

## Modeling of ecophobic tendencies of consciousness of higher education students

Oksana V. Klochko<sup>1,\*</sup>, Vasyl M. Fedorets<sup>2,\*\*</sup>, Oleksandr V. Mudrak<sup>3</sup>, Tamara S. Troitska<sup>4</sup>, and Vasyl V. Kaplinskyi<sup>5</sup>

<sup>1</sup>Department of Mathematics and Informatics, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, 32 Ostrozhskogo Str., Vinnytsia, 21001, Ukraine

<sup>2</sup>Department of Psychological and Pedagogical Education and Social Sciences, Public higher educational establishment “Vinnytsia academy of continuing education”, 13 Hrushevskoho Str., Vinnytsia, 21000, Ukraine

<sup>3</sup>Department of Ecology, Natural and Mathematical Sciences, Public higher educational establishment “Vinnytsia academy of continuing education”, 13 Hrushevskoho Str., Vinnytsia, 21000, Ukraine

<sup>4</sup>Department of Philosophy, Bogdan Khmelnytsky Melitopol State Pedagogical University Melitopol, 20 Hetmanska Str., 72300, Ukraine

<sup>5</sup>Department of Pedagogy, Vocational Education and Management of Educational Institutions, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, 32 Ostrozhskogo Str., Vinnytsia, 21001, Ukraine

**Abstract.** The article reveals the peculiarities of the formation of strategies for the development of ecological consciousness (ecophilic educational strategies) of higher education students on the basis of digital models of ecophobic tendencies (intentions, values). Based on the application of the developed “Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial epoch”” an experimental study of ecophobic and ecophilic intentions and values of higher education students. This mini-questionnaire reveals the environmental aspects of consciousness by actualizing the culture and psychology of everyday life. Based on the application of digital and mathematical modeling, ecological and value comprehension of the results of experimental research conducted using this mini-questionnaire, a model of “Archaic ecophobic intentions and values” was formed. This model contains the following digital models: “Matrix of coefficients (weights) for determining ecophobic intentions and values” and “Cluster model of ecophobic intentions and values”. Based on the application of these digital models, the concept of sustainable development and other concepts and approaches, three ecophilic educational strategies have been developed: “Synergistic strategy of personal security through care for the Earth”; “Strategy for harmonization of needs based on care for the Earth”; “Strategy for harmonization of human-Earth interaction”. When using the “Matrix of coefficients (weights) to determine ecophobic intentions and values” determines the system-organizing value and the dominant influence of the “Synergistic strategy of personal security through care for the Earth”. This strategy has a genetic and semantic connection with the basic vital (vital) value – food security (individual and collective). The application of this strategy can be relevant in educational theory and practice and in everyday life (life, work) to optimize and minimize human needs.

### 1 Introduction

The use of digital models in education is a direction that is correlated with the goals of sustainable development, in particular the 4th (“Quality Education”) and the 9th (“Industrialization, Innovation and Infrastructure”) [1]. As modern innovative technologies, digital and mathematical models are actively used in education: in health pedagogy in order to prevent the development of heart disorders in physical education classes (“Hemodynamic digital models”) [2], in mathematical ecology [3] etc.

In the 21st century, there are ecologically oriented changes in the consciousness of Homo Sapiens, which contribute to the transformation into Homo Ecologikus [4]. Consciousness is totally and systematically changed on the basis of a system of ecological values and inten-

tions. In relation to the “ecologically-revolutionary” and “ecologically-constructive” ideas of A. Peccia [5], we consider these ecophilic changes in the consciousness of modern man as a defining and system-organizing spiritual-mental and socio-cultural condition for achieving sustainable development goals [1] and accordingly as such that can ensure the existence of humanity and the planet Earth. In this aspect, the ideas of ecologically and socially oriented changes in the capitalist way of life are presented in the report of E. U. Weizsäcker and A. Wijkman to the Club of Rome [6]. Speaking about the relevance of ecologically oriented transformations of human consciousness and socio-cultural sphere, the decisive factor is the thesis presented in the “Human Development Report 2020” [1]: “The report calls for a just transformation that will expand human freedoms while reducing the global burden”.

From an anthropological standpoint in this aspect as an important methodological condition is the need to take into

\*e-mail: klochkoob@gmail.com

\*\*e-mail: bruney333@yahoo.com

account the phenomenon of human consciousness. Man and his consciousness are a central and determining factor in socio-cultural, technological and environmental transformations. A certain type of consciousness and as its components rationality, values, intentions are inherent in a certain type of person and, accordingly, is determined by epoch, culture, religion, technological and socio-political systems. Accordingly, there is the influence of consciousness on the world and socio-cultural sphere. That is, considering the problem from an anthropocultural standpoint, we can say that there is a mutual influence and determination in the system “consciousness – culture”. A significant component of consciousness are typical ideas, attitudes, values, intentions, stereotypes, cognitive schemes, mythologies that are primarily primary and “natural” are manifested on a daily, “everyday” and everyday levels.

Man is a creature that exists primarily in “his daily life”. Everyday life is considered as a component of the life world “Lebenswelt” (according to E. Husserl) [7] and as its structuring principle. Everyday life is accordingly manifested in all spheres of human life activity. In M. Heidegger’s system of defining existentially oriented ideas, Husserl’s “Lebenswelt” (Life World) is represented as “Alltäglichkeit” or “alltägliche Lebenswelt” (“everyday life”) and “everyday life”.

In this study, consideration of the development of environmental consciousness from anthropological and value positions determines the need for its understanding in the framework of anthropology [8–11] and the psychology of everyday life, as such, which is a manifestation of socio-cultural and communicative nature of man [8]. F. H. Tenbruck [11] considers everyday life as a “representative culture” that is recognized and perceived. It is at the level of everyday life that “naturally” and “authentically” system-organizing intentions, values, meanings and ideas are formed, formulated, comprehended, exist and transformed, which often become strategic and defining in human life and professional, sociocultural and environmental activity.

Given the inertia of socio-cultural processes, we actualize the need to analyze ecophobic trends present in the minds of modern man. Ecophobic as well as ecophilic tendencies [12] have been characteristic of many traditional societies. They manifested themselves most in the modern era in the format of an industrial technological-technocratic society, which carried out an active, systematic and constant “attack” on nature and the Earth. To some extent, the “eternally new” idea of linear and “constant” progress, as well as the corresponding socio-cultural, technical, industrial and economic achievements, as well as socio-political and cultural catastrophes manifested in the format of wars and revolutions can be interpreted as a manifestation of ecophobic tendencies. Which in the collective and individual consciousness has existed since ancient times. Accordingly, in this aspect, the essence that must be perceived and understood is not only environmental activities, but above all the preservation of the planet [1] including biodiversity, climate catastrophe prevention and significant climate change [13] and others.

