

DEVELOPMENT OF CRITICAL THINKING THROUGH ONLINE ACTIVITIES

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Abstract: *The present research capitalizes the activity carried out within the project Development and implementation of innovative motivational and didactic tools for the inclusive school in Sibiu, the module Development of critical thinking. The course started with face-to-face training activities. The pandemic caused the entire training activity to be reoriented and carried out through ONLINE activity. The research presented involved 71 teachers, in three working groups, from several schools. Each of the three groups spent 13-hour ONLINE activity, in which both learning sequences and applications, psycho-pedagogical reflections and sequences of continuous evaluation were proceeded. The course itself pursued, permanently, two purposes: to cover the contents related to Critical Thinking (the role of critical thinking in achieving learning, benefits of critical thinking, ways of development, problems faced by teachers) and to practise methods of thinking development critical, so that, by transfer, the teachers can lead them in the activities specific to the subject they teach. In addition, the development of ONLINE activities has generated a third goal: familiarizing teachers with work tools, using google forms, for specific methods of critical thinking. The research results have confirmed the formative value and the beneficial impact of the practical applicative character of the carried out activities.*

Keywords: *critical thinking; ONLINE activity; interactivity; responsibility; methods; techniques.*

1. Introduction

Critical thinking involves "taking ideas, examining their implications, subjecting them to constructive skepticism, balancing them with opposing views, building systems of arguments to support them, and taking a stand on these structures." (Steele, J., Meredith, K., Temple, C., 1998).

Critical thinking is an essential quality in both personal and professional life; it facilitates the transmission of one's own ideas and the

understanding of the ideas of others, making communication more productive, it accelerates the assimilation of new information and the derivation of its consequences. These skills are essential in daily life and in any field of activity. It is a clear, rational and free thinking, it is not based on the accumulation of information, but on the development of the ability to process information, it triggers complex cognitive processes, which begin with the accumulation of information and end with decision making, it is a way to approach and solve problems, based on convincing, coherent, logical, rational arguments.

Critical thinking involves the manifestation of a succession of abilities:

- to identify, understand and make logical connections between own ideas and arguments;
- to detect reasoning errors in arguments and presentations;
- to understand the relevance and importance of some ideas;
- to identify the context and implications of an argument or an idea;
- to identify, build and understand the justifications behind opinions, arguments or beliefs;
- to build new arguments and ideas based on those previously accumulated;
- to distinguish between facts, opinions and value and non-value judgments;
- to solve problems with a high degree of difficulty.

A student who possesses these abilities can solve math problems much easier, can understand much better any text or argument from any subject.

Along with creativity, critical thinking is crucial in innovation, research and development.

The development of critical thinking brings benefits not only to trained individuals, but also to the society to which they belong. Critical thinking heals a society of prejudice and passivity.

When we aim to develop critical thinking, it is needed to consider the necessary effort and time. We need time to explore previous ideas, beliefs and experiences, to form new opinions and to express points of view. In order to develop critical thinking, it is necessary to tell students what we expect from them, what we appreciate most, applying other methods and giving them a different kind of feedback.

It is also necessary to accept diversity - once students feel free to express their own point of view and give up the belief that there is only one correct answer, the diversity of opinions and ideas appears.

Critical thinking can only be formed through involvement. Involvement is essential.

In the activity that promotes the development of critical thinking, the actors are: students and teachers, in a permanent interactivity.

Thus, students:

- expresses their own points of view regarding a problem;
- exchange ideas with others;
- argue;
 - ask and ask themselves questions in order to understand things, to realize the meaning of ideas;
- cooperate in solving problems and learning tasks.
- Teacher:
 - organizes and directs learning, he/she orchestrates and directs it;
 - facilitates and moderates the learning activity;
 - helps students understand and explain things;
 - accepts and stimulates the expression of different points of view about a problem;
 - is a learning partner;
 - promotes learning through collaboration and cooperation.

Learning occurs through the use of one's own experience, with an emphasis on the development of thinking through confrontation with others, and assessment emphasizes the measurement and appreciation of abilities.

The future belongs to those who interpret information critically and discover the truth on their own. Critical thinkers are more unlikely to be manipulated and more confident in their beliefs. Knowledge is valuable when it is useful. And what we know determines what we can learn.

