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Original article

Cognitive and socio-affective strategies in the critical thinking of Peruvian teachers

Estrategias cognitivas y socioafectivas en el pensamiento crítico de profesores peruanos

Estratégias cognitivas e sócio-afetivas no pensamento crítico dos professores peruanos

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ABSTRACT
Critical Thinking is a fundamental skill in the practice of teachers, but there is a lack of attention towards its development or strengthening due to ignorance of appropriate strategies. Faced with this situation, the use of cognitive and socio-affective strategies emerges as an alternative. The objective of this research is to verify if the use of Cognitive and Socioaffective Strategies (ECS) improves the Critical Thinking of Regular Basic Education teachers. The study is of a quantitative type, quasi-experimental, longitudinal and explanatory level design. We worked with 60 teachers from the primary and secondary levels, of which 40 constituted the Control Group (GC) and 20 the Experimental Group (GE). For the measurement, a Critical Thinking questionnaire was used with adequate indices of validity and internal consistency (á = 0.93). The main results revealed that in the pretest there is no significant difference between the Control Group and the Experimental Group; while after the intervention of the Cognitive and Socio -effective Strategies the difference was high and significant in both groups ($p < 0.05$; TE > 0.5). In conclusion, Cognitive and Socioaffective Strategies significantly improve the Critical Thinking of basic education teachers.

Keywords: analysis; communication; cognitive strategies; socio-affective strategies; Critical thinking; synthesis.

RESUMEN
El Pensamiento Crítico constituye una habilidad fundamental en el ejercicio del profesorado, pero existe una desatención hacia su desarrollo o fortalecimiento debido al desconocimiento de estrategias adecuadas. Ante esta situación, surge como alternativa el empleo de estrategias cognitivas y socioafectivas. El objetivo de la presente investigación es comprobar si el empleo de las Estrategias Cognitivas y Socioafectivas (ECS) mejoran el Pensamiento Crítico del profesorado de Educación Básica Regular. El estudio es de tipo cuantitativo, diseño cuasiexperimental, longitudinal y de nivel explicativo. Se trabajó con 60 docentes de los niveles primaria y secundaria, de los cuales 40 constituyeron el Grupo Control (GC) y 20 el Grupo Experimental (GE). Para la medición, se empleó un cuestionario de Pensamiento Crítico con adecuados índices de validez y consistencia interna (á = 0.93). Los principales resultados revelaron que en el pretest no existe una diferencia significativa entre el Grupo de Control y Grupo Experimental; mientras que tras la intervención de las Estrategias Cognitivas y Socioefectivas la diferencia fue alta y significativa en ambos grupos (p < 0.05; TE > 0.5). En conclusión, las Estrategias Cognitivas y Socioafectivas mejoran significativamente el Pensamiento Crítico del profesorado de educación básica.

Palabras clave: análisis; comunicación; estrategias cognitivas; estrategias socioafectivas; Pensamiento Crítico; síntesis.

RESUMO
O pensamento crítico é uma habilidade fundamental na profissão docente, mas há uma falta de atenção ao seu desenvolvimento ou fortalecimento devido à falta de conhecimento das estratégias apropriadas. Diante desta situação, o uso de estratégias cognitivas e sócio-afetivas surgiu como alternativa. O objetivo desta pesquisa é verificar se o uso de Estratégias Cognitivas e Socioafetivas (CSS) melhora o pensamento crítico dos professores regulares da educação básica. O estudo é quantitativo, quase-experimental, longitudinal e explicativo. Trabalhamos com 60 professores do ensino fundamental e médio, dos quais 40 eram o Grupo de Controle (CG) e 20 eram o Grupo Experimental (GE). Um questionário de pensamento crítico com índices de validade e consistência interna adequados (á = 0,93) foi utilizado para a medição. Os principais resultados revelaram que no pré-teste não há diferença significativa entre o GC e o GE; enquanto que após a intervenção do CST a diferença foi alta e significativa em ambos os grupos (p < 0,05; TE > 0,5). Em conclusão, a CST melhora significativamente o pensamento crítico dos professores de educação básica.

