

Metacognition and Emotional Ecology in College Students.

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SUMMARY

Metacognition is the ability to reflect on, analyze, and monitor thinking processes, and it is directly related to emotional ecology. The research approach was a mixed-methods approach, with descriptive level, including documentary-type and field research, non-experimental and cross-sectional design. The methods applied were inductive, deductive, analytical-synthetic, and systemic. The study population consisted of students enrolled in the Marketing career (700), with a sample of 248 students. For the metacognition variable the following dimensions were identified: planning, management, and execution were applied in the second dimension Management, 10 metacognitive strategies were applied to help understand and act in adversity. Regarding emotional ecology, the "4Rs model" was applied with 11 items distributed across 4 indicators: (i) reducing emotional pollutants, (ii) recycling positive emotional resources, (iii) recovering skills and abilities, and (iv) repairing emotional wounds. The Likert scale was used with four options: never or almost never, sometimes, frequently, and always or almost always, rated with 1, 2, 3, and 4 points, respectively, with a higher incidence in factor 4. The results obtained show an average of 73.5 among students, indicating that they cultivate self-awareness and emotional well-being, which positively contributes to our environment and interactions, the 4Rs involve the ability to recognize, understand, and regulate our emotions consciously, it is about managing our emotional reactions effectively, promoting emotional balance and healthy relationships, and managing negative emotions so they do not affect our actions and relationships. It is concluded that metacognition and emotional ecology influence mental health, well-being, and harmony in our lives and surroundings.

KEYWORDS: metacognition, cognition therapies, emotional ecology, 4Rs, eco-emotions, resilience, sustainable ecology.

1. Introduction.

In the world, one in five people, and half of young individuals aged 18 to 25, have experienced anxiety due to stress, uncertainty, the pursuit of immediate pleasure, economic crises, addictive social media, insomnia, loneliness; in other words, we are facing a mental health epidemic, and we need metacognition and emotional ecology to become more resilient in the current challenges of this century. Metacognition, as described by Torre E. (2000), is understanding that the cause of our problems is not others or the "outside world" but our own minds, seemingly unable to focus on the present because we are always thinking about the past and worrying about the future.

In this context, metacognition is a concept that is not yet clearly defined and has various meanings, the roots of current studies on metacognition are based on cognitive psychology (Hart, 1965; Peters, 2007), cognitive developmental psychology (Piaget, 1950; Steinbach, 2008), and social developmental psychology (Tsai, 2001; Vygotsky, 1962). Hart (1965) conducted studies on the accuracy of judgments made by adults and the memory that reveals valid predictors in behavior: (Peters, 2007). Piaget (1950), on the other hand, was the first to mention "knowing knowing and thinking thinking" in the early years of cognitive education, developmental epistemology, and personal information (Steinbach, 2008). Vygotsky (1962) argued that consciousness and conscious control were basic contributors during the school years (Tsai, 2001). According to Georghiades (2004), it was Plato who mentioned "consciousness of one's own cognition" (Sandí-Ureña, 2008), additionally, Aristotle pointed out that "the mind used a different power beyond seeing and hearing" and laid the foundations for thinking about metacognition. However, Flavell, John (1976; 1979), is the author who used the concept of metacognition, which was derived from the term meta-memory in the early 1970s.

With this explanation of the origin and meaning of metacognition, which focuses on "knowing oneself," the concept is related to learning and how it is constructed, such as "I learn" from learning systems, in other words, it is "self-knowledge." The word "meta" means beyond, and "cognition" means knowing oneself; it goes beyond mere knowledge, it is a mental process that becomes aware of "what is being learned" and the intellectual mechanisms that can be controlled and self-regulated for intellectual functioning, it involves understanding our own cognitive processes to "learn how to learn." (Akturk & Sahin, 2011) and Arbuckle, T. Y., & Cuddy, L. L. (1969) identify the dimensions of metacognition: (i) Planning: recognizing and evaluating one's own cognitive structures, knowledge structures, methodological possibilities, processes, skills, and disadvantages. (ii) Administrative: is applying cognitive components to formulate strategies, provide a reasoned solution to a problem situation, and have a positive behavior in a given situation. (iii) Evaluation: encompasses implementing strategies and measuring the degree to which the goal has been achieved.

Differences between metacognition and cognition.

Metacognition is necessary to understand how one thinks, how a task will be performed, what its process is, and cognition is the tool necessary to fulfill it. Ayersman, D. J. (1995); (Schraw, 2001) states that metacognition is being aware of something and knowing how to learn, in other words, it is "learning and understanding something" (Senemo-lu, 2005) says: cognition means "being aware of something and understanding it." Gourgey (1998) states that cognition is necessary to shape the learning process.

The concepts of cognition and metacognition are related to each other. Metacognition is necessary for individuals to observe, develop, and evaluate their own processes and apply their knowledge to new or adverse situations. Therefore, metacognition is a basic requirement for cognitive efficacy and learning. Metacognitive activities occur before cognitive activities (planning), during activities (monitoring), or after activities (evaluation).

For example, the relationship between metacognition and cognition can be illustrated by a student who has a reading assignment, and use observation strategy during reading, the student realizes that they cannot fully understand the reading (metacognition) with the first reading, at the same time, they recognize that they can better comprehend the text when creating a concept map, summarizing and explaining it, or highlighting the text during reading (these actions are called metacognition). This example is depicted in Figure 1 below.

