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## Impact of a Program to Promote Critical Thinking through Informal Logic in University Students of Argentina

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### ABSTRACT

The aim of this empirical research was to evaluate the impact of an educational intervention program to promote higher order cognitive skills involved in critical thinking in university students. Methodology: Socratic Dialogue and Informal Logic. Rating: by the Argentinian Adaptation of the Watson Glaser Critical Thinking Appraisal Form A (Robert Goodwin Watson & Glaser, 1980) by Chalupa (2006) and validated by Da Dalt and Difabio (2007). The sample consisted of 94 academic students (38 subjects, experimental group 56, control group) of Psychology and Education at a private university in Argentina, of middle socio-cultural level. Design: before-after. Statistical procedure: MANOVA of repeated measures.

**Keywords:** Critical Thinking, Socratic Dialogue, Informal Logic, University Students

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### INTRODUCTION

Betancourth Zambrano (2015) views education as a transforming factor of society. To achieve this mission "it is necessary questioning, critical analysis of reality and proposing new alternatives; however, this is not real "(p.240). Particularly in higher education -as in all education levels-, knowledge is reduced to the accumulation of systematic knowledge and teaching is predominantly behaviorist, repetitive and oriented to memorize "data that do not transform society". Now if we consider that education does not change the world, but that changes people who are going to change the world, the transforming action assumes a personalized stamp promotes, in this wonderful dyad teaching and learning located contextually in the "here and now ", that both learner and educator are fed of genuine reality. In this empathic teaching link both enrich because: the best education is the result of better relationship, that is, genuine and uplifting dialogue through which healthy interpersonal communication is established. And from this discovery that the teacher and the pupil performed together emerges the "astonishment" that aroused sharp questions that permeate deeply; astonishment and bewilderment that reflects the difficulties, serious problems, complexity and disorientation that characterize contemporary life. This perplexity claims that people are able to discern according to criteria of a strong critical thinking and develop operational quality habits that favor the search toward the Common Good. The amazement not only cognitive but also affective and axiological; is the essential factor to educate and maintain a personal relationship with others, with oneself and with reality (Musaio, 2012).

Indeed, nowadays, the problem that hinders the development of critical-reflective and independent thinking is multiple.

Contemporary society is immersed in mass media and technology. They can be used for good or evil; this depends on the positive or negative value that is being communicated and the objective. Visual and auditory images transmitted through programs, advertisements, drawings, photographs, reality shows, etc, are "inductive modes of persuasion, as they set a mark on the mind which indirectly encourages the purchase or accession (Rifo and Vega Perez Alvarado, 2002: 33). So, they have an enormous power of inference that points to the quality and credibility of what they want to set. In the language of advertising and political propaganda, the images are added with "definition-slogans", often elliptical. These slogans, in fact, try to avoid arguments or reasoning, as they look to seduce, to

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move the emotions, the will and instincts of the receiver. They feed back the persuasiveness of a message, which is forced and seeks to establish evidence. Some may be positive; other not. The negative in all cases is that they are intrusive, prevent reflection and reasoning by the person and, thus, promote handling.

The trance in front of the TV and the computer with the speed and intensity that characterizes them, multiplying the frequency of the stimuli transmitted: social violence, family, personal, gender, etc; produces desensitization and indifference to situations of violence in real life. Also, as it has been demonstrated in the Social Learning Theory of Bandura, by action of the modeling exercise, they influence the actions of the spectators, who end up replicating the "model". The penetration of mass media in relative privacy has replaced the daily dialogue, the time for reading, reflection. The World Commission on Culture and Development synthesized and suggested in its final report in 1996 that among the reasons that explain the degree of underdevelopment of the nations of Latin America are the poor intellectual level, the absence of reflection and critical judgment of contexts. Several authors converge to detect major problems for the promotion of critical thinking: ones of educational nature; others referred to the "Analysis of the context" global and national. In the educational field, the empirical evidence shows a high percentage of incoming students and the early years of the University of Latin America and Argentina (30% or more) that presents various difficulties to face the significant learnings that demands higher order cognitive skills and abstract thinking. Indeed, the work of Betancourth Zambrano (2015) evidences "serious difficulties to relate ideas or concepts -both verbally and writing-, and a lack of logical skills required in induction and deduction thinking of higher-order "among university students. The research of Perez and Perez (2009) reveals in students of that level, serious problems in inferential reading comprehension and identification of the thesis presented by the author of a text. Merchan's study (2012, p. 121) shows "that students answer correctly questions that directly investigate memory or require only knowledge, but they fail when (...) involving deduction or relationship." That is, he argues, students present serious difficulties in the processes of analysis, synthesis, inferential comprehension, critical judgment, "difficulty that is evidenced by having to apply that knowledge to solve different problems; to find the answer to a question "(Merchán, 2012, p. 121) or to focus and to discern the relevant from the irrelevant. The affirmation of Newsome (2000, p. 199) is held up to the present: the new students "have dominion over facts and mechanical skills, but lacks the powers of reasoning and higher-order thinking skills needed to use their knowledge to think critically, reflective and creatively and to implement what they already know to learn new content faster " and to effectively address and resolve conflicts that arise in the various areas of your life: academic, personal, social, daily, etc.