Accordingly, to achieve the goals of sustainable development [1] by forming environmental consciousness determines the need for diagnosis, understanding and correction of ecophobic tendencies (in the sense – values, attitudes, intentions, stereotypes, mythologists, etc.) of modern human consciousness. Knowledge of the specifics of ecophobic tendencies is a necessary cognitive and value prerequisite for the development of “symmetrical” ecophilic educational strategies, as those aimed at the formation of environmental awareness and the greening of education and socio-cultural sphere. Relevant in this aspect is the diagnosis, consideration and digital representation of models of ecophobic tendencies of consciousness as a specific system of values (anti-values), intentions and attitudes. The defining aspect of this study is the educationally and competence-oriented greening of socio-cultural space, including collective and individual consciousness. Now greening is one of the defining and system-organizing areas of modern science and culture. The problems of greening of education, culture, including consumer, management and business are reflected in the studies of S. D. Fassbinder [14], J. Isakova and M. Pchel'nikov [15], I. Zaharia and S. Zaharia [16], S. Dutta [17]; O. V. Mudrak et al. [18]; M. B. Yevtuch et al. [19].

This paper presents the results of a study of students of higher pedagogical education, including postgraduate. The relevance of the choice of this category of persons who are socially active is due to the fact that due to the peculiarities of professional activity, they are considered as potential carriers of environmental awareness. In relation to the realization of the goals of sustainable development [1], future teachers and working teachers are considered as agents of change.

In the scientific pedagogical literature, the issue of constructing digital models of development of ecological consciousness of students of higher education institutions, including the development of educational ecophilic strategies based on the study of ecophobic tendencies (intentions and values) is insufficiently covered. Given the importance of this problem for the greening of education and the implementation of sustainable development goals, it is defined as relevant.

*The purpose of the study.* Modeling of ecophobic tendencies of consciousness of higher education students.

## 2 Methods of the research

The following methods were used in the study: environmental [1, 18–20] anthropological [4, 10, 11, 21] cultural-logical [22], psychological [23], competence, problem, axiological, transdisciplinary, ethological [24], humanistic.

Applied ecological, anthropological and pedagogical concepts: sustainable development [25]; greening [15, 17, 19] new humanism; the doctrine of functional systems of P. K. Anokhin [26]; human nature [27], observance to the full extent [27], nous (mind, thought, intelligence) [27], harmony [27], care of one self (epimelesthai sautou) (interpreted by M. Foucault) [27, 28].

*Use of own methodological developments.*

Using the methods of mathematical and computer modeling, and anthropological and ecological concepts, a model of “Archaic ecophobic intentions and values” was developed (see “Results”). This model is also formed on the basis of the application of the Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial era”. This model is the basis for the formation of ecophilic educational strategies.

*Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial era”:*

1. Are there harmful animals and plants that need to be destroyed so that nature is cultivated and developed for the good of man? (Yes / No / I don't know)
2. Swamps should be drained if possible so that there is more land and harmful microorganisms and animals are not bred in the swamps? (Yes / No / Don't know)
3. Is the world created to meet the needs of mankind? (Yes / No / I don't know)
4. To provide humanity with food, it is necessary to win back land for agricultural land in the wild. Is this an indicator of the development of civilization? (Yes / No / I don't know)
5. Wild plants and animals that cannot be used for food and for the needs of industry are not needed and occupy a place in nature where there could be useful species? (Yes / No / I don't know)

The mini-questionnaire consists of five questions. This minimized number of questions is due to many factors. The mini-questionnaire questions reflect typical phenomena that reveal traditional for industrial societies of modern ecophobic cultural trends and behavioral patterns. Accordingly, these systemic issues also reveal typical ecophobic ways of concentration and formation of meanings. There are relatively few such typical ways of conceptualization, so the number of questions in the questionnaire is insignificant – 5. An important factor is the appeal in matters of mini-questionnaire to the culture and psychology of everyday life in which accumulate both ecophobic and ecophilic traditions, values, interpretations. In turn, ecophobic tendencies deposited in everyday life can be revealed in issues that are concise, “simple” at first glance, conceptualizing and that do not “overweight” with their number.

The purpose of this survey was to identify at the level of “everyday consciousness” (attitudes, ideas and trends) [8–11] defining and system-organizing ecological values and their antipodes – anti-values, intentions, interpretations, metaphors. Ecophilic values in this mini-questionnaire are represented by the kingdom of plants and animals and the “unique” authentic landscapes of the Earth, including, for example, swamps, as well as the world as a whole.

Anti-values that are typical of the industrial age are represented in the format of expansive growth and primitive and pragmatic notions of useful and harmful to man and to humanity. The emphasis in the representation of

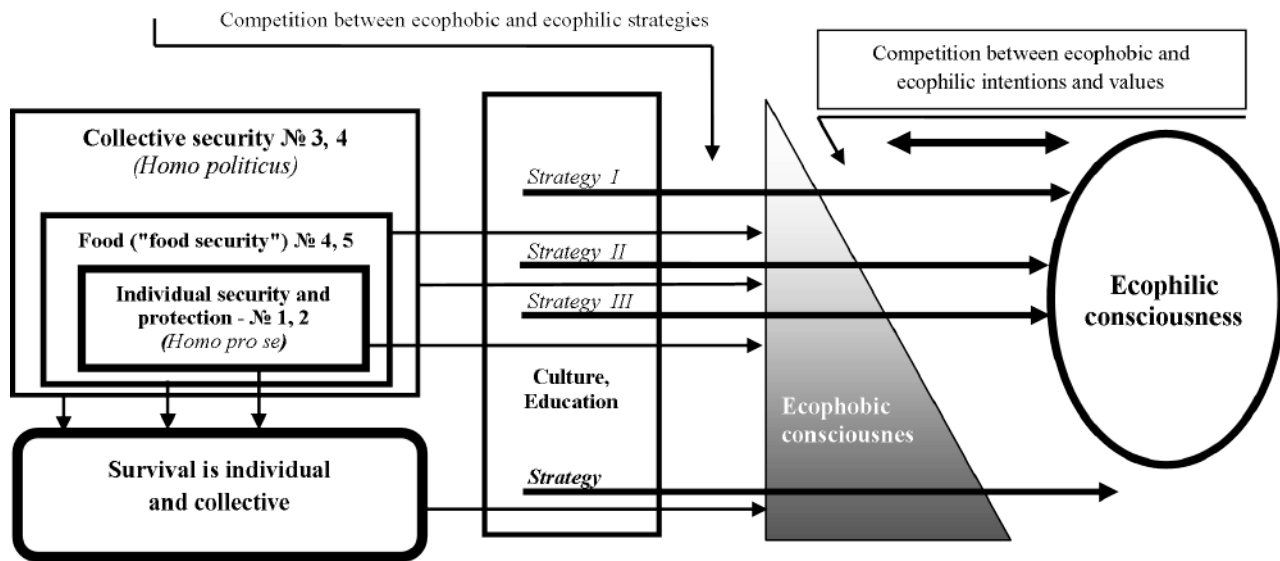
anti-values is on the idea of “collective good” (a system of typical ideologues characteristic of totalitarian societies) in the form of food, “common good”. Contextually, the idea of “Enemy” in the form of “harmful animals and plants”, “useless” landscapes – “wildlife”, swamp is also actualized. Congruently to the idea of the enemy the archetype “Warrior” is actualized [23]. These anti-values reflect the archetypal level of consciousness [23] with the corresponding archetypes “Warrior”, “Struggle”, “War”, which manifests itself in the form of war with nature, fears of the unknown and chaos, which are swamp, wildlife, harmful and unnecessary animals, plants, microorganisms.