We must understand that "Critical Thinking" is a result and not a subject to study. That is why it is important to teach students to answer the most important question: "Why?" in every subject they study at school and in every organised extracurricular activity.

Before starting the lesson, it is recommended that the teacher should reflect on some aspects and answer some questions (Steele, Meredith, Temple1997):

Table 1. Aspect for reflection and anticipatory questions

Aspects for reflection	Anticipatory questions
Motivation	Why is this activity valuable? How does it relate to what I have taught (do students already know what will I teach further?) What opportunities to practice critical thinking does this activity offer?

Objectives	What knowledge and meanings will be explored or passed on? What will students be able to do with them?
Prerequisites	What does a student need to know and be able to do already in order to learn what I propose to them?
Evaluation	What evidence will there be that the student have learned what I proposed to him?
Resources and time management	How will resources and time be managed for the various activities?

Critical thinking development methods are promoted in a four-stage teaching-learning framework (E-A-R-E):

- evocation;
- achieving meaning;
- reflection
- extension.

Table 2. Stages of the framework for the development of critical thinking

Stages of the framework for the development of critical thinking	Anticipatory questions
1. EVOCATION, when students are asked to remember what they know or think they know about the topic to be addressed.	How will students be led to formulate questions and goals for learning preparation? How will they come to examine their previous knowledge in order to bring to their working memory what is needed as the anchors for the learning we propose?
2. REALIZING THE MEANING, when students make contact with the new contents.	How will the content be explored by students? How will they monitor their understanding of this content, for its integration into the already existing knowledge system?
3. REFLECTION, when students truly acquire new knowledge, expressing it in their own words.	How will students use the meaning of the lesson? How will they be directed to seek additional information, answers to remaining questions, and solutions to the remaining ambiguities? What conclusions should be reached by the end of the lesson? To what extent can the issues raised be resolved?
After the lesson, the teacher must be concerned about the way in which the	

new acquisitions will be capitalized in the educational and daily context.	
4.EXTENSION, when they are helped to use new acquisitions in living contexts.	What else can be learned from this lesson? What should students do with new acquisitions after the lesson is over?

2. Description of the research

The module Development of Critical Thinking was a component part of the training course within the project Development and Implementation of Innovative Motivational and Didactic Tools for the Inclusive School in Sibiu, which started with face-to-face training activity. The pandemic caused the entire training activity to be reoriented and carried out through ONLINE activity. Three working groups participated in the research presented, representing 71 teachers from several schools. Each of the three groups spent 13 hours, ONLINE activity, in which both learning sequences and applications, psycho-pedagogical reflections and continuous assessment sequences took place.

The course itself pursued, permanently, two purposes: reading the contents related to Critical Thinking (the role of critical thinking in achieving learning, benefits of critical thinking, ways of development, problems faced by teachers) and learning and using development methods of critical thinking: Carousel, Gallery tour, Mosaic, I know / I want to know / I learned, Reflective journal, Interactive Grading System for Streamlining Thinking and Reading (IGSSTR), so that, by transfer, teachers can lead them in activities specific to the discipline they teach. The psycho-pedagogical reflection exercises and the applications, made for each method learned, had the role of clarifying, through interactive activity, the possible ambiguities.

In addition, the development of ONLINE activities has generated a third goal: familiarizing teachers with techniques and tools, using Google forms, for specific methods of critical thinking: I know / I want to know / I have learned, with the theme Critical Thinking (Appendix 1), IGSSTR, with the theme, Learning in 6 steps (Annex 2), Quintet, with the theme Continuous evaluation (Annex 3), Reflective journal, with the theme Dialogue evaluation (Annex 4).

Each workshop ended with an assessment of the degree of satisfaction, the news found and the questions that still exist. The next workshop began with a reflection on previous assessments and answers to questions.

After completing the course, teachers completed a questionnaire, consisting of 6 questions, regarding the degree of usefulness, applicability of learning, and recommendations for increasing efficiency.