Now, if you consider that the current education is limited to storage data, you ask if they search, within the framework of a totalitarian authoritarian populist government, the promotion of critical, reflective and independent thinking. In this context, the mass media take a "power almost omnipotent and fearsome" (...) because, by an excessive use of national chains are redundantly transmitted ideological principles that influenced and disturbed "customs, ideas, culture, becoming real weapons of social control "(Perez de Perez, 2009). Such manipulation of information detected in the "context analysis" of Argentina was a major obstacle to promote critical, reflective and independent thinking. Since the second half of the twentieth century, the socio-political development of Argentina was marked by the establishment of a growing populism interrupted by military coups and dictatorships. Since the restoration of "democracy", promising fulfillment, neomarxist cultural revolution stamp Gramsci (Magrini, 2014), catalyzed in Argentina by the socio-political Laclau's (Laclau, 2005) discourse, crystallized into a "populist-party-totalitarian". Indeed, from 2007 to 2015 in the "Argentine people," which has followed the footsteps of Venezuela, it resignified not only education, but also the culture, "politic party", the economy and even the same history. The government head (2007-2015) that monopolized the three powers into one-the executive, legislative and judicial power, imposed a "discourse that includes the verbal dimension, 'what is said' and the social practices "what is done" (Laclau, 2005). That promoted not only the division of the Argentina society, but also the confrontation between who was not on his side and who was the "enemy" of "Argentine people." Such control cut public freedom in various fields: intellectual-academic-educational, personal and social, political, cultural and religious. The socio-political diagnosis showed the collapse of the Argentina society, confronting each other, the breakdown of healthy social harmony. That division hinders all attempts to dialogue with those who thought differently. It dialogue is necessary to able the meeting of minds, hearts and people for mutual personal and social construction.

Also, from a global contextualization, it should be noted that globalization promotes the accessibility of everyone to a profuse flow of information for the different type and quality. This requires acquiring the tools to exercise critical thinking in order to discern the treatment of that information: to select relevant information; be able to analyze, evaluate their validity or falsity; its strength or weakness, and transfer to new situations (Saiz and Rivas, 2008a; Nieto and Sáiz, 2010). In the postmodern context (Da Dalt, 2006), in which the subject is located in a world where he must solve problems and be in constant relationship with others, is considered Betankurth (2015, p.241) that the Critical Thinking (from now CT) is "not fashionable" but it is an imperative necessity where human beings learn to take decision with criterion and to think and act taking into account clear parameters clear to both him and others. It is from this perspective that takes into account the common good of the nation and the whole society.

This complex situation has aroused the reflection and crystallization of proposals, experiences and programs of intervention in order to promote the CT. The need to develop the CT is present in the discourse of educational policies and laws; but it is absent in the curricula of different educational levels and in teacher training.

The different streams of CT include the figure of the teacher as a key to promoting the CT in the students (Betancourth Zambrano, S., 2015), (Albeniz Iturriaga, A.; Pascual Suftrate, MT, 2010). The action-research of Betancourth Zambrano (2015) with teachers of Psychology's program at the University of Nariño shows that CT is a necessity in all professional and that one way to develop it is working with university professors who have the task of forming future professionals. Teachers displayed this need not only for what was stated in the Higher Education Act Colombian, but also because they realize that to promote CT they should learn and teach how to develop argumentative skills, make decisions for themselves, work for a common good, learn from the other, knowing how to refute their ideas and differentiate the human being of the other person from their personal positions, so there not be personal confrontation and discord (239). Merchan's work (2012) search for the college student, and especially the future teachers, develop and exercise the ability to reason the reading, the Critical Thinking, the creative and independent thinking and the skills to understand, analyze and interpret what they read, so you can be able to clearly express and support, in oral or written form, ideas and opinions" through the "Pedagogy of the Question" (p.119). It stresses the need to promote logical reasoning or higher order cognitive skills. An empirical study of college students in the career of Psychology at the UBA (Curone, G; Alcover, S.; Pabago, G.; Martinez Frontera, L., Mayol, JC; Colombo, M.E, 2011) reveals the best results at the "Substantive Dimension" of the CT, which includes the reasons and evidence upon which the subject sustains his point of view; while the greater dispersion appears in the "dialogical dimension" referred to "actions aimed at the analysis and/or integration of divergent views, or contrast with your own point of view" (p. 171). That is, that the greatest difficulty presented in the "dialogue" or Socratic discussion.

While there is consensus on the need to promote critical thinking, this consensus disappears when we have to define what critical thinking.

### **Towards a Definition of Critical Thinking**

This paper assumes Critical Thinking as a psycho-educational claim demanded by the present times. Therefore, it is considered important to define what CT is? CT movement is growing in the United States, within cognitive psychology and its immediate origin is the application of psychology to this field of education. From the reports of the National Institute for the Education of the 80s, which reveal that the greatest weakness of American education is the deficiencies in the process of high-level thinking, teaching becomes such an essential part of formal education that George Hanford called "4th R". It is recalled that the three "R" of American basic education are: "Reading", "Writing" and "Arithmetic"; the 4th would be then: critical thinking.