Palavras-chave: análise; comunicação; estratégias cognitivas; estratégias sócio-afetivas; Pensamento Crítico; síntese.

INTRODUCTION

The development of Critical Thinking (CP) in Higher Education is very important, since it allows future professionals to acquire abilities and skills that help to critically analyze the problems that arise in professional life and can offer practical and effective solutions. The quality of life is associated with the way of thinking; therefore, the pc must be practiced until it reaches its excellence.

PC is about thinking in such a way as to meet the relevant standards; therefore, it requires intellectual resources such as prior knowledge, operational knowledge of norms, critical concepts, heuristics, and mental habits (Bailin *et al.*, 1999). Along the same lines, Palacios *et al.* (2017) add that this refers to a type of argument that involves the

act of questioning or evaluating; For this reason, it requires questioning and evaluation exercises that help to form a judgment or a position on a topic, a phenomenon or an idea. To this is added the contribution of Miranda (2003), who states that the teacher's PC is characterized by being of a cognitive type that questions; that is to say, it problematizes the diverse truths or knowledge that it acquires, which could be taken as unique, definitive or absolute and it assumes as true without an adequate critical judgment. Other theorists, such as García Noguera *et al.* (2021) express that the PC is an intellectual ability that occurs with a defined, reasoned and objective purpose; this is considered as one of the basic learning methods to teach skills in the 21st century.

Under this conceptual line, the teacher must master the didactic strategies involved in the use of the mind and reflection on life, which allow him to build a PC to analyze reality from an interdisciplinary approach. In this way, the teacher will be able to exercise his profession in a better way, he will adapt more easily to changes, he will have a more dynamic and predictive capacity to anticipate any difficulty that arises in his professional practice, as well as provide alternative solutions to problems. (Miranda, 2003). In order to adequately develop Critical Thinking, the development provisions, choice of strategies and content of topics to work on are needed; Therefore, Betancourth Zambrano (2015), in his study, found that teachers must develop CT because it is a necessity, since they are the main trainers. This is only possible under a series of dynamic activities that avoid falling into monotony through various techniques such as: role playing, use of videos or slides that contribute to the efficient achievement of the PC, so this is an indication that the combination of strategies heavily favors the PC.

In Peru, since the beginning of the new educational reform in regular basic education, the development of competencies that allow students to face difficult situations through "know-how" has been promoted, based on a competency-based approach that develops creativity, innovation, Critical Thinking, self-learning, communication, collaboration and teamwork, adaptability, initiative, results orientation, leadership, responsibility and respect (Pérez-Morán *et al.*, 2021). The PC is understood as a complex macro-skill, but essential in students to develop fundamental skills and areas of education. That is why, in an educational context with a competency-based approach, it seeks to promote personal development for a good quality of life, develop Critical Thinking as a process of analysis, understanding and evaluation, since it is the necessary resource to achieve results. of learning in any field, whether school or extracurricular.

Along the same lines, García Noguera *et al.* (2021) suggest applying active strategies such as PBL or cognitive and socio-affective strategies. In this sense, to achieve an adequate development of the PC, it is necessary to enable spaces (conversations, round tables and different interactive techniques) and to have didactic material (recreational and reflective readings), as well as to promote reading activity at its different levels (literal, inferential and critical) that encourage critical, autonomous and reflective capacity, as is the case of activities associated with the elaboration of conceptual maps, networks of ideas, forums, dissertations, etc. (Gómez-Gómez & Botero-Bedoya, 2020).

Unfortunately, the studies that address the combination of strategies aimed at the development of Critical Thinking are very scarce in the country, which opens a gap for the achievement of such intellectual ability. Therefore, the present study aims to verify that the use of Cognitive and Socioaffective Strategies (ECS) improves the Critical Thinking of Regular Basic Education teachers.

MATERIALS AND METHODS

The research is quantitative, with a quasi-experimental and longitudinal design, since the variable is measured on two occasions (pre and post-test), where comparisons were made. Likewise, it is of an explanatory level, since it seeks to verify the causality of the intervention of cognitive and socio-affective strategies for the development of Critical Thinking in a group of teachers (Supo & Zacarías, 2020).

