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The critical time for critical thinking: intellectual virtues as intrinsic motivations for critical thinking

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ABSTRACT

This paper addresses the complexity of critical thinking, a multifaceted concept that includes cognitive skills, knowledge, and dispositions. We argue that existing literature has largely overlooked the vital role of dispositions, which are essential for understanding why individuals engage in critical thinking. Therefore, at the heart of our research is the challenge of motivation: how can we best encourage individuals to engage in critical thinking? To answer this question, we begin by conceptualizing critical thinking as a five-steps temporal process, thereby refining and clarifying its definition. Then, drawing on Self-Determination Theory, we argue that intrinsic regulation not only boosts engagement but also cultivates a long-term commitment to critical thinking. This insight establishes a direct link between intrinsic motivation and intellectual virtues, prompting us to propose a pedagogy focused on developing these virtues. Furthermore, we explore the challenges of initiating, sustaining, and completing the critical thinking process. We suggest that a virtue-centered pedagogy offers a holistic solution, promoting enduring intellectual engagement and completion of the critical thinking process. This approach promises to deepen intellectual inquiry and foster more robust analytical skills in educational contexts.

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Introduction

The importance of critical thinking (CT) is widely acknowledged across various aspects of contemporary life, including education, political involvement, business, and personal relationships (Fisher, 2021). UNESCO (2023) highlighted that critical thinking represents one of the major challenges in modern education. However, despite a focus on developing CT skills and an increasing number of educational interventions aimed at cultivating these

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skills in students, research on their effectiveness remains limited and the outcomes often disappointing. CT has been taught, especially in American schools and universities, for over 40 years, yet the effectiveness of these interventions has not been clearly demonstrated, with recent studies showing only marginal progress (Arum & Roksa, 2011; OECD, 2022). This apparent stagnation raises the question: why is it so challenging to effectively develop CT?

Several factors significantly influence the efficacy of CT instruction. Key among these is the formulation of educational policies, the priority given to CT in the educational agenda, the standards by which such skills are assessed, the training of instructors, and, of course, the allocation of financial resources, which impacts the availability of adequate materials. Furthermore, various pedagogical challenges play a critical role, including the complexity of teaching methods that must adapt to diverse learning styles and environments, and the integration of CT skills into various subject areas. On this last point, the literature abounds with studies, including meta-analyses, exploring these methods, highlighting approaches that work better than others (Abrami et al., 2015; Allen et al., 1999). While they are very important, this article will not delve into these aspects. Instead, we argue that a fundamental conceptual problem with CT – beyond the challenge of defining it clearly – lies in the traditional emphasis on skills rather than the necessary dispositions or attitudes.

We contend that the individual dispositions intrinsic to CT are crucial as they *motivate* individuals to initiate and persist in critical evaluation. Without the appropriate disposition, the application of critical skills is unlikely, as in the case of a talented musician who, despite excellent piano skills, might choose not to play under certain circumstances. This analogy underscores the importance not only of knowing how and why to engage in critical thinking but also of wanting to apply it proactively. Focusing on dispositions opens a new field of investigation into the underlying mechanisms that encourage or inhibit active engagement in CT. In other words, the central question in this article is *what motivates people to think critically?*

To better understand the challenges that might hinder engagement in critical appraisal, we have decided to conceive of CT as a temporal process (in which the different CT skills are organized) and developed a temporal model that delineates this process into five distinct stages. While this model is idealized and theoretical – thus not predictive – it helpfully isolates stages of critical reasoning, making it easier to identify moments susceptible to lapses in CT. This temporal framework is instrumental in pinpointing the specific dispositions and motivations necessary for a successful critical process. Building on this model, we explore the various motivations that propel individuals to think critically, drawing on Ryan and Deci's Self-Determination Theory (2000). We examine the different regulations that might enhance epistemic success, with a particular

emphasis on intrinsic regulation. This emphasis brings us to the concept of intellectual virtues, highlighting their strong conceptual alignment with intrinsic regulation. This approach not only deepens our understanding of CT but also introduces a novel framework for enhancing and practically applying CT in educational and everyday settings.

It is important to note that, while the significance of interpersonal interactions in fostering CT should be acknowledged, this article simplifies the discussion by treating CT predominantly as an individual process. This perspective is admittedly limited, as it intentionally overlooks the impact of environmental (financial, educational, political, or media-related) and socio-relational factors. However, our focus here is strictly on specific intrapersonal factors, such as cognitive skills, dispositions, or motivations, acknowledging that this choice narrows the scope of our exploration.

Understanding the issue: what is critical thinking?

Since Dewey's work in the 1910s, the definitions of CT have multiplied (see Supplementary Material for an overview of the definitions collected). Surprisingly yet, we do not currently have a consensus definition of it (Hitchcock, 2020). This "glut" of visions leads to confusion about what the term encompasses. There are several possible explanations for this absence of consensus. One of the most salient is that CT is approached by a variety of disciplines (mainly philosophy of pedagogy, cognitive psychology, and education) that do not necessarily interact.

Fortunately, despite this lack of conceptual unity, there seems to be a consensus on several intrinsic elements. First, CT is commonly seen as a *decision* process, as suggested by Ennis in a definition he first used in 1987: "Critical thinking is reasonable reflective thinking that is focused on deciding what to believe or do" (2015, p. 32). Furthermore, since Glaser's work in 1941, there has been a consensus on the constituent elements of CT:

> The ability to think critically [...] involves three things: (1) an attitude of being disposed to consider in a thoughtful way the problems and subjects that come within the range of one's experiences, (2) knowledge of the methods of logical inquiry and reasoning, and (3) some skill in applying those methods. (Glaser, 1941, p. 5)