Ecophilic values are revealed in the mini-questionnaire by actualizing the archetype of “Harmony” and the idea of nous (mind, thought, intelligence) [23]. These ecophilic values are generally more complex and accordingly require a certain level of cognition, prudence, moderation and spirituality. It is more difficult to understand the expediency of a swamp than to see in it a “set” of sewage, moisture and “terrible” animals and pathogenic bacilli.

The mini-questionnaire of “Ecophobic consciousness of the industrial age” is called to illustrate the manifestation of the typical “ecophobic spirit” or the spirit of struggle with nature with the Living, which manifests itself in the form of ideas, metaphors, intentions, values, psychological attitudes of the industrial age. Year, man-made miracles and catastrophes (such as the Chernobyl accident), that is, the total barbaric cultivation “of nature and its transformation into a commodity, a product followed by” exponential “consumption”. The ecophobic spirit and the corresponding tendencies of the industrial epoch due to the inertia of socio-cultural processes continue to exist in the modern realities of postmodernism. Therefore, the purpose of the mini-questionnaire is to determine these ecophobic intentions, values, attitudes, ideas and trends of both individuals and their presence in the collective consciousness.

Consider in more detail the conceptual basis of this mini-questionnaire and its in-depth structure (figure 1), which models the existential, intentional, axiological, biological and psychological preconditions and components of ecophobic consciousness. The defining and conceptualizing starting point on the basis of which the mini-questionnaire is developed is the idea that everyday life is considered as a defining and system-organizing dimension of human existence in which both ecophobic and ecophilic tendencies are formed and manifested. Therefore, the mini-questionnaire is formed at first glance on the basis of “simple” and fairly clear questions that reflect everyday life [10, 11]. The next aspect is the existentiality and vitality (vitality) of the issue, which is relevant in the mini-questionnaire questions. The basic contextual ideas, intentions, values and meanings of survival and security of both the individual and the family and the species *Homo Sapiens* are contextually laid down in the questions.

The number of questions is deliberately limited. This makes it possible to conduct a survey quickly without the active involvement of the intellectual component. It is important to determine the deep existential intentions and values “immersed” in the collective unconscious [23]. As



**Figure 1.** Conceptual scheme of the semantic structure of the Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial era”. № 1, 2, 3, 4, 5 in the figure indicates the question number in the mini-questionnaire.

noted, the mini-questionnaire is based on the ideas: vitality and survival through protection and safety. These ideas are revealed through: coverage of the problem of vitality by actualizing the safety, protection and salvation of the individual, which is reflected in the first two questions (questions № 1, № 2); presentation of the problem of vitality through the possibility of obtaining and eating food, which in the semantic context includes the problem of preventing hunger and accumulation of resources, wealth which is initially understood and interpreted as food, reflected in the last two questions (questions № 4, № 5); actualization of the issue of vitality and survival, which is revealed through unity with humanity, with the team, in collective security, presented in questions № 3 and № 4. The mini-questionnaire also presents the idea of collectivism, social and cultural nature and the corresponding socio-cultural way of its existence in the “megasytem” “Humanity or within a certain group, through collective survival, including the prevention of dangers and active food production (questions № 3, № 4). Question 4 reflects both individual and collective food security. Thus, the mini-questionnaire actualizes the idea of individual and collective survival and security, including food security. The core of the system of questions and relevant meanings is individual survival by minimizing dangers (questions № 1, № 2) and providing food (questions № 4; № 5). The periphery surrounding the core is collective security. That is, the question is the understanding of man as an individual or in itself – (Latin *Homo pro se*) and political man (Latin *Homo Politicus*) (used in the sense as a person in the family, team, collective) and social (*Homo Socialis*). Such an individualized interpretation of the instincts of preservation and the corresponding basic vital intentions and values correlates with the Western tradition of individualism and liberal ideology.

An attempt is made to actualize in the mini-questionnaire deep, archaic, existential, respectively, “sat-

urated” with mental energy problems, which are included in individual and collective systems of survival and security. To some extent, the mini-questionnaire simulates an archaic consciousness in which the main thing is to survive and “eat”. This “archaic” layer of consciousness exists in all people. We present this layer as basic congratulatory intentions and values. By its biosocial nature, it is essentially “pro-archaic” and correlates with behavior determined by the “reptilian brain”, which determines the basic biologically determined behavioral strategies – survive and defend, eat, attack, reproduce. These basic life aspirations and strategies are also inherent in animals. In humans, they become decisive and important in crisis situations, in pathology, in the presence of psychological or mental disorders and insufficient socialization and inculturation (human entry into culture). At the same time, man as a teleological being differs from animals primarily in higher goals, values and intentions. Simplification and reduction of man and the reduction of his high aspirations to biological instincts is characteristic of industrial societies, crises of society, wars.

Considering the problem of ecophobic consciousness from an anthropocultural standpoint, it can be noted that education, individual life path and experience can transform these “archaic” or rather “protoarchaic”, and in fact biological-psychological survival patterns based on food and protective instincts. in socially, culturally and personally acceptable and environmentally oriented behavior. It is important that this energetically and vitally “saturated” “archaic layer” of consciousness (more precisely the subconscious) is represented by basic vital intentions and values, which is responsible for food, sexual and protective behavior can actively influence decisions and ways of life. Accordingly, basic vital intentions and values can also largely determine ecophobic tendencies of consciousness and behavior, representing them as personally signifi-

cant and acceptable, as well as contribute to the formation of ecophobic orientation of consciousness and personality. These anthropobiological ideas and ideas on the basis of which the mini-questionnaire was developed, are primarily formed on the basis of knowledge that human conservation instincts (food, protective, sexual) and their corresponding behavior are not aimed specifically at conservation – environment, biodiversity or planet Earth. The logic of nature is clear – an individual using biologically defined ways of survival and existence will not be able to cause significant harm to the environment. In fact, the individual as well as the group (ethnic group, tribe) without the use of technology and science and the necessary social and cultural organization have a very limited and local impact on nature and the Earth.

At the same time, we can talk about the “ecophilic nature of man”, which is revealed and manifested precisely through culture. Hypothetically, this can be seen as a “socio-cultural instinct to preserve the environment”, which still needs to be identified and explored as a separate phenomenon, provided that it exists as such. This is just a hypothesis.

