%)	12 (38%)
TOTAL		44 (100%)	32 (100%)

Table 3.4 Boys' opinion about girls at pre- and post-training stages

Type of opinion	Description provided by the participants	No. girls Pre-training	Nr. girls Post-training
<i>Negative</i>	"Girls sometimes show fear and lose control. Girls are mentally weaker than boys and may have panic attacks."	46 (74%)	8 (23%)
<i>Neutral</i>	"Some girls can show calm and reason, others are afraid. Girls behave as organized as boys, sometimes even better than boys. Not all girls panic and experience stress, it depends on their level of training, some do really well. "	8 (13%)	18 (54%)
<i>Positive</i>	"Girls show self-control and emotional continence. Girls can organize efficiently and react responsibly, patiently, help others. "	8 (13%)	8 (23%)
TOTAL		62 (100%)	34 (100%)

4. The psychoemotional resilience and optimism of the training program participants showed an increasing tendency. The training activities strengthened their self-knowing, assertiveness, team spirit and cooperation, civic spirit, flexibility and adaptability, tolerance and empathy. Since the array of functional knowledge, qualities, abilities, attitudes and values has diversified, it is natural for adolescents to live a state of self-confidence, this fact considerably contributing to their optimism (table 3.5).

Table 3.5 Presentation of average values for resilience and optimism at the pre- and post-training stage

	Resilience		Optimism	
	Girls	Boys	Girls	Boys
Pre	15,4286	21,7344	35,7381	37,8281
Post	28,32	33,45	48,453	54,298
t	2,16	2,2	2,33	2,42
p	0,05	0,05	0,05	0,05

5. The comparative analysis in the fact-finding stage showed the lack of correlation between knowledge and resilience and between knowledge and optimism, which can be explained by the fact that resilience and optimism are complex constructs that may be developed in quite different settings. They are gradually nurtured by practicing positive thinking, living life experiences and reflecting on them, through active listening, receiving feedback and learning from it. As a result of the training program implementation, however, a direct proportional correlation between climate knowledge and resilience, and climate knowledge and optimism was identified, leading to the conclusion that the higher the level of knowledge, the greater resilience becomes and the more advanced the knowledge, the more amplified optimism is (tab. 3.6).

Tabel 3.6 Correlation between objective level of knowledge, resilience, optimism at the post-training stage

	Resilience	Optimism
<i>Objective level of knowledge</i>	0,399	0,346
p	0,01	0,01

We assume that this change could be given the following explanation: the climate-related knowledge transferred during the training program was rather functional / applicative than theoretical, so adolescents could cultivate their resilience and optimism in more practical ways, through experiences, feedback and reflection and that was what made the difference.

- The direct proportional correlation between climate resilience and optimism was even more pronounced as a result of the training program, confirming that the higher the level of climate resilience the higher the level of optimism and validating the hypothesis that resilient adolescents have a high level of optimism (table 3.7).

Tabel 3.7 Correlation between *resilience* and *optimism* at pre- and post-training stage

Pre-training	
Total sample	Optimism
Resilience	0,270
p	0,01
Post-training	
Resilience	0,421
p	0,01

This phenomenon can be explained by a 'chain' reaction: once a person has more knowledge about environment, including rules of behavior and personal safety in the event of natural disasters, he/she becomes more resilient by enriching his/her internal resources, learning how to prioritize, what community services to access, how to interact with others in case of disaster, how to take care of oneself, how to help others. Having a rich knowledge portfolio in disaster risk management and benefiting from the effects of resilience, the chances increase for the person to live in a state of well-being, confidence and optimism as well as feel secure in the event of a climate calamity.

- To assess the competence of climate resilience in adolescents, we conceptualized a grid of indicators for measuring competence acquisition, which were applied to the experimental group and the control group. As a result of the indicators application, a significant difference was found between the level of climate resilience competence in the participants of the experimental training program and the level of climate resilience competence in the control group (table 3.8).