Let's study each of these three components in more depth. First of all, if one is willing to think critically, they need to rely on *knowledge* related to the topic they intend to examine. Second, CT constitutes a set of *skills* (or abilities) that are not innate and that are often considered as higher-order thinking skills (Halpern, 1998). They can be acquired, often within an educational framework.[1] These abilities include "distinguishing relevant from irrelevant facts" (Paul et al., 1989), "recogniz[ing] the existence of logical relationships between

propositions" (Glaser, 1941), "judg[ing] the credibility of a source" (Ennis, 2015), among many others. However, developing cognitive skills is not sufficient to be a good critical thinker. One must also develop some *attitudes* of being disposed to consider the epistemic problems in a cautious way and to use those skills appropriately.[2] These attitudes are called dispositions and they include intellectual autonomy, intellectual courage or fair-mindedness (Paul & Elder, 1999/2020). The meaning of the term disposition varies among authors, but generally it is understood either as encompassing motivational components (i.e., inclinations or tendencies) or attitudinal components (i.e., attitudes, mental habits or even virtues, as we shall see) (Nieto & Valenzuela, 2012). Hence, we can assert that dispositions encompass a combination of motivation and intellectual attitudes; but these two components do not play the same role, as we shall see.

This tripartite construction of CT (in skills, dispositions and knowledge) can be considered the consensus view. But when we look more closely, we realize that many authors (Ennis, 2015; Facione, 1990; Glaser, 1941; Halpern, 1998; Bailin et al., 1999; Paul et al., 1989; Sternberg & Halpern, 2020) propose lists of skills and dispositions related to CT that, despite sharing some common points, also have many points of divergence, increasing the vagueness surrounding this notion (see Supplementary Material for an overview of these dispositions and skills). These lists give a good idea of what CT is about, but they also give the impression that it goes in all directions. In response to this conceptual vagueness, and given the importance attached to its teaching, a conceptual clarification of CT seems paramount. To this end, we propose to conceptualize CT as a five-step temporal process, which will allow us to point out the key moments where an individual is more likely to fail to put their CT skills to use. This model will serve as the basis for a central question of this article: how can we foster engagement in CT?

Exploring critical thinking as a time-based process

The philosophical definitions of CT often describe the figure of the ideal critical thinker out of any temporal reality. One well-known definition is the one proposed by the American Philosophical Association (APA), which brought together a consortium of experts to propose a synthesis of characterizations of CT. In their report, here is how the critical thinker is defined:

> We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. [. . .]

> The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. (Facione, 1990, p. 3)

While this definition gives a broad and relatively complete picture of what CT is, it does not give us information about when individuals think critically and when they do not. As CT requires a lot of cognitive effort, time and resources, it would be too demanding to think critically all the time. Although this can be a pleasant activity, it is still costly, cognitively speaking. It is therefore necessary to identify the stages of this process and the moments when CT is triggered. Whereas philosophers rarely envision CT as a temporal process, some psychologists do. Thus, we used Halonen's (1986) and Brookfield's (1987) models to develop our five-step CT temporal process (Table 1). The process we describe is obviously an "ideal" process. It is rare that it is precisely applied in this way – typically, the different cognitive skills are engaged not sequentially, but rather concurrently. Hence, the distinctions we are making, while somewhat artificial, is essential for achieving a conceptual clarification and then making explicit where the process can go awry.

In addition to this theoretical model, we would like to point out that in her model, Halonen (1986) acknowledges that this view is simplistic and that these stages are not as linear as presented. It is indeed obvious that the critical process involves going back and forth between the different stages (see Figure 1), mostly when the question on which we inquire is complex.

The problem of motivation: how to engage in the critical process?

As previously mentioned, these steps outline an ideal scenario. In real-world situations, various issues may arise, such as critical thinkers lacking necessary information, skills, or resources. However, this theoretical model is interesting because it allows us to examine in detail certain problems related to CT. Among these challenges, let's focus on the engagement in the critical process. This issue is related to the fact that sometimes we do not engage in a critical process at all and that we go directly from the "acquisition of relevant new information" phase to Step 5. In other words, this would mean avoiding entering in the critical process at Step 1 and thus "bypassing" the deliberation process and the use of CT skills. There are several ways to interpret this "bypassing", from a cognitive point of view. There are at least three possible (but not exclusive) interpretations – we will elaborate on them further in section 4 when discussing intellectual vices. First, it can be seen as a form of *intellectual arrogance* (or *overconfidence*), where the

Table 1. Time process of critical thinking.

