



# Review of the Theories of Critical Thinking. An Approach Directed to the Professional Career of Medical Technology of the National University of Jaén in Peru

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## *Author's contribution*

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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## **ABSTRACT**

The development of Critical Thinking is recognized as the main criterion of educational quality in international forums of Higher Education. However, there are few studies on the teaching processes, skills and methods to meet this criterion in Peruvian universities. This paper presents a review of the different approaches to critical thinking with an emphasis on students of the medical technology career at the National University of Jaén. The theoretical foundations of critical thinking are addressed, it is contextualized in the careers of health science, it is linked to scientific production and reasoning and the university environment from the various perspectives of critical thinking with an emphasis on university students. All this in order to present critical thinking in the daily dynamics of students of the medical technology career at the National University of Jaén, Peru.

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## 1. INTRODUCTION

In this sense, Reflective and Critical Thinking (PRyC) is conceptualized as the set of cognitive abilities and affective dispositions by the American philosopher (Facione, 1990). Among the authors who study the issue of critical thinking we have Dewey [1], Schön [2] Boud (1998). Among them, it is worth highlighting the postulate of Dewey, a North American philosopher and pedagogue, around reflective thought (PR), when expressing that it is the active, persistent and careful examination of all beliefs or supposed forms of knowledge in light of the foundations that support it and the conclusions to which Dewey [1] tends in his work teach that reflective thinking is acquired through constant training, in order to interpret the facts to place a meaning on them. Schön contributes in this regard with the affirmation that reflective practice is summarized as the mental activity through which professionals become aware of their implicit knowledge base and learn from their experience. He talks about Knowledge in action, Reflection in and during action and Reflection about action and about reflection in action [2].

Complementing the conception of Schön, Paul and Elder [3], define critical thinking as “a way of thinking in which the thinker improves the quality of his thought by taking over the inherent structures of the act of thinking and subjecting them to intellectual standards”, These correspond to clarity, accuracy, precision, relevance, depth, breadth, logic, importance and justice, these have a baggage of questions that the thinker makes as an exercise to turn from a thoughtless thinker to an advanced critical thinker. Paul and Elder agree that learning has a dialectical interrelation of the instrumental cognitive with the affective motivational, as stated in the cultural historical approach from the conception of the Current Development Zone - Potential Development Zone (ZDA ZDP) Vygotsky (1989).

By taking into account how to act on the object of study that is the object of learning, to develop educational activity, communication and individual subjectivity. Interpersonal communication is favored through a system of methods that include psychological configurations such as the subjective sense that recursively and complexly interrelates emotions and the entire symbolic system that recognizes

the unique identity of each subject, such as personality [4]. Worldwide, research on PRyC has increased, and research has increased among secondary education teachers [5] and higher education [6], as well as seen a greater motivation for the creation of technological tools that promote it [7]. Among the world organizations that encourage the PRyC, is the WHO (2011) that promotes the need to develop PRyC based on various methodologies with self-instructional and training activities, on the other hand, in the UNESCO world conference on higher education mentions that critical thinking is one of the guiding principles for university education.

## 2. THEORETICAL FOUNDATIONS OF CRITICAL THINKING

Chen and Lin [8] and Najera and Castrillón [9] refer that PRyC is considered a professional and occupational attribute for millennial nurses since it enables them to make efficient judgments in rapid changes during clinical situations. In Spain, the evolution of nursing thought followed the evolution of the dominant thought paradigms at all times, moving from a practice based on technical rationality, typical of the positivist paradigm, to another reflective practice guided by the socio-critical paradigm Minguez and Siles, [10] that in multidisciplinary contexts of practice contribute to the training of the nursing student and the development of PRyC.