Thus, the mini-questionnaire reflects the “ecophilic neutrality” or indifference of human nature. This human “ecophilic neutrality” in interaction with the environment may acquire a certain ecophobic “color” and direction. This is due to the fact that nature, environment, Earth for living beings as well as for man is a background and a given. Accordingly, man naturally perceives the environment as an inexhaustible resource and as such a “compatible being of the World”, which is infinite and exists always and “forever”. Thus, the environment and the Earth are not initially included as an actual component of the defining intentions and significance for man in his biological, existential and “pre-cultural” or “non-cultural” state. Such states of “ecological savagery” can also exist in the context of socio-cultural adaptation of a person due to the fact that the ecological dimension and significance and value of preserving the Earth and the natural environment in culture are not purposefully updated, and contextual ecological meanings are absent or minimal.

The mini-questionnaire represents a layered structure of intentions, values, motivations, attitudes, which are both anthropobiologically determined and existential. We can discuss what should be at the core – food, collectivism (collective security) or individual protection and security. It depends on age as a person, on cultural and historical specifics, situational factors, features of education and upbringing, which actualize and make more significant this or that. For example, people who have suffered from hunger have the ability to center food in the mind as a determining value, those who were at war represent protection and security as the main thing. Accordingly, these aspects, in addition to the individual, are also in the collective memory of peoples as humanity as a whole.

This structuring of mini-questionnaire questions with the formation of a certain hierarchy correlates with the concept of pyramids of needs (hierarchical model of human needs) A. Maslow [29]. According to this concept of A. Maslow in our mini-questionnaire, the first two ques-

tions (questions № 1, № 2) reflect the physiological needs underlying the pyramid; the fourth and fifth questions (№ 4, № 5) illustrate the need for security; the third (№ 3) question corresponds to the need for belonging (friendship, love, communication).

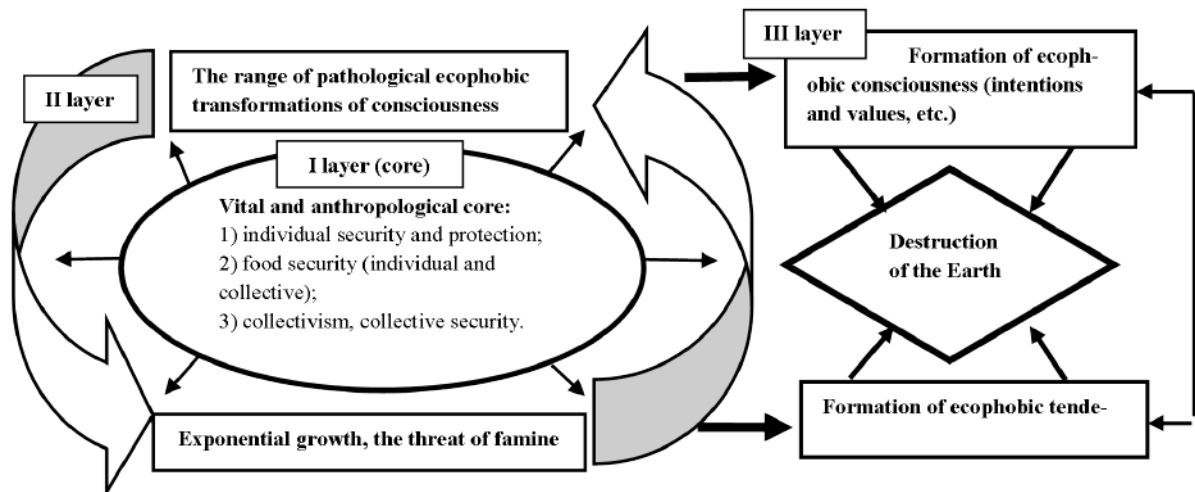
*Digital technologies and mathematical methods.* In order to achieve these purposes, we used: Microsoft Excel spreadsheets to perform calculations to determine ecophobic intentions and values [30]; Knowledge Analysis Weka system [31] and SimpleKMeans cluster analysis method for data clustering [32, 33]; mathematical methods of linear algebra for the development and implementation of the “Matrix of coefficients for determining ecophobic intentions and values”. The WEKA SimpleKMeans algorithm was used based on the Euclidean measure of distance to calculate the distances between instances and clusters. It is considered in more detail by us in the article “An empirical comparison of machine learning clustering methods in the study of Internet addiction among students majoring in Computer Sciences” [32, 33].

### 3 Results and discussion

The system-organizing content-semantic line of our research is the development of ecophilic educational strategies based on the analysis of ecophobic tendencies of consciousness. We form ecophilic strategies as competitive with ecophobic ones. That is symmetrical or congruent (figure 1). Defining in this methodology is that ecophobic tendencies represented in the format of the model are the basis for the development of ecophilic strategies. Consider the developed model of “Archaic ecophobic intentions and values” (figure 2), which is formed on the basis of analysis and interpretation of the results of the Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial era”. This mini-questionnaire reflects ecophilic and ecophobic intentions and the corresponding values and anti-values. This model is also developed using generalizations and environmental ideas formed on the basis of the concepts of A. Peccei [5], reports of the Club of Rome [1, 6], environmental [1, 18, 20, 25], anthropological [4, 10–12, 21], ethological [24] and culturology [22] approaches.

This model (figure 2) has several successive layers. It consists of a “core” and two layers: I – “Vital-anthropological” (core); II – “Pathological circle of ecophobic transformations of consciousness”; III – “Ecophobic consciousness” (ecophobic intentions and values) and ecophobic cultural tendencies. We consider the phenomenon of consciousness somewhat reduced, mainly focusing on the intentions and values (and anti-values) on the basis of which the Fedorets-Klochko mini-questionnaire of the Ecophobic Consciousness of the Industrial Age was formed.

The core (“Vital-anthropological layer”) of this model reflects the basic greeting intentions and values and, accordingly, is formed by three components: 1) individual security and protection; 2) food security (individual and collective); 3) collectivism, collective security. We call



**Figure 2.** Structural and logical scheme of “Archaic ecophobic intentions and values”.

this nucleus “Vital-anthropological” because in it the vitality of man and human nature are revealed in the corresponding aspirations. It reflects the vitality (vitality) that is inherent not only in man but also in all living beings, which reveals to us the kinship of living things and the systemic and unity of the biosphere. According to the sphere of instincts, this level, as noted, reflects the instincts of conservation: protective (personality and species), food, sexual. At the same time, the components of the nucleus are considered “environmentally indifferent”. They are represented as anthropobiologically determined basic living (life) intentions and values. These components can be arranged in a hierarchy format, or relatively independently. In this way, both functional and hierarchical connections and interactions are defined between them. The variability of the interaction of these components may be manifested in the specifics of ecophilic and ecophobic values (and anti-values) and intentions. These components that form the core are environmentally indifferent (neutral). They become ecophobic due to the introduction of civilizational tendencies of exponential consumption and fear of hunger or other problems.

Fear of nature by its forces and its grandeur is characteristic of archaic societies. Accordingly, in such societies, ecophobia could be manifested, for example, by “barbaric” burning of forests for primitive agriculture and protection from enemies and wild animals, as well as the total destruction of certain species in order to provide food and others.