Step	Time Process of CT
-	*Acquisition of relevant new information*[3] This stage is not an integral part of the critical thinking process, but it is the situation in which individuals are likely to engage (or not) in CT. As a starting point, we postulate that individuals have a certain amount of knowledge, information, values, beliefs, intuitions, memories, and assumptions, which lead them to evaluate, based on previous experiences, what seems correct or not, or good or not. This is what Halonen (1986) calls *the personal theory*. The starting point of CT is typically the acquisition of a new relevant[4] piece of information. This information then either contradicts (generating a dissonance) or supports (generating consonance) the personal theory.[5] In the case of a dissonance, the new information will generate a greater or lesser form of perplexity in the individuals that might elicit them to engage in the critical process. In the case of consonance, it is a specific clue (intrinsic to the information or to its source) that will awaken the vigilance of individuals and generate a doubt that will push them to think in a critical way. In both cases, the individuals *may* engage in a critical process with the aim of deciding what to believe or do, and therefore adopting one of these three doxastic attitudes: believing the new information, not believing it or suspending their judgment,[6] and then acting consequently.
1	*Clarification of the situation* The aim of this first step is to understand exactly what this new information is and how it fits in with the personal theory. This would allow us to understand why this information has elicited a doubt or a discrepancy in them. This is a time for critical thinkers to 'take stock' and consider *how* they should proceed to decide what to believe or do. The use of previously acquired knowledge or resources can be useful, as well as a form of introspection. In this step, the following skills are mobilized (among others): 'ask and answer clarification questions' (Ennis, 2015) et 'clarifying [. . .] the meaning of words or phrases' (Paul et al., 1989)
2	*Information seeking* Once the situation has been clarified, critical thinkers start looking for explanations to make sense of their doubt. As we have seen, one of the three fundamental components of CT is knowledge. Therefore, it's crucial to be well informed about the subject you intend to think critically about. This step is therefore characterized by an openness to new information and new concepts. During this stage, both the personal theory and the new information are present in critical thinkers' minds. In this phase, various skills are utilized, including the following: 'gather and marshal pertinent information' (Glaser, 1941); 'concern to become and remain generally well-informed' (Facione, 1990); or 'try to be well informed' (Ennis, 2015)
3	*Analysis* At this stage, the information collected is not just compiled, but analyzed as a whole, allowing critical thinkers to discern and identify underlying patterns. This step involves the deployment of logical reasoning techniques such as deduction (to detect the presence of logical inconsistencies between information), induction (to draw general conclusions from matching pieces of evidence), and abduction (to generate new hypotheses that might either be confronted to the present evidence or will guide the search for additional evidence). During this stage, a range of skills are engaged, such as 'recogniz[ing] the existence of logical relationships between propositions' (Glaser, 1941); 'recognizing contradictions' (Paul et al., 1989) or 'analyzing arguments' (Facione, 1990)
4	*Evaluation of alternative perspectives* At this stage, critical thinkers sort and evaluate the new perspectives they have discovered in terms of their appropriateness to the situation, their values and their validity. They apply evaluative criteria for which they will be held accountable (e.g., where they put their epistemic trust and why) since this step also includes a self-evaluation of the way the critical analysis was conducted (this is the reflective part of CT). Insofar as it allows critical thinkers to account for both the *criteria* used to investigate and the mental processes involved in the investigation, we argue that this step is crucial in characterizing CT as *critical*. At this stage, both evaluative and self-evaluative skills will be mobilized, which means not only 'judge the credibility of a source' (Ennis, 2015) and 'put to test the generalizations and conclusions at which one arrives' (Glaser, 1941) but also 'be aware of, and check the quality of their own thinking ('metacognition')' (Ennis, 2015).

(*Continued*)

Table 1. (Continued).

Step	Time Process of CT
5	*Integration* As a resolution of the initial situation, critical thinkers will either revise their personal theory, reject the external event or suspend their judgment (in the particular case where the evidence does not allow a decision to be made). The new perspectives developed and analyzed during the critical process are integrated into their life, which may involve greater or lesser transformations (e.g., from change of points of view to change of political affiliation or even jobs) (Brookfield, 1987). As these new perspectives become comfortable, the critical thinkers can affirm them and explain to others why they believe certain things or behave in a certain way. This can be considered as finding a solution and as completing the critical process since the initial goal (deciding what to believe or do) is achieved. Almost none of the cognitive skills mentioned seem to belong to this stage. We can, however, talk about 'presenting arguments' (Facione, 1990) and 'employ rhetorical strategies' (Ennis, 2015), since Step 5 also includes the possibility for critical thinkers to explain to others why (based on what criteria) they believe certain things. Finally, temporal patterns of decision-making are usually circular: although it seems crucial to be able to decide once and for all whether to accept or reject information, in the final stages, critical thinkers may be brought back to Stage 1 as new information on the topic may again create doubt or dissonance within their personal theory. Furthermore, it is possible, owing to time effects and memory alteration, that, one day, they will come back to Step 1 about the same issue.

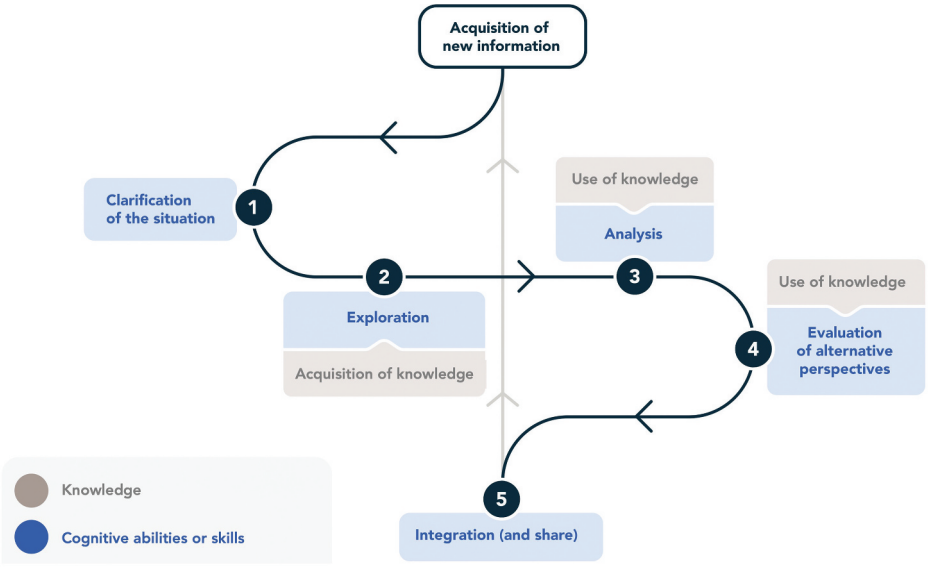

Figure 1. Temporal model of critical thinking skills and knowledge.

individual is mistakenly convinced that their personal theory does not require revision. Second, *intellectual laziness* might also account for the lack of engagement in the critical process, as such processes are often lengthy and cognitively demanding. Third, this "bypassing" may resemble the immediate rejection of an idea that contradicts an established belief system, driven by fear or *intellectual cowardice*. This reaction is understandable, as letting go of a belief can be a painful and daunting experience.

In some cases, it may seem more advantageous to cling to the belief, avoiding change, because the perceived benefits in other areas (e.g., in relationships or professionally) outweigh the potential gains of engaging in a process of negotiation and compromise. Depending on the situation, CT is not always the optimal choice. However, for all cases where CT is warranted,[7] we need to understand what may prevent engagement in the process.