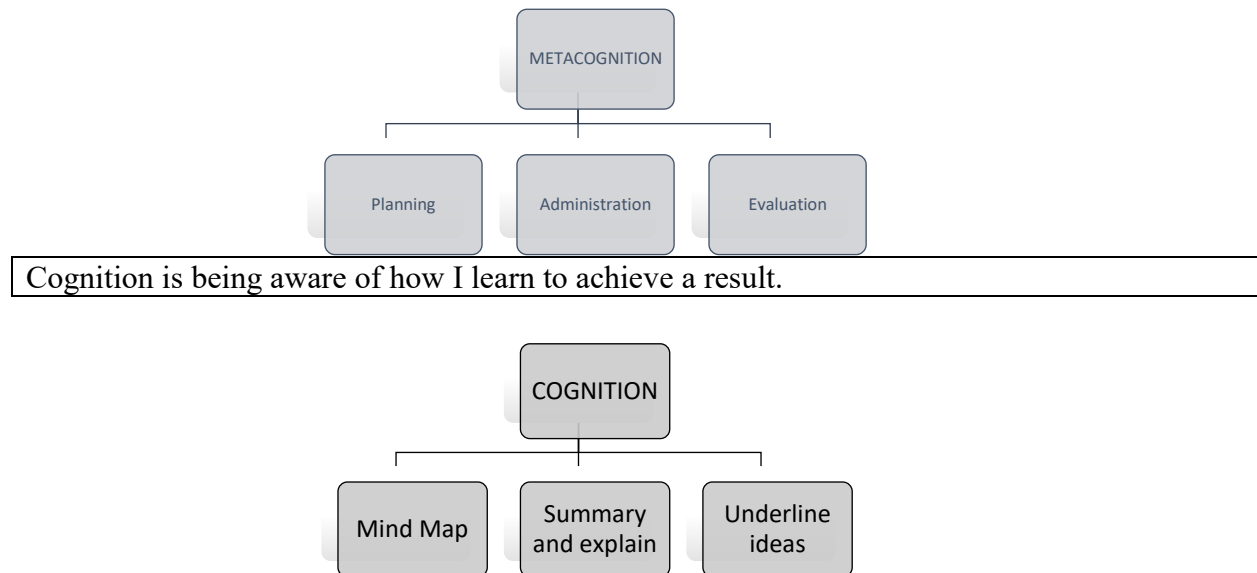


Figure 1. Example of metacognition in reading application.

In recapitulation of the explanation, metacognitive strategies enhance academic performance. Individuals with metacognitive skills are those who are aware of what they have learned and what they have not. Baker, L. and Brown, A. L. (1980); (Biggs, 1988), generally, students with advanced metacognitive skills can monitor their own achievements and learning, articulate their opinions about information, update their knowledge, and develop and implement new learning strategies to get more knowledge. In comparison to other students, those who effectively utilize their metacognitive skills are the ones who are more aware of their strengths and weaknesses and strive to improve their learning while further developing their skills (Bonner, J. (1988); (Bransford, Brown, & Cocking, 1999). The greater individuals' awareness of metacognition, the more their effectiveness increases, and according to Jones, Farquhar, & Surry (1995), awareness increases with the use of metacognition.

Arbuckle and Cuddy (1969) worked on individual judgments about learning, concluded that individuals' judgments about their own learning were accurate, measuring metacognition is challenging, because metacognition is not an explicit behavior; it is an internal process, and people are often unaware of these processes. According to Sandí-Ureña (2008), citing Veenman (2005) who defined methods for measuring metacognition, measurement methods involve relative measures in task implementation, which are implemented in three phases: (i) probability of task completion, (ii) simultaneously during the task, and (iii) prospective evaluation after task completion. The measurement tools used to assess metacognition fall into two categories, in other words, self-report based reports from an individual (questionnaires and interviews) and objective behavioral measurements (such as systematic observation and think-aloud protocols).

In the late 1960s, Tulving, E., & Madigan, S. A. (1970) conducted studies on memory, these authors posited that one of the most characteristic traits of humans is "the ability to have memory of one's own memory," meaning (González, 1996) each person is capable of scrutinizing their own memory processes. According to Cambridge (International, 2024), the prefix 'meta' means "about" something in itself. Metacognition is "cognition about cognition," or "thinking about one's own thinking." It has two dimensions: metacognitive knowledge and metacognitive regulation, which includes the ability to organize, monitor, and regulate those processes with the aim of achieving specific learning outcomes.

Tulving and Madigan expressed their criticisms regarding the state of research on human memory, highlighting an aspect that had been little explored in humans concerning memory. This aspect refers to the fact that people have knowledge and beliefs about their own memory processes; in other words, our own memory processes can have a significant impact on how we remember, retrieve, and use information.

Metacognition, according to Cynthia Klinger (1993), involves two processes: “Metacognitive knowledge, self-assessment, or metacognitive consciousness, executive control, and regulation of cognition or self-administration”.

The first one refers to the knowledge that a person has regarding a specific situation, it is understood that a person must make use of their own cognitive resources to effectively solve a task; the second one refers to the ability to maneuver, regulate, or control cognitive resources or strategies with the purpose of ensuring the success of a task or problem-solving, which includes planning activities and finally, monitoring, reviewing, and evaluating their effectiveness, either in a task or in managing emotions.

Metacognition according to John Flavell.

Flavell concluded that people needed to employ a higher level of thinking that focused attention on intellectual processes, rationalized to correct errors, optimize cognitive mechanisms, to enhance the implementation of strategies in task execution and difficulties. Flavell studied meta-memory in children, referring to the knowledge children have about their own memory, for this research, Flavell asked children to reflect on their own memory processes, this line of investigation became the key study of metacognition: knowledge about cognition. Flavell used the term metacognition to refer to the ability of individuals to exercise certain conscious control over their own mental states and processes. Since then, metacognition has become the subject of study by numerous authors in the field of Cognitive Psychology and education.

Kluwe (Eds.); Leader, W. S. (2008), Livingston, J. A. (1997), and Miller, P. H. (1985) demonstrate the usefulness of Metacognition, which involves being aware of the strengths and weaknesses of our own intellectual functioning, and the reasoning errors that are commonly made, this awareness helps to leverage strengths and compensate our weaknesses, and also to avoid common errors later on. Its processes are: observation, defining what is observed, relevant or important memorization, following instructions, classification, whether it's useful or not, comparison, inference and consequence of decision-making acts, analysis and synthesis.

The subprocesses are: the meta-attention, which is the awareness of capturing stimuli from the environment; meta-memory, which is being aware of the knowledge one possesses and what one knows and doesn't know; the meta-reading, which involves encoding and achieving comprehension; the meta-writing, which is planning, drafting, revising, and rewriting; the meta-comprehension, which is the subjective representation of meaning; the meta-subjectivity, which is the ability to discriminate between correct and incorrect judgments; and the meta-efficiency, which refers to the individual's level of performance, mastery, self-control in performance levels.

Weil 2023 and Fleming and Dolan (2012); Jacobs, J. and Paris, S. (1987), demonstrated metacognitive efficiency increases during adolescence, in line with the maturation of prefrontal regions supporting metacognition. Therefore, its application is: when (always), where (in all circumstances), and how (knowing oneself and applying reasoning).

Table 1. Philosophical approaches and tools for transforming adversity into strength.