Tabel 3.8 Comparative results of *the level of climate resilience competence* in the experimental group and the control group

Level	Average	High	Very high
<i>Experimental group participants</i>	15	37	14
<i>% from the total 66</i>	23%	56%	21%
<i>Control group participants</i>	25	15	0
<i>% from the total 40</i>	62,5%	37,5%	0

These contrasting results confirm the effectiveness of the implemented program, but also the fact that, in general, the level of preparedness of adolescents in case of climate calamities is low, the reason being the minimum importance assigned to this subject in school subjects, extracurricular activities and in family environment.

A significant aspect is that in the control group no student was able to demonstrate a very high level of the climate resilience competence, while 14 of the participants in the training program demonstrated full competence and generated ideas for organizing information campaigns addressing peers in the community. In this sense, we consider that the training program contributed both to the development of communication skills, sense of initiative, social engagement and encouraged creativity and freedom of thought and action.

The experiment demonstrated that:

- Boys have a higher level of knowledge for survival in situations of climate calamity than girls, but both girls and boys can increase their psychosocial resilience, especially climate resilience competence, through training activities.
- Girls have more realistic perceptions than boys of climate-related risks. As a result of the training, the perception of climate risks and the level of psychoemotional preparation increased in both girls and boys.
- Adolescents' attitudes towards the other sex during a climate disaster can be influenced / shaped to become tolerant, empathetic, objective and non-discriminatory.
- Informed adolescents are more climate resilient and more optimistic.
- Boys are more resilient and more optimistic than girls. Lower resilience in girls is explained by the strong influence of social roles, as men are strong and will take care of their own safety and of those around them in case of natural disasters. The aspect of reduced optimism can be explained by the more realistic and responsible view of girls in various life situations.

Chapter 3 concludes with the results and deductions regarding the diagnostic stage of the level of climate resilience competence in adolescents, the experimental training program and the training results along with the personality changes / transformations found in adolescents, evidence confirming the validity of the main research hypothesis and the operational hypotheses.

GENERAL CONCLUSIONS AND RECOMMENDATIONS

Present research developed the educational theory and practice through the conceptual, methodological and experimental validation of the development of climate resilience competence in adolescents. The most important values of the research are summarized in the following conclusions:

1. The analysis of the research variables *life competencies*, *climate change*, *psychosocial resilience* have elucidated the evolution, experiences and trends in the field of study as well as identified the theoretical approaches and existing practices at national and international level with reference to sustainable development in the context of climate challenges, revealing models for the development of resilient personality, which were the premises for conceptualization of the psychopedagogical model for development of the climate resilience competence in adolescents.
2. Research has shown that the *climate resilience competence* is a precondition for dealing with climate disasters by mobilizing internal resources, showing decisiveness, calmness, logic, optimism and acting effectively for own safety and mental balance [19]. It was confirmed that the formative component of climate resilience is determined by leveraging the competence of climate resilience, the development of which involves a) activating functional knowledge in case of climate calamities; b) mobilization of internal resources for one's own survival; c) tolerance, empathy, support and involvement in collective survival actions.
3. It was proven that *climate resilience competence* reflects correlated knowledge, cognitive, affective and motivational skills, which interacting with the attitudes and personality traits of adolescents, form the necessary competencies to manage stress caused by extreme climate phenomena. The concept of climate resilience competence is developed by cumulating the

psychological dimension, which refers to the control of emotions and stress; positive attitude and optimism, rational, organized, efficient behavior; psychosocial adaptation, with the pedagogical dimension, which includes measures to prepare for situations with climate risk and rules of behavior in case of their occurrence; actions for personal, peer safety and involvement of intervention services; the scale of material and non-material values in case of calamities and with the sociocultural dimension, which focuses on psychosocial vulnerability in the light of gender stereotypes; prejudice and discriminatory behavior in the context of climate change; ethical norms, values and prosocial principles: solidarity, cooperation, joining efforts, synergy, empathy. At the same time, the concept also includes the philosophical dimension: philosophical concepts that promote symbiosis between human and nature, such as humanism, sustainable development, resilient development, the legal dimension: strategies and policies to adapt to climate change, emergency services, etc. and the socio-economic dimension: sustainable management, conservation and regeneration of natural resources. Both on the theoretical and methodological levels, connections were established between the psychological, pedagogical and sociocultural approach, combining these approaches with the philosophical, socio-economic and legal elements relevant to the climate resilience competence.