Obviously, an environment where access to information is difficult or represents a significant financial cost will prevent any exploratory behavior. The same is true if individuals do not have sufficient time to conduct their critical inquiry. In the same way, the social environment can be more or less unfavorable to exploratory behavior, depending, for example, on the closed-mindedness of the people around us. From the point of view of individuals, several elements can influence CT: past experiences, their cognitive skills (more specifically to the cognitive skills related to CT mentioned above) or their affective states (as we stated before, we are sometimes coward, lazy or arrogant, intellectually). But most of all, the motivational dispositions are a crucial element. In other words, we must ask *what motivates people to think critically?* We have emphasized that cognitive skills, while necessary, are not sufficient to make one a critical thinker (Lai, 2011). We then need to pay attention to the dispositions linked to CT.

Earlier, we defined dispositions as a set of motivations and mental habits and pointed out that these two sides of dispositions do not have the same role. Indeed, even if it is difficult to assign CT dispositions to the different stages of our process[8] (see Figure 2), we can still argue that the motivational factor has an impact on both the initiation of the critical process (i.e., the application of critical skills and the use of knowledge) and its maintenance (Nieto & Valenzuela, 2012).

However, what specific type of motivation are we referring to? To answer this question, the Self-Determination Theory (Ryan & Deci, 2000) is interesting as it presents different types of motivations, ranging from non-self-determined behavior (extrinsic motivation) to self-determined behavior (intrinsic motivation) and is divided into different types of behavioral regulation. If we leave aside the absence of motivation (amotivation), we can analyze how this theory applies to CT, starting with extrinsic motivations. These are divided into four styles of behavior regulation (classified, once again, from non-self-determined to more self-determined): external regulation, introjected regulation, identified regulation and integrated regulation.

The case of *external regulation* does not appear to be the most common scenario within the context of CT, largely because it's driven by external incentives (like teacher approval or high grades) or the avoidance of penalties.

Indeed, one could consider the case of a student employing their CT skills and dispositions purely for the purpose of securing high grades, rather than out of genuine interest in the intellectual process – though such a scenario appears unlikely. Furthermore, it's conceivable to encounter scenarios where individuals are essentially "forced" to apply CT due to the need for rational decision-making in critical situations in which mistakes might prove particularly costly. These situations may effectively stimulate the use of CT, yet the question remains whether such forced applications can foster a true internalization of CT skills or merely temporary compliance.

Introjected regulation is mostly linked to self-esteem (Ryan & Deci, 2000). One can therefore imagine that some critical thinkers engage in the process for their own self-esteem. However, as the critical process is often long and costly, it seems more likely that the introjected motivation is related, rather, to the avoidance of certain negative affects. Indeed, the authors also state that "it is a relatively controlled form of regulation in which behaviors are performed to avoid guilt or anxiety or to attain ego enhancements such as pride" (Ryan & Deci, 2000, p. 72). It is important to emphasize that CT is almost universally regarded as a positive attribute. The capacity to analyze, evaluate, and interpret information, coupled with open-mindedness, are widely recognized as valuable qualities. Consequently, no one willingly describes themselves as gullible or naive, as these terms carry negative connotations and are often linked to perceptions of weakness or incompetence. This suggests that there is a form of "epistemic shame" associated with the inability to engage in CT. But things are not quite that simple. Indeed, the starting point of CT is often a cognitive discrepancy accompanied by a feeling of discomfort that one wishes to make disappear. Consider an individual who, influenced by social pressure and the expectations of their peer group, has adopted particular political beliefs. These beliefs are deeply internalized, and the individual actively advocates for them within their social circle. However, they encounter arguments or evidence that challenge these beliefs, and this creates a state of cognitive dissonance. So they decide to examine their own beliefs and think critically. This scenario illustrates that, when it is understood in this way, introjected regulation is a common motivator for engaging in the critical process. However, we have seen that the desire to resolve the cognitive tension can also lead individuals to "rush" the critical process to its conclusion: to decide what to believe or do based on their personal theory without evaluating the new dissonant epistemic element(s) – in order to maintain psychological coherence. As we explained earlier, in other words, individuals would go straight from acquiring new information to stage 5, without going through the process of analyzing and evaluating the information. It would seem, then, that introjected regulation cannot be sufficient to ensure epistemic success. Furthermore, this type of regulation does not apply when the individuals decide to engage in a CT process when confronted with consonant

information, indicating its limitations in fostering a thorough and unbiased CT process.

In the case of *identified regulation*, critical thinkers make the effort to go through the stages of the critical process not only to get rid of the unpleasant feeling that accompanies dissonance, but also, and especially, because being able to achieve epistemic success and to be able to justify their beliefs and actions with objective criteria has become personally important as a means to attain one's self-selected goal. Consider the example of an individual with a deep interest in climate change driven by their beliefs in environmental preservation. This person has identified the importance of understanding and analyzing the multiple implications of climate change – e.g., to be able to present a more substantiated argument during debates. Consequently, this individual may engage in a critical analysis of scientific data on climate change to gain a nuanced understanding of the facts and impacts. Similarly, they may apply critical evaluation to government policies and private initiatives related to environmental protection. In other cases, individuals actively want to become critical thinkers and develop the skills and knowledge to do so, because it can be a means to an end: e.g., becoming a better lawyer, journalist, scientist or philosopher – in such cases, the individual realizes that CT is a crucial skill for verifying facts, analyzing information, and constructing sound arguments – essential skills in the fields of journalism, law or philosophy. Thus, identified regulation can elicit a CT process both in the case of dissonant and non-dissonant information, reflecting a profound internalization of CT as an essential tool for personal and professional efficacy.