Metacognition	Similarities between Stoicism and Psychotherapies	Cognitive Behavioral	Therapy of Acceptance and Commitment	Mindfulness
<p>It is based on two principles:</p> <ol style="list-style-type: none"> 1. Meta - subjectivity . - It is the ability to discriminate between correct and incorrect judgments. 2. Meta - efficiency - The subject's level of performance, including mastery and self-control in performance levels. 	<p>It is based on four principles:</p> <ol style="list-style-type: none"> 1. What depends on us and what doesn't. 2. It's not the external events that attack our emotions, but rather the interpretation we give to these external events. 3. Self-control and self-discipline to manage thoughts and emotions. 4. The belief that thought, lies between emotion and behavior. 	<p>It is based on three principles:</p> <ol style="list-style-type: none"> 1. Emotions and behaviors are the result of our beliefs and thoughts, not external events that happen or are about to happen. 2. Changing our irrational interpretations, that are causing us suffering. 3. The emphasis on self-acceptance, acceptance of what is happening, tolerance of frustration, and focusing on what is within our control. 	<p>Stephen Hawking in the 1980s, whose theory is based on four principles:</p> <ol style="list-style-type: none"> 1. Accepting what is beyond our control. 2. Commitment to actions aligned with our values despite difficulties. 3. The importance of living in the present. 4. The notion that suffering is part of the human condition and can be managed through acceptance and commitment to life. 	<p>It coincides with Acceptance and Commitment in some concepts with both Stoicism and Cognitive Behavioral Therapy.</p> <ol style="list-style-type: none"> 1. The importance of living in the present and being mindful of the current moment. 2. Accepting experiences just as they are without judgment. 3. Acknowledging that our control is limited to our own actions and reactions, and we cannot change external events, as is often stated: It's not what happens to us but what we do with what happens to us.

With this introductory part that involves meta-subjectivity in metacognition, ten strategies are presented that can be applied to develop mental strength and resilience.

Strategy 1. It Depends and It Doesn't Depend on Me - What happens in the world, "what other people do or say," does not depend on us, does not depend on you, does not depend on me; it only depends on what we do, "what I do, what I think." The first task is to differentiate that there are

two types of matters in the world: "what depends on me and what does not depend on me, and we must let go of." For Stoics, "what does not depend on the person is not important," even if something unfortunate is happening, even if it's a war, if it doesn't depend on you to start or stop the war, that's not important for you; in this sense, one must focus on what they can control; and this may seem harsh, but in reality, it saves us a great deal of suffering. The practical exercise is to acquire the habit of asking oneself "does this depend on me or not," every time there's something, every time something happens, ask yourself if it depends on you or not, if it does, take action; if it doesn't, let it go.

Strategy 2. Don't Resist - Don't resist the reality that is happening. Torres, Ohio (2012), quotes one of the phrases of Swiss psychiatrist Carl Gustav Jung (1875-1961), which says, "What you resist, persists," defining an attitude of clinging to the known, to preconceived ideas, without even discerning their validity. This is a significant reality in human beings; at a psychological level, every time we resist something, it causes us enduring suffering, and we often insist on changing things that are not within our control, and this leads to a tremendous amount of suffering and frustration because we cannot change things that do not depend on us; moreover, it is something that exhausts us ecologically and energetically, in terms of percentages it will be: if you have 100% of energy, 80% is spent on things that do not depend on you, on fighting against the current, leaving you with only 20% of energy to use on what "is under our control."

Thoughts of resistance reflect suffering, phrases like: "it should be this way" or "it ought to be like this," where conditionals are used, lead to resistance to acceptance and understanding that "it's not the things that happen to us, but our opinion about them" that matters, even in difficult situations like the loss of a loved one, each person's response will be different, sadness, despair, loneliness, among others; however, it's possible to view the loss of a loved one differently in a way that allows the person to overcome that loss; otherwise, they will become stuck in a mourning process from which they won't be able to move forward.

Tolle, et al. (2000), explains that when something causes us suffering, there are three solutions: the first is to change the situation, the second is to leave, and the third is acceptance. If something depends on you, take action and change its outcome; for example, if the cause is stress due to a poorly organized schedule, change and organize your schedule; if what causes you stress is not having good planning in your life, change the situation and make a good plan; however, if the cause of suffering or stress does not depend on you but on other circumstances or your relationship with another person, leave.

For example, imagine you are in a relationship with someone who is a consumer of some type of drug or substance, and this situation is causing you suffering, and you also can talk to that person and try to get them to stop using these substances, but ultimately, "the other person can do it or not." In this type of situation, the second solution to suffering applies, which is "leaving", whenever possible, leave the situation; if you can't change the situation, distance yourself from it. Now, imagine this situation at work, you don't have other job options, or you can't find another job, and you have to provide for your family, you may not like the job; perhaps it's a source of exhaustion and stress. In that case, the third strategy is "acceptance," accepting the reality as it is in a serene manner.

The practical exercise is not to resist and to apply the acceptance mantra, which involves repeating phrases that lead us to acceptance, with the practice of repetition, one begins to experience peace. For example, mantra phrases include: "I fully accept that," "I accept what has happened," "I accept that this is reality and not a dream," "I accept what has happened even though it hurts a lot" these types of acceptances or mantras are applied in situations where something sudden has occurred, a difficult traumatic event that is hard to assimilate and accept, these situations can trigger a defense mechanism and mental blockage, making one think it's a nightmare and that they will wake up from it at some point, these mental blocks are the worst things that can happen, leading to post-traumatic stress disorder, and the best option is to accept that reality as it is.

Strategy 3. Be indifferent to what others do and say. - You cannot control what others do or say, but you can control what we do and say. For example, in life, if we are in a relationship with someone who harms us, who is toxic, the second solution by Eckhart Tolle (2000) is similar to the case of substance consumption; you can talk to the person and try to make them change, but the other person may or may not want to change, the solution was to distance oneself or leave; what the person does or says is not under our control. A great mind with metacognition rises above insults, treating insults like the barks of small dogs, and maintains serenity.

Braund et al. (2015), in their Seneca work, *multiplex*, state that Seneca, a Stoic philosopher, believed in viewing the attacks of others in a different way, without responding. For example, in today's use of social media, there are much "Hate," which are attacks and hate reactions because, on social media, "nobody sees you or knows you," so people throw insults and say outrageous things. The practical exercise is, when you receive criticism or experience ghosting, which is when you send a message to someone and that person does not respond, in these kinds of circumstances, try "not to respond" and remain calm, it can be difficult at first. The second exercise is, when there is another person's negative opinion, ask yourself "if the other person's opinion is valid for you" and if it aligns with your life goals; otherwise, discard it, this underscores the importance of being clear about your life goals and purposes.

Strategy 4. Acceptance of reality. - Sometimes this reality is tremendously harsh and difficult to accept. Looking at adversity without toxic optimism or excessive optimism that rejects reality harms us and increases suffering; faith should not be confused with toxic optimism.