4. *The psychopedagogical model for development of the climate resilience competence*, structured on the theoretical and methodological dimensions is functional, applicable and effective in acquiring knowledge, skills and attitudes, fostering partnerships between girls and boys, nurturing tolerance, empathy, optimism and overcoming stressful situations related to climate imbalance, in valuing resilient behaviors and adapting to climate change, which contribute to personal development and preparedness for life of adolescents [20].
5. *The climate resilience competence training program for adolescents* is an important innovation in the field of training competencies for life, in particular climate resilience competence, opens up significant perspectives for the sustainable and resilient development of adolescents, outlines strategic lines of research on this topic to be covered by the educational sciences from an interdisciplinary perspective.
6. *The experimental validation of the psychopedagogical model for the development of the climate resilience competence* demonstrated:
 - correlation between the psychological, pedagogical, sociocultural, philosophical, legal and socioeconomic dimensions in the development of the climate resilience competence in adolescents;
 - interdependence and mutual empowerment of teaching and self-training activities carried out within the experimental training program;
 - functionality of the climate resilience competence trained in adolescents, by applying the evaluation indicators at the end of the training program.

The pedagogical experiment confirmed the considerations of the research and demonstrated that the application of the methodology for training climate resilience competence in secondary education institutions broadened the participants perspective on climate change; called for interconnections of concepts and interdisciplinarity in the educational approach; motivated adolescents for continuous and multilateral self-training; provided them effective support in solving problems and overcoming both instructive-educational and psychosocial difficulties; encouraged teamwork and collaborative thinking and learning; promoted relationships based on tolerance, non-aggression, solidarity and empathy between colleagues of both sexes and in relationship with teachers [21]. All these features outline the contribution of the present research to the psychopedagogical field in Moldova.

7. The analysis of the research results allows us to confirm *the solution of the scientific problem*, which resides in the development of the theoretical and methodological framework for training climate resilience competence in adolescents, targeted by the psychopedagogical model for the development of climate resilience competence in case of climate calamities

and acquisition of a range of competencies useful for life such as resistance, adaptability, stress management, positive thinking, self-efficacy, etc., this model qualifying as a determining factor of the quality of educational services provided in Moldova.

RECOMMENDATIONS

At policy level:

- Development of educational policies in order to capitalize on competencies for life, particularly social and environmental competencies, in line with the Education Code.
- Expanding the research areas specific to life competencies in the context of climate change, the perspectives of addressing the competence of climate resilience by transferring the key concepts of research in educational practices.
- Development and implementation of information programs on adaptation to climate change addressed to different target groups of population.

At the level of secondary educational institutions:

- Creation of environmental teams of volunteers in secondary education institutions with the task to implement awareness-raising campaigns for students and teachers about the climate change phenomenon, mitigating its consequences and adapting to the new climate reality.
- Expanding the possibilities of training the competence of climate resilience by introducing the experimental training program developed in the curriculum framework of the compulsory discipline *personal development* or creating opportunities for the development of the optional course “Competencies for life in the context of climate change” to be conducted in secondary education institutions.
- Inclusion of the research-action and the indicators developed as a tool for monitoring and evaluating the progress made by adolescents in the field of developing climate resilience competence at the end of the secondary cycle [52].
- Development and inclusion of a module on development of competencies for life in the context of climate change in the in-service teacher training.
- Development of methodological guidelines, teaching and learning aids with reference to acquisition of competences for life in the context of climate change.
- Inclusion of the gender dimension in all training activities for the development of climate resilience competence in adolescents as well as for other target groups [18].
- Leveraging the subject of climate change in educational initiatives as opportunities for advancement by encouraging innovations in the field of sustainable development, circular economy and social entrepreneurship.