During the 13 hours, some methods of developing critical thinking were used to learn didactic contents. Others were only explained and topics were

identified, in different disciplines, for which they can be used. Among these methods were: I know / I want to know / I learned, Reflective diary, Interactive Grading System for Streamlining Reading and Thinking, Carousel, Gallery tour, Quintet, Mosaic and techniques including: Analysis of small group workload and Mutual reading. Next, we make an analytical presentation and present the format from google drive, so that it can be used by those interested.

2.1. The Methods used

I know / I want to know / I learned is a method through which the student, with the support of a colleague and under the guidance of the teacher, learns how to learn.

The purpose of this method is to learn.

Description of the method

1. The theme of the activity is announced.
2. Students draws a table as follows:

I know/I think I know	I want to know	I learned

3. Working groups are formed, of four or five students each.
4. Through individual activity, for a few minutes, students will write in the first column everything they know or think they know about the topic to be discussed.
5. Then, for a few more minutes, they will ask questions about things they are not sure about and want to know about the topic. Help the students who are unable to work on their own to ask at least one question.
6. In the groups formed, by mutual reading, the students will present the ideas and the written questions.
7. You can use as a support for learning the lesson from the textbook, a working sheet prepared by you, a film, a lecture or an experiment.
8. Help those who need remediation to find the answers to the questions asked and to highlight the interesting or important information found in the text, film, experiment, which they will pass in the section I LEARNED.
9. Through frontal activity, discuss in order to answer unanswered questions.
10. At the end of the lesson, fill in the column I LEARNED with the information found by the students, and they fill in the column with what they are missing, so that they will go home with the lesson plan.

Method I know/I want to know/I have learned - Critical thinking

In activity 2 of this workshop I suggest you to use the method I know / I want to know / I have learned. steps:

- 5 Minutes complete the section I know
- 5 Minutes competition section I want to know
- During the presentation, complete the section I learned.

Send the form only at the end, after we finish the frontal discussion.

Email address *

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Name and surname *

Long-answer text

What do I know or think I know about critical thinking? *

Long-answer text

What do I want to know about critical thinking? *

Long-answer text

What I learned about critical thinking? *

Long-answer text

Fig 1. Representation of the method I know / I want to know / I learned in google forms

The Reflective journal is a method by which readers establish a close connection between the text and their own curiosity and experience. This journal is especially useful in situations where students have to read longer texts, outside the classroom, introductory texts in the study of a learning unit, a chapter or a subject. The purpose of this method is to prepare students for learning. The method has its psycho-pedagogical foundation in experiential psychology, according to which we become more willing to make an effort for learning if we find ourselves, we connect through our own experience to the material to be used for learning.

Method description:

1. Students are divided into groups of four.
2. Each splits a page in half, drawing a vertical line in the middle.
3. On the left they will write passages, ideas that particularly impressed them, that surprised them. On the right they will comment on that passage or idea.
4. They are given some helpful questions. It is not mandatory to answer all the questions.
“Why did they write it down?”
"What made them think?"
„Why do they find it interesting? / Why did it intrigue them?”
After they finish interpreting, they read in the small group what they wrote.
5. After completing, do the group reading in groups of 4, each reading to the others their personal interpretation.
6. Those who want can read for the whole class the selected idea and the interpretation they made.
7. The teacher makes his own comments.

Reflective journal Dialogue evaluation

Dialogued evaluation
It is seen as an integral part of the process of development, change, learning and involves reflection. It focuses on dialogue, on qualitative appreciation rather than on quantitative appreciation. a control process that acts from outside the learning process. It starts from the idea that everyone is unique, having their own work style, different ways of perception, thinking and action. Negotiation and consensus are important elements, and the teacher discusses the results with the students and makes recommendations for improving learning. The role of the evaluator is that of an internal facilitator of the learning process rather than a neutral observer. It facilitates learning and evaluation, starting from the premise that evaluation fulfills functions of improvement, correction, motivation rather than sanctioning and speculating on mistakes.

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Name and surname *

Long-answer text

Choose an idea from the worksheet. The evaluation continues. Dialogued evaluation *

Long-answer text

Long-answer text

Fig 2. Representation of the method Reflectiv journal

IGSSTR (Interactive Grading System for Streamlining Reading and Thinking) is a way of coding the text, which allows the reader to actively and pragmatically read a certain content.

The purpose of this method is to learn.