In an industrial society, ecophobia has different origins and nature than in the archaic and traditional. It is a significant component of the ideologies and socio-cultural intentions and values that underlie “barbaric” industrialization, collectivization, business and profit by destroying the environment. Ecophobia is also an ideological and methodological prerequisite for the development of totalitarian societies formed on the basis of different ideologies (communism, etc.). At the same time, ecophobia in industrial societies is realized in the format of mega-projects of drainage, “flooding”, climate change, etc. Powerful ecophobic cul-

tural and professional value-semantic contexts are mainly formed and effectively influence nature and society. Another aspect of industrial societies that is close to archaic is the threat of famine to large masses of the population. Accordingly, it requires the development and implementation of targeted food security policies by harming nature.

In this model, the layer (II) which is a system of factors, conditions and triggers implementing ecophobic transformations of basic vital intentions and values (“protection-security”, food, collectivism) is the exponential growth of needs, production and consumption and fear of probable hunger. Pointing to the factor of fear, we are guided by the ideas of ethology. Within ethological notions, fear is one of the factors determining the direction of personality and behavior and which, together with anxiety, can be unconscious and at the same time manifest itself in appropriate ecophobic decisions and stereotypes of thinking and lifestyles. We call this layer “Pathological circle of ecophobic transformations of consciousness” (figure 2). We define this circle as pathological, because mostly attempts to solve global problems by local measures lead to even bigger problems. This understanding is also due to the fact that the man of the industrial age, who was obsessed with the idea of progress in its simplified ideological version, lost understanding of the expediency, extent and limits of influence on nature and thus violated the harmony between themselves and the environment. Mostly the man of the industrial age positioned himself as a fighter with nature, as a titan who makes “superhuman” and “supernatural” accomplishments. Accordingly, for this epoch the influence on the individual and mass consciousness of the corresponding archetypes [23] of the Titans is relevant, in particular Sisyphus (think of the idea and archetype of “Sisyphus’ work”), Prometheus – the idea and archetype of hero and heroic work, which often destroys nature or at least nature. the man himself. Exit from the “pathological circle” is possible through the formation of qualitative ecophilic changes of consciousness that harmonize the interaction of man and the Earth and through the development of new environmentally oriented

technologies. This pathological circle, which is a system of influences, ideologies, meanings, risks and threats is complex and “composed” of many problems, as well as dynamic and dependent on socio-cultural, mental, psychological and other factors of influence.

Using digital technologies, we can present the model of “Archaic ecophobic intentions and values” in an expanded way, presenting its quantitative characteristics. Therefore, this model also includes the following digital models: 1) “Matrix of coefficients for determining ecophobic intentions and values” and 3 scales that reflect them; 2) “Cluster model of ecophobic intentions and values”. These digital components were developed as a result of experimental research.

*Experimental study.* In the study, in order to determine ecophobic intentions and to build the above digital models, the Fedorets-Klochko mini-questionnaire of the Ecophobic Consciousness of the Industrial Age was used (see “Methods”). 162 students took part in the research. This number of participants was determined after pre-processing of test data, in particular, checking for missing values. The sample consisted of students – future teachers and teachers who studied in advanced training courses in postgraduate education. Teachers and future teachers of various specialties were studied, namely: teachers of physical culture, computer science, mathematics, ecology, elementary school. That is, the sample was quite heterogeneous in pedagogical specialties and age. The study was conducted in 4 institutions of higher education in Ukraine: the Municipal Institution of Higher Education “Vinnytsia Academy of Continuing Education”, Vinnytsia Mykhailo Kotsiubynskyi State Pedagogical University, the Municipal Institution of Higher Education “Vinnytsia Humanitarian and Pedagogical College”, Berdyansk State Pedagogical University. Based on the analysis and interpretation of the research results, 3 digital models were formed.

“Matrix of coefficients for determining ecophobic intentions and values” and 3 scales that reflect them. This matrix (table 1) is formed by conducting an expert assessment to determine the significance (weight) of each question of the Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial era” in the system of basic vital intentions and human values which include: 1) individual security and protection; 2) food security (individual and collective); 3) collectivism, sociality, collective security. The authors of the article and industry experts (5 experts) were experts on the formation of coefficients. The consistency of the opinions of the authors of the article and the experts was checked using the concordance coefficient. The value of the concordance coefficient is 0.93, according to Pearson’s chi-squared test it is significant [34].

Thus, the resulting matrix provides an opportunity to understand and represent each of the mini-questionnaire questions not only as a separate result that characterizes a certain basic value and intention, but also as a continuum that reveals the integrity, systemicity, permeability and structure of each mini-questionnaire question. It also makes it possible to determine the weight and significance in each mini-questionnaire question of each of the three basic vital intentions and values. Accordingly, basic con-

**Table 1.** “Matrix of coefficients (weights) for determining ecophobic intentions and values” in the form of a table and quantitative representation of the answers of the Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial epoch”.

Question	Individual security and protection	Food security (individual, collective)	Collectivism, sociality, collective security
№ 1	0.7	0.2	0.1
№ 2	0.7	0.2	0.1
№ 3	0.1	0.3	0.6
№ 4	0.1	0.4	0.5
№ 5	0.1	0.7	0.2

gratulatory intentions and values, by disclosing them in the context of certain issues, can be presented as a scale that determines the ability to quantify them and form an appropriate model (table 2, table 3). The data in table 2 were obtained by calculating the sum (separately for individual security and protection, food security (individual, collective) and collectivism, sociality, collective security) of the product of the corresponding value of the number of answers “yes” to the corresponding coefficient of table 1. The data in table 3 were obtained by calculating the sum (separately for individual security and protection, food security (individual, collective) and collectivism, sociality, collective security) of the product of the corresponding value of the number of answers “no” to the corresponding coefficient of table 1.

**Table 2.** Table of answers (positive), which distribute the ratio of basic vitamin substances and values and, accordingly, illustrate environmental tendency (intentions and values).

Individual security and protection	Food security (individual, collective)	Collectivism, sociality, collective security
51.5	35	32.5

**Table 3.** Table of answers (negative), which are distributed in relation to the basic living room intentions and values, which, accordingly, illustrate the ecophilic tendency (intentions and values).

Individual security and protection	Food security (individual, collective)	Collectivism, sociality, collective security
189	229.9	187.1

The maximum values of indicators on three scales are respectively: individual safety and protection – 275.4; food security (individual and collective) – 291.6; collectivism, collective security and expansion – 243 (table 4). The maximum values of indicators on three scales are formed on the basis of distribution of answers of the mini-questionnaire concerning three groups of basic vital inten-

tions and values taking into account “Matrix of coefficients (weights) for definition of ecophobic intentions and values”. The scale reflects the total maximum value and, accordingly, can have both ecophobic and ecophilic interpretation.

**Table 4.** The maximum values of indicators on three scales are respectively: individual safety and protection – 275.4; food security (individual and collective) – 291.6; collectivism, collective security and expansion – 243.

