METHODOLOGICAL CONSIDERATIONS ON THE DEVELOPMENT OF CRITICAL THINKING AMONG STUDENTS OF THE AGRONOMICAL HIGHER EDUCATION

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Abstract. *Without critical thinking, students make no headway in developing their cognitive skills of higher order and the non-cognitive ones, such as: teamwork skills, communication and negotiation skills, etc. Starting from this idea, the present paper describes a techique for developing critical thinking among students of the agronomical higher education.*

Key words: *critical thinking, teaching strategy, teaching method*

INTRODUCTION

Etymologically, the word "critic"comes from the Greek "kriticos" which means "looking for meaning", but also "being able to analyse" (FLUERAȘ, V., 2003).

In specialized literature, there are many meanings assigned to the concept of "critical thinking". Thus, Fisher & Scriven (apud FLUERAȘ, V., 2005) consider that "*critical thinking involves an active and penetrating evaluation and interpretation of observations, communication, information and arguments*", while Paul R., quoted by the same author, states that critical thinking is "*a systematic approach to forming and shaping a person's thinking. It functions with a certain aim and with precision. It is organized, comprehensive based on well-developed intellectual values*". Much in the same way, DULAMĂ, MARIA ELIZA (2009) believes that "*to think critically means to examine ideas and their implications, to expose them to constructive scepticism, to compare them with opposing points of view, to build systems of arguments in their support and to take a stand based on these structures".*

GAVRILĂ, CODRUȚA (2015), mentions that "*critical thinking* is the continual mental process of analysis of information pretended to be true. It implies systematic exercise, training, interior reflection, conceptualization, comparison, analysis, synthesis".

In what regards its meaning as an *operational concept in pedagogy*, CRISTEA SORIN (2016) defines critical thinking as a set of cognitive and non-cognitive psychological resources employed by students in their activity of training at a superior level, corresponding to the cognitive psychological objectives that target skills such as analysis, synthesis and critical assessment. Therefore, its central function is the superior use of cognitive resources (rational, intellectual resources), but also of non-cognitive ones (motivational, affective, pertaining to one's character) that give a logical, reflexive and at the same time impartial orientation to the students' learning activity which is integrated in their training activity.

In addition, the same author mentions that, in the context of the training activity, critical thinking (formed and developed as a superior capacity to learn) is efficient as:

- ***a cognitive strategy*** which makes the best use of all fundamental and instrumental operations of thought;

- ***an investigation*** that leads to a conclusion justified in terms of a final decision;
- ***aprocess*** that allows for the best practice of the cognitive skills and attitudes available within the structured functioning of critical thinking (CRISTEA, S., 2016).

In the university education system, where students are determined to learn huge amounts of information, if they do not reflect on the content, if they do not have the ability to express of apply what they know into practice, then their knowledge is not operational and therefore worthless. That is why specialists believe that in the training activity "*the process of thinking and the content to be learnt should be approached as a whole",* and students should understand that"*the end result of learning is not the collection of data that will be kept in mind and reproduced at certain moments, but knowledge that is alive, modifiable and applicable"*(DULAMĂ, MARIA ELIZA,2009).

Quoting Ferret (1997) (apud FLUERAŞ, V., 2003), but also LAUREN STARKEY (2004), some of a critical thinker's capacities and competencies that should be found in a student's profile are:

- the ability to ask pertinent questions;
- the ability to make observations;
- the ability to evaluate sentences and arguments;
- the sense of curiosity;
- the ability to recognize and define problems;
- interest in finding new solutions;
- the clear definition of a set of criteria for analysing ideas;
- the ability to listen to others attentively and give feed – back;
- the ability to look for evidence to support assumptions and beliefs;
- the ability to search for proof;
- the ability to examine problems thoroughly;
- the ability to reject irrelevant or incorrect information, etc.

Talking about cognitive levels in critical thinking, DULAMĂ MARIA ELIZA (2009) mentions that "*in the process of developing their critical thinking, people perform operations that are on different cognitive levels: the level of analysis, the level of comparison, the level of evaluation, the level of decision and the level of argumentation*".

At the same time, in order for students to build their knowledge by critical thinking, they should be able to perform a wide range of cognitive operations on the object of research (beliefs, conceptions, situations, problems, facts, solutions, objects, beings, projects).

MATERIAL AND METHOD

In perfect accord with MARIA ELIZA DULAMĂ (2009), who considers that critical thinking "*is an active, either spontaneous or intentional process that involves authentically thinking of something and that makes the learner get control over the information by questioning it, integrating it, reconfiguring it, adapting it or rejecting it",* the present paper argues that the use of training techniques and methods based on the development of critical, logical and independent thinking is the most efficient way to learn how to find solutions for problematic situations.

The aim of the present study was to apply an interactive teaching strategy that plays a very important role in developing critical thinking among students.

The paper is the result of using an investigation-based strategy – the **FRISCO technique**, during the seminars from Specialty Didactics, the latter being an academic subject that is included in the curriculum for the psychopedagogical module.

The seminars under discussion were held in the second semester of the 2017-2018 academic year.

Forty students of the Faculty of Agriculture were involved in the making of this study: twenty-four from the specialization Agriculture and sixteen from the specialization Environment Engineering and Protection; they were all in the second year of study and had chosen to study the subjects of the psychopedagogical module.