Critical thinking is a concept that is difficult to define, since it can be understood from different perspectives [3]. On the one hand, as a process of logical and scientific thought, or as a process that allows reflection [11]. Historically, it has been proposed as a type of elaborate thinking, that is, as a cognitive process that involves evaluation and reflection, which allows the construction of new knowledge, and the strategic use of this in the solution of problems present in everyday life [12]. It is also defined as a type of complex cognitive process, made up of interrelated sub-processes that allow evaluating, analytically and reflexively processing, judging and accepting or rejecting information produced in social contexts or in scientific works [13]. It is likewise a way of thinking in which the subject improves the quality of said process by taking over the inherent structures of the act of thought and subjecting them to intellectual standards [3]. It is also considered as a thinking skill that allows

evaluating the merit, precision, or authenticity of the information that is being learned or elaborated, therefore it is an important skill for the development of scientific professionals [14]. It is also conceptualized as a cognitive mechanism that filters information regarding ideological intentions that accompany said information, through the continuous questioning of knowledge production practices, and recognizing its different perspectives.

A person with critical thinking is characterized by knowing how to formulate vital problems and questions, having clarity and precision regarding information, accumulating and evaluating relevant information, using abstract ideas to interpret that information effectively, reaching conclusions and solutions, testing them with criteria and standards relevant; in addition to thinking with an open mind within alternate systems of thought, recognizing and evaluating as necessary, the assumptions, implications and practical consequences, and finally, devising solutions to complex problems by communicating accurately and effectively [15,16,3]. It is also possible to characterize critical thinking as a cognitive conflict skill, related to problem-based learning. There are studies that show that the development of problem-solving activities is a method that allows the promotion of critical thinking in university students [17]. This, since it would imply taking mental risks to establish connections and evaluate the steps taken, as well as to generate reasoned and reflective conclusions. A set of basic elements of a cognitive nature can be established as components of critical thinking; Reflection, evaluation of information, analysis of options and metacognition stand out among them. These basic components in the description of critical thinking would allow us to achieve complex cognitive functions such as reasoning, problem solving, and decision-making [14,11]. This suggests that critical thinking is of an elaborate level, it is not similar to the other types of elaborated thoughts such as those called reflective, deep or metacognitive.

### **3. CRITICAL THINKING AND SCIENTIFIC REASONING**

Scientific reasoning is an important skill for the training of students in areas such as science, technology, mathematics and engineering, so better training must be delivered to enable student learning, so that they can effectively apply their knowledge to the problems of reality

[13]. For this, it is essential that abstract thinking schemes can be developed so that a transfer of knowledge from the classroom to reality is achieved [18]. It has been suggested that the development of scientific reasoning is related to advanced levels of thought, in relation to the Piagetian stage of formal operations, where abstract thinking predominates [19,18]. The above could give a wrong idea, when relating science teaching with traditional methodologies such as the master class [20]; However, the development of scientific skills cannot be disconnected from specific activities, since scientific work requires, in most cases, experimentation and manipulation of elements of reality.

For this reason, there is the need to seek teaching strategies that allow the practical application of scientific skills and, likewise, of cognitive skills that allow to improve and sustain it. Regarding the aforementioned, a fundamental component in said reasoning would be critical thinking, since it also corresponds to cognitive skills to evaluate the validity of information, allowing the level of analysis necessary for this. Thus, a close relationship can be observed between critical thinking skills and scientific reasoning skills, even when they are not the same [21]. The foregoing could establish that a person could have adequate scientific reasoning and generate very valid and reliable knowledge, but not necessarily using critical thinking; even when using it, that person would be much more effective in determining that the knowledge gained is more valid and reliable than others. Activities such as searching for information, proposing hypotheses to efficiently solve problems and generate knowledge are, for today, normal strategies and procedures of professional and scientific activities, which is why it is very relevant that university education can incorporate them as competencies of graduate profiles of his students [22].

It is essential that professional groups in education develop learning processes that promote critical thinking, at a scientific and professional level, since this allows fostering a higher level of professionalism, by allowing teaching staff to have effective reasoning that allows them to build knowledge in a scientific way and, at the same time, reflect deeply on the implications of this knowledge in the face of problems [23]. On the other hand, it is necessary to strengthen the development of policies that allow their promotion and use in the curriculum

[24]. Due to all of the above, in this study a definition has been considered that places critical thinking as a set of higher order cognitive skills, which allows identifying relevant information on a topic, analyzing it in search of discrepancies, and also communicating it in an argumentative and based on evidence [25,16]. This position is the one that, considering all definitions and perspectives, is most closely related to scientific reasoning skills.