Description of the method

1. Students receive a text, which can be from the textbook or on working sheets.

2. While reading, students mark ideas in the text, using the following notations:

(√) for the knowledge they already know and find in the text;

(+) for the new information, which they did not know;

(?) for uncertain, confusing information, for which they need further explanation;

(-) for information that contradicts what they knew, that creates cognitive dissonance.

3. Through independent activity, students list the essential ideas in a table, dividing them into four categories:

√	+	?	-

4. Students discuss ideas in pairs or small groups.

5. In a frontal activity they discuss the ideas marked with (?) and (-), to ensure understanding and clarification of uncertainties.

Interactive Grading System for Streamlining Reading and Thinking - Continuous evaluation

Read the following text carefully. Select the essential ideas, which you write down below, according to 4 categories:

- known ideas (√)
- the new ideas, the ones you have found out now (+).
- ideas that need further explanation (?)
- ideas that contradict what you knew (-).

Ways to perform continuous evaluation, for the development of critical thinking

1. The three-step interview. Starting from questions like: What did I learn today ?; How can I use what I learned today? Students develop answers individually, then interview in pairs, with each pair presenting the answers to the neighboring pair. It ends with a frontal activity, answering questions.
2. Five-minute essay. On the worksheets, each student makes a short essay, using the knowledge acquired.
3. Develop a quintet about the key concept of the lesson.
4. Give me the last word! Students work in groups of 5-6. Each student writes on the front of a worksheet an idea that he thought was the most important, from the lesson and a comment on that idea on the other side of the worksheet. The worksheets are transferred between colleagues in the group, who have the task of reading and commenting on ideas already written. The worksheets rotate until they reach the one who initiated them, who reads the comments of colleagues and makes a summary, draws a conclusion. The last word belongs to the one who wrote the original idea.
5. Formulation of sentences with the essential content. Individually, students formulate a statement in which they use essential content learned. If the class is large, you can work by dividing the class into groups. At the end, ideas are formulated in frontal activity (Chişiu, 2016).

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Name and surname *
Long-answer text

1. Known Ideas. (√) *
Long-answer text

2. New Ideas that you have now learned. (-) *
Long-answer text

3. Ideas that are not clear to you, for which you need an explanation. (?) *
Long-answer text

4. Ideas that contradict what you knew. (-) *
Long-answer text

Fig 3. Representation of the method *Interactive Grading System for Streamlining Reading and Thinking*

The gallery tour involves the interactive and deeply formative evaluation of the products made by groups of students, products that can be lists, graphic organizers, tables, diagrams, charts, etc.

The method can be used for the purpose of learning or for fixing knowledge. If used as a learning method, students receive: a working sheet, the lesson from the textbook, they can watch a film, a PPT presentation, a laboratory experiment or a virtual one. If it is used for the purpose of fixation, it is assumed that the learning took place in the previous classes and the students have the necessary knowledge. Advise them to use notes or a manual if they need to clarify certain ideas.

Description of the method

1. In groups of three/four/five, depending on the class, students first work on a problem (with various approaches), which can be materialized in a poster, which can be: a graphic an organizer, a table, a diagram, a chart.
2. Posters are displayed on the classroom walls.
3. At the teacher's signal, the groups go around the classroom to read, examine, and discuss each poster made by colleagues in the other groups.
4. In front of each poster, after the group discussion, a representative puts the question mark where they think they did not understand or something is wrong and completes with at least one idea, to increase its quality.
5. The groups go round until they reach the front of their poster.
6. Examine their poster and discuss what is added by colleagues and existing question marks.
7. A representative of each group expresses opinions on the ideas completed and the ambiguities reported, giving the necessary explanations.
8. Through frontal activity, starting from the ideas expressed, have a discussion with the whole class.

In the online training, each group received a link, which leads to a google doc, to connect and create their own activities to identify concrete educational situations through which the critical thinking of students can be developed. The groups then connected to the links of the other groups to assess the validity of the ideas written by colleagues and to make additions to new educational situations.

The carousel is a method that stimulates the finding through cooperation of several ideas or alternatives to solve, to approach a problem. The purpose for which this method is used is to fix or update the previously acquired knowledge.