Excessive optimism is a tough situation that doesn't allow for realism. James Stockdale (1993) presents the "paradox of Commander James B. Stockdale" from 1965 during the Vietnam War. He was a United States Navy pilot flying an A-4 Skyhawk returning from a combat mission when he was hit by enemy anti-aircraft fire, injured, and captured by Vietcong troops. He was taken to the "Hanoi Hilton" prison where he spent the next seven years as "the highest-ranking naval officer in captivity." His life changed in a matter of minutes, going from being an admired officer in command of over 100 pilots and more than 1,000 men to being a prisoner of war, where he was degraded and treated like a criminal. Following his captivity, President Gerald Ford awarded him the Medal of Honor in 1976. Stockdale became one of the most decorated officers in the history of the United States Navy, receiving 26 personal combat decorations, including two Distinguished Flying Crosses, three Distinguished Service Medals, two Purple Hearts, and four Silver Star Medals, in addition to the Medal of Honor. He was the only three-star admiral in Navy history to wear aviator wings and the Medal of Honor, and later, he became the president of the U.S. Naval War College and retired in 1979 after a 32-year professional career, he passed away in July 2005. Today, a destroyer of the Arleigh Burke class, the DDG-106, bears his name, and its motto is "Return with Honor." he said, "Excessive optimism deprives us of considering unfortunate situations that can happen to us with greater probability, leading to disappointment and other negative feelings that can affect our lives and even cause death." The practical exercise is to accept reality without excessive optimism. Another practical exercise is to be realistic and avoid excessive optimism.

Strategy 5. Don't complain. - A widely cited phrase goes: "What stands in the way becomes the path." It's about training the mind so that difficulties become the path, difficulties are opportunities to look inward and invoke our internal resources, the challenges we face become strengths. Phrases like "if the cucumber is bitter, throw it away" and "if there are stones on the path, sidestep them" encapsulate all you need to know, when we don't accept reality, there are fights, internal and external conflicts, resistance, frustration, and a drain on energy.

Sometimes we wonder, "Why me?" or "Why this?" These "why" questions don't make sense; we want to know the "why," which is a complaint, in reality, we are saying, "This is unfair," "What's happening to me shouldn't be happening." we seek the truth that discomforts us today with "why." it's a complaint that should be eliminated, and we should move forward; in other words, if it's something that doesn't serve us, let it go; if it's an obstacle, sidestep it and figure out how to

navigate around it, but don't ask to know why or demand to know why; it simply happened, throw it away, withdraw, and keep moving forward.

The practical exercise is to use the acceptance mantra when we are in the midst of complaining, when we find ourselves asking "why." It's about realizing that it's a "complaint" and stopping the complaints. In the face of complaining attitudes, patience and resignation are applied, valuing internal strength and acceptance of life's trials, challenges, and difficulties. For example, sometimes we see people constantly complaining, they have the habit of complaining about everything, which is a habit that needs to be eradicated as it leads to depression and anxiety, complaining goes against the current and does not accept reality; fighting it consumes extra energy. The second practical exercise is not to blame anyone, not to complain about anyone, and not to accuse anyone of anything. Making problems bigger by adding complaints makes pain more tolerable if complaints are not added. The thought of complaining is psychological abuse, it beats me down, defeats me, and I broke myself up, those who harbor these thoughts will never free themselves from hatred. It's our thoughts that keep the emotion alive or allow the emotion to naturally dissolve. Over time, emotional distress fades, but our thoughts can keep it alive, which is the basis of resentment and grudges, it is holding onto thoughts of past harm. The quote attributed to Buddha that says, "Holding onto resentment is like drinking poison and expecting the other person to die," is very true, if you harbor resentment towards a person or situation, that person or situation couldn't care less; they will continue as they were and the only person harmed by resentment is you, the one holding onto it. We all have some form of resentment, so we must turn the page, forgive, and stop complaining. The third exercise is to realize that when we are in a state of complaint, we should suppress the complaint and turn it around, accepting reality, therefore, complaining is often related to something from the past or harboring resentment, the solution is to forgive, either others or ourselves.

Strategy 6. Your response depends on your thoughts: anxiety, anger, rage, sadness. - The responses to our behavior and emotions depend on our thoughts, here, the phrase "It's not what happens to us, but what we do with what happens to us" applies. It's the action the mind takes. "What happens to us is not our choice and is not within our control," but "what is within our control is our choice" and what we will do with what has happened to us.

Developing a habit of acceptance towards life leads to resilience and emotional independence, according to Jon Kabat-Zinn (2009), our emotions and reactions in the face of circumstances and adversities are a result of our own interpretations and judgments. He says, "Sometimes we run from one place to another in search of being happier, to a better place, a more stable partner, among other things", as a result, we change jobs, locations, partners, and then after some time, we realize that we are exactly the same, wherever we go, if we continue with the same way of thinking and don't work on our minds, we will remain the same, trying to escape won't help because your mind will always be with you, so you must free yourself from mental burdens to be comfortable with someone or anywhere. You have the freedom to feel, even if you have toxic thoughts and emotions. When we cultivate those kinds of thoughts, when we pay attention to those things, we become what we focus on. If you don't choose your thoughts, others will choose for you.

Sometimes we let ourselves be influenced by others and go along with them, when we hear others complain, we also start complaining; when we hear others reject reality, we also start rejecting reality. We need to become aware and quiet the mind, realizing that this way of thinking, feeling, is causing me suffering, or on the contrary, it is freeing me, freedom is nothing but the "release from suffering."

Dunlosky, J. and Hertzog, C. (2000), point out that nowadays, we are no longer slaves as in previous eras, but we are still slaves to a mortgage, to a job, to needs and desires, freedom lies within our minds, in the way we think. We are slaves to fears, to our desires, ambitions; freedom is in the mind, in the freedom of thought, and the emotions generated by thoughts are what produce suffering. For example, anxiety arises from thoughts of future or past suffering, when these thoughts come to mind, our job is to return to the "now" and thus reduce unnecessary suffering.

Whenever we are in the present moment, even in difficult or challenging times, if we remember and find ourselves complaining about how challenging that moment is, fear is generated, and even illness can be raised.