#### **4. CRITICAL THINKING IN HEALTH SCIENCES CAREERS**

The PRyC in nursing has been studied and promoted since 2012 by the Ibero-American Network for Research in Nursing Education (RIIEE) with clearly established objectives, including educational evaluation, characterization of teachers, students, educational policies, teaching methodology, among others [26]. In the case of Ecuador, other authors such as Guaygua [27], investigate the PRyC in correspondence with the graduation profile and their studies, Echeverria [28], Tercero (2016), Guerrero [29], and Arcos, Rueda and Balseca [30], investigated PRyC and the need to promote its teaching in safe, effective and scientific evidence-based clinical practice. Therefore, in the face of the facts described, the need to study in depth the theoretical and methodological foundation of the PRyC and evaluate the type of thinker required by the academic training for the Nursing Degree in Ecuador is essential. In order to improve the principle of quality university education in reference to the development of thought, the Council for Evaluation, Accreditation and Quality Assurance of Higher Education (CEAACES) began the corresponding processes in-situ since 2017, for the qualification professional and accreditation of the university career. Due to the aforementioned, said article aims to identify existing research / publications related to reflective and critical thinking in Nursing in Ecuador and analyze them according to the results obtained.

#### **5. SCIENTIFIC PRODUCTION AND CRITICAL THINKING**

The scientific production on the studied subject places the development of the PRyC at a basic level, which shows that the PCYR needs to exceed this level of mastery and deployment of skills, attitudes and values that represent the nature of knowledge in the contextual and social order of those involved. For this, the renewal of

the teacher's mediating role must arise and in the way in which this process is conceived and developed from the psychological, pedagogical and general didactic nature and the sociocultural perspective of learning. Additionally, the researchers of this study reconsider as a necessity, the scientific foundation as that of teaching and that the development of the PRyC can be evaluated by cognitive, instrumental, attitudinal and evaluative processes that promote the understanding from where the knowledge arises, that affirm progressively different levels of learning and consequently consolidate personal, professional and social identity in the nurse and that generates new demands in the teaching staff, students and society in correspondence with international qualification standards [31].

#### **6. CRITICAL THINKING IN UNIVERSITY INSTITUTIONS**

In recent decades, one of the main objectives of higher education institutions in the world has been to develop critical thinking in students, that is, to train students capable of arguing their ideas, evaluating what others have said and reasoning with scientific rigor in any curricular subject, but fundamentally capable of making solid decisions and solving problems effectively.

The educational field is a natural space for Guidance as a discipline and praxis, within which the counselor is the professional who leads the processes of integral development of the person, such as the development of thought, as well as their affects (emotions, feelings) and their behavior (their relationship with the social environment, with the context). It then means that the study and development of critical thinking is part of the counselor's research and professional interest, as confirmed by Olivera [32], who states that counseling requires generating people with "critical awareness, self-reflection, emancipation, focused on daily action". Also Müller [33], who, for his part, considers that "Orienting seeks to discourage the subject, help him to become aware of himself as an actor, expand his margins of autonomy, engage in change projects." Similarly, for Vera [34] the purpose of the Orientation is to enhance talents and generate processes of self-determination, freedom and emancipation in the permanent construction of the development and integral well-being of people and their communities; Therefore, the author argues

that Guidance focuses its action on the development of processes that lead to the promotion of critical thinking of people in any context; for the liberation of their potential, for the achievement of change and community autonomy and for the identification and challenge of any form of oppression and exclusion on the person and the community. Given that UNESCO [35] considered within its educational policies, the need to develop critical thinking as a priority of 21st century education, more and more Latin American universities and countries are joining that incorporate critical thinking into their curriculum, this reinforces the value and importance that this theme has rapidly gained in other settings.