Description of the method

1. The topic is announced.

2. Divide the class into groups of 4-5 students.
3. Posters are placed on the walls of the classroom, recommended in equal numbers with the number of work groups.
4. On each poster appears a question, a problem, a topic to be solved (which accepts several answers / points of view, at least as many working groups as there are).
5. In groups, students go through each poster. They read the existing answers and complete another answer. A representative writes the answer on the poster.
6. At the teacher's signal, the groups move to the next poster.
7. Each problem / question, at the end, will have a number of answers, at least equal to the number of participating groups.
8. Through frontal activity, each problem is discussed, in turn, correcting, arguing and prioritizing the answers.

In online training, every problem situation needs to be solved: What is critical thinking? Why is critical thinking useful? What are the benefits of having students develop critical thinking? and so. They received a link that leads to a google doc. In a certain order, the groups entered one by one and completed the list with at least one answer. Passages were made to each link, until each group contributed answers to each problem.

Mosaic is a method of mutual learning. The purpose of this method is to learn.

Description of the method

1. The class is divided into "mother groups", each group consisting of as many students as there are parts of the material to be taught.
2. All those who have no. 1 forms a group of "experts 1", all those who have no. 2 form the group of "experts 2" and so on. Each group of experts receives a different part of the material to be learned.
3. Each group of experts learns, in collaboration with colleagues, the section they got. They read and study the material together, repeating so that they could feel able to teach it to their colleagues. I can read the material individually and then discuss or you can recommend that one should read and the other listen and together analyze, discuss, understand, repeat each one until learning. Through this technique, we come to the aid of those students who face functional illiteracy. The teacher will intervene whenever asked for help or notice that he needs help.
4. After the learning has taken place, each one returns to the "mother group" (the initial group) and teaches the others what he/she has learned.
5. In the "mother group" the learning of each paragraph is done, either by repeating the taught material, or by questions and answers.

6. Through frontal activity, the whole learned content is fixed.

The mosaic method could not be used, only explained, in the online activity. This is because the trainer did not know the participants in the course and it was difficult to configure and reconfigure the groups. The method can be used, provided that the teacher knows participants and they are accustomed, from the classroom, with the method.

2.2.1. The Techniques used

Analysis of small group workload When workload involves individual work, especially for a problem that is more difficult to understand or is more complex (it has many data, it involves multiple connections, it has more operations) we recommend that after the explanation for the better understanding of the task and the problem solving, the pupils discuss at a small group level to identify the keywords, to clarify the steps, the steps, the issues that can raise problems and only then to start individual work.

Mutual reading is a pedagogical concept that designates a work technique that can be used in school learning after each sequence of independent activity, with the aim of:

- a. to share with colleagues from the small group the way of solving individually;
- b. to express, at the level of the small group, the way of solving a problem, his own opinion, a personal opinion;
- c. a first assessment of the learning outcomes by confronting the solutions, opinions, opinions of others.

3. Interpretation of results

The questions and answers were as follows:

1. To what extent do you consider it possible to develop critical thinking in your classes?

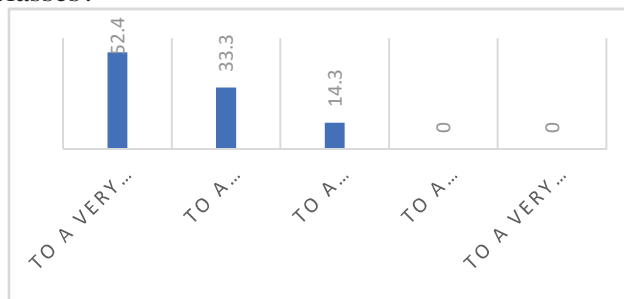


Fig 4. All the teachers participating in the course appreciate that they can develop critical thinking in the activities they carry out in class, 85.7% to a large and very large extent and 14.3% to a moderate extent.