In Robert Sapolsky's book "Why Zebras Don't Get Ulcers" (2008), the answer is that zebras do not have stress. Zebras do not get ulcers even though they are occasionally chased by a lion; they have to run for their lives, but once the danger is gone, they return to grazing peacefully, they don't dwell on what could have happened or the fright they experienced. Humans, on the other hand, when we have any kind of experience, we are constantly thinking about what happened, what could have happened, the conditional "and," we are thinking with fear about when it will happen again, over and over. This is torture for our minds and also a cause of diseases like ulcers.

Human beings have the ability to visualize the future, which is one of the greatest blessings of humanity but often turns into a curse. Sapolski et al. (2008) explain that in the 20th century, wild animals escaped danger when they saw it and once safe, they stopped worrying; humans, on the other hand, do the opposite; we torment ourselves with the past and what is yet to come, not focusing on the present moment and now, thus leading to unhappiness. Don't let your thoughts about too many things crush you; don't fill your mind with all the bad things that could happen, stay focused on the present situation and ask yourself, "What is so difficult that it cannot be overcome?" Even if the situation is challenging, like what happened to James Stockdale, he eventually managed to overcome it by fully accepting reality and staying fully present in that moment. The things that scare us and cause us harm and suffering are due to imagination, not reality itself—this is anxiety. We are always inventing worries and imagining that things are worse than they really are, and anxiety is not something of our time; it has always existed.

The best thing to do when angry is not to respond, postpone our response, say nothing. At first, it will be challenging, but by not responding, a new habit is gradually formed, in the face of an angry outburst, this habit will diminish, count the days when "you don't get angry," and gradually, you'll notice that you used to get angry every day at first, then every two days, every three or four days, until you become less and less prone to anger.

Anger and sadness should not be repressed; it's good to express ourselves, let sadness pass, let your tears flow, but also let them cease. For example, in a situation of mourning, initially the pain is tremendous, we cry a lot, but after some time, we start to laugh again or feel hope. Remember, "let your tears fall, but also let them dry." The practical exercise is the observation of our thoughts, keeping a journal for self-reflection helps develop "metacognition," which is the ability to observe our own thoughts, it involves stepping back from our thoughts to be able to observe them, to see if they are appropriate or not, if we are judging or interpreting the situation in a suitable way, if we have been empathetic, if we have exaggerated, etc. Write down what you feel in the journal, your thoughts and emotions about specific situations, and after some time has passed, they will be in the past. Some people refer to this practice as "the unsent letter" - writing down what angers you and letting two to three days pass. After this time has elapsed, you read the letter again, and you may realize that you may have exaggerated or made a big deal out of something that could be easily resolved, if you still feel these conflicting feelings when you read the letter, you write another letter about the same situation, in this second letter, you express and release all your thoughts and emotions without any filter, and after waiting for another two or three days, you'll notice that when you read the letter again, you are in a state of total serenity and complete calmness. The purpose of the letter is not to send it to anyone; it's not for the other person to find out, it's for me to calm my emotions, to gain inner strength, this is metacognition "the ability to self-observe my own emotions", when we look at the first letter, the emotions and thoughts are exaggerated and dramatic, and in a few days, those thoughts gradually fade away. So, whether in the form of letters or a journal, write, and then reread the journal or letter to gain that ability to observe your thoughts and emotions.

Strategy 7. Prepare for the worst. - It involves having a negative visualization about something, someone, or a circumstance. In Latin, it's called "premeditatio malorum," which means "visualizing the worst-case scenario that could happen," with the purpose of accepting that possibility in advance, it's a meditation on visualizing the negative, serving to plan for adversity in advance, in contrast, an anxiety crisis visualizes adversity and generates panic. Visualizing adversity allows us to see ourselves responding calmly, there are therapies that apply this tool, such as rational emotive therapy and cognitive-behavioral therapy, through these therapies, one can realize that during an anxiety crisis, you don't die.

It happens that in many cases, a person may experience a series of physical symptoms of an illness such as cancer, which can be very frightening and cause panic. The practice involves telling oneself whether what's happening will make you die or not; imagine that you die; well, like everyone else, we are all going to die, nobody stays here, it's time to face that fear, which makes the symptoms of the illness disappear.

In psycho-oncology courses, visualizations of being ill are conducted, we imagine going to the doctor and being diagnosed with cancer, this visualization can make one feel very bad, but it's an important tool for facing a potential situation with serenity by facing it calmly and recording the impact on emotions, we can empathize better. Additionally, we visualize ourselves as doctors with patients, especially those with cancer, in order to demonstrate serenity; this negative visualization leads to preparation for death. Observing the moment of dying helps us become aware of life's brevity and focus on what truly matters. The technique considers death not as something negative but as a natural part of existence. If we are alive, we will eventually die.

Braund, et al. (2015) quote Seneca who said, "He who learns to die has unlearned to live; he who learns to die is serene in the face of death, and is no longer a slave." This tool helps us realize that sometimes we perceive life as short and fleeting, feeling like we have very little time, and we end up wasting that time, when we realize our time is limited, we tend to make better use of it. It's important to remember the phrase that says, "Don't think someone has lived a lot just because they have white hair and wrinkles; they haven't lived much, maybe they've just existed." This can be explained with the following example: imagine a man embarking on a journey by boat and getting caught in a storm, staying there and doing nothing but trying to get out of it, being battered by the winds and sailing in circles; he hasn't made a great journey, just gone around in circles. This is the difference between existing and living.

Studies show that patients with hypochondria improved their health when they began reading about death, a topic they were trying to avoid in their minds at all costs. Culture and materialism are related to letting go, facing the topic of death, and talking about it, reading about the subject helped improve the health of these patients. Scientific studies by cardiologists, involving patients who have had a near-death experience and have been resuscitated, reveal that some of these individuals recount what we've heard many times: "the light." While we've all heard about it, there's a difference between hearing about it and reading a book with scientific data and stories from doctors discussing this reality, when scientists talk to us about this topic, it gives us security and credibility. The coincidences in the accounts of their patients, especially those with hypochondria or a fear of death, help minimize this effect and allow them to view death with serenity. These studies were also conducted on terminally ill cancer patients, with two study groups, one group discussed death, fear, and their emotions, while the other group underwent standard psychotherapies. It was discovered that the individuals who openly discussed their fear of death and their emotions in the first group experienced less pain and required less pain medication compared to the other study group.

Strategy 8. Be willing to look foolish. - appearing unnoticed generates strength and resilience, changing habits isn't achieved in two or three days; it's a learning process, there are times when one can stumble, lose, and make mistakes; learning isn't a linear upward process, there are ups and downs, like climbing a mountain, I climb and now there's a downhill slope, then I climb again, and maybe this time I'm higher up, but I have ups and downs, and it's a normal evolution.