Every human being develops the ability to think from certain biological-natural and historical-cultural conditions. As part of its processes of natural adaptation and cultural appropriation, the human being develops higher mental functions such as perception, memory, problem solving and decision-making. The process by which a meaningful world is constituted for the subject is the same by which the subject is constituted. "Throughout its development, the subject develops not only his knowledge, but also the structures or mechanisms through which he acquires this knowledge, that is, he builds his knowledge of the world, but also his own intelligence" (Piaget, 1986). So we define "thought" as the ability to process information and build knowledge, through the combination of mental representations, operations and attitudes. This combination can occur automatically, systematically (reflective), creatively, and critically, according to the purposes pursued by thought. In addition to this, human thought has a series of outstanding characteristics that correspond to its psychological structure and brain organization: it is historical-social in nature; it has an active, dynamic character, it tends to evolve; It is also procedural in nature, it progresses in stages; and finally it is supported by cognitive operations or strategies. Now, for the purposes of this research, critical thinking is the fundamental issue that we need to deepen. Let's start by highlighting the intellectual roots of critical thinking, which begin with the teaching practice and vision of Socrates 2,500 years ago in Classical Greece Paul and Elder [3]. It is with that Greek Socratic vision and strategy that the need of man to achieve a systematic and deep understanding of his thought is born.

## 7. DIFFERENT PERSPECTIVES OF CRITICAL THINKING

Today, we can approach critical thinking from different perspectives, since it has been of great interest to study it, not only from classical Philosophy, but also from Pedagogy, Sociology and Psychology among other sciences.

So then we have a rationalist perspective, where the emphasis is on good thinking, focused on criteria and standards, which seeks to develop reasoning and metacognition to achieve it. Its purpose is disciplined, self-regulated, purposeful thinking. Unanimously, within this perspective, it is accepted that critical thinking is made up of a set of skills and a set of dispositions. Skills represent the cognitive component and dispositions the motivational component. This distinction is very important because it reflects the fact that if a person knows what skill to apply in a given situation but is not willing to do so, they will not exhibit critical thinking. Within this perspective, Paul and Elder [3] stand out, who consider that what most characterizes critical thinking is the understanding of problems, the evaluation of alternatives, and the decision and resolution of them. Critical thinking has to do, then, with understanding, evaluating and solving. Hence, it is later defined as: "the intellectually disciplined process of conceptualizing, applying, analyzing, synthesizing and / or evaluating, in an active and skillful way, information gathered from, or generated by, experience, reflection, reasoning or communication, as a guide for belief and action "Paul [36]; Paul and Elder [3]. According to these authors, critical thinking has two components: (1) a set of information generation and processing skills, and (2) the habit of using these skills to drive behavior, based on an intellectual commitment. In this way, Paul and Elder [3], consider that critical thinking is opposed to the mere acquisition and retention of information, since it implies a search and active treatment of information.

Another perspective is the sociocritical one, whose purpose is social transformation through reflection-action processes, which allow the individual to develop their autonomous thinking as well as to be able to achieve societies with the ability to make their own interpretations, to analyze how their own history and biography are reflected in the way one sees himself, in how he sees his roles and social expectations; in the

same way, it seeks the formation of responsible citizens who guarantee the maintenance of a democratic, reflective and free society. Within this perspective, the studies of Lipman [37] stand out, on critical thinking, who focuses on the importance of the study and development of critical thinking in terms of the formation of responsible citizens who guarantee the maintenance of a democratic society. Citizen training is a key in this author because he considers that a democratic society is composed of citizens capable of evaluating how the institutions of that society are working. For this reason, for Lipman [37], one of the fundamental assumptions underlying the idea of democracy has been that the members of a society of this type should not simply be informed, but must be reflective; They should not just be aware of problems but have to deal with them rationally. A responsible citizen is one capable of thinking critically, and of mastering cognitive strategies typical of the reflective process. Lipman [37] defines critical thinking as self-correcting, context-sensitive, criteria-oriented, and judgment-driven thinking. It is therefore the thought that is supported by reasoning and judgment. According to the author, reasoning is thought determined by the rules that have been approved through judgment, or that which is guided by criteria, so that it always involves the activity of judging; while trials are agreements or determinations that emerge during the course or at the conclusion of an investigation process. They are guided by criteria and the specific identity of such criteria will emerge from the context Lipman, [37].