Finally, the extrinsic motivation that is seen as the most self-determined is *integrated regulation*. In this case, CT becomes an end, as its purpose is aligned with the individual's needs and values. In other words, the individuals wish to become critical thinkers as this becomes a goal in itself. As an illustration, consider a high school science teacher who has thoroughly embraced the principle of fostering CT in their students. They view the cultivation of critical skills as a fundamental aspect of their educational mission and dedication to delivering high-quality teaching. Accordingly, the teacher structures their pedagogical programs to promote the analysis, evaluation, and questioning of information, prioritizing understanding over mere memorization. In their lessons, they actively foster debate and discussion, urging students to challenge ideas, articulate well-founded arguments, and develop their own critical perspectives. According to Ryan and Deci (2000), *integrated regulation* and *intrinsic regulation* are often seen as synonymous in the literature, but in the case of *intrinsic regulation* it is not the *goal* of the critical process that contains a high value, but the critical process *itself*. Critical thinkers, therefore, derive satisfaction from each phase of their activities, despite the substantial time and effort involved, due to the profound value they place on these processes. This deep commitment ensures that they are open to revising their personal theories in

light of new epistemic evidence and are willing to engage in CT both when confronted with dissonant and consonant information.

Considering the analysis above, we propose that intrinsic regulation not only enhances engagement with the CT process and makes it more appealing, but also ensures that the capacity for critical reflection becomes ingrained over the long term. Ryan and Deci highlight that when motivation is genuine and intrinsic – thus minimally influenced by external factors – it leads to increased interest, enthusiasm, confidence, persistence, creativity, self-esteem, and overall well-being. They further identify three essential psychological needs at the core of intrinsic regulation: autonomy, competence, and relatedness. Consequently, if we recognize CT as a fundamental educational priority, our focus should extend beyond merely teaching CT skills. It is equally important to nurture the associated dispositions, particularly those concerning motivational aspects and the fulfillment of these fundamental psychological needs. But how can we stimulate intrinsic motivations to think critically in students? Our claim is that one of the most promising ways is to try to adopt a critical skills approach to learning that is part of a pedagogy of intellectual virtues. Indeed, our examination of intrinsic motivation naturally progresses to a discussion on the epistemology of virtues, given their conceptual similarities.

A solution: for a pedagogy of intellectual virtues

Most authors writing on CT do not mention the epistemology of virtues (Hitchcock, 2020). Yet this field is interesting in many ways. Its primary object is no longer mental states of belief and knowledge, but *epistemic agents* insofar as they possess intellectual virtues (e.g., moderation in judgment, weightiness, scrupulousness, intelligence) and intellectual vices (e.g., haste, credulity, conformism, stupidity) (Engel, 2001). More precisely, like their moral counterparts, intellectual virtues must be seen as a "middle ground" between two vices,[9] one being an excess and the other a deficit. Here, virtues are understood as: "a deep and enduring acquired excellence of a person, involving a characteristic motivation to produce a certain desired end and reliable success in bringing about that end. What we mean by a motivation is a disposition to have a motive; a motive is an action-guiding emotion with a certain end, either internal or external" (Zagzebski, 1996, p. 137). Thus, since virtues are acquired and they focus on the volitional dimension of the agent, not only are they comparable with dispositions, but they could well replace them in the context of CT. Indeed, a few philosophers (Bailin & Battersby, 2016; Hamby, 2014; Paul & Elder, 1999/2020) already argue that certain virtues are linked to critical thinking – for Paul & Elder, (1999/2020) the eight major virtues of CT are intellectual integrity, intellectual humility, confidence in reason, intellectual perseverance, fair-mindedness, intellectual courage, intellectual empathy, intellectual autonomy. They suggest adopting an "Aretaic Turn" in CT similar to the shift already

observed in various fields of philosophy and argumentation. This approach emphasizes the role of intellectual virtues and vices in shaping effective argumentation practices, offering a complementary perspective to traditional analytical approaches (see Aberdein and Cohen (2016) on Virtue Argumentation Theory). By highlighting the moral and character-based dimensions of reasoning, this view enriches our understanding of what it means to think critically.

These philosophers advocate that the notion of "virtue" is more appropriate than that of "disposition" to define CT, as it allows for a focus on the *value* that the agent places on the critical process. Furthermore, this notion is stronger than that of dispositions as it includes the idea of *perfectionism*. The epistemology of virtues implies (at least in its responsibilist vision) the moral responsibility of critical thinkers to strive, as much as possible, for a good way of practicing CT. In other words, the desire to resolve the dissonance may no longer be the sole driver that generates the critical process, since critical activity and the pleasures associated with it could become, after a lot of practice, a motivation. These characteristics of the intellectual virtues lead us to suggest that intrinsic motivation from the Self-Determination Theory and intellectual virtues have a strong conceptual alignment. Intrinsic motivations explain why we think critically, whereas intellectual virtues delineate our approach to the critical process. But how can we develop intellectual virtues in students?

Although the addition of intellectual virtue training may complicate the already difficult task of teaching CT skills (Siegel, 2016), it does seem to be a fundamental motivational element in ensuring that critical thinkers both engage in the process and persevere on this journey despite the discomforts it may generate. Nieto and Saiz (2011) suggest that fostering the development of dispositions (and, consequently, virtues) must commence by explicitly underscoring the meaning of the process. This awakening to the "why" behind constructing and appraising knowledge through the lens of rationality, or why this mode of thinking holds more allure than alternatives, serves as a catalyst for motivation. Furthermore, in order to sustain this enthusiasm, students must be forewarned about the lengthy and occasionally arduous journey that mastering critical thinking entails. To counterbalance this, elucidating the purpose behind instructing critical thinking becomes paramount. By conveying the advantages, students can gradually internalize the incentives, thereby cultivating intrinsic motivation. In his article, Baehr (2013) also suggests seven feasible and interconnected strategies aimed at fostering intellectual virtues within an educational environment. First, he stresses the importance of a supportive institutional culture (intellectual character growth in students should be part of the school identity). Then he suggests providing students with direct instruction in intellectual virtue concepts

and terminology, with real-world examples; to give them opportunities to practice the actions characteristic of intellectual virtues (e.g., intellectual perseverance, by seeing the task through to the end, or open-mindedness, by listening to the point of view of another student), but also regular opportunities for self-reflection and self-assessment; to establish explicit linkages between the course content and intellectual virtues and vices and to integrate virtue concepts and standards into formal and informal assessments (e.g., paying attention and commending instances of intellectually virtuous actions as they manifest); and finally he insists on the role model that teachers have, stressing out the importance of offering natural and authentic demonstration of intellectual virtues. Indeed, according to Baehr: "The experience of being taught by an exemplar of intellectual virtue can be an extremely powerful invitation to the life of the mind. Witnessing how such a person reflects on, communicates, and feels about her subject matter can have a profound impact on a student's fundamental beliefs and attitudes toward thinking and learning" (2013, p. 259).