Epictetus said, "To do anything well, you must have humility, allow yourself to stumble, follow your intuition, get lost, and appear clumsy." He also urges us to have the courage to start something and do it poorly, to have the eyes of a beginner, and to be aware that we don't know and can admit it without apologizing. This gives us strength and prepares us for any aspect of life.

When you have a plan, the strategy is not to share it. Some people say, "Don't share it because it brings bad luck", it's not bad luck, but what does happen is that when you share something you want to do, you'll encounter two types of people, some won't applaud you and won't approve of what you're sharing, which will make you doubt your plans and objectives, the other type of people will praise you and applaud you, and that applause releases dopamine, giving you a reinforcement to do things. The interesting thing about the second case is that people who receive this reinforcement, who receive that applause when sharing an intention of their plans and objectives, are less likely to have the motivation to actually execute the plan, so, when you have a truly important plan, don't share it, keep it to yourself. The practical exercise is to set goals, don't share them, walk, progress, have compassion for your clumsiness, and keep improving, periodically ask yourself, what have I improved, what could I have done better, forgive yourself, accept, and later on, you will gradually improve.

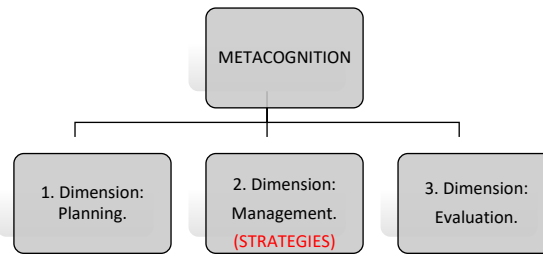
Strategy 9. Live in the present. - Living in the present with mindfulness and without concerns about the past or the future. Braund et al. (2015), in their work Seneca, multiplex, Seneca said, "The greatest obstacle in life is the anticipation of tomorrow and the loss of today."

Mindfulness emphasizes the importance of staying in the present, living in the now, being in the moment., living in the present means being in the present moment, feeling and observing our breath when we are driving, picking up the kids from school, cooking, vacuuming, doing household chores, brushing our teeth, and so on. When we do tasks, we often do them automatically, making it easy for our brains to wander and activate the Default Mode Network (DMN), which comprises a series of brain structures that engage in self-referential thinking, focusing on "me," my issues, my problems, and my sad story, the DMN is an intrinsic activity of certain brain regions that activate when an individual engages in mind-wandering activities and decrease in activity when engaging in perceptual and motor activities, this network is more active in people with anxiety and depression.

People who practice mindfulness have less activity in this Default Mode Network (DMN), when the DMN is too active, one is outside of the "now." Remaining in the present leads to better emotional health, while those who spend less time in the "now" and let their minds wander into other things, especially during automatic tasks like commuting or driving, forget about the present moment and operate on autopilot, with their minds wandering and not fully aware of their surroundings. These individuals often score high levels of anxiety and depression compared to those who remain in the "present moment".

Strategy 10. Purposeful and Directed Action. - Asking ourselves when we are going to do something is essential; I have to do it; it's important; it brings me closer to my goal, to what is important in life. This strategy also highlights the importance of rest; it's part of life's goal, going out to eat somewhere, going to the countryside, walking with contact with nature, is something that humans need and aligns with the goal of balance, health, a balanced and harmonious life, of a simple life, free from excess, unnecessary luxuries.

Hays, G., translator (2004) "Meditations of Marcus Aurelius," who was a Roman emperor, led a very simple life, and they believed that simplicity helped to focus on what really matters in life. Find out what your purposes in life are, what your goal is at this stage of life, and it will be easier to make a decision with everything that aligns with your goal; what does not align with your goals will be easier to discard, these practices of daily actions and goals should align with a life purpose. Next, Figure 2 displays the ten strategies for the metacognition variable in its dimensions: planning, management, and execution. The strategies are applied to dimension 2: Management.



No.	Metacognition Strategies.
1	Distinguish between what depends on you and what doesn't.
2	Resists against reality.
3	Is indifferent to what others say or do.
4	Looks at adversity without toxic optimism.
5	Constantly complains.
6	Responses depend on your thoughts: anxiety, anger, frustration, sadness.
7	Always prepares for the worst that could happen.
8	Is willing to appear foolish.
9	Lives in the present.
10	Actions are purposeful and directed with meaning.

Emotional Ecology

Emotional ecology (EE) is the art of sustainably managing our emotions in a way that enriches cognitive and affective processes, aiming to increase emotional quality, improve relationships, and enhance the environment (Vallejo-Chávez, Jarrín-Zambrano, & Tapia-Bonifaz, 2020). Emotional ecology is formed through constant training, allowing individuals to motivate themselves, improve emotional quality of life, and seek human perfection. Congacha-Marín & Soler-Lleonart state, "All energy that is not directed towards creation becomes destructive energy; thus, we choose to be part of the problem or part of the solution."

Emotional Ecology is a model that requires training, daily practice, and emotional education (Conangla & Soler, 2023), the 4Rs provide a solution to society's emotional problems; its theory aims to achieve inner balance and proper management of emotional resources so that humans can lead fulfilling lives, with emotional resources managed in a balanced way, integrating mind, emotion, and action. Negative emotions impact society and are present in all ecosystems: family, social, education, health, and organizations (Vallejo-Chávez, Jarrín-Zambrano, & Tapia-Bonifaz, 2020).

Emotional sustainability and emotional ecology aim for individuals to be responsible for themselves and co-responsible with the world, to achieve emotionally sustainable lives, it is necessary to work on the 4Rs: reduce emotional pollutants, recycle resources and emotions, recover skills and abilities, and repair emotional wounds.

The 4 Rs

The 4Rs allow (i) reducing emotional pollutants found in the environment, such as internal language, self-talk "what we say to ourselves", avoiding toxic people who affect us, reducing stress, dependency, and chaos (Villasante, 2019). (ii) Recycle positive emotional resources, capabilities, and skills to relate to others (Villasante, 2019). These resources (Duarte, 2023) are related to the dialogue one maintains with oneself. (Vicedo, 2018) requires (iii) recovering these

skills and capabilities; self-knowledge and acceptance, the ability to admire and be surprised, and finally (iv) repairing emotional wounds that result in a baggage of negative emotions affecting health. The 4Rs are a therapeutic representation, supported by psychological processes, that brings personal benefits to improve social and emotional life in interpersonal relationships (Higuera, 2015).

