Critical Realist Activity Theory

CRAT

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In memory of Jesús José Núñez
my grandfather

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Declaration

I hereby declare that, except where explicit attribution is made, the work presented in this thesis is entirely my own. Word count: 98, 831 words (exclusive of appendices, list of reference and bibliography). The thesis was conducted from October 2008 to October 2011 under the supervision of Professor Roy Bhaskar and Professor Candia Morgan at Institute of Education, University of London.

Abstract

This thesis develops a theoretical-interpretive scheme, a Critical Realist Activity Theory (CRAT). It is argued that learning is a passage through the dialectic, the logic of emancipation and for self-emancipation. The structure of CRAT follows the 1M-5A Bhaskarian dialectical schema to show how the theories of Collaborative Learning, Cooperative Learning, Supplemental Instruction, and Activity Theory (AT) function in a pluralist sense to account for the main critical realist categories of reality — 1M: learning as product (non-identity), 2E: learning as process (negativity), 3L: learning as process-in-product (totality), 4D: learning as product-in-process (transformative agency), and 5A: learning as emancipatory intentionality (reflexivity). In particular, CRAT engages the basic tenets of Critical Realism to provide a philosophical foundation and simultaneously, a resolution to various dualisms that AT suffers from. An immanent critique of AT, as a method of argumentation, is particularly effective for this purpose since it involves taking a theory and its claims about the world and using them to show that the theory is inconsistent with itself. Then CRAT goes on to show, at the level of omissive critique, that a key element that is absent from the historical development of the activity-theoretical approach and explains its dualisms is the omission of a critique of empiricism, i.e., a critique of Humean philosophy. Thereafter, CRAT goes on from the immanent and omissive critiques, a step further with an explanatory critique as a means by which to reincorporate the absent element in AT in order to reclaim and strengthen our perception of emancipatory human praxis. The result from cementing this tradition in a critical realist philosophy is a move through dialectical learning.

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Glossary

Symbols

= mutual equivalence: is, equal, homology, equivalent to

≠ not equal to, collapse

+ plus, and

> greater than sign means constellationally contains within or over reaching, e.g., 2E, constellational contains and presupposes 1M formally so that we could not have 2E without 1M. Furthermore, it is the case that implicitly, we cannot have 1M without 2E, so that 1M tacitly presupposes 2E, and 2E tacitly presupposes 3L, and 3L tacitly presupposes 4D; in Bhaskarian dialectics, we also see that the reverse implication holds

≥ greater than or equal to

→ implication, it follows

↛ does not imply, hold, or follows

↔ mutual implication

√ approval, acceptance, or agreement

χ rejection or any variable

∼ **or -** the negation of, not

φ activity

Domains of reality

d_r domain of the real

d_a domain of the actual

d_e domain of the empirical

Epistemic dialectic

ρ-**transform** rhõ-transform: work or practice requirement to arrive to understanding.

σ-**transform** sigma-transform: emergence and isolation of contradiction, inadequacy, etc.

τ-**transform** tau-transform: rectification of contradiction, inadequacy, inconsistency, etc.

Dialectic

dt dialectical totality

dp dialectical process

dr dialectical reason

$\mathbf{dr}^0$ (non-deterministic) geo-historical product or outcome that results from dp

$\mathbf{dr}^+$ dialectical totality resulting after the resolution of contradictions in dp

Causal-axiological chain

1M first moment non-identity structure

2E second edge negativity process

3L third level totality holistic causality

4D forth dimension transformative agency intentional causality

5A fifth aspect reflexivity

6R sixth realm (re)-enchantment

7Z/A seven zone awakening non-duality

$\mathbf{dr}'$ dialectical result conforming to the Hegelian determinate negation

$\mathbf{dr}''$ dialectical reconciliation as the possibility of theory-practice consistency

$\mathbf{dr}'''$ dialectical reconciliation or unity as the encouragement of an emancipatory society

Abbreviations

AT activity theory

BCR basic critical realism

CHAT cultural-historical activity theory or activity theory for short

CL collaborative learning theory

CLE constructivist learning environment

CN critical naturalism

Coop cooperative learning theory

CR critical realism

CRAT critical realist activity theory

CT computer technology

DCR dialectical critical realism

D-N deductive and nomological, or universal law-like statements

DRIE(C) description, retroduction, elimination, identification, correction

EC explanatory critique

ID intransitive dimension

MC$_1$ meta-critique$_1$ identifies and isolates the omitted element (absence) in a theory

MC$_2$ meta-critique$_2$ explains the causes for the omitted element identified in MC$_1$

MD meta-critical dimension

PMR philosophy of Meta-Reality

PPW post-philosophical wisdom

PRT pre-reflexive thought

RRREI(C) resolution, re-description, retrodiction, elimination, identification, correction

SEPM synchronic emergence powers materialism

SI supplemental instruction