The last perspective is the pedagogical one, and it addresses the development of thought from a free, rational and autonomous vision. This perspective gathers the contributions of great Latin American pedagogues who throughout history have left their legacy, such as Simón Rodríguez, José Martí, Luís Beltrán Prieto Figueroa and Paulo Freire; Its traces are still valid, feeding the Latin American hope of achieving self-determined and emancipated thought that will lead our peoples to the true decolonialization of thought and development as independent nations. Education as a socio-political and cultural tool of a society, has in its being and essence the idea of liberation. These liberating possibilities of education characterized a number of movements in Latin America during the last decades.

## 8. CRITICAL THINKING IN COLLEGE STUDENTS

In relation to critical thinking in students Pérez et al. [38] obtain the following findings: Critical thinking is built in the student in a conscious and progressive way as he advances in university studies: The university student in the course of his academic-professional training, experiences changes in his thoughts, which They positively impact "improving" their way of thinking, and are linked to their university experiences, as well as to maturity and age; that is, the student realizes how she grows and changes cognitively. This is confirmed by expressions such as: "I did not think the same as I think now", "Well I have realized that progressively every time I change the semester I have been learning new things that have changed my way of thinking". Now, the students relate or link their experiences about changes in the way of thinking with favorable consequences in their personal and academic life, as they express verbalizations such as "my way of seeing life has changed", "I have achieved greater understanding", "I am more logical." Some even manage to compare different moments in their lives, recognizing how they thought before and after, an example of this statement is the expression "I did not think the same as I think now."

University studies contribute to the development of critical thinking in the student: Among the academic factors that students perceive to influence, it is found that some careers and / or subjects encourage the development of critical thinking more and have influenced the continuation of their career, the Which contribute to the development of critical capacities to achieve greater understanding, greater analysis of both their thinking and their ideas, and their relationship with the circumstances they live. Reading as a strategy for the development of critical thinking: Students value reading as a strategy that has helped them in the development of their critical thinking.

University students have characteristics that define Critical thinking: By analyzing the data, it has been possible to infer those macro critical capacities, which define and determine the type of critical thinking present in the students participating in the research. Such capabilities have been considered characteristic. Each of the six characteristics found that define the type of thinking are described below:

It is Autonomous: The university student reflects in his answers a thought capable of assuming his own position in front of something; to make your own interpretations; independently to express their ideas and opinions, to decide and to take responsibility for it. He does not passively accept the beliefs of other people, analyzes them for himself, and rejects unjustified arguments of authority, recognizing only those justified. It is not easy to manipulate.

It is Reflective: it is evidenced by how much it expresses being careful to make a careful examination of ideas; also because it weighs and determines the elements involved to make a judgment, a decision, a reasoning; It considers different perspectives on a fact, situation or position, as well as the consequences of the decisions it intends to make.

It is Metacognitive: It is clearly perceived that the student is able to self-consciously monitor their own cognitive activities, the elements used in those activities, and the results obtained, particularly applying analysis and evaluation skills to judgments their own, with the idea of questioning, confirming, validating, or correcting their own reasoning or results.

It is Rational: The student shows that he is able to decide what to do and what to believe. Identify arguments, recognize important relationships, analyze and evaluate evidence, draw conclusions.

It is Emancipated: The university student is capable of being critical of her reality and of seeking and proposing solutions. He is critical of his reality when he is able to make judgments about matters of his social environment that concern him, proposing ways to change said reality. They are able to seek and propose solutions, as they dare to present solutions to problems that affect them, and are included as affected actors. They are committed to finding the best solution; they approach problems realistically.

It is Democratic: He is able to express himself freely since he gives himself permission to publicly present his ideas, opinions, and judgments without feeling fear or censure. He dares to make judgments about situations, facts, or issues within the economic, political and social events of the country and that could generate signaling towards the government or state apparatus action.