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ADNOTARE

Damian-Timoșenco Gabriela, *Repere teoretice și metodologice de formare a competenței de reziliență climatică la adolescenți, teză de doctor în științe ale educației, Chișinău, 2020*

Structura tezei. Teza este structurată din introducere, trei capitole, concluzii generale și recomandări, bibliografie din 202 titluri și 4 anexe. Teza are 126 pagini text de bază, 15 figuri, 28 de tabele.

Publicații la tema tezei. Rezultatele cercetării sunt reflectate în 14 publicații științifice: 5 articole și 9 lucrări prezentate la foruri științifice naționale și internaționale.

Cuvinte-cheie: competențe pentru viață; schimbări climatice; repere de gen, psihopedagogice și socioculturale; reziliență psihosocială, reziliență climatică; provocări de mediu; model psihopedagogic de formare a competenței de reziliență climatică; adolescent rezilient climatic; învățare experiențială, bazată pe sarcină, integrativă; diferențe de gen, atitudini, valori și comportamente în cadru climatic.

Domeniul de studiu îl constituie competențele de viață relevante în context climatic și procesul lor de formare și manifestare la adolescenți, în diverse situații critice, generate de dezechilibrul ecologic.

Scopul cercetării constă în fundamentarea teoretică și metodologică a formării competenței de reziliență climatică la adolescenți.

Obiectivele cercetării: analiza diacronică și comparativă a evoluției conceptului competențelor pentru viață din diverse perspective; elucidarea reperelor teoretice cu referire la formarea competențelor pentru viață; elaborarea demersului metodologic / crearea unui model psihopedagogic al formării competenței de reziliență climatică la adolescenți, necesare adaptării la schimbările climatice; stabilirea unui sistem de indicatori de evaluare a competenței de reziliență climatică; validarea experimentală a modelului psihopedagogic de formare a competenței de reziliență climatică.

Noutatea și originalitatea științifică constă în conceptualizarea unei noi competențe sociale, în particular, de mediu – competența de reziliență climatică și elaborarea unui program de formare, ce oferă un cadru teoretic și metodologic pentru dezvoltarea rezilienței climatice și altor competențe pentru viață relevante în cadru climatic, și pentru valorificarea maximă a potențialului personal al adolescenților.

Problema științifică soluționată în domeniu rezidă în conceptualizarea teoretică și metodologică a unui model psihopedagogic de formare a competenței de reziliență climatică, care să asigure creșterea nivelului de adaptabilitate și reziliență a elevilor la schimbările climatice, fapt ce contribuie la dezvoltarea personală și pregătirea pentru viață a adolescenților.

Semnificația teoretică a investigației: Conceptul de competențe pentru viață în context climatic, în particular, reziliență psihologică și climatică au fost definite și analizate multispectual, urmate fiind de identificarea și argumentarea teoretică a dimensiunilor filosofice, psihopedagogice, socioculturale, socioeconomice și legale, care stau la baza competenței de reziliență climatică. De asemenea, s-au determinat principiile valorice, ca element semnificativ în direcționarea procesului de formare eficientă a rezilienței climatice la adolescenți, elucidându-se reperele psihopedagogice și socioculturale ale demersului formativ, în vederea fundamentării Modelului psihopedagogic de formare a competenței de reziliență climatică. Ca rezultat, a fost elaborat instrumentarul de implementare și evaluare a competenței de reziliență climatică, un algoritm științifico-practic, inclusiv metodologia de formare și indicatorii de progres.

Valoarea aplicativă a lucrării este certificată de abordarea interdisciplinară și multispectuală a conceptului de reziliență; studiul experiențelor avansate din țară și de peste hotare privind oportunitatea de promovare a conceptului de reziliență climatică în R. Moldova și formularea reperelor teoretice și metodologice pentru formarea competenței de reziliență climatică; determinarea posibilităților de impulsivare și optimizare a procesului de formare a competențelor pentru viață la adolescenți; valorificarea experimentală în sistemul național de învățământ a Modelului psihopedagogic de formare a competenței de reziliență climatică; elaborarea și aplicarea Programului de formare a competenței de reziliență climatică la adolescenți, obiectiv prioritar al căreia vizează promovarea conceptului de reziliență climatică, concretizat în dezvoltarea și manifestarea abilităților de adaptare a adolescenților la schimbările climatice, la nivel de comunitate și individ.