The study had the following **objectives**:

- to identify the possibilities to integrate the FRISCO technique in the educational process;
- to use the FRISCO technique in the educational process, as it is well-known that this technique encourages the development of imagination, creativity and critical thinking.
- to support the student's development based on the social interactions that lead to the shaping of the cognitive, social and affective support that is necessary for the formation of the intellectual and psychological profile of the student and for their integration in society (BOACĂ, VIORICA, 2016).

The FRISCO technique was proposed by a research team: *Four boys of Frisco* for identifying the complex and difficult problems and solving them in simple and efficient ways (DULAMĂ, MARIA ELIZA, 2008). It allows for approaching one problem from several perspectives, students playing specific roles that cover a certain dimension of their personality. Thus, the group members will take turns playing different parts: the conservative person, the exuberant one, the pessimist, the optimist.

The method is based on directed brainstorming and requires the students to have empathetic abilities and a critical spirit, focusing on stimulating thought, imagination and creativity (OPREA, CRENGUȚA – LĂCRIMIOARA, 2007).

Its advantage lies in the fact that from the very beginning the problem will be dealt with from several perspectives, and that, probably, the production of ideas will be more prolific, and also more systematic. (PALICICA, MARIA, 2007).

RESULTS AND DISCUSSIONS

To exemplify, we present the application of the FRISCO technique in a class of agronomical specialty, for solving problems by stimulating creativity.

The technique was used to stimulate critical thinking on the issue of pesticide use.

The use of pesticides in agriculture is a controversial subject.

A critical thinker can look for answers to the following questions:

- Are pesticides dangerous for the health of people and the environment or not?
- If pesticides are dangerous for the health of people and the environment, what does the risk consist in?
- Why are certain pesticides considered hazardous while others are not?
- What decisions should be made at a European, national and individual level related to the import and use of pesticides in agriculture?

For students to find the answers to these questions and become aware of the possible risks brought about by the use of pesticides in agriculture, they were involved in the learning situation described below.

The following *methodological operational objectives* were set in order to create the learning situation.

While in the learning sequence, the students will be able to:

- Analyse the problem of pesticide use in agriculture from four perspectives;
- Decide the approval or interdiction to import pesticides that are considered dangerous for the health of people and the environment, which appear on the black list of pesticides in the European Union;
- Bring arguments in favour of their decision to approve or forbid the import of some pesticides that are dangerous for the health of people and the environment and that appear on the E.U. black list of pesticides.

The didactic approach had the following stages specific for the FRISCO method:

1. *The stage of bringing the matter to the table and organizing the group.*

The teacher or the students notice a situation or a problem and propose it for analysis.

Task: Divide into four groups.

You will discuss the following issue: You are Ministers of Agriculture of E.U. countries and are supposed to approve or forbid the import of some pesticides that are dangerous for the health of people and the environment. These pesticides are on the E.U. black list of pesticides.

The first group will adopt the position of the *conservative* person

The second group will be the *exuberant*

The third group will have a *pessimistic* view and

The fourth will display an *optimistic* approach.

- *The conservative*'s task is to appreciate the merits of old solutions and be in favour of keeping them, without excluding possible improvements.
- *The exuberant person*'s task is to look forward to the future and come up with innovative ideas which are apparently impossible to put into practice, thus assuring an imaginative and creative setting. The role the members of this group have to take on is to stimulate the other participants to look at things from another perspective, creating a phenomenon of contagion.
- *The pessimist*'stask is not to have a good opinion on what is being discussed, censoring the ideas and solutions proposed by the colleagues. The members of this group have to reveal the bad aspects of any improvements.
- *The optimist'*s task is to encourage the participants to look at things from a perspective that is real, concrete and achievable. The members of this group find possibilities to put into practice the solutions found by the exuberant people, stimulating the participants to think positive.

2. *The stage of collective debate.*

The variant chosen for this stage was to organize the students into large groups: several participants interpret the same role at the same time and they make up a team (six participants in a group, and four, respectively).

3. *The stage of systematizing the ideas and concluding on the solutions.*

During this stage, the students systematized the main ideas and formulated conclusions regarding the way to solve the initial problem. At the same time, they highlighted certain objectives, as well as certain measures that students should take so that the use of pesticides could become beneficial for agriculture and not dangerous for people or the environment.

CONCLUSIONS

The use of the FRISCO technique, as well as of other training methods and techniques that focus on the development of critical, logical and independent thinking, helps students develop skills such as:

- Discerning between the problems that can be proven rigorously and the ones that are a matter of opinion;
- Willingness to weigh in discussions;
- Willingness to build a self-corrective type of thinking;
- Resistance to manipulation;
- Attitudeto language;
- Willingness to have a dialogue;
- Making wise decisions and finding adequate solutions;
- Evaluating arguments in a just and effective way.

Active involvement of students in the process of learning must be promoted at all times, because it is essential for stimulating critical thinking, which works best in a setting where any idea is respected, in a risk-free atmosphere.

There must be confidence in each student's ability to think critically.

As they make use of their critical thinking abilities, the students develop their aptitude to express themselves freely, coherently, convincingly, with arguments, in a written or oral form; they develop autonomous thinking (having respect for their own ideas and the ideas of others), as well as the ability to find and accept alternatives, to make judgements and practice constructive thinking.

Indisputably, this technique encourages the development of imagination, creativity and critical thinking.

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