2. To what extent are these activities useful you for the class activity?

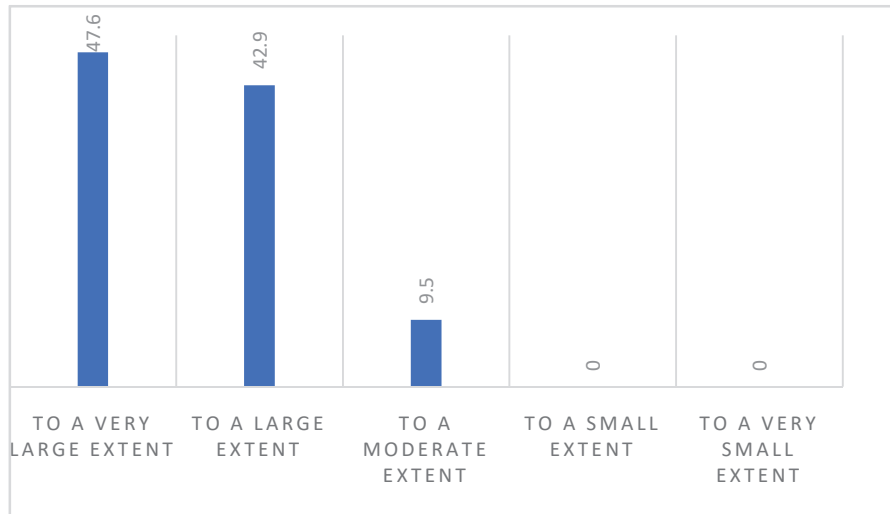


Fig 5. All participating teachers appreciate that they can use the activities carried out in the course. 90.5% to a large and very large extent and 9.5% to a moderate extent.

3. Which of these techniques can you use in the classes you work on?

Reciprocal reading, for interevaluation

Group discussions to clarify the task of individual activity

Skill in 6 steps

Reading the study text by a group member to support those with functional illiteracy

Techniques for performing continuous evaluation

Fig 6. Among the techniques practiced in the workshops, most of the teachers: 90.5% consider that they can use the discussion, in group, to clarify the task of the individual activity, followed by, 66.7%, the technique of reading the study text by a member of group to provide support to functional and equally illiterate people, 57.1% mutual reading, for interevaluation and continuous assessment techniques. 42% of teachers consider that they can use the skill in 6 steps. I consider these opinions to be justified, starting from the different degree of applicability of the techniques, in different school subjects.

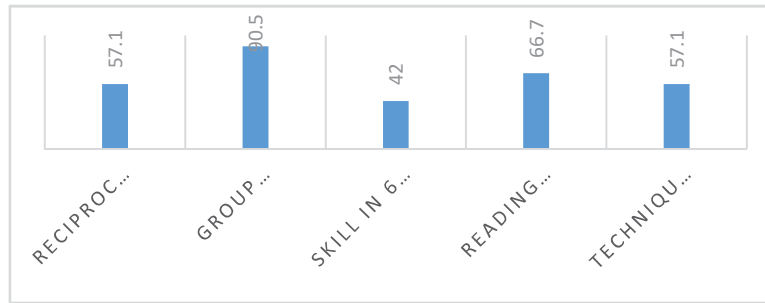


Fig.6.

4. Which of these methods can you use in the classes you work on?

I know / I want to know / I learned

The reflective diary

Carousel

Gallery tour

Interactive grading system for efficient thinking and reading IGSSTR

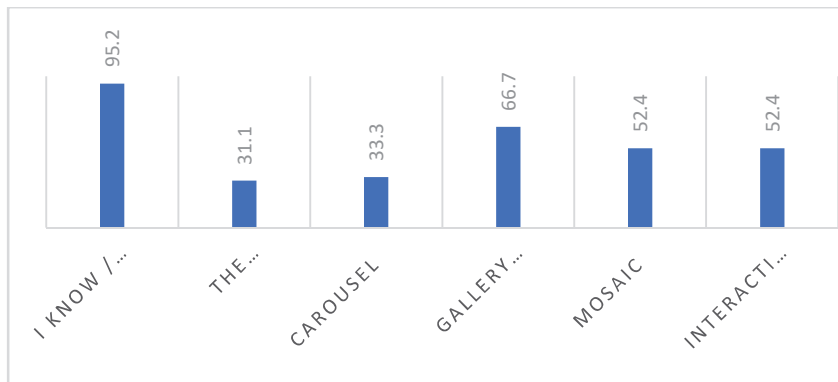


Fig 7. Among the methods used in the workshops, most of the teachers: 95.2% consider that they can use the method I know / I want to know / I learned, followed by, 66.7%, the method Gallery tour, 52.4%, in equally, the Mosaic method and the Interactive scoring system for the efficiency of reading and thinking, 33.3% consider that they can use the Carousel method and 31.1% the Reflective Journal method.