The objective of the present research is to apply metacognition in order to identify how individuals can come to know themselves and achieve the transformation of adversity into strength, also relating metacognition to emotional ecology. There are several philosophical approaches, including stoicism, psychotherapy, behavioral psychology, acceptance and commitment therapies, and mindfulness, which have allowed humanity to become more resilient in the face of traumas, tragedies, and daily threats. These approaches enable us to become stronger, wiser, more resilient, and more humane, providing tools to overcome adversity.

2. Materials and Methods.

The research had a mixed-method approach, descriptive level, documentary and field type, non-experimental and cross-sectional design; the methods applied were inductive, deductive analytical, synthetic, and systemic in developing the study's conclusions, the study variables were metacognition and emotional ecology. In this pilot study, a population of (700) Marketing students from the Faculty of Business Administration at the Superior Polytechnic School of Chimborazo was targeted. The sample consisted of 248 students enrolled in this program, with a 5% margin of error and a 95% confidence level.

For the metacognition variable, the study examined its dimensions of planning, management, and execution. In the second dimension, Management, 10 strategies were applied to help individuals understand themselves better and act in the face of adversity. Regarding the emotional ecology variable, the "4Rs model" was applied with 11 items distributed across 4 indicators: (i) reducing emotional pollutants, (ii) recycling positive emotional resources, (iii) recovering skills and capabilities, and (iv) repairing emotional wounds.

The items are stated in the third person in declarative format, on a Likert scale with four options: (i) never or almost never, (ii) sometimes, (iii) frequently, and (iv) always or almost always, with ratings of 1, 2, 3, and 4 points, respectively, the factor of highest incidence is 4, subsequently, the scores for each indicator were summed up, and their highest incidence was analyzed in relation to the highest score, to summarize and proceed with their analysis and interpretation. The Metacognition variable is obtained from standard scores on the ten strategies in dimension 2. Management. The Emotional Ecology variable is obtained from standard scores on each of the four indicators of the 4Rs. Below is Table 1, which shows the assigned scores based on the questions of the items requiring higher scores.

Table 1. Scores according to the importance of variables 1 and 2.

No.	Metacognition.	Always or almost always	Frequently	Sometimes	Never or almost never
1	Differentiate what depends on you and what doesn't depend on you.	4	3	2	1
2	He/she resists reality.	1	2	3	4
3	Is indifferent to what others say or do.	4	3	2	1
4	Views adversity without toxic optimism.	4	3	2	1
5	Constantly complains.	1	2	3	4
6	His/her responses depend on your thoughts of anxiety, anger, rage, sadness.	1	2	3	4
7	Is always preparing for the worst that could happen.	1	2	3	4

8	Is willing to look foolish.	1	2	3	4
9	Lives in the present.	4	3	2	1
10	His/her actions are directed with meaning and purpose.	4	3	2	1
No.	Emotional Ecology.	Always or almost always	Frequently	Sometimes	Never or almost never
	Reducing environmental emotional pollutants.				
1	Identifies contaminating individuals in his/her family.	1	2	3	4
2	Identifies at least three toxic words per day.	1	2	3	4
3	Identifies contaminating individuals in his/her workplace.	1	2	3	4
	Recycling emotional resources.	Always or almost always	Frequently	Sometimes	Never or almost never
4	Recognizes three positive emotional resources within himself/herself.	4	3	2	1
5	Recognizes three important people in his/her life.	4	3	2	1
6	Remembers three motivational phrases that he/she applies daily in his/her life.	4	3	2	1
	Recovering skills and abilities.	Always or almost always	Frequently	Sometimes	Never or almost never
7	Recalls three skills in which he/she efficiently develops.	4	3	2	1
8	Recalls three abilities in which he/she efficiently develops.	4	3	2	1
9	Recalls three emotional resources he/she possesses.	4	3	2	1
	Healing emotional wounds.	Always or almost always	Frequently	Sometimes	Never or almost never
10	Easily forgives.	4	3	2	1
11	Is aware that negative emotions affect his/her health.	4	3	2	1

Source: Metacognition models and 4Rs.

Table 2. Demographic data.

First Name:			Day	Mon th	Yea r
Last Name:		Application date			
Gender:	Male <input type="checkbox"/> Female <input type="checkbox"/>	Date of birth			
How do you identify:	White <input type="checkbox"/> Afro-American <input type="checkbox"/> Mixed race <input type="checkbox"/> Indigenous <input type="checkbox"/> Others <input type="checkbox"/>	Semester/PAO:			
Location:	Urban <input type="checkbox"/> Rural <input type="checkbox"/>		Day	Mon th	Yea r
Phone number:		Age			
Language:					
Interviewer:	Affiliation: ESPOCH-FADE-Marketing				

3. Results and Discussion

The metacognition theory and the 4Rs model facilitated the application of the test, applied according to the circumstances and situations in the study sample.

Table 3. Scores of the variables: Metacognition and Emotional Ecology.

No .	Metacognition.	Always or almost always		Frequentl y		Sometime s		Never or almost never		Total
1	Distinguish between what depends on you and what doesn't.	4	78	3	33	2	45	1	92	248
2	Resists reality.	1	41	2	30	3	25	4	152	248
3	Is indifferent to what others say or do.	4	84	3	41	2	35	1	88	258
4	Views adversity without toxic optimism.	4	113	3	55	2	25	1	55	248
5	Constantly complains.	1	55	2	42	3	33	4	118	248
6	Their responses depend on your thoughts of anxiety, anger, rage, sadness.	1	81	2	63	3	26	4	78	248
7	Always prepares for the worst that could happen to them.	1	47	2	28	3	45	4	128	248
8	Remains willing to appear foolish.	1	55	2	15	3	39	4	139	248
9	Lives in the present.	4	83	3	38	2	42	1	85	248
10	Their actions are guided by meaning and purpose.	4	94	3	52	2	75	1	27	248
	Total scores	9						18		27

The total score is 27 out of 40, resulting in a highest score of 67,5%.

No.	Reducir contaminantes ambientales en las emociones	Always or almost always		Frequently		Sometimes		Never or almost never		Total
11	Identify toxic individuals within their family.	1	55	2	56	3	88	4	43	248
12	Identify at least three toxic words each day.	1	93	2	44	3	111	4	22	248
13	Identify toxic individuals in their workplace.	1	79	2	97	3	72	4	11	248
The total score is 8 out of 12, resulting in a highest score of 67%.										