Individual security and protection	Food security (individual, collective)	Collectivism, sociality, collective security
275.4	291.6	243

*Cluster model of ecophobic intentions and values.* This model was developed using the system Weka [31], algorithm SimpleKMeans [32]. As a result of the study, 4 clusters were formed. This number of clusters was selected by preliminary evaluation (using validity indices for testing Dunn, DB, SD, CD<sub>bw</sub> and S<sub>Dbw</sub>) and experimental verification (using other clustering methods, splitting data into 3–5 clusters). We will analyze and interpret the results.

Cluster 0 has the following centroids according to the mini-questionnaire questions – no, no, no, no, no. This cluster contains 105 elements, which is 65% of the answers. In quantitative representation, it represents the dominant group in which ecophilic intentions and values are system-organizing, systemic and cross-cutting.

Cluster 1 is formed by centering the answers to the questions – undefined, no, undefined, no, no. This cluster is formed by the answers of 13 people and is – 8%. Quantitatively, this cluster is relatively small, but at the same time significant. The presence of indifferent responses in this cluster indicates the lack of formation in individuals of this group of ecophilic intentions and values. Therefore, even a relatively small volume of this cluster indicates the possibility of some socio-cultural impact that may have ecophobic connotations. In addition, the presence of “environmentally indifferent” intentions also indirectly creates a competitive strategy for ecophilicity.

Cluster 2 is formed by centering the answers to the questions – yes, yes, no, undefined, no. This cluster contains the answers of 20 people and is – 12%.

Cluster 3 is formed by centering the answers to the questions – yes, no, no, no, no. This cluster combines the answers to the questions of 24 people and is – 15%.

Cluster 2 and Cluster 3, despite some differences, reflect the presence of ecophobic intentions and values represented to a greater or lesser extent. In total, this is 27%, which is almost a third of the entire sample. This indicates the presence of a significant number of people who are more or less characterized by ecophobic tendencies of consciousness (in this case, intentions and values). The influence of these people on the socio-cultural sphere and cultural and educational space can be significant because the professional activity of the teacher contributes to the

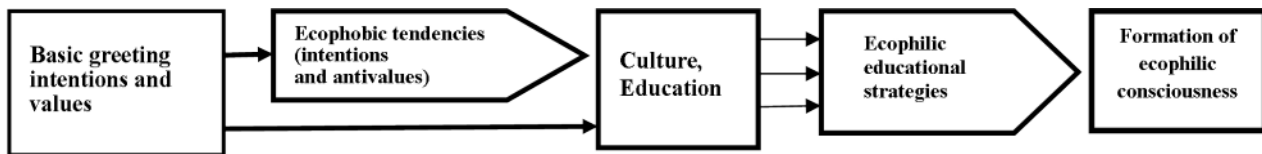
translation of existing intentions, values, attitudes, stereotypes and more.

*Conceptualization of ecophilic educational strategies.* Based on anthropocultural positions, the basic and system-forming in the development of ecophilic consciousness is the understanding of culture, including education as a determining and “constructive” factor [5, 20–22]. Accordingly, the ecophobic intentions and values present in a person under the influence of culture and education can be transformed into ecophilic or, conversely, strengthened in their direction (figure 3). That is, culture and education can act as a factor of transformation, “cultural filter” or, conversely, “amplifier” of certain trends. First of all, this applies to the essentially existential in its power powerful, representative [11] systemic, “through” factor, which is the culture of everyday life [8–11]. Accordingly, the basic vital intentions and human values formed on the basis of the “transformation” of conservation instincts (protective and food, including individual and species component) under the influence of culture and education can acquire an ecophilic orientation. This anthropocultural idea underlies this development of ecophilic educational strategies (figure 3). The ideological and methodological basis for the development of these strategies is also the concept of Sustainable development, which we consider as a defining, structuring and system-organizing cultural phenomenon and a manifestation of the “instinct of self-preservation of mankind” at the socio-cultural level.

In this methodology, we turn to the technological and value reflection of the teachings of P. K. Anokhin on functional systems [26]. In the semantic framework of this doctrine, behavior, values and meanings are presented as specific dynamic and targeted combinations of structures and functions of the body and the mental sphere, ie are functional systems between which there may be competitive relations. According to the theory of functional systems, ecophobic and ecophilic values, intentions, metaphors, ideas, reflections and experiences are considered as specific functional systems between which there can be competitive interactions that can be purposefully actualized. Thus, this approach is aimed at the development of ecophilic consciousness is formed on the basis of the idea of actualization and formation of competitive strategies. That is, we do not purposefully act on ecophobic tendencies, but “displace” them and deactivate them with the help of competitive ecophilic strategies as those that correspond to the harmonious nature of man and the goals of sustainable development. An important aspect of this methodology is its liberal nature. It is a natural right and desire of every person to choose any strategy. At the same time, ecophobic tendencies against the background of the developed system of ecophilic strategies can be defined by a person as irrelevant and, accordingly, desensitized. Accordingly, in this methodological system, ecophilic strategies are formed congruently with ecophobic intentions and values.

In this methodology, we also apply the idea of polarity, the essence of which is that psychological phenomena can have a polar or antagonistic direction. Under the influence of external conditions, the polarity can be changed





**Figure 3.** Structural and logical scheme of formation of ecophilic strategies.

to the opposite. Therefore, we are talking about the possibility of transforming ecophobic tendencies of the psyche into ecophilic by developing appropriate strategies that take into account the psychological phenomenon of polarity. In the formation of ecophilic strategies we also use: the archetypal psychology of C. G. Jung [23], the meaning and direction of which is the actualization of the archetype of harmony; existential philosophy and psychology used to reveal the existential dimension of man as tangent to the existence of the Earth; ancient Greek concepts of harmony [27] and self-care [27, 28] (M. Foucault), which are interpreted ecophilically oriented; greening [15, 17, 19], the concept of “Care for the Earth” by A. Gore [20].