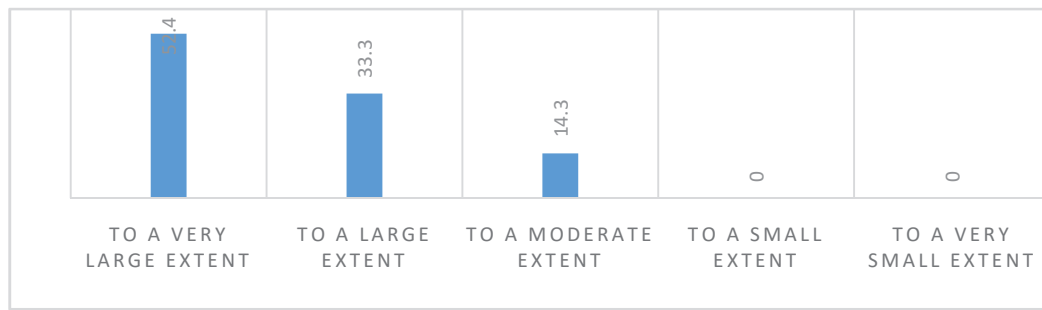


Fig 8. All participating teachers consider that the experience of the course Developing Critical Thinking Online, the tools used help them in carrying out their own online activities: 85.7% to a large and very large extent and 14.3% to a moderate extent.

The preference for some methods (those aimed at learning) may be explained by the fact that teachers consider the main purpose of school activity learning and less reflection, interpreting messages or fixing knowledge.

5. To what extent do you think that the experience of the course Developing Critical Thinking Online, the tools used will help you in carrying out your own online activities?

6. What do you appreciate about the Critical Thinking Development course?

- Practical applicative character
- The usefulness of information
- The atmosphere during the activities
- The usefulness of methods
- Interactivity during the course
- Examples of good practice
- Psychopedagogical reflections
- Explanations received

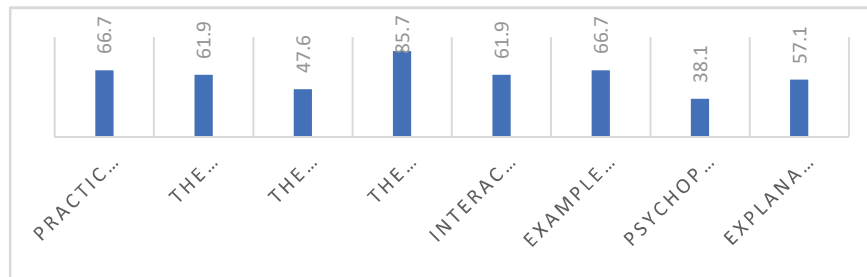


Fig 9. For the workshops, most of the trainees: 85.7% appreciate the usefulness of the methods, equally: 66.7% practical applicability feature and example of good practice, also: 61.9% usefulness of information and interactivity of the course time, 57, 1% Explanations received, 47.6% Atmosphere during the course and 38.1% Psycho-pedagogical reflections.

4. Conclusions

The research leads to some conclusions. The development of critical thinking is something that teachers in the pre-university system consider very useful. The way in which the course was held was an opportunity to develop from a professional point of view, both for face-to-face and online school activities. The trainees appreciate mostly the usefulness of methods and information, I know/I want to know/I learned method and the method Reading the study text by a group member to support those with functional illiteracy. The training activities represent an opportunity to develop the psycho-pedagogical knowledge but also to develop the skill to use some techniques and working methods in school teaching.

Teachers consider that the transfer of tools, methods and techniques is applicable even in online teaching.

The information received, the tools used, the practical applicative character, the examples of good practices, the interaction during the course, the possibility to capitalize on their experience, made the training, although online, to be considered pleasant and at the same time effective. The only recommendation was to allocate several hours to the module.

Although the emotional part remains completely uncovered, we believe that online training activities and online courses, in general, can meet the expectations of students in the conditions in which they are interactive, have a practical applicative character and target aspects of interest to participants.

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