Implementarea rezultatelor științifice s-a efectuat în trei instituții preuniversitare din mun. Chișinău, mun. Bălți și or. Orhei – Școala Profesională nr. 7, Gimnaziul „A. I. Cuza”, Liceul teoretic „I. L. Caragiale”. În cadrul experimentului au fost proiectate și realizate etapele: constatativă, formativă, de evaluare. Obiectivul urmărit în activitatea experimentală a fost aplicarea și validarea Modelului psihopedagogic de formare a competenței de reziliență climatică, pilotarea programului de formare și validarea instrumentelor de evaluare.

АННОТАЦИЯ

диссертации на соискании учёной степени доктора образовательных наук на тему *Теоретические и методологические основы для формирования климатической устойчивости у подростков*, автор Дамиан-Тимошенко Габриела, Кишинэу, 2020

Структура диссертации: введение, три главы, общие выводы и рекомендации, список литературы из 202 источников, 4 приложений, 126 страниц основного текста, 15 рисунков, 28 таблиц.

Публикации по теме диссертации. Результаты исследования отражены в 14 научных работах: 5 статей и 9 презентациях на научных форумах национального и международного уровня.

Ключевые слова: жизненные навыки, изменение климата, психопедагогические, гендерные и социокультурные основы, психосоциальная устойчивость, климатическая устойчивость, экологические проблемы, психообразовательная модель обучения климатической устойчивости, подростковая климатическая устойчивость, экспериментальное обучение, интегративное обучение, гендерные различия, отношения, ценности и поведение в климатической среде.

Область исследования включает в себя жизненные навыки в климатическом контексте, процесс их формирования и проявления у подростков, в различных критических психосоциальных ситуациях, вызванных экологическим дисбалансом.

Цель исследования состоит в теоретическом и методологическом обосновании формирования компетенции по устойчивости к изменению климата у подростков.

Задачи исследования: исторический и сравнительный анализ эволюции концепций жизненных навыков и психологической устойчивости; выяснение теоретических ориентиров применительно к формированию жизненных навыков; разработка методологического подхода: создание психообразовательной модели формирования компетенции по устойчивости у подростков, необходимой для адаптации к изменению климата, также создание системы показателей для оценки сформированной климатической устойчивости; экспериментальная проверка методологической модели обучения климатической устойчивости.

Научная новизна и оригинальность исследования заключаются в концептуализации новой социальной компетенции по климатической устойчивости и разработке учебной программы, которая предлагает теоретическую и методологическую основу для развития устойчивости и других жизненных навыков, а также создаёт среду для максимизации личного потенциала подростков.

Научная проблема исследования: теоретическая и методологическая концептуализации психопедагогической модели формирования компетенции по устойчивости к изменению климата у подростков, обеспечивающая повышение уровня адаптивности и устойчивости учащихся к изменению климата, что способствует личностному развитию и подготовке к жизни подростков.

Теоретическая значимость исследования. Жизненные навыки в климатическом контексте были определены и анализированы с разных перспектив, последовала теоретическая идентификация и аргументация философских, психопедагогических, социокультурных, социоэкономических и легальных аспектов, которые лежат в основе компетенции по климатической устойчивости. Были определены ценностные принципы как важный элемент управления процессом развития климатической устойчивости у подростков, выяснения психопедагогических и социокультурных основ учебного подхода с целью создания модели развития устойчивости к изменению климата. Был разработан инструмент для формирования и оценки компетенции по климатической устойчивости, включающий методологию обучения и показатели прогресса.

Прикладная ценность работы подтверждена междисциплинарным подходом к концепции устойчивости; изучением передового опыта в стране и за рубежом для продвижения концепции устойчивости к изменению климата в Молдове и разработкой теоретических и методологических основ для развития устойчивости; определением возможностей повышения и оптимизации процесса обучения подростков жизненным навыкам; экспериментальное внедрение в системе образования психопедагогической модели формирования компетенции по устойчивости к климату; разработка и реализация учебной программы по развитию устойчивости к изменению климата у подростков.