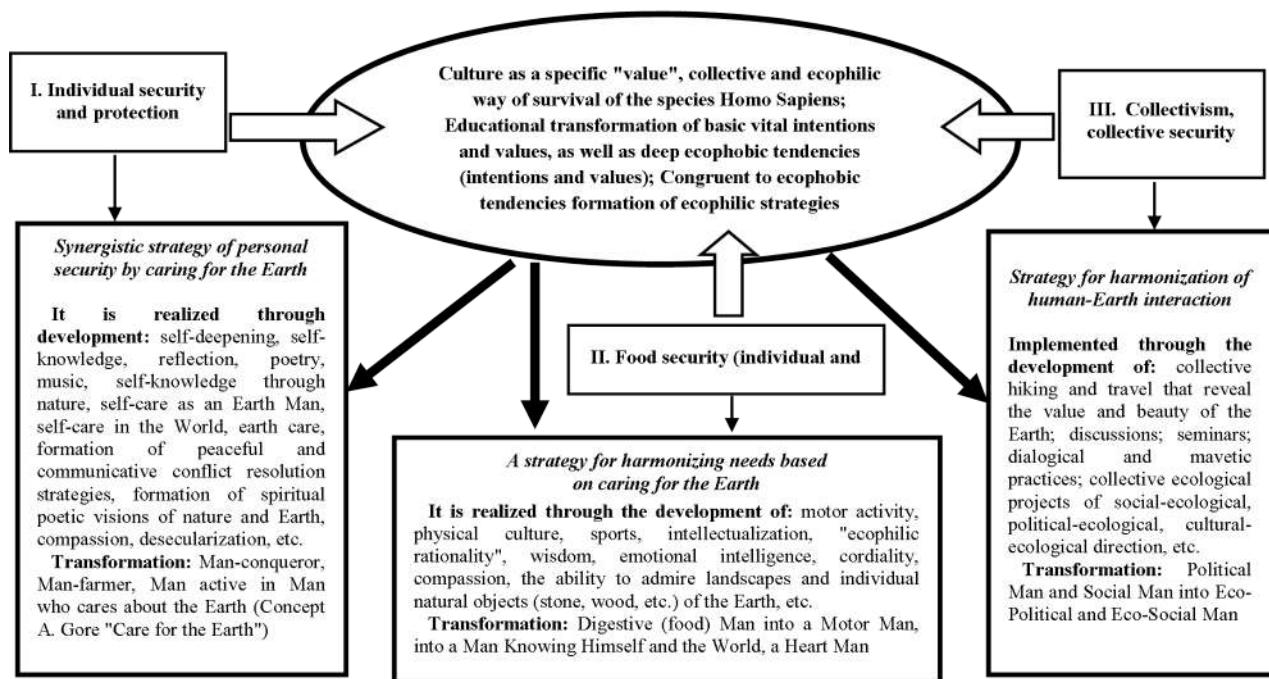
Ecophilic strategies are developed through ecological and value comprehension of three basic vital intentions and values (individual security and protection; food security; collectivism and collective security). Accordingly, the model of “Archaic ecophobic intentions and values” makes it possible to identify ecophobic tendencies of the psyche on the basis of which ecophilic strategies are formed as competitive (figure 4). We present the main ecophilic strategies, which are formed in relation to the three basic vital intentions and values and congruently to the relevant ecophobic tendencies (figure 4): “Synergistic strategy of personal security through care for the Earth”; “Strategy for harmonization of needs based on care for the Earth”; “Harmonization of human-Earth interaction”.

Individual security and protection is interpreted in existentially oriented formats of care, as protection not only of the individual but also of the Earth. This strategy is defined by us as “Synergistic strategy of security of the person by care of the Earth” (figure 4). This strategy meets the goals of sustainable development, in particular the 3rd “Good Health and Well-Being”, the 5th “Gender Equality”. The essence of this strategy is the security of the individual by preserving the Earth and caring for it. Determinant in the formation of this strategy is the concept of A. Gore “Care for the Earth” [20]. The system-organizing anthropological aspects of this strategy are self-knowledge, existentialization, the development of emotional intelligence and intellectualization aimed at knowing oneself as a person closely “connected” with the Earth, the formation of gender equality. Human aggression is thus transformed into care for the Earth and care for one self [28]. This strategy can be implemented through the development of: self-absorption, self-knowledge [28], reflection, poetry, music, self-knowledge through nature, care for one self [28], self-care as an Earth Man [19], self-care in the world, care about the Earth [20], the formation of peaceful and communicative strategies for conflict

resolution (including technology and practice of nonviolent communication), spiritual poetic visions of nature and the Earth [19, 22], compassion, desecularization. Accordingly, the essence of man changes, which becomes not only active, active but also caring, directing this concern to the planet Earth.

Food security (individual and collective) is interpreted as a reasonable, rational and harmonious use of nature, which includes an environmentally friendly understanding of the world around us. That is, we actualize the competition between the attitude to the surrounding world as a potential food or other resource and knowledge of the Earth, which is boundless in its essence. An important aspect of this strategy is the minimization, optimization and harmonization of human needs. This strategy is defined by us as “Strategy for harmonization of needs based on care for the Earth” (figure 4). The defining aspect of this strategy is intellectualization aimed at learning about the outside world and the Earth. Accordingly, motor activity is also presented as a technology of cognition and as a way of being (special motor ontology). This strategy is implemented through the development of: motor activity, physical culture [19], sports, intellectualization, “ecophilic rationality”, wisdom, emotional intelligence, cordiality, compassion, the ability to admire landscapes and individual natural objects (stone, wood, etc.) of the Earth. etc. This strategy meets the goals of sustainable development [19, 22] in particular the 4th (“Quality Education”), 12th (“Responsible consumption and production”), 14th (“Preservation of marine ecosystems”), 15th (“Preservation of terrestrial ecosystems”). Accordingly, there are transformations of the Digestive (food) Man, who tends to accumulate material resources in the Man of the Movement, in the Man who knows himself and the world, the Man of the Heart, who “accumulates” spiritual and intellectual values.

Collectivism, collective security is a basic vital intention and value that reflects the socio-cultural and political essence of man, as well as presents the essence of man as a species of Homo Sapiens. Ecophilic strategy, which is developed on the basis of this attributive quality of human is defined as “Harmonization of human-Earth interaction” (figure 4) [19, 22]. This strategy meets the goals of sustainable development [1, 22] in particular the 11th (“Sustainable Cities and Settlements”), the 13th (“Combating Climate Change”), the 14th (“Partnership for Sustainable Development”). Implemented through the development of: collective hiking and travel that reveal the value and beauty of the Earth; discussions; seminars; dialogical-maevtic practices; collective ecological projects of social-ecological, political-ecological, cultural-ecological direc-



**Figure 4.** Structural and logical scheme of transformation of ecophobic intentions and values (anti-values) into ecophilic educational strategies under the influence of education and culture.

tion, etc. At the same time, there is a transformation – of a Political Man, a Social Man, respectively, into an Ecopolitical Man, an Eco-Social Man.

Applying for development of ecophilic educational strategies “Matrix of coefficients (weights) for definition of ecophobic intentions and values” we consider that the maximum values of indicators on three scales are formed on the basis of distribution of answers of Fedorets-Klochko’s mini-questionnaire and the values of “Food Security (Individual and Collective)” (291), slightly lower for “Individual Security and Protection” (275.4) and even lower for “Collectivism, Collective Security” (243). We interpret this as the need to pay special attention to the development and implementation of a “Strategy for the harmonization of needs based on concern for the Earth”, which ecophilically interprets food security. Accordingly, this strategy should be the most relevant in the socio-cultural space compared to others.