Students apply specific critical cognitive skills: These six skills are used by the participants of which some are described by themselves, while others are inferred by the researcher. Let's see each one:

Understanding: according to the answers obtained, the students know when they are "understanding" because the information can be interpreted by establishing relationships between new knowledge and existing knowledge, or by relating it to their own experiences, or when they manage to apply it, give examples or contextualize it.

The explanation: It is possible to appreciate how the participants demonstrate that they apply the explanation as a critical capacity when they present the results of their own reasoning in an extensive and coherent way on a topic. This means being able to present someone with a vision of the big picture: both to state and justify that reasoning in terms of the evidence, criteria and contextual considerations on which the results obtained were based; as to present the reasoning in the form of very solid arguments.

Analysis: When analyzing a topic, an interpretation or argument, university students as critical thinkers use analytical tools such as: clarifying key concepts, assumptions, implications, examining ideas, detecting and analyzing arguments, inquiring reasons, drawing inferences or conclusions. They analyze questions and place conflicting arguments, interpretations, and theories in opposition to one another.

The evaluation: The interviewed participants apply the evaluation as intellectual capacity by recognizing reliable sources of information, once they apply strategies to evaluate them such as: investigating in various bibliographic sources, whether books or on the internet, checking how much they share or differ about the information, depending on the author of the information, consulting other people who know the subject, applying a critical or reflective process. They also acknowledge that internet sources can be confusing. In short, they compare, review, consult various sources.

The questioning: they can question a statement or position that another says, and present their arguments; They pursue and defend the truth from their perspective.

Students assume critical communicational attitudes: It is appreciated that participants put into practice these four attitudes or dispositions to achieve effective communication: Attitude of respect: For participants it is the disposition to consider with dignity, tolerance and a certain submission what the other express person or decides not to cause offense or harm. Knowing how to listen: It is shown that the cases assume an attitude of listening, of understanding, of giving them the opportunity to express themselves freely even if they do not agree with it. Attitude of humility: Informants as critical thinkers recognize the limits of their knowledge. They demonstrate their intellectual humility based on the recognition that one should not affirm more than one knows. This implies shedding all arrogance, willing to reconsider and if necessary to back down. Fairness Attitude: The cases assume considering and weighing the strengths and weaknesses of opposing points of view; as well as imaginatively placing oneself in the place of the other to understand them, to identify the truth; and recognize that their behavior affects others and themselves. g. The student develops her critical thinking at levels of increasing complexity as she advances in her university education: It is evident that in the course of her university studies the student develops a higher level of critical thinking, observing these changes in four specific aspects:

Experiences of change: As the student progresses in his university education, he consciously and progressively experiences changes that improve his way of thinking. Critical thinking characteristics: As the student advances in his university training: - Develops more awareness of your ability to understand. - They evaluate the credibility of the information with their own knowledge and vision of the subject. - He develops more coherent explanations, arguments, evidence. - Analyze in greater depth by applying more analytical criteria, such as conflicting arguments, interpretations and theories in opposition to each other; clarification of key concepts, assumptions and implications; presenting own reflections. - She questions applying more and better criteria since she pursues and defends the truth from her perspective; is able to question a statement or position that another says and presents their arguments. Critical cognitive abilities: As the student advances in her university training: - She develops greater autonomy of thought, since she presents independence to express her ideas and opinions; You do not passively accept other

people's opinions, you analyze them yourself, and you reject arguments you do not agree with. - His metacognition is increasing since he is able to describe his thought dynamics in more detail. - Shows more elements of reflective processes that are reflected in a more careful thought to analyze, fix position, make decisions, organize ideas and debate them. - They are able to express themselves more freely, since they give themselves permission to publicly present their ideas, opinions, and judgments without feeling fear or censure. - He is capable of being critical of his reality and seeking solutions, since he makes judgments about matters of his social context that affect him, and is capable of proposing ways to change that reality. Critical affective attitudes: As the student progresses in his university training: - Reinforces his attitude of intellectual humility: based on the recognition that the other also has something to say that should be valued and that one should not affirm more than one knows. This implies shedding all arrogance, willing to reconsider and if necessary to retract or remain silent.

