Development of Ecological Thinking in Students-Managers in the University Ecosystem

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ABSTRACT

In the modern VUCA world, the higher education system is changing due to the needs of society and the economy, as well as widespread digitalization. To train competitive specialists, primarily in the field of economics and management, universities create their own ecosystems. They are designed to ensure the sustainability of the system and the quality of education through the diversity of the learning environment. Close interaction with the outside world requires new skills from student managers. One of these social skills is ecological thinking. The purpose of our study is to show the possibility of developing the ecological thinking of student managers in the conditions of the ecosystem of the university with the help of special pedagogical tools, which we call pedagogical cues. As the main author's method of empirical research, a questionnaire survey with a Likert scale and a set of 10 questions were used. This made it possible to identify the level of formation of ecological thinking among students of the Faculty of Economics and Management. The author's methodology assumes 5 levels of development of such a skill. This is necessary in order to learn in dynamics how quickly and efficiently a skill is formed. The article presents tools that contribute to the development of ecological thinking. For example, the WOOD strategy. Pedagogical cues, which were used as a universal pedagogical tool in teaching various disciplines, have shown their effectiveness. Student managers actively interacted with teachers and with each other, including in a distance format. The scientific significance of the article lies in the possibility of the practical use of this methodology for the development of the ecosystem of other universities. The listed pedagogical tips can be applied in any form of education, which also contributes to the creation of the stability of the system in a constantly changing world. Such a skill as ecological thinking is universal and necessary for all future specialists for successful work. The upbringing of environmentally literate students is the key to the sustainability of the university ecosystem.

Keywords: VUCA-world, ecological thinking, ecosystem, pedagogical cues, soft skills, students-managers

1. INTRODUCTION

In the modern VUCA-world, the higher education system is undergoing major changes. Future specialists in the field of economics and management need not only new personal soft skills, but also new types of thinking.

In addition to the critical, there is a need for the development of algorithmic, systems, computational, design and ecological thinking.

In addition to knowledge, skills and abilities, modern students-managers should also have a certain set of competencies that are directly related to metasubject results. These results include the formation and development of ecological thinking, the ability to apply it in

cognitive, communicative, social practice and vocational guidance.

Ecological thinking is the ability to deliberately relate to what is happening without harm to oneself and the environment, to be responsible for actions, to enjoy the results achieved. This type of thinking can be developed both with the help of special pedagogical tools and in a special ecosystem of the university.

Ecosystem is a biological concept, meaning the totality of a community of living organisms, their habitat, a system of connections, exchanges of energy and substances, etc. The ecosystem of the university is a flexible system with multiple connections, capable of quickly and adequately responding to external and internal changes in society. It is contrasted with hierarchical systems that are run from top to bottom. The basis of any ecosystem is multiple interactive horizontal communications.

In natural ecosystems, diversity is essential for the sustainability of the system. At the university, the ecosystem is supported by faculty members with diverse professional and cultural backgrounds. There is also an evolutionary argument for diversity in learning environments. New projects within the university emerge and develop in a process related to the Darwinian principles of diversity and selection. The selection of new projects is more successful when there is a high variability in the combination of students, teachers, tools and ideas. Diversity within an ecosystem leads to its stability and better adaptability to different types of activities (primarily educational). Innovative teaching methods are especially important for students of the "digital generation" [1].

Designing an environmentally friendly learning environment requires the teacher to shift in the traditional approach to how supervision is carried out. The learning experience cannot be tightly controlled or planned from above. It is impossible to control what (or when and how) a student learns. University ecosystem developers cannot directly program the learning experience. The challenge teachers must meet is to create an extensive ecosystem in which interesting ideas and interesting activities will grow. However, monitoring in the education system still comes to the fore in connection with the need to assess the effectiveness of educational organizations [2].

Ecological thinking, focused on caring for people, the environment and resources, can be developed through e-learning to build an education information ecosystem that contains three key factors such as human factors, information resources and educational information environment [3]. The ecological system of the university is influenced by the global environment and the surrounding spheres of neighboring and influential societies [4].

Successful socio-ecological systems develop resilience over time by adapting to change and uncertainty, and by combining and incorporating different types of knowledge and opinions from their many stakeholders through transformative learning [5].