Analyzing the quantitative indicators of responses (positive), which are distributed in relation to the basic congratulatory intentions and values and accordingly illustrate ecophobic tendencies (intentions and values), we highlight the most significant ecophobic intentions and values related to “Individual security and protection” (51%). For comparison, the indicators of “Food Security (individual and collective)” (35%) and “Collectivism, collective security” (32.5%) are almost at the same level. Ecologically and value-wise comprehending the indicative distribution, we make a generalization that the problem of ecophilic impact on “Individual safety and protection” is insufficiently updated and developed. Therefore, individual security is mainly understood as the formation of pro-

tection systems against a potential “enemy” who is outside in the environment and can be personified with natural, including terrestrial phenomena. Such ideas and tendencies are an “atavism” of archaic consciousness. Because often modern man has more problems in himself, becoming a force that destroys itself through active influence on the environment. The gap of almost a third of other indicators also indicates a hidden fear and anxiety about the unknown, which is potentially dangerous and, accordingly, associated with nature with its forces and essences. These interpretations tell us about the need to develop a “Synergistic strategy for personal security through care for the Earth” based on the development of reflection, value and existentially oriented understanding of man himself and the Earth and nature. Accordingly, the direction of existentialization, self-knowledge, self-knowledge of oneself and one’s human nature through the “external” nature of the Earth is decisive. Relevant within the framework of this strategy are the ideas of cosmism, mysticism (as anthropopractices of self-improvement), the direction of desecularization, as well as the application of environmentally oriented experiences of Eastern anthropo practices of qigong, yoga and others.

We take into account when developing ecophilic educational strategies “Cluster model of ecophobic intentions and values”. In summary, we note that this model can be presented in the format of three leading trends: I “Ecophilic” – Cluster 0 (65%); II “Ecophobic” (27%) – Cluster 2 (12%) and Cluster 3 (15%); III “Environmentally Indifferent” (13%). The quantitative distribution of ecophobic and ecophilic tendencies (intentions and values) presented in the cluster model indicates to us a signif-

ificant influence of ecophobic tendencies, which is almost a third. This influence can be significant and dominant in the decision-making process, in stressful situations, in everyday life, in professional activities, which is an important anthropobiological, anthropocultural and personal prerequisite for the destruction of the Earth. Accordingly, based on the analysis of the above trends, we consider it important to develop an ecophilic strategy – “Strategy for harmonization of needs based on care for the Earth”. It is this strategy that has significant limiting potential against negative influences compared to others. This influence is due to the actualization of ecophilic trends in the culture of everyday life and in professional culture. Accordingly, this can minimize the negative impact on the Earth at the level of culture, including professional.

#### 4 Conclusion

Digital modeling of the development of ecological consciousness is carried out by developing ecophilic educational strategies. The development of ecophilic educational strategies is based on the use of digital models and ecological and value understanding of man and his consciousness as a multidimensional anthropological, social and cultural phenomena.

A component of the experimental study was a survey of students of higher education institutions using the developed “Fedorets-Klochko mini-questionnaire “Ecophobic consciousness of the industrial epoch””. This mini-questionnaire is based on the idea of the importance of culture and psychology of everyday life. Because in the culture of everyday life, both ecophilic and ecophobic tendencies (intentions and values) of the individual can be clearly, systematically and authentically manifested and formed.

Based on the methodological and value reflection of the phenomena of existence and competition of ecophobic and ecophilic tendencies (intentions and values), as well as by ecological and value comprehension of the results of experimental research, the model “Archaic ecophobic intentions and values” is formed. This model contains the following digital models: “Matrix of coefficients (weights) for determining ecophobic intentions and values”, “Cluster model of ecophobic intentions and values”.

Based on the application of these digital models and other concepts and approaches, three ecophilic educational strategies have been developed. These strategies are formed in relation to the three basic vital intentions and values (individual security and protection; food security – individual and collective; collectivism and collective security) and ecophobic tendencies (determined by the mini-questionnaire) that correspond to them. These are the following strategies: “Synergistic strategy of personal security through care for the Earth”; “Strategy for harmonization of needs based on care for the Earth”; “Strategy for harmonization of human-Earth interaction”. The ideological and methodological basis for the development of these strategies is the concept of sustainable development. The model of “Archaic ecophobic intentions and values” was

used in the formation of the system of these strategies. In addition, in the development of ecophilic educational strategies used: ecological and value potential of anthropology, namely the culture and psychology of everyday life; C. G. Jung’s archetypal psychology; existential philosophy and psychology; the idea of competitive strategies is formed on the basis of P. K. Anokhin’s doctrine of functional systems; the phenomenon of polarity of psychological phenomena (values, intentions, attitudes, motivations, emotions); liberal ideology; ancient Greek concepts of harmony and self-care (interpreted by M. Foucault); the concept of “Care for the Earth” A. Gore.

The application of the “Matrix of coefficients (weights) to determine ecophobic intentions and values” reveals the maximum values of indicators on three scales, which are the largest for the basic vital intention and the value of “Food security (individual and collective)” (291), slightly lower for “Individual security and protection” (275.4) and even less for “Collectivism, collective security” (243). These indicators reveal the environmental significance of the “Strategy for harmonization of needs based on concern for the Earth”. This strategy, which ecophilically interprets food security and behavior, is relevant in psychology and anthropology of everyday life, in professional activities. That is, it relates directly to the “Alltägliche Lebenswelt” (German) (“Everyday Life” by M. Heidegger) and aims to harmonize human life in everyday life, not in stressful conditions, but in professional activities, in education, in everyday life, in the family being. Accordingly, this strategy contributes to the peaceful and harmonious existence of man through rationalization, minimization, optimization of their needs, as well as through intellectualization, intercultural communication, development of physical activity (physical culture and sports).

Summarizing and interpreting the results of the “Cluster Model of Ecophobic Intentions and Values”, which also underlies the development of ecophilic educational strategies, we can identify three leading trends. Representing these tendencies in quantitative representation we allocate: I “Ecophilic” – Cluster 0 (65%); II “Ecophobic” (27%) – Cluster 2 (12%) and Cluster 3 (15%); III “Environmentally Indifferent” (13%). Significant influence of ecophobic tendencies is defined which in quantitative representation makes almost a third (27%). Ecophobic tendencies can have a systemic, defining and dominant influence. This influence can be manifested in the decision-making process, in stressful situations, in crisis situations in society and to a lesser extent in everyday life, in everyday life, in professional activities. An ecophilic strategy that is competitive with ecophobic intentions and values manifested in stressful and crisis situations is a “Synergistic Strategy for Individual Security by Caring for the Earth”. This strategy reflects the impact on the basic vital value – individual security and protection. Although certainly ecophilic strategies, which are a system aimed at systemic influences act integratively.

Formed on the basis of digital models and ecological, pedagogical, anthropological and humanitarian approaches and concepts, ecophilic educational strategies represent a competence-oriented “intellectual-value-

activity” system of influences. This system formed by ecophilic strategies can actively influence human consciousness through the impact on vital areas (individual and collective security, including food). The application of ecophilic strategies can be relevant for educational theory and practice, as well as everyday conditions (life, work) to optimize and minimize human needs. The development of educational ecophilic strategies based on digital models contributes to the realization of sustainable development goals through the formation of a new ecologically oriented person – Homo Ecologikus, an attributive feature of which is ecophilic consciousness.

In the future, we plan to develop digital models using a systems approach and risk theory to determine the risks of ecophobic consciousness and the prerequisites for the development of ecophilic consciousness.

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