However, the literature review revealed that there is no consensus in the scientific community regarding the definition of the CT. From a historical point of view the authors identify Socrates as the paradigm of critical thinker (Johnson and Blair, 2000; Johnson, 2006 and 2008). This study was limited to taking the contributions of the most important representatives of the Movement, namely McPeck (1981), Ennis (1987), Siegel (1988), Lipman (1988), Facione (1990), Fischer and Scriven (1997). Robert H. Ennis (1985) defines the CT as "a reasoned and reflective thinking oriented to make a decision about what to believe or not." The contributions of Matthew Lipman (1997, p. 210) have

today great effect, as "critical thinking assumes a vital role: protect from coercion or brainwashing to which we are submitted (...) to believe in issues on which we have not had the opportunity to reflect and investigate for ourselves. There are strong powers that restrict individuals in our society -the economic, political and military powers-. They are the best known, whose goals are often based on the acceptance of their proposals without resistance or reflection(Ibid., p. 210). People need to think critically "to have the ability to evaluate and decide the consistency or the weakness of the arguments that circulate (...). Critical thinking is our shield against the uncritical thinking and thoughtless action (...) and confronts us with a reflection on "fundamental issues and existential questions (...)". As such, "we considered issues about what a human being is, about the attitude of people towards nature, about the purpose of our lives (...)" (Ibid, p. 209). Johnson (2008) identifies relevant convergences present in the most representative CT Movement, which called "Group of Five" (Robert Ennis, Matthew Lipman, John McPeck, Siegel and Richard Paul): a) the critical thinking appeals to numerous cognitive skills; b) its manifestation requires to search and selection the information and knowledge; c) the argumentative interaction involves socio-affective dimensions, relating to the components of emotional intelligence, empathy and social competence (Da Dalt & Laudadio, 2011); d) an unavoidable factor is the application of force criteria (Johnson, 2008). Etymologically, the term comes from the Greek "krinein" meaning judge, assess, to estimate the value of something. In summary, this study assumes that the CT designates a multidimensional construct that refers to cognitive processes reflective or reflective rational capacity by structural analysis of the arguments, it seeks to assess its validity and solidity through deliberation, discernment and application of convenient criteria and reasoned conclusions. Their product is a value judgment that result from argumentative analysis, deliberation, consideration and explanation of evidence considerations, conceptual, methodological, contextual and discernment achieved by applying appropriate force criteria (Johnson, 2008; Da Dalt 2008; Da Dalt and Laudadio, 2011, Delphi Report). Its dialogic dimension implies: self-regulation and socio-emotional components that operate as encouraging the argumentative interaction: social competence, empathy and attitudes both intellectual-humility - impartiality, independence and intellectual integrity –such as volitional ones -perseverance and intellectual courage (Paul, 1990).

Robert Ennis, Stephen Toulmin, Richard Paul, explore all possible ways of reasoning, because they are the fundamental processes of thought. His proposal goes beyond the deductive reasoning, since that does not account for everyday reasoning modes, mostly of inductive nature. Then, there begin to talk about practical or everyday reasoning.

Critical thinking refers to reflective thinking involving a doubt, perplexity or mental difficulty that arises inquiry to: 1) interpret or clarify the meaning of concepts, judgments, analogies, rules, symbols; 2) identify the different positions that articulate in a concise manner in the arguments; 3) analyze the arguments in order to identify the proposition, thesis or conclusion and the reasons for support the premises and assumptions 4) evaluate the validity and strength of the inferences and deductions.

### **Methodology for Promoting CT: Informal Logic**

The "Logic is the science that studies the principles and methods to distinguish a correct reasoning from a wrong one" (Peretó Rivas, Ruben and others, 2006: 5). One of the greatest contributions to the gestation of the Informal Logic was the Dewey's pragmatism because it warns the instrumental nature of logic with respect to the other sciences. Indeed, the logic is the science common instrument to all sciences and its application ensures the formal validity of reasoning. Informal Logic is a novel way of teaching logic, an alternative approach that makes it more accessible, easy, agile and enjoyable to learn. It was a real educational revolution that began in universities (First International Symposium on Informal Logic, 1978) and now can be apply to all educational levels, from Matthew Lipman's program "Philosophy for Children and Youth". Its origins are in the logic of Aristotle (as we place the seeds of critical thinking in the polemic against the Sophists Socrates); hence the Aristotelian treatment of fallacies is still valid. "Among the skills to be developed, identifying fallacies is an important goal to prevent tampering: The truth and the lie are, indeed, the essential binomial to make the other person believes and does what you want" (Perez Rifo and Vega Alvarado, 2002, p. 9). Eemeren, Frans and Grootendorst, Rob (2002) dealing with the study of fallacies as violations of the rules of communication. For authors, the principles of communication can be summarized as "be clear, honest and efficient and go straight to the point.

Informal Logic arises from the disappointment of many teachers of formal logic when they see that in their courses the students did not improve their abilities to analyze and correctly assess the processes of thinking; among them, emphatically, the reasoning; in the context of natural language: for example, in daily comments, opinions expressed in the media, academic debates, the parliamentary debate, legal processes, the experimental scientific knowledge, the study of science, etc.-. This led a group of experts to design and generate new ways, methods, strategies for teaching the logic. The expression "informal logic" was coined by Gilbert Ryle in his article *Formal and Informal Logic* of 1966. This discipline also responds to the need for the student to be able to reason well about the events that must face daily and on issues where it is genuinely committed. "It's an approach that addresses the teaching skills of the argument as a key part of education, (...) to prepare young people for responsible social, political and labor roles" (Blair and Johnson, 1980). While informal logic still does not reach the status of a clearly defined discipline, we can say that "means that branch of logic whose task is to develop criteria, standards and informal procedures, for analysis, interpretation, evaluation, criticism and construction of argumentation in everyday discourse and stylized speech "(Johnson & Blair, 2000, 2002, Johnson, 2006; 2008).

Robert Ennis, Stephen Toulmin pose explore all possible ways of reasoning, because these are the fundamental processes of thought. His proposal goes beyond the deductive reasoning, since that does not account for everyday reasoning modes, mostly of inductive nature. Then, it begins to talk about practical or everyday reasoning.