To us, these different elements attest the merits of training both in the skills and knowledge necessary for CT, but also (and maybe more importantly) in its dispositions (or virtues) to think critically, which should be considered as virtues. Let us now see how the virtue model can provide a satisfactory answer to the problem of engaging in the critical process (see Figure 2).

We claim that avoiding going from the *acquisition of new information* (initial situation) to the *clarification of the situation* (Step 1) can be linked to a deficit of intellectual virtues. To illustrate that, we take, among all the

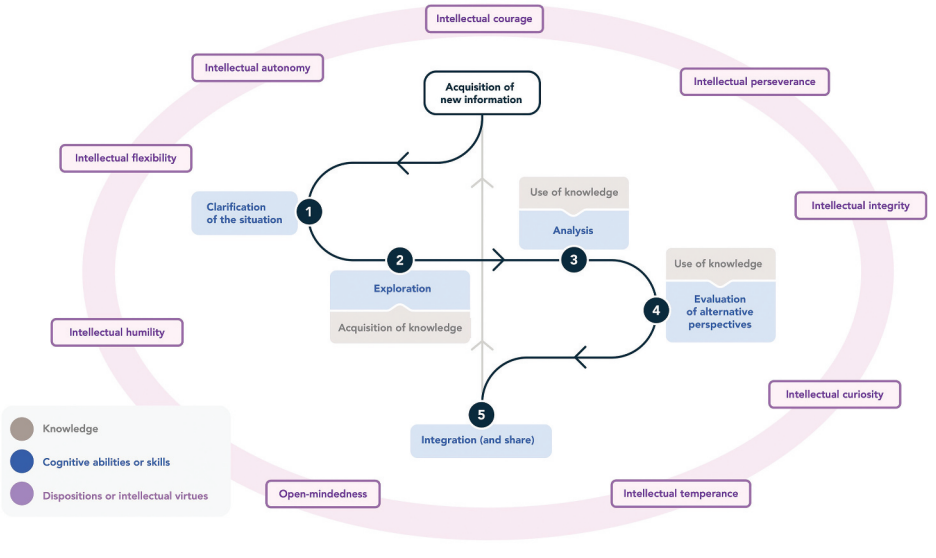

Figure 2. Temporal model of critical thinking skills, knowledge (see Figure 1) and dispositions.

intellectual vices, intellectual cowardice (as a lack of intellectual courage), intellectual arrogance (as a lack of intellectual humility), and intellectual laziness (as a lack of intellectual perseverance).[10] We assume that a virtue-based pedagogy could encourage individuals to engage in the critical process, instead of remaining in a form of intellectual conservatism:

- *Intellectual courage* as a response to *intellectual cowardice*, which means daring to hear ideas that seem less obvious or attractive, and to study them with as much care as the more appealing opinions. Paul & Elder (1999/2020) emphasize that courage also lies in questioning, or even opposing, the beliefs held by those closest to us. This notion thus seems closely linked to intellectual autonomy. For Robert & Wood (2007), intellectual courage consists of facing up to the negative emotions (especially fears) that one may feel in an investigative process, e.g., the fear of being confronted with painful truths, of having our favorite opinions or even our work criticized by others (especially those closest to us), of having our colleagues or relatives develop a bad opinion of us.
- *Intellectual humility* as a response to *intellectual arrogance (or overconfidence)* means to be aware that our reasoning is fallible and that our knowledge is limited but also that some of our heuristics can be problematic in some contexts. It also means understanding that the personal theory may include erroneous elements and therefore that it is important to be skeptical and question it. As Roberts and Wood said: "Humility is a disposition not to make unwarranted intellectual entitlement claims on the basis of one's (supposed) superiority or excellence, out of either a concern for self-exaltation, or some other vicious concern [. . .]" (2007, p. 250–251).
- *Intellectual perseverance* as a response to *intellectual laziness*, a virtue that demonstrates an ability to cope with difficulties, frustration, confusion, and lack of clear answers in investigative work (especially during the *information seeking* Step), sometimes for long periods. Indeed, we saw that the CT time process can be long since it implies many back and forth movements and that "critical success" (the arrival at Step 5) is usually short-lived because new information can be obtained at any time. Intellectual perseverance may also help to endure the epistemic fails. Finally, intellectual perseverance could also translate into a feeling of uneasiness when critical thinkers realize they are going too fast and botch the critical process.

Consequently, we can predict that employing the pedagogical methods suggested by Nieto and Saiz (2011) and Baehr (2013) to develop these intellectual virtues – and many others – could address numerous challenges

that potentially undermine the achievement of CT. However, focusing solely on developing intellectual virtues as opposed to vices by default is not entirely satisfactory. This approach considers only part of the Aristotelian model of virtue epistemology, which posits that virtues lie at a mean between vices by defect and vices by excess. Therefore, it is essential to also consider the risks associated with vices of excess in CT. This broader examination will ensure a more balanced and comprehensive application of virtue theory in the context of promoting CT.

A further need for intellectual virtues: how to reach the end of the process?