2. MATERIALS AND METHODS

The purpose of the study is theoretically and experimentally to prove that pedagogical cues can serve as a universal tool for the development of ecological thinking of manager students-managers in the university ecosystem.

In this study, a hypothesis was put forward that the development of students-managers' ecological thinking is possible in the conditions of the ecosystem of the university with the help of special pedagogical tools, which we call pedagogical cues. They are designed to support the student, transform learning information, and develop soft skills. These skills are necessary for the future successful specialist in the field of economics and management.

The objectives of the study are diagnosis and determination of the level of development of ecological thinking, the description of the experiment using pedagogical cues, the assessment of the experimental data obtained, identifying the most successful pedagogical tools, confirmation of the hypothesis extended.

Questioning is one of the most common methods of empirical research. That is why the Likert scale is widely used in different studies and comprises 3-7 responses with different degrees of agreement and disagreement [6-7].With the help of the Likert scale, a survey was conducted to understand how much the student's ecological thinking has already been formed. To do this, it was necessary to express your attitude to the statement, setting points from 0 (completely disagree) to 10 (completely agree):

- I understand the relationship of all processes in nature;

- I understand that everyone is responsible for the future;

- I try to get rid of the consumer attitude towards nature and lead an eco-friendly lifestyle;

- I perceive my activities in the context of the entire ecosystem;

- I understand the consequences of the decisions made on the natural ecosystem (nature, fauna and people);

- I can identify elements of any system;

- I can interact with other members of the ecosystem;

- I know that ecological thinking is a dynamically developing process;

- I know how to develop my skills from an environmental point of view;

- I understand the hidden potential of the ecosystem for developing ecological thinking.

The maximum number of points is 100. These points are translated into levels of development of ecological thinking:

- Low level (< 35 points) – the student has no ecological thinking at all or is expressed weakly and haphazardly, and also has no practical experience of its application;

- Reduced level (35-49 points) – the student's knowledge and abilities did not become skills, because they are unsystematic in nature, showing a tendency to strengthen under the external influence of the teacher;

- Middle level (50-69 points) – all characteristics that determine ecological thinking are expressed evenly and to a sufficient extent; there are basic knowledge, abilitiesand skills that progress under the influence of internal and external motivation of the student;

- Elevated level (70-89 points) – sufficient motivation helps the student to develop ecological thinking. There is a regular practice of applying knowledge, skills and abilities, but there is a lack of a creative, creative component that allows you to move to a new level of self-development;

- High level (90-100 points) – full awareness by the student of the importance and necessity of ecological thinking personally for him; a creative and synergistic approach

to in-depth improvement in various areas; steady-positive student interest in learning and creativity based on adequate self-assessment.

To develop ecological thinking during the experiment, we used such pedagogical cues as "Decision tree", "5 Whys" [8], "SWOT-analysis" and others related to choosing the right solution or analyzing a problem from different angles. It is necessary to use the TREE strategy [9]:

- TR – test randomly – try to make a random choice;

- E – evaluate – evaluate (determine which of the roots (solutions) found the best soil, that is, gave the best result);

- E – elect – choose (the direction in which we will move to correct our mistake).

This strategy helps to adapt to rapidly changing conditions and is suitable for group reflection [10].

3. RESULTS

For the experimental work, students of the Faculty of Economics and Management (30 people) of the Saint Petersburg State University of Architecture and Civil Engineering were selected.

Initially, these students-managers were measured by the level of formation of ecological thinking (*Figure 1*).
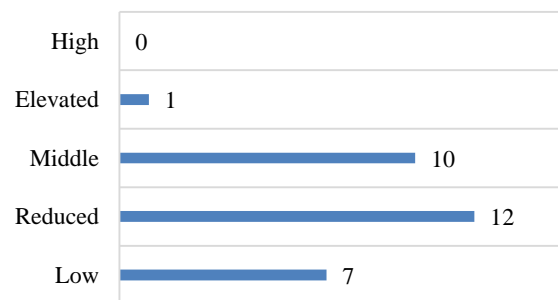
Level	Value
High	0
Elevated	1
Middle	10
Reduced	12
Low	7

Figure 1. The start level of ecological thinking
Source: Compiled by the authors

Then, for 3 months, the students-managers of the experimental group were given classes in various disciplines using the same universal pedagogical tools aimed at the development of ecological thinking ("Decision tree", "5 Whys", "SWOT-analysis", the TREE strategy).