No.	Recycling emotional resources.	Always or almost always		Frequently		Sometimes		Never or almost never		Total
14	Recognize three positive emotional resources within yourself.	4	71	3	88	2	62	1	27	248
15	Recognize three important people in your life.	4	104	3	68	2	42	1	34	248
16	Remember three motivational phrases that you apply daily in your life.	4	63	3	92	2	77	1	16	248
The total score is 10 out of 12, resulting in a highest score of 83%.										

No.	Recovering skills and abilities.	Always or almost always		Frequently		Sometimes		Never or almost never		Total
17	Remember three skills you develop efficiently.	4	89	3	77	2	79	1	3	248
18	Remember three abilities you develop efficiently.	4	62	3	95	2	72	1	19	248
19	Remember three emotional resources you possess.	4	67	3	75	2	96	1	10	248
The total score is 9 out of 12, resulting in a highest score of 75%.										

No.	Heal emotional wounds.	Always or almost always		Frequently		Sometimes		Never or almost never		Total
20	Forgive easily.	4	46	3	72	2	85	1	45	248
21	Is aware that negative emotions affect their health.	4	85	3	85	2	72	1	6	248
The total score is 6 out of 8, resulting in a highest score of 75%.										

Source: 248 Marketing students from ESPOCH, 2023.

Table 4. Summary of scores for the Metacognition and Emotional Ecology variables.

Emotional Ecology	Direct Scores	Direct Scores	Percentage
10 Metacognition Strategies.	40	27	67,5
Reducing environmental pollutants in emotions	12	8	67
Recycling emotional resources	12	10	83
Recovering skills and abilities	12	9	75
Healing emotional wounds	8	6	75
PERCENTAGE AVERAGE-TOTAL 73,5%			

Table 4 shows the summary of scores obtained in the study variables, metacognition, and emotional ecology, in the sample of 248 surveyed students, the percentage of the average exceeds 50%; with the result of the total media of the 21 items, in 5 blocks, being 73.5%, it can be concluded that the surveyed students manage positive metacognition and emotional ecology in their daily activities; they are metacognitive, resilient, and adaptive to environments and circumstances, in other words, they enjoy good neuroplasticity. The scores of the variables highlight the human capacity to seek solutions to social, personal, and professional challenges, contributing to being part of the self-creation of an emotionally metacognitive, ecological, balanced, and harmonious inner and outer world. Emotions, thoughts, expectations, knowledge, and experiences are intangible elements that profoundly influence behavior and attitudes towards life's challenges, many of which are ignored, and we do not know how to manage them? or how to identify them?

Paris, S. G. and Winograd, P. (1990); Scarr, S. and Zanden, J. (1984); Schraw, G. (1994) have all discussed that metacognition is applicable to self-awareness, allowing for a better quality of emotional life. Tobias, S. and Everson, H. T. (1996:2002) also emphasize its utility as a tool for preventing and dealing with both personal and collective crisis situations, this includes learning to set limits, identifying what depends on oneself and what does not, ceasing to resist reality, being indifferent to what others say or do, facing adversity without excessive optimism, letting go of complaints, and recognizing that emotional responses depend on one's thoughts: anxiety, anger, rage and sadness. Preparing sometimes for the worst-case scenario, being willing to appear foolish, living in the present, and ultimately directing our actions with meaning and purpose. Together with emotional ecology (Cantopher, 2022), which aims to avoid toxic people, avoid internal negative self-talk that poses a risk to our emotional health, establish appropriate limits, and recognize warning signs in order to improve mental well-being and lead an ecologically sustainable life.

Table 5. Demographic Data.

Gender of Marketing students		
	FA	FR
%		
Women	151	61
Men	97	39
Total	248	100
Language of Marketing students		
	FA	FR
Spanish	248	100
Spanish and Quechua	20	8
Spanish and English	104	42
Total	372	100
Ethnicity of Marketing students		
	FA	FR %
White	7	3
Afro-American	15	6
Mixed race	143	58
Indigenous	83	33
Total	248	100

Table 5 shows the demographic data of Marketing students surveyed in 2023 with similar variables; 61% are women, 39% are men; 100% of the students speak Spanish as their native language, 8% speak Spanish and Quechua as indigenous students with Quechua as their native language, and 42% speak Spanish and English due to their academic background; 3% identify as white, 6% as Black/African American, 58% as mixed race, and 33% as Indigenous. These demographic data coincide with a similar study, where the variable 2, Quality of Life, was changed, conducted on Marketing students by Vallejo, L.; Tapia, A.; Miranda, M. & Ureña, V. (2023).

4. Conclusions

The conclusion reached is that the meaning of the word metacognition, "knowing oneself," focuses on learning and how learning is constructed, such as "I learn" from learning systems, in other words, "it is self-knowledge." Acquiring the habit of asking oneself "does this depend on me or not" every time something happens. Not resisting is applying the acceptance mantra, which involves repeating phrases that lead us to acceptance, such as "I completely accept that," "I accept what has happened," "I accept that this is reality and not a dream," "I accept that this has happened and even though it hurts a lot, I accept it." These types of acceptances or mantras are applied in different situations. When receiving criticism, it is necessary to "not respond," remain calm, similarly, when faced with another person's negative opinion, one should ask oneself "if the other person's opinion is valid for you" and whether it aligns with our life goals; otherwise, it's important to discard others' opinions. Accepting reality without excessive optimism, being realistic and avoiding excessive optimism, letting go of complaints, questioning "why" is a "complaint," and we must stop complaining, avoiding the habit of complaining, and staying away from constantly complaining people as it can be contagious. Stop blaming others, don't make problems bigger, the thought of complaining is psychological abuse; our thoughts are what keep emotions, don't hold onto resentment, suppress complaining, emotional responses depend on our thoughts, such as anxiety, anger, rage, and sadness, and how we manage them. It's also important to prepare sometimes for the worst-case scenario; this helps eliminate suffering. Being willing to appear

foolish and doing things with humility, living in the present "here and now," and ultimately directing our actions with meaning and purpose in life are crucial as well.

Emotional ecology contributes sustainability and emotional well-being by being responsible for oneself and co-responsible for the world, to maintain emotionally sustainable life, it is necessary to work on the 4Rs: reduce emotional pollutants, recycle resources and emotions, recover skills and abilities, and repair emotional wounds to generate personal well-being. The test results in Marketing students were positive. In this way, meta-subjectivity, which is the capacity of humans to discriminate between correct and incorrect judgments, should be applied in adverse situations to achieve meta-efficiency in performance, mastery, and self-control of individuals under stress and frustration. It is expected that this research will serve as bibliographic basis for future research in metacognition and emotional ecology, aiming to transform adversity into strength and generate life-long learnings.

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