The argument is a "reasonable way to bring a difference of opinion to its conclusion". It is a matter of properly assemble the reasons, identify different viewpoints, interpret and handle objections, assess evidence for or against each perspective, identify the assumptions, the strengths and weaknesses, compare the pros and against each decision option and the various possible alternatives, take up the challenge of assessing the criticisms of the arguments themselves. All this, so in order to promote critical thinking.

As part of the argumentative interaction it is required: ability to cope with social competition arguments against their own; to be relevant, coherent and effective contributions; to have independent thinking; be empathetic. And, in all cases: knowing how to apply the strength of the criteria (Johnson, 2008), know how to distinguish the position or opinion of the person that hold it; always respected what is a person; what is questioned is his position.

"Educating to learn to argue, to reflect and think critically, to communicate assertiveness -avoiding the manipulation and aggressiveness- and identifying fallacies, should have a prominent place in the intellectual education "(Da Dalt, 2006, pp. 132-133). The characteristic feature of logical argument is the effort to support an assertion rationally. The issuer is not simply stating something as true, it should also explain the reasons why it is true. When the reason or reasons of an argument are good, we say that argument proves the conclusion. The ways in which the propositions of the argument are chained is called result, or logical nexus or inference. An argument is valid or right when there is consistency between antecedent and consequent, although both or one of them is false. Hence, in all reasoning or argument there is distinguished the content from the form. Knowing how to abstract the "form" of the reasoning can identify their condition of validity or invalidity. To learn to distinguish clearly the formal aspect of the argument, which is independent of the material of trials that comprise, comprises the essence of logic. "In the reasoning, the consequent follows from the antecedent by logical necessity. Thus, the formal aspect of reasoning makes possible an intimate linkage between false propositions, between true propositions, and between true and false propositions. And it is for this reason that a scientist, when he reasons, does not always reach the truth, since he does not part of the truth or because he parts of the truth but makes some flaws in the logical process"(Peretó Rivas, Ibid. 63).Therefore, the first thing to be established is the truth or falsity of the premises. The truth of the antecedent corresponds to the suitability of the premises with reality. To determine this truth, usually an external expert information source (the various sciences) is required. Then, the determination of the truth of the premises escapes from the formal and informal logic. This refers to the limit of formalism: "(...) in any situation in which the basis for the belief are uncertain -that is, in any situation that requires critical thinking-, is not so much the form or logical validity of the relevance assumptions what is difficult to assess about the content or truth of the premises. It is it difficult to determine whether certain premises are truth. And this difficulty brings us to a field of any domain in which each question seems to generate many others and epistemological uncertainties"

(McPeck, 1981: 25-26). Various types of knowledge to appreciate the different dimensions of the real problems are needed. We have "the truth" of very few things, so we must resort to various expert knowledge or an external source (or expert in a subject) (Govier, 2001). Other requirements stipulated by Robert Ennis (1996) are: there is no conflict of interest, there is agreement among experts, etc. The author provides a detailed analysis of the credibility of the sources. For this reason, in our study, it is considered the interdisciplinarity as an important factor in education. Second, the premises should be logically related to the conclusion so that if the premises are true, the conclusion will be too.

### **Program for the Promotion of Critical Thinking. Pedagogical Intervention**

The main objective of the program is: To promote critical thinking and logic skills involved: Inference, Recognition of implicit assumptions or statements contained in proportioned assertions, deduction, interpretation, evaluation of arguments.

The specific objectives are: 1) Learn to identify the central thesis and the reasons that support them to analyze and evaluate the argumentation (valid or false) that occurs in contexts of natural language - scientists, journalistic, advertising, political, etc- to know how to argue, give reasons for or against controversial thesis, prevent tampering, and to be persons of judgment and to exercise freedom responsibly. 2) Improve communication strategies to turn the classroom into a "research community" that promotes rigorous thinking.

Within the framework of action- research, the substantive hypothesis was: A systematic pedagogical mediation, focusing on reflection and debate on controversial life situations and that respect certain conditions, promotes critical thinking and skills involved in it.

The conditions that must be respected are: A mediation of at least one semester; Commitment of teachers in the appropriation of the skills involved in the promotion of critical thinking. Active and adequate participation, student motivation as protagonist and active participant in the learning. Transfer to new problem situations in order to develop habits and strengthen learning.

Two weekly meetings of 45 minutes each in curriculum space of "Formal Logic" course is conducted, but the methodology used is that of "Informal Logic or applied" to practical reasoning. It is used an argumentative "trigger" text involving doubt, perplexity, mental difficulty, conflict arising the search in order the classroom belongs a scientist community that searches: 1) to interpret or clarify the meaning of concepts, judgments, analogies, rules, symbols 2) to detect the various positions that are articulated in concise and consistent arguments; 3) analyze the arguments to identify the premise or conclusion and the reasons for support and the assumptions 4) evaluate the validity and strength of the inferences and deductions. The framework and the courtly proposal rely, on the one hand, on the movement of informal logic and critical thinking, and secondly, in the pragma-dialectical approach to argumentation of Frans and Rob Van Eemeren Grootendorst that seeks to detect various forms of violation of the rules of communication in oral and written texts. Socratic's maieutics, as path of reflection, concentrates on the question, the questioning whose aimed is to try to find the real meaning of the statements and arguments, discover the fallacies, etc. As Lipman says, the aim of the research community is "the search for truth, beauty and goodness" (Lipman, Sharp y Oscanyan, 1980, p. 15).