As we have seen, CT is a long process that requires much cognitive energy and resources (which does not necessarily mean that it is not enjoyable). While understanding how to *start* and *maintain* the process is fundamental, equally critical is exploring how to *conclude* it. However, this aspect has largely been overlooked. Indeed, to achieve some form of epistemic success, the critical thinker should not explore indefinitely either as they would not be able to bring the critical process to a conclusion and reach its goal: "to believe or do" (Ennis, 2015, p. 32). So, in trying to ensure "critical success" (understood here as reaching Step 5, in Table 1), critical thinkers may encounter several problems that can undermine it. Here are four criteria required to call the process a success.[11]

First, possessing enough resources and critical skills. Developing all the skills related to CT requires time, training, but also an environment that generates and encourages the aspiring critical thinkers (in other words, an environment that allows satisfaction of fundamental psychological needs, such as autonomy, competence, and relatedness). Furthermore, we have seen previously that without a certain amount of knowledge on a subject (which forms the personal theory), it is impossible to think critically. Thus, succeeding in the critical process also implies knowing the extent and limitations of one's skills and knowledge – the development of virtues seems therefore to be crucial.

Second, taking the context into account. It seems clear that not all skills are used in every critical inquiry. It is therefore a matter of making a choice of the skills to be used and therefore considering the context of the subject or of the situation that is submitted to the critical examination. A poor assessment of the critical skills needed in a given context can be akin to a metacognition problem and can lead to a failure of CT.

Third, going through all the steps of the process *at least once*. Some critical thinkers may have the intellectual courage to engage in a critical process, to get involved in Steps 1 and 2 but then, as the discrepancy becomes too strong, they may give up, going straight to Step 5 and deciding they want to reject the new epistemic element (based on their discomfort

and not on the critical analysis). In this case, the process is incomplete and, hence, not successful. Furthermore, the order of the steps must be respected.

Fourth, knowing when to stop. We could imagine a very seasoned critical thinker who has many skills and knows when and how to apply them, but through overzealousness fails to reach the end of the critical process. It is indeed true that in addition to the many backs and forth that critical thinkers must endure, some steps in the process take longer than others. Thus, there is a risk for critical thinkers either to give up, owing to lack of time, or to get stuck in the process. In this regard, Step 2 (*information seeking*) seems to be the riskiest. Therefore, it appears that a critical thinker needs to be attuned to conducting research that, while not exhaustive – since that would be unreasonable – should be both "ample enough" and "good enough". This sensitivity aligns closely with the capability for metacognition.

These observations lead us to consider that a fully successful critical process is rather rare, and that several elements can happen to parasitize it. It is therefore important for us to think about the features that maximize the success of the critical process. In this regard, we need once again to take a closer look at the *virtues* linked to CT, since those motivational components can be used both to initiate the critical process (moving from the initial situation to Step 1) as well as to continue the process to its completion, without giving up or getting stuck at a particular stage. Let's now examine what we might call the vice by excess of CT.

Applied to CT, the vice by excess could be translated into a glut of exploration (Step 2) that leads critical thinkers to never manage to complete the critical process and reach its goal: deciding what to believe or do. And this posture of eternal exploration could once again be translated, from our point of view, into certain intellectual vices:

- *Intellectual relativism* as an excess of *intellectual courage*. Since critical thinkers must be open-minded and curious about all opinions, even the less appealing ones, they may end up with the feeling that it is impossible to make a statement about anything because everyone might be right. In this case, critical thinkers keep on collecting information, without being able to evaluate if some of it is more trustworthy than others (they are stuck at Step 4). Consequently, this vice hinders the conclusion of the critical process.
- *Intellectual self-depreciation* as an excess of *intellectual humility*, which would constitute, as Wright (2021) says an "epistemic self-injustice". This vice can hinder the smoothness of all steps by considering one's own thoughts as non-relevant or biased. As it can be considered a metacognitive evaluation disorder, it could be particularly disabling

during the Step 4 (*evaluation of alternative perspectives*) since critical thinkers would systematically doubt their own conclusions.

- *Intellectual obstinacy* as an excess of *intellectual perseverance*. This vice is characterized by an incapacity to stop the search for new or contradictory epistemic elements. Like intellectual relativism, stubbornness does not allow the critical process to be finalized because it hinders the development of a fruitful alternative (Steps 4 and 5).

Although these vices by excess may be less common than vices by default, they do exist, and we must be wary of them as well. In summary, Table 2 represents the intellectual virtues that we must try to achieve by avoiding both their vices by default (which prevent us from engaging in the critical process) and their vices by excess (which prevent us from finalizing it and achieving epistemic success).

Even if we believe that virtues provide satisfying answers to many problems, we do not claim that they are the ultimate answer to all the epistemic and conceptual problems raised by CT. We are aware that this approach faces an empirical challenge (Flores, 2021). Indeed, the critical thinkers may not know when and how to use certain virtues, since it is not possible to be virtuous all the time (just as it is not possible to think critically all the time). According to Flores: "results in social psychology suggest that people do not robustly behave in trait-manifesting ways. Instead, normatively irrelevant situational influences – e.g., moderate social pressure, mood, framing-have substantial effects on behavior. Therefore, global character traits (which, by definition, are robustly manifested across a wide range of conditions) are rare." (2021, p. 6). Indeed, the conception of virtues as lasting character traits is not empirically defensible. But that's where the other "side" of dispositions comes in: while we have extensively emphasized the motivational aspect of CT dispositions in this article, they also include an aspect that can be described as attitudes or mental habits. As we have said, the motivational aspect is of major importance in initiating and maintaining the critical process. However, as CT becomes more ingrained through practice in various contexts, the application of critical skills (originally activated by motivation) transitions into mental habits. Consequently, the critical attitude remains over time and motivation plays a less important role (Nieto & Valenzuela, 2012). Put differently, virtue transcends the necessity for behavioral confirmation, serving instead as a concept that fosters intrinsic

Table 2. Some of the intellectual virtues related to critical thinking.