Participants

The study worked with a population of 60 primary and secondary teachers from a Regular Basic Education (EBR) educational institution in the city of Moquegua. The control group was made up of 40 teachers, while the experimental group was made up of 20 teachers between men (30%) and women (70%).

Instrument

The instrument used was a Critical Thinking questionnaire prepared and validated by Zaldívar (2010), which initially had 20 items; however, after the factorial analysis applied by the authors, it is divided into three dimensions that are called "recognition of assumptions" (items 2, 4, 6, 9, 10, 11 and 14), "evaluation of arguments" (items 1, 5, 8 and 13) and "interpretations" (items 3, 7 and 12). The instrument has a scale from 1 to 6, where 1: never, 2: almost never, 3: rarely, 4: quite often, 5: almost always and 6: always. Likewise, it shows adequate internal consistency, which was calculated using Cronbach's alpha before its application with a pilot group; the overall score obtained is 0.93, which exceeds the value of 0.8, thus showing high reliability. Regarding the validation of the construct, it was confirmed that the model presents adequate values in CMIN/DF < 5, CFI, TLI, GFI > 0.90, RMSEA and SRMR < 0.08 based on the authors' model, as well as adequate factorial loads > 0.5.

Process

An intervention program was designed for the teachers of the experimental group of the educational institution, through the Critical Thinking Route (RPC) in 07 learning sessions (table 1). Its application lasted three months, aimed at improving cognitive and socio-affective processes, through the management of their social or socio-affective skills. Likewise, reading comprehension was affected through the insertion of readings in the Reading Plan, through Socratic questions to reach the critical level; as well as the inquiry for the formulation of their hypotheses and verification of assumptions.

We worked from different cognitive dimensions such as: analysis, comparison, interpretation and communication, as well as problem solving suggesting the POLYA method. Regarding the strategies used, they focused on socio-affective skills with an incidence on self-confidence and teamwork to conclude in all processes with metacognitive and reflective questions that allow the development of Critical Thinking, implemented in the following proposed route (figure 1):

1. Observation: it is part of the scientific method and begins in real and hypothetical situations to put into play the higher thinking skills that teachers work with students.

2. Higher Thinking Abilities:

a) Analysis and synthesis: capacity that allows dividing the whole into parts to explain, relate and unite the parts, organizing and relating them with depth and rigor.

b) Comparison and contrast: ability to compare two or more elements, objects,

processes, establishing differences and similarities for verification and verification.

c) Interpretation: explains actions, sayings or events that can be understood in different ways, reconstructing from a point of view and understanding realities and contexts.

d) Criticism: it is an analysis or judgment about a situation, a person or an object; may be objective or subjective. In the PC this is characterized by the use of cognitive abilities, by the way in which they are approached in different scenarios and contexts in life.

e) Evaluation: consists of developing and improving cognitive abilities in the process, determining the credibility to support the conclusions, without entering into contradictions.

3. The formulation of hypotheses: it is related to the inquiry for the development of investigative skills and to verify the assumptions made in different situations and/or contexts.

4. Predictions and estimates: they are made in order to anticipate situations of reality, estimating possible solutions; previously evaluated as evidence of Critical Thinking.

5. Evaluation: a value judgment is issued regarding the object of study when judging/prosecuting for decision making.

6. Proposal of solutions: creativity is used, when proposing solutions, and it culminates with a social skill that is to assertively communicate proposals to problems in its context.