### **Types of Reasoning. Structure and Assessment of its Conclusions**

The forms of reasoning are studied in two categories: the deduction and the induction. Inductive reasoning comprises: inductive generalizations, causal, analog and hypothetical reasoning. "The everyday reasoning is the joint use of all of them in order to prove a conclusion or to explain facts. The general treatment of reasoning requires us to develop a common approach to all forms of it"(Saiz and Nieto, 2002, p. 17). The analysis scheme proposed is the proposed by Toulmin. (1992)

### **Practical, "Informal" or Everyday Reasoning. Structural Analysis, Representation and Evaluation**

In order to establish the solidity of an argument we should carry out two tasks: a structural analysis and its evaluation. With teaching purposes, Saiz and Nieto (2002, *ibid*: 23) propose five stages: 1) identify the elements of an argument; 2) establish the relationships between them; 3) represent the elements and their relationships; 4) apply the basic criteria of solidity and 5) assess its strength globally. The first three, refer to the analysis; the last two, to the evaluation.

Step1: The following example shows the first step: to identify the thesis or conclusion -to which is assigned the number one (1) and the reasons behind it, (2), (3), (4), etc.

"The day dawned clear, sunny and fresh air; however, concerns occupied the minds and prevent to enjoy the beauty of that morning. We should improve the teaching of subjects in public universities. There are serious problems that require it: students have many subjects in their curricula; also, the classes are overcrowded, which severely limits the forms of education. And finally, we must not forget that a significant percentage of teachers is engaged in a very negative economic and temporal conditions of instability that affect the proper performance of their work and produce stress". (Example: Argument A)

(1) We should improve the teaching of subjects in public universities.

*The reasons argue are:*

(2) Students have many subjects in their curricula

(3) "The classes are overcrowded"

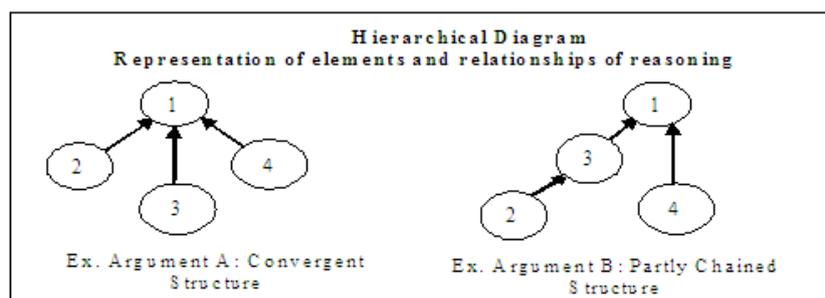
(4) Many teachers are on precarious contracts

Step2: To establish the relationship between the elements. What relationship is noted between the conclusion (1) and the three reasons that support it (2), (3) and (4)? Each reason is held separately without relying on others and converges to the conclusion independently of the other. Hence, this kind of relationship are called "convergent relations." If the example is changed to the following:

"We should improve the teaching of subjects in public universities. There are serious problems that require it. Students have many subjects in their curricula. This prevents to have enough time to follow the course in a normal way. And we must not forget that a significant percentage of teachers is engaged in a precarious economic and time conditions that are very negative for the performance of their work and their health "(adapted from Saiz, 2002, p. 25). (Example: Argument B)

Now (2) and (3) do not operate as independent grounds because the fact of not having enough time depends on the many subjects of the plan. The dependent relationships are called: Chained relations. The relevance of one or another type of relationship is based on the degree of support that each offers to conclusion. The support is greater when the reasons have a converged connection with the conclusion.

Step3: The Representation of an argument is made by hierarchical diagrams consisting of arrows and numbers or letters. The numbers represent the elements and the arrows the relationships. The Graphic 1 shows through the hierarchical diagram, the representation of the elements and the relationships of examples of Reasoning or Arguments A and B. The structure of Argument A is convergent; the one of B, is chained, in part: the reason (2) supports the conclusion through (3). This structure is weaker than the example 1.1 because it is as if only has two reasons to support the conclusion, rather than three, as the (3) requires the (2) for support. The conclusion receives direct support from (3) and (4); it consumed or "used up" a reason in an intermediate support. The diagrams, especially for complex arguments, are of invaluable value in establishing the solidity of an argument.



**Graphic1**

Step4: Criteria of Solidity. When an evaluation is performed, it is performed on the conclusion, that is, if it is held or not and to what extent. The degree to which the conclusion is supported depends on the reasons and on the interlocking that it has with the thesis. Therefore, there are two important aspects to consider: the accuracy of the statements and the strength of relationships.

The first thing that must be established is the truth or falsity of the premises. The truth of the antecedent corresponds to the suitability of the premises with reality (cfr. Section Informal Logic). Second, the premises must be logically related to the conclusion so that if the premises are true, the conclusion will be too. In other words, it is not enough that the premises are true; Relevance (R) of the reasons for conclusion should be estimated. If you hear, "You should vote in white, because none of the candidates is two meters high," it warns that the reason "measuring two meters high" is irrelevant to the conclusion. But if you say: "You should vote blank because all the candidates of the various parties act with the intention to reach and stay in power, regardless of the common good"; the reason is relevant. The logic provides standards for evaluating the internal strength of the arguments. One of the main is the technique to ask, "Is it the conclusion established the only that can be set from the evidence provided by the premises?. In this case, the argument is strong, solid. Or, "Are there other findings that could be equally consistent with the evidence?. In this case, the argument is weak.