Vice by deficit	Virtue	Vice by excess
Intellectual Cowardice	**Intellectual Courage**	Intellectual Relativism
Intellectual Arrogance	**Intellectual Humility**	Intellectual Self-depreciation
Intellectual Laziness	**Intellectual Perseverance**	Intellectual Obstinacy

motivation and mental habits. In contrast to virtues, habits can accommodate exceptions. For instance, should you have a 20-year routine of walking your dog at 7:00 a.m., but one morning your kitchen catches fire, your immediate response would likely be to call 911 and attempt to extinguish the fire, deviating from your habitual morning walk. In this regard, once again, the environment within which critical thinkers operate assumes a pivotal role, shaping the circumstances necessary for intrinsic motivation to arise and for the cultivation of critical skills until they evolve into mental habits.

Conclusion

Our exploration of ideal CT, through a five-stage process, though not empirical nor predictive, has significantly broadened our conceptualization of CT. Our examination reveals a significant gap in the existing literature, which has predominantly focused on the cognitive skills of CT, underestimating the critical role of dispositions in fostering genuine intellectual engagement. In response, drawing on Ryan and Deci's Self-Determination Theory (2000), we applied external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic regulation to CT. We argued that intrinsic regulation, in particular, is paramount for ensuring engagement in the critical process, since it allows critical thinkers to derive satisfaction, despite the extensive time and effort involved, due to the profound value and appreciation they place on the CT process in itself. We also highlighted that when motivation is intrinsic it leads to increased interest, enthusiasm, confidence, persistence, creativity, self-esteem, and overall well-being, making it all the more necessary in order to engage students in such a costly process as CT. Then, by associating intrinsic regulation with intellectual virtues such as intellectual courage, humility, and perseverance, we advocate for a heightened focus on pedagogy of virtues – acknowledging the complexity it introduces to the already challenging responsibilities of educators and teachers. This aspect allows us to make predictions about the outcomes of such an educational focus on CT skills. Specifically, we emphasized the necessity of presenting students with instances of intellectual virtues in action. This entails, for example, illustrating the acceptability of uncertainty and incomplete knowledge, even among teachers, to model intellectual humility effectively. In this regard, while there is a burgeoning research interest in intellectual humility, it is imperative that attention is also directed toward other virtues to ensure that CT is harnessed as effectively and widely as possible. Furthermore, we demonstrated that the drive to think critically resides in a virtuous mean between deficiencies (e.g., intellectual cowardice, arrogance, and laziness) and excesses (e.g., intellectual relativism, self-depreciation, and obstinacy).

This framework not only enriches our understanding of CT but also emphasizes the role of virtue in the cultivation of a critically minded society.

Of course, this paper's scope has its limitations. Notably, we have scarcely discussed the role of *others* in the CT process. Epistemic communities play a crucial role in cultivating intellectual virtues. Awareness of our own limitations and the practice of intellectual humility emerge specifically through engagement with others' ideas and feedback. We deeply regret our inability to delve more deeply into this topic in the present paper. It's essential that future research focuses on the role of others within the CT process, ensuring it is not misconceived as an isolated endeavor. Furthermore, our discussion has only marginally touched upon the affective, environmental, and developmental underpinnings of virtue and vice. Despite these limitations, our model offers a scaffold for examining how these diverse factors influence critical thinking's various stages and how they may intervene in the CT process. As such, this work lays the groundwork for further exploration into the intricate web of influences shaping the practice of CT, pointing toward a holistic understanding that incorporates both individual and collective dimensions of thought.

Notes

1. Instructing CT is notoriously difficult and entails various challenges. These encompass concerns about the transferability of these skills across diverse domains, the decision of whether to present CT as an independent subject or integrate it within existing subjects, and the durability of these skills over time (Lai, 2011).
2. Of course, the converse holds true as well: possessing the motivation for critical thinking, without the requisite skills, yields similarly unproductive outcomes – for example an individual who is motivated to engage in CT, but who lacks the skills to judge source reliability, might mistakenly trust dubious information. Despite their best intentions and genuine effort to think critically, their inability to discern trustworthy information from deceptive or fraudulent content ultimately misguides their judgment and decision-making process.
3. By "relevant new information," we refer to information that holds newfound relevance for individuals. Thus, the information may already be known to others or even to the individuals themselves. It is the aspect of relevance that is novel in this context.
4. As Sperber et al. (2010) pointed out, individuals will not evaluate whether or not to believe information if irrelevant to them.
5. There is, of course, a third possibility: the person may encounter entirely new information, that is unfamiliar to them. In this case, neither consonance nor cognitive dissonance will occur, as their personal framework will lack any existing knowledge on the subject. We argue that, in such situations, it is not appropriate to speak of CT, as the individual does not possess the requisite knowledge to evaluate the relevance of the new information (steps 1 to 5).
6. According to Friedman (2017) the suspension of judgment is a doxastic attitude where the individuals are not able to decide whether or not to believe a statement (e.g., because the available evidence does not settle the question).

7. Here we mean warranted for pragmatic reasons, since we argue that it is always *epistemically* warranted.
8. e.g. to "be alert for alternatives" (Ennis, 2015), to "develop insight into egocentricity or sociocentricity" (Paul et al., 1989), and to show "precision to the degree permitted by the subject and the circumstance" (Facione, 1990) seem necessary at any point in the process.
9. "Virtue, then, is a state of character concerned with choice, lying in a mean, i.e., the mean relative to us, this being determined by a rational principle, and by that principle by which the man of practical wisdom would determine it" Aristotle, *Nicomachean Ethics*, II 4 1106b36 - 1107a1.
10. There are, of course, many more virtues associated with CT. We have chosen these three virtues because they allow us to illustrate more easily the two problems we wish to address, since their vices by default and their vices by excess are easily identifiable For other virtues, such as fair-mindedness, while it's easy to recognize that its default vice is being unfair in one's critical approach, it is challenging to pinpoint what constitutes the vice of excess.
11. Furthermore, succeeding *once* in the critical process according to these criteria does not guarantee that individuals will become critical thinkers. It is indeed the repetition of the different steps, in different contexts, that forge CT in them.

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