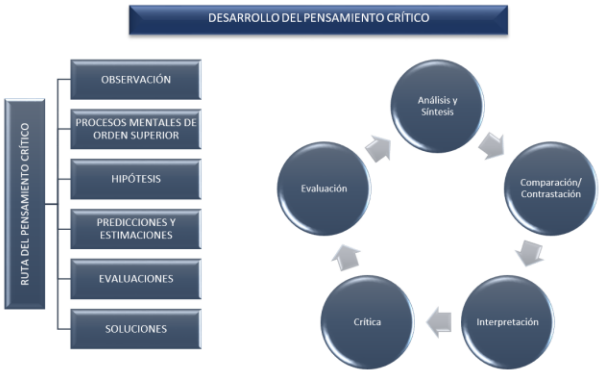

Fig. 1- Proposal for the development of Critical Thinking

Table 1- Sequence of program sessions

Session	Description	Resources / Products
1. The Thought Critical	The proposed Critical Thinking Route is presented to develop cognitive and socio-affective processes in the reading of the text "La Marihuana".	Questionnaire with questions socratic.
2. Current affairs (reading)	The reading on economics is carried out: "Peru before the silk road project" Answer to questions of the Socratic method.	Questionnaire Visual organizer (concept map).
3. the pc. Cognitive dimension: inquire	Cognitive inquiry strategies are applied to develop an argumentative text through the reading of a scientific text on "Autism and vaccines".	Rubric to evaluate argumentative text.
4. the pc. Cognitive dimension: analyze	The information is systematized through visual organizers, text analysis and news: "The Scotsman Angus Deaton wins the Nobel Prize in	Reading sheet Ishikawa's thorn (causes and consequences of poverty).

		Economics 2015".	
5.	the pc. Cognitive dimension: communicate	The outline of the news in different newspapers is reviewed and a news item is written on a current topic of interest.	Newspapers News created on a current topic of interest.
6.	the pc. Problem solving strategies	The POLYA method is applied to structure thought and guide self-reflection processes for problem solving in various contexts. Challenging questions are presented through logical reasoning in the text problem "Los huevos de la campesina".	Inductive-deductive questions through the Socratic method. Problem resolution. Checklist.
7.	the pc. Strategies socioaffective	Playful strategies are used to develop socio-affective skills. The "Precious Stones" strategy is applied to recognize talents and strengths and develop self-confidence and confidence in others.	Strategy: "Precious stones". Banner of confidence, recognizing your talents and strengths.

Analysis of data

In the first place, the application of the input evaluation was carried out, where the situation of the CP of the control group and the experimental group was verified before the intervention of the strategy. Likewise, the normality of the findings was verified using the Kolmogorov-Smirnov statistic, since the sample is > 30 subjects and, thus, the non-parametric Mann Whitney U test for independent samples was applied. Subsequently, after the intervention of the cognitive and socio-affective strategy, the same statistical test was applied to compare both groups. The descriptive results were presented as percentages under three levels (low, regular and high), with cut-off points at 36 and 60 respectively; likewise, the mean and standard deviation were calculated for the intergroup comparison.

RESULTS

Table 2- Comparison of the pretest and posttest levels in the dimensions of Critical Thinking

Before						
Criterion	**G1 (n = 40)**			**G2 (n = 20)**		
	B.	**R.**	**A**	**B.**	**R.**	**A**
RA	20.0	65.0	15.0	15.0	75.0	10.0
AE	27.5	55.0	17.5	10.0	75.0	15.0
IN	30.0	45.0	25.0	25.0	55.0	20.0
After						
Criterion	**G1 (n = 40)**			**G2 (n = 20)**		
	B.	**R.**	**A**	**B.**	**R.**	**A**
RA	15.0	65.0	20.0	0.0	75.0	25.0
AE	20.0	62.5	17.5	0.0	70.0	30.0
IN	30.0	42.5	27.5	5.0	70.0	25.0

Note: G1: control group; G2: experimental group; RA: Recognition of Assumptions; EA: Argument Evaluation; IN: Interpretations; B: low; A: Regular; A: high

The results of figure 1 revealed that before the application of the cognitive and socio-affective strategies, at least 85% did not reach the high level in the recognition of assumptions, 82.5% did not show a high evaluation of arguments and 75% did not He showed a high level in interpretations. In the case of the experimental group, this situation was quite similar, because 90% did not reach the high level in the recognition of assumptions, 85% in evaluation of arguments and 80% in interpretations. These findings show that, initially, both groups shared similarities regarding Critical Thinking.

After the intervention through cognitive and socio-affective strategies, in the control group the situation was quite similar, where the predominance was located at the regular level and a large part at the low level; however, in the experimental group, most of the teachers were only between regular and high in each of the dimensions.