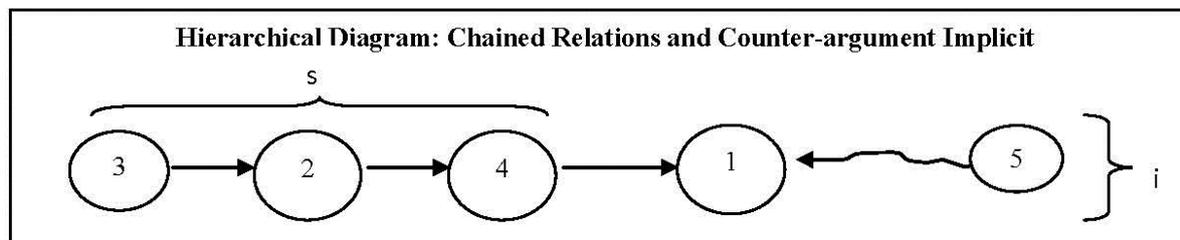
Step5: Overall assessment of the solidity through three criteria: Acceptability, Relevance and Sufficiency (ARS). Sufficiency (S) refers to that there must be sufficient relevant qualitative and quantitative reasons. There may be the case that one reason is relevant enough to support an argument or to have several weak reasons that do not offer an equally sustainable argument.

We proceed to make an example where all the steps are done. Example of Argument C

[Some argue that drugs should not be legalized. They are mistaken] (1) The benefits of legalization are very important. [One of the biggest would be the disappearance of trafficking] (2). [To can be legally bought and sold, the distribution of the drug may meaningless] (3). In addition, the marginal drug addict population disappeared, something very important for society](4).

(1): Drugs should be legalized.

(5): Produce more addicts.



Graphic 2, reveals by the Hierarchical diagram the chained relations to which an implicit counter-argument is added (underlined) which relates to the conclusion through a wavy arrow, to distinguish it from the others. The reasons seem acceptable, relevant but insufficient. There are three chained reasons that actually provide support for the conclusion as if they were one. There is also a strong counter-argument, that avoid that support. Then, overall, the argument is evaluated with nonexistent solidity, that is, as fallacious.

An example of Argument or Inductive Reasoning by analogy is presented

Drugs should be legalized (D). One of the biggest benefits is that disappear illegal trafficking (a). To can be legally bought and sold, the distribution of the drug should meaningless (b). Junkie marginal population will disappear, socially relevant question. These reasons are also found in the issue of abortion (D). Also abortion should be legalized (A). One of the biggest benefits is that disappear illegal abortion (a) When legally performed abortions can be done, illegal practice of abortion meaningless (b). It will disappear marginal population without access to an abortion in conditions of asepsis, socially relevant question. The poor would agree to equal conditions than the rich. (c). Decrease the deaths caused by the lack of asepsis conditions. (d). If it is not practiced professionally, it may cause several deaths in mothers who have abortions because of the lack of aseptic conditions in which they are performed (e).

Counterarguments analogs or refutation by analogy

The legalization of drug produces more addicts (E). Science has shown the morbid harms of drug abuse. Similarly: The legalization of abortion produces more abortions (E). Science has shown that the zygote, from the moment of the union of the male and female germ cells, has the full genetic

potential of a person with a human life different of the life of his mother. The zygote is not a part of mother's body. The zygote is in a stage of development of human life such as the childhood, adolescence, youth or adulthood. The abortion is a violation of a basic and primary right of the person, such as the right to life. This is the murder of unarmed people (F). The number of women suffering from severe post-abortion psychological sequelae increases (G). No decrease clandestine abortions, since many women want to keep their identity hidden.

The pedagogical proposal has attempted to favor the appropriation of strategies that promote critical thinking to teenagers, as receivers of an overwhelming amount of transmitted messages by the mass media, are able to thoughtfully analyze them: learn to identify the central thesis of the arguments, the relevance of the reasons that support them, the strength or weakness of the reasoning, etc. The critical reflective thinking can know how to give reasons why this speech is solid or misleading, such action detrimental to their physical or moral health, for personal and community life and even contrary to the life of the individual and encourage decision making consistent. Another didactic strategy is the Socratic dialectic through which the teacher also promotes communicative competence.

## **METHOD**

The methodology used in this research is Quantitative.

### **Design**

The research design used was "before and after". First, the pre-test evaluation was performed in both, the experimental and the control group. Then it was conducted a systematic educational intervention only in the experimental group. Finally, it was made the post-test evaluation in both groups

### **Participants**

The type of sample was intentional not probabilistic . The study population was a sample of 94 young people between 19 and 21 years of the first grade at a private university. The college belongs to a university in Argentina, based in Mendoza, of the middle socio-cultural level. The experimental group consisted of 38 students of the careers of Psychology and Educational Sciences; while the control group was of 56 young people of Psychology.