Внедрение научных результатов проводилось в трех образовательных учреждениях г. Кишинэу, проф. училище №. 7; г. Бэлць, гимназий «А. И. Куза»; г. Орхей, лицей «И. Л. Караджиале». Основной целью экспериментальной деятельности было внедрение психопедагогической модели формирования компетенции по устойчивости к изменению климата, пилотирование обучающей программы и оценочного инструмента.

ANNOTATION

Damian-Timoșenco Gabriela, *Theoretical and methodological framework for development of climate resilience competence in adolescents*, PhD thesis in educational sciences, Chisinau, 2020

Thesis structure: introduction, three chapters, general conclusions and recommendations, 202 bibliography sources and 4 annexes. The thesis has 126 pages of basic text, 15 figures and 28 tables.

Thesis-related publications. The research results are reflected in 14 scientific publications: 5 articles and 9 papers presented at national and international scientific forums and conferences.

Keywords: life competences, climate change, gender-based, psychopedagogical and sociocultural principles, psycho-social resilience, climate resilience, environmental challenges, psychopedagogical model for development of climate resilience competence, climate-resilient adolescent, experiential learning, integrative learning, gender differences, climate-relevant attitudes, values and behaviors.

The field of study covers life competencies related to climate change and disaster risk management, along with other competence development and manifestation in adolescents, during critical psychosocial situations, generated by ecological instability.

The research purpose resides in the theoretical and methodological argumentation for developing the climate resilience competence in adolescents.

The research objectives: diachronic and comparative analysis of life competences concept evolution from different perspectives; identification and clarification of the theoretical principles applicable to life competencies training; development of the methodological approach and psychopedagogical model for development of climate resilience competence in adolescents; design a system of indicators to assess acquired climate resilience competence; experimental validation of the psychopedagogical model for climate resilience education and adaptation to climate change of adolescents.

The scientific novelty and originality of the research consists in the conceptualization of a new social competence, in particular, an environment competence - climate resilience competence and the development of a training program, which provides the theoretical and methodological framework for building climate resilience competence and other life competencies relevant to unstable climate, which leads to capitalizing and enhancing personal potential of adolescents.

The scientific problem solved by the research resides in the theoretical and methodological development of a psychopedagogical model designed to ensure the increase of adaptability and climate resilience of students, which contributes to their personal development and preparedness for life.

The theoretical significance of the research: climate-related life competencies have been defined and analyzed from different perspectives, followed by theoretical identification and argumentation of philosophical, psychopedagogical, sociocultural, socioeconomic and legal aspects of climate resilience competence. The value principles underlying the process of efficient development of climate resilience competence in adolescents have been identified so as to create a solid foundation for the psychopedagogical model for development of climate resilience competence. The tools for training and assessing climate resilience competence in adolescents were developed: the training methodology and the progress indicators.

The applied value of the research is confirmed by the interdisciplinary and multiaspectual approach to the concept of life competencies and resilience; the overview of the advanced experiences at home and abroad with a view to promote the concept of climate resilience in Moldova and the formulation of the theoretical and methodological benchmarks for the development of this critical life competence; determining the possibilities of enhancing and optimizing life competencies training in adolescents; integrating the psychopedagogical model of climate resilience competence training in the national education system; design and implementation of the training program for development of climate resilience competence in adolescents.

The implementation of the scientific results was carried out in three secondary institutions from Chisinau, Balti and Orhei - Vocational School no. 7, Gymnasium „A. I. Cuza”, Lyceum " I. L. Caragiale". The experiment had the following stages: fact-finding, training and evaluation. The main objective pursued in the piloting activity was the application and endorsement of the psychopedagogical model for development of climate resilience competence in adolescents, implementation of the training program and validation of the assessment instruments.

DAMIAN-TIMOȘENCO GABRIELA

**THEORETICAL AND METHODOLOGICAL FRAMEWORK FOR
DEVELOPMENT OF CLIMATE RESILIENCE COMPETENCE
IN ADOLESCENTS**

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