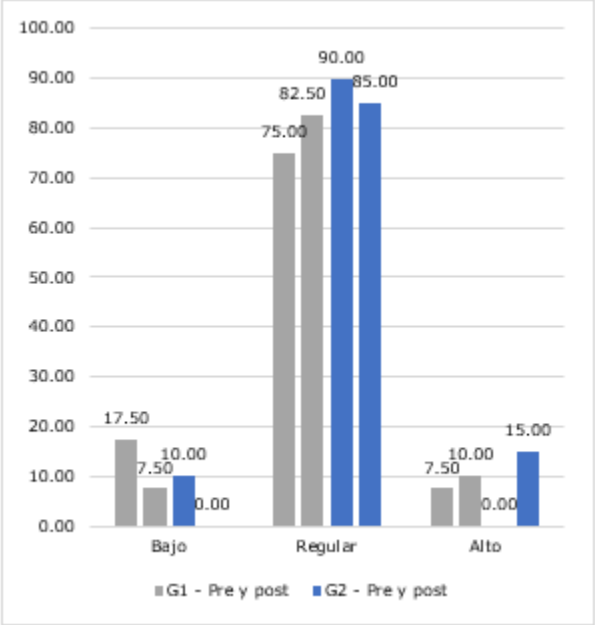

Fig. 2- Comparison of the pretest and posttest of the levels of Critical Thinking

According to the results obtained in Figure 2, the percentage of students with a low level has decreased by 10% in the control group and, in the same way, in the experimental group. Regarding the regular level, there is an increase of 7.5% in the control group and a decrease of 5% in the experimental group. However, at the high level there was an increase in both groups, the first is 2.5% in the control group and the second, 15% in the experimental.

Table 3- Comparison of the pretest between the control and experimental group

pre test	G1 ME (DE)	G2 ME (DE)	*z*	*p*	*TEA*
RA	23.9 (±6.0)	23.8 (±5.8)	-0.05	0.96	0.02
AE	12.9 (±3.9)	13.8 (±3.3)	-0.99	0.32	0.25
IN	10.7 (±3.7)	10.7 (±3.6)	-0.02	0.98	0.01
pc	47.4 (±10.2)	48.2 (±9.6)	-0.47	0.64	0.08

Note: PC: Critical Thinking; ET: Effect Size

According to the results of the normality test (KS < 0.004), the findings revealed that there is a normal distribution in the study sample, so the Mann Whitney U statistic was used for the hypothesis test, which shows a value greater than the significance level (> 0.05), so the null hypothesis is not rejected in the dimensions "Acknowledgment of assumptions", "Evaluation of arguments" and "Interpretations", as well as in the variable Critical Thinking.

In addition, the variable presents an effect size that does not reach the small level > 0.10; Thus, the similarity between both groups is corroborated (Table 3).

Table 4- Comparison of the post- test between the control and experimental group

post test	G1 ME (DE)	G2 ME (DE)	*z*	*p*	*TEA*
RA	24.7 (±5.6)	27.4 (±4.9)	-1.50	0.13	0.51
AE	13.2 (±3.5)	15.9 (±2.3)	-3.12	0.00	0.91
IN	10.9 (±3.5)	12.3 (±2.2)	-1.43	0.15	0.45
pc	48.9 (±9.3)	55.6 (±6.5)	-3.12	0.00	0.83

Table 4 shows that the comparison between the control and experimental group, after the

intervention of cognitive and socio-affective strategies in Critical Thinking, presented certain differences. In the argument evaluation dimension, a significant difference ($p < 0.05$) was found between the control (ME = 24.73; DE = 5.58) and experimental (ME = 27.40; DE = 4.87) groups; likewise, a high effect size > 0.50. Regarding Critical Thinking, there was also evidence of a significant difference between the control group (ME = 48.85; SD = 9.30) and the experimental group (ME = 55.55; SD = 6.54) and a high effect size (TE = 0.83). In the case of the recognition of assumptions and interpretations dimensions, a mathematical difference was evidenced in favor of the experimental group, but this did not reach the expected significance, given that the p value is > 0.05; therefore, there is not enough evidence to affirm that the proposal improves such situations.