Next, a repeated measurement of the level of formation of ecological thinking was carried out (*Figure 2*).
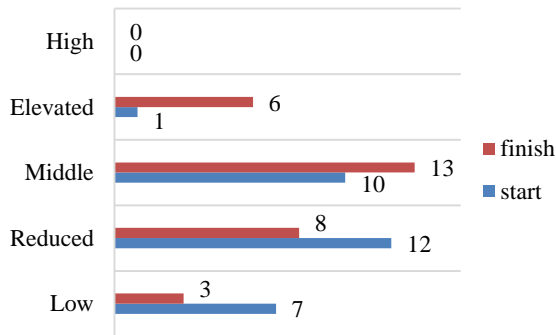

Figure 2. Comparative analysis of the levels of ecological thinking
Source: Compiled by the authors

Then a questionnaire was conducted to identify the pedagogical tool, which turned out to be the most interesting for the students (*Figure 3*).
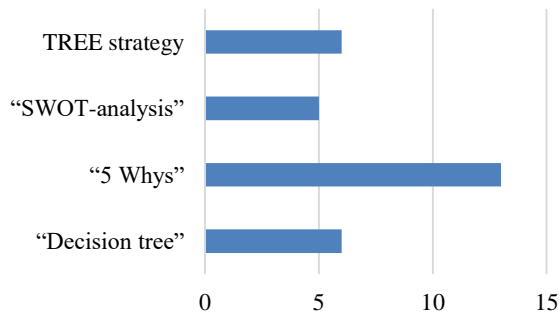

Figure 3. Most interesting pedagogical tool
Source: Compiled by the authors

According to the students-managers, "5 Whys" turned out to be the most interesting pedagogical cues. They especially liked the digital equivalent, which allowed them to create a causal chain for the creation of the university ecosystem

As a result of the experiment, the hypothesis was proved that the development of students-managers' ecological thinking is possible in the conditions of the ecosystem of the university with the help of pedagogical cues.

4. DISCUSSION

The ecological system of the university is influenced by both the external environment (society and the economy) and internal elements (teachers and students). Like any living system, it lives and changes.

It is the diversity of programs, people, and tools within the learning ecosystem that leads to its sustainability and adaptability. Innovative educational tools increase motivation especially among students of the digital generation. That is why classes during the experiment were conducted in different disciplines, but using the same pedagogical cues. This opens up the ecosystem of the university.

Widespread digitalization is leading the modern generation of students to prefer digital pedagogical cues.

5. CONCLUSION

Modern VUCA-world brings new challenges to society and the economy, which will have to be addressed by specialists of the new generation:

- Volatility – the surrounding ecosystem is constantly changing;

- Uncertainty – it is quite difficult to predict an ecosystem;

- Complexity – too much information prevents you from quickly finding the only simple and correct answer to a question;

- Ambiguity – there is no truth in itself, it all depends on the circumstances and context.

Raising environmentally literate citizens with an ecological thinking is the main key to achieving ecosystem sustainability. Attributes such as curiosity, creativity, and disruption tolerance contribute to the VUCA skill set development [11-13].

Some learning strategies, such as blended learning, project learning, problem learning, adapt the andragogical method. Teaching trends will change and create good networks for interdisciplinary research. Case studies and scenario building will provide students with opportunities to communicate, collaborate, think critically, and be creative [14]. The concept of "comfortable educational environment" is used to denote a special atmosphere in the team [15].

The practical significance of the study lies in the fact that in the modern world, universities must build their ecosystems in order to provide society with competent specialists.

Further developments can be aimed at creating various pedagogical tools for the development of ecological thinking in the context of digitalization.

AUTHORS' CONTRIBUTIONS

Roza M. Sherayzina and Marina V. Alexandrova designed and directed the project. Elena M. Zorina and Natalya V. Alexandrova wrote the article with input from all authors. Elena M. Zorina and Yulia A. Tsapaeva carried out the experiment. All authors discussed the results and contributed to the final article.

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