### **Evaluation Procedures**

Before and after the educational intervention (which lasted one semester of classes) the Test of Watson-Glaser Critical Thinking Appraisal (WGCTA), Form A, designed by Goodwin Watson and Robert Glaser (1980) was administered. It evaluates cognitive abilities involved in critical thinking, originally 80 items, adapted by Chalupa (2006) whose version reduces the items to 66 items. Previously, the analysis of the psychometric properties of the adapted test was conducted. It showed very good reliability (Cronbach's alpha = 0.82), construct validity, homogeneity in 65% of the items, discriminative potential of acceptable level, well or very good in 71%, a suitable medium level of difficulty (0.63) (Da Dalt and Difabio, 2007). In its two alternative forms -A and B-, the original WGCTA consists of five factors: 1) Inference, defined as the conclusion to be drawn from observed facts or assumptions; that assesses the grades of discrimination validity of immediate inferences with five options for each item (valid, probably valid, insufficient data, probably invalid and void). 2) Recognition of implicit assumptions or assertions contained in the data provided. 3) Deduction, determination of the logic atingencia of the conclusions from the given premises. 4) Interpretation, weight of evidence to judge whether generalizations proposals follow from the data beyond a reasonable doubt. 5) Evaluation of arguments, arguments distinction of "strong" or "weak" in terms of their relevance to the topic under discussion.

### **Intervention Procedures and Variables**

The program was structured and implemented on the basis of CT Movement, the methodology of informal logic and the dialogue as a way of reflection. Its development was carried out by generating or selecting arguments or controversial thesis and fallacies in natural language (extracted from the various media) or of scientific domain. Some of the multi-ethical issues addressed were: addiction, violence, physical and psychological abuse, humanist ecology, abortion, consumerism, hedonism, political campaigns. The texts were analyzed individually; in educational duo and at classroom by argumentative interaction through dialogue, which at first is guided by questions from the teacher, but then the students assume the questioner paper, in order to learn to listen actively, challenge, refute and

to make contributions turning the classroom into a research community committed to finding solutions to problems. The independent variable was the program of pedagogical intervention. The dependent variable was higher order cognitive skills involved in critical thinking: inference, recognition of assumptions, interpretation, deduction, argument.

**Statistical Procedure**

In order to identify whether the educational intervention had significant effects on cognitive skills of a higher order, the statistical procedure applied was MANOVA (Multivariateanalysis of variance) of repeated measures. Warning: the post hoc tests were not performed because there are less than three groups.

**RESULTS**

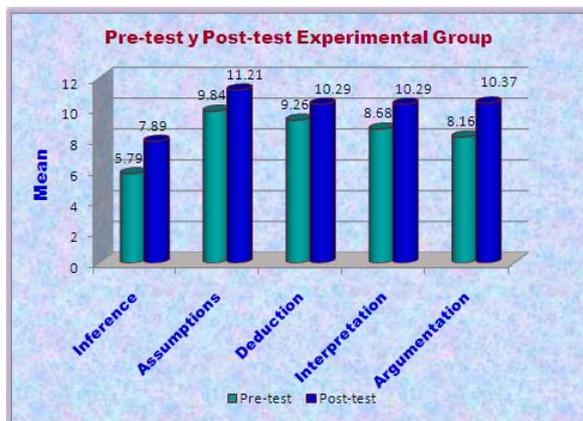
The aim of this study was to test and evaluate the impact of an intervention program developed "ad hoc" to promote various higher order cognitive skills involved in critical thinking.

Analyzing increases in the 5 dimensions of critical thinking it is observed in the control group not only increases were minimal but in some dimensions lower average ("Interpretation" and "Assumptions") was obtained. The average before-after in the control group had ranged between -0.23 and +0.25. Unlike them, the experimental group increased their average after the intervention in values ranging from 2.21 ("Evaluation of Arguments") to 1.02 (deduction). This is explained - according to the authors of the motion representative by Robert Ennis, Stephen Toulmin, Richard Paul, to name a few- because the informal logic goes beyond the deductive reasoning, since that does not account for everyday reasoning modes, mostly of them of inductive nature. So we talk about practical or everyday reasoning, which is predominantly inductive, not- deductive. That is, the program emphasizes the promotion of inductive reasoning (see Table 1 and Graphics 3 and 4). The F univariate of the contrast tests (intrasubject, pre-test and post-test) between both groups (intersubject), are significant on all scales, except Deduction. In inference, assumptions, interpretation and argumentation, the subjects in the experimental group increase their average, but not in the control group.

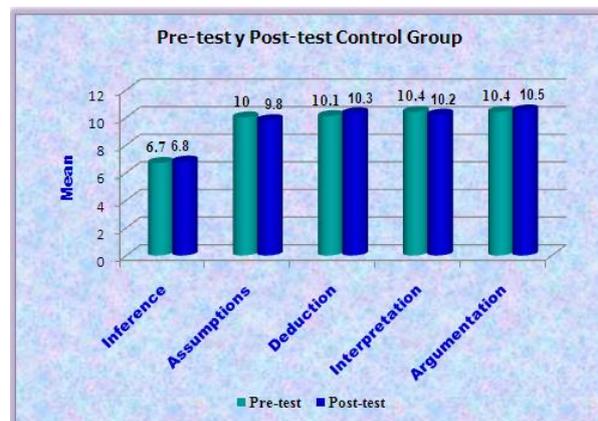
**Intersubjet Factors**

**Table1**

Scales	Experimental Group					Control Group					F (1,92)	p
	Pre-test		Post-test		F (1,92)	p	Pre-test		Post-test			
	Mean	S.D	Mean	S.D					Mean	S.D	Mean	S.D
Inference	<b>5,79</b>	2,25	<b>7,89</b>	2,87	19,96	0	6,77	2,25	6,79	0,35		
Assumptions	<b>9,84</b>	1,93	<b>11,21</b>	2,37	14,44	0	10	0,22	9,82	0,28		
Deduction	<b>9,26</b>	2,25	<b>10,29</b>	1,81	2,61	0,1	10,07	0,32	10,32	0,32		
Interpretation	<b>8,68</b>	2,76	<b>10,29</b>	2,26	18,35	0	10,42	0,34	10,2	0,31		
Argumentation	<b>8,16</b>	3,03	<b>10,37</b>	2,61	23,16	0	10,37	0,37	10,54	0,33		
	N=38				19,96	0	N=56					



**Graphic 3**



**Graphic 4**

In the univariate analysis of variance with repeated measures of the total score of critical thinking can be seen more clearly the significant increase achieved by the intervention program. So we see that in

the experimental group, the increase was 8.32 (Me1 and Me2 = 50.05 = 41.73) while in the control group was only 0.02 (47.66 Mc1 = MC2 = 47,64). Comparing the average in both (See Table 2).