Increase your ability to listen assuming willingness to understand the other, to give them the opportunity to express themselves freely even if they differ from their opinion. - Strengthens their attitude of respect: little by little they develop the willingness to tolerate and accept the ideas and feelings of the other with dignity so as not to cause offense or harm. - His attitude of fairness improves to imaginatively place himself in the place of the other and understand him; to recognize that their behavior affects others, as well as to gain an understanding of another's perspective. Conclusions The research allowed to propose a theory based on the process of construction of critical thinking of the student during his university training. Likewise, it was possible to reveal the experiences that students have on the development of their thinking; the different characteristics, abilities and attitudes that make up critical thinking were identified; as well as it was possible to explore the process of development of the critical thinking of the student at different moments of his academic pursuit. Therefore, it was possible to describe their experiences, characteristics, skills and attitudes as well as the process of development of critical thinking from the sociocultural perspective of its actors; deriving a substantive explanation of the phenomenon of study, which led to identify the most relevant constructs of the same as well as make visible the system of internal relations

given in the phenomenon according to the context and the processes that characterize it. The theory that emerged was based on seven findings found as a product of data processing. In summary, the findings that emerged from the study are the following: • Critical thinking is built in the student in a conscious and progressive way as they progress through university studies. • University studies contribute to the development of the student's critical thinking. • Reading is a strategy that contributes to the development of critical thinking. • University students have six characteristics that define their Critical thinking: autonomous, rational, reflective, metacognitive, emancipated and democratic.

Students apply specific critical cognitive skills such as understanding, explanation, analysis, evaluation, and questioning. • Students assume critical communicational attitudes, such as: an attitude of respect, knowing how to listen, an attitude of humility and fairness. • The student develops their critical thinking at levels of increasing complexity as they progress through their university education. By virtue of the knowledge obtained, it is concluded that the process of construction of the critical thinking of the university student, is composed of a structural part that integrates elements or components of critical thinking and a dynamic part that is integrated by a series of active thought processes. Likewise, an own concept on critical thinking is presented, which responds to the sociocultural context of the research, let's see below: As human thought is modifiable in its structure and operation, through social interaction and education, it is considered that University studies generate changes in the structure and thinking psychological dynamics, producing new configurations or cognitive constructions that enable the student to act actively and with purpose on the information with which they interact.

Critical thinking is then a set of cognitive processes that enables the person to act actively and with purpose on the information with which they interact; This thinking tends to be conscious, self-regulating, and purposeful; relies on operations or critical cognitive skills that process, structure and elaborate information, to guide action, the issuance of judgments, decision-making, problem solving, which are combined with attitudes or dispositions that impact affectively the responses that are issued (Pérez, 2015). The university students were investigated from and within their social context, that is, in the university's own spaces, and interacting with

them in a natural way in the teacher-student relationship. For this, a subjective conception of social reality was assumed, investigating deeply and from within, in the search to understand the phenomenon of critical thinking in the very frame of reference of its social actors. A research design was achieved that led to the optimal development of the data collection, processing and validation processes, especially the construction of the interview and critical reading, which included a complex process of construction-evaluation-validation- reflection that ultimately led to the production of an interview guide and a critical reading that allowed and guaranteed the obtaining of abundant and validated data.

## 9. CONCLUSIONS

Based on the exhaustive review of the theories of critical thinking, it can be said that in the professional career of medical technology at the National University of Jaén in Peru, critical thinking must be built in students in a conscious and progressive way as they advance in university studies. Similarly, students in this professional career must possess characteristics that define a critical thinking profile; autonomous, being able to assume their own position, reflective, in terms of making a thorough evaluation of ideas, democratic, referring to the ability to express themselves and let others express themselves freely, metacognitive, that is, capable of monitoring the own cognitive activities, rational and emancipated. Finally, the critical thinking that students of the medical technology professional career at the National University of Jaén in Peru must develop must be oriented to a set of cognitive processes that allows them to act actively and with purpose on the information with which they interact.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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