DISCUSSION

Critical Thinking is a fundamental activity that the teacher must develop to improve student learning, since these must be lasting and throughout their lives. This is evidenced in the successful insertion in the world of work and in their life project. In this sense, Critical Thinking is considered a macro -skill and can be achieved through different strategies. Therefore, the objective of this study was to demonstrate that the use of cognitive and socio-affective strategies improves the Critical Thinking of basic education teachers.

The study showed that cognitive and socio-affective strategies improve Critical Thinking, since the EG where the intervention was made shows a greater improvement compared to the CG. This is due to the route implemented in the proposal, which starts from observation (based on the scientific method) to communication (based on the use of soft skills). The development of the CP allows people to: identify assumptions, beliefs, values and actions; imagine and explore new alternatives; maintain skepticism with universal statements and be aware of the context in which they are found (Tamayo *et al.*, 2015).

In addition, in the implementation of the modeled sessions, cognitive strategies such as: analysis, interpretation, evaluation, inference, explanation and socio-affective strategies such as self-regulation were used. Facione (2011) explains that analysis involves the identification of assumed and factual inferential relationships between statements, questions, concepts, descriptions, or other forms of representation intended to express beliefs, judgments, experiences, reasons, information, or opinions. Interpretation includes the subskills of classification, meaning decoding, and meaning clarification. Evaluation is the description of a person's perceptions, experiences, situations, judgments, beliefs, or opinions. The inference consists of identifying and ensuring the necessary elements to reach a reasonable conclusion; In addition to the ability to interpret, analyze, evaluate, and reason, critical thinkers can do two other things: explain what they think and how they arrived at this judgment. And they can apply Critical Thinking to themselves and improve their previous opinions; these two skills are called "explanation" and "self-regulation." Nieto & Saíz (2008) point out that the definition of Critical Thinking is of a higher order, because it demands a high use of reflection, control and self-regulation to improve cognitive, metacognitive and socio-affective processes according to the context. Likewise, Bezanilla -Albisua *et al.* (2018) add that the strategies used to achieve Critical Thinking must address its concept in a systemic way and occur progressively, oriented to the mastery of the three levels of understanding.

Regarding the dimensions of recognition of assumptions and interpretations, it was not

possible to demonstrate a significant difference between the experimental and control groups after the intervention of cognitive and socio-affective strategies. This is due to the fact that the teachers still maintained their preconceived ideas regarding Critical Thinking, since they had previously participated in an innovation project on Critical Thinking and Information and Communication Technologies. Therefore, this has generated that the CG and the EG show similarities associated with what Zaldívar (2010) explains refers to the use of analysis or reflection of the environment to assume a fact as true, which allows acting in the future (recognition of assumptions) and the use of the analysis or reflection of the environment as a possibility to assume a fact as true and act in the future (interpretations). However, the teachers showed an adequate capacity to narrate, express and argue with coherent ideas and verify to what extent the answer coincides with the original question without deviating from the topic in question (argument evaluation).

In order to improve these procedural difficulties, it is necessary to implement new strategies that accompany those based on cognitive and socio-affective ones. In this case, some didactic proposals emphasize linking them with developer learning that enhances emotional, conceptual, procedural, and attitudinal aspects (Moreno-Pinado & Velázquez Tejeda, 2017). Another strategy is Project-Based Learning (ABP) that develop cognitive skills and abilities; In addition, it channels the conscious and reflective use of the various thinking skills such as analysis, synthesis, planning, organization, research, transfer of knowledge and procedures, management of various sources of information, oral and written expression, Critical Thinking and also skills socio-affective such as individual and group responsibility, teamwork, planning, organization and decision-making (Morales, 2018). Likewise, Research Based Learning (ABI) develops cognitive skills such as discovery, knowledge for scientific, technological, humanistic and social innovation, autonomous and collaborative work to turn teachers into researchers with Critical Thinking and as subjects for change. of his country.

In this sense, it is suggestive that for future research additionally new complementary strategies to cognitive and socio-affective ones such as developer learning, PBL and ABI, which are related to Critical Thinking, should be implemented.

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Conflict of interests:

The authors declare not to have any interest conflicts.

Contribution of the authors:

The authors participated in the design and writing of the work, and analysis of the documents.

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