**Table2**

Scales	Experimental Group				Control Group				F (1,92)	p
	Pre-test		Post-test		Pre-test		Post-test			
	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D		
Critical Thinking	41,73	7,08	50,05	6,57	47,64	6,98	47,66	6,95	78,22	0,0001
	N=38				N=56					

## CONCLUSION

As seen (see Table 1) at the time of starting or the pre-test administration, the experimental group was at a lower level regarding the control group, in the various dimensions of CT. About the Total Critical Thinking the control group had better scores on the pre-test; while in the post-test it just kept its score and was overtaken by the experimental group. In the total Deduction, even though a significant difference between the groups was not obtained, the experimental group increased its average 1.02; whereas the control group, rose it only 0.25.

The results revealed a significant increase in four of the five cognitive skills evaluated by the Watson and Glaser: Inference, Recognition of assumptions, interpretation and arguments. There was no significant increase in deduction, which can be explained because the methodology of informal logic emphasizes the reasoning in the context of everyday life, which are predominantly inductive. So it follows that the intervention program was effective.

## DISCUSSION

The control group had better scores on the pretest. In the administration of post-test results in the experimental group show a statistically significant increase from the pre-test. In the control group, no increase was evident in any of the subtests or dimensions. Now, even though the experimental group at the time of the pre-test was at a lower level, when the post-test, the experimental group outperformed the control group in Total Critical Thinking. One might think that, since the experimental group was at a lower level, would most likely to increase with intervention. From an empirical point of view, this pedagogical proposal has tried to satisfy a central requirement of applied research, which is seeking its ecological validity: working with intact groups (and not selected students), take the content of the instructional processes, over a long period of (since most of the results of the classroom are influenced by continuous process).

After a long period of twelve years in which democracy in Argentina was more declaimed than practiced, the socio-political framework that characterized Argentina (2007-2015) was an authoritarian populism that exerted a powerful information management and enforcement their ideological postulates through the mass media, particularly in educational field. This led to the inevitable situation of helplessness, ideology and manipulation in which the Argentine citizen is, particularly the young one. However, the existence of private educational institutions, allowed to create spaces where critical, reflective and independent thinking could be exercised freely. It can be applied to populism the contradiction inherent in the reigning postmodern relativism, on the one hand, proclaims the equality of opinions and, secondly, which are the appropriate ones. The Argentine socio-political context reveals the importance of establishing the true republican democracy to favor the development of a social and personnel healthy life, transparent and promoter of responsible freedom.

The various authors of the CT movement describe the critical thinker as the one who is willing to see the true strengths in the points of view with he do not agree and is honest to recognize his own weaknesses. He must be open to criticism from his own criticism because there is always the chance of mistake, cognitive distortion, undervalued, overvalued some aspect of the original product, even to fall into dogmatism in contingent matter. The genuine critical thinker manifested in his assertive way to answer the objections of his points of view; in the attentive and active listening of the other point of view; in the cognitive flexibility, in his ability to reassess their perspective and consider rebuttals. Now, it is difficult to recognize his own mistake and to agree with the viewpoint of the other person. And if this is evidence in everyday life - which normally is in the field of privacy, which should

facilitate recognition-how more difficult it is in the public and social spheres. However, a virtue itself and unavoidable that can't be missed is humility- Richard Paul (1991). In summary, the ideal critical thinker is characterized as usually inquisitive, knowledgeable; fair in evaluation, honest to face their personal biases, prudent in trials, with adequate provision to reconsider and clarify aspects; diligent in seeking relevant information, reasonable to select criteria and persevering to achieve results commensurate with precision when the subject and context of inquiry permit. This has allowed warn other limit in the present study and the various empirical studies on CT, namely, the evaluation of the quality of argumentative or dialogic interaction dimension, which can't be measured by the direct method of test, but through several observers who register in a "Certificate of observation" the essential behaviors of the critical thinker.

The large gap that exists around the CT is that there are only isolated programs that promote it, a product of the goodwill of teachers or specific investigations. The CT does not exist as a subject in the curriculum in any of the educational levels or training of teachers, nor as a transversal strategy. This explains the diversity of studies on critical thinking: in teachers and students at various levels; with varied methods and results because of epistemological differences.

On the other hand, it notes that Lipman advises to make a longitudinal study which probably show that, if the logical skills, like any habit, do not exercise, you lose them. Hence, it is considered that to develop the CT we must begin from childhood, and continue into adolescence and youth.

Our ideal, like Lipman, was " to turn the classroom into a research community concerned with seeking the meaning of the own existence and of the world around us, concerned about the pursuit of truth, goodness and beauty."(Lipman, Sharp y Oscanyan, 1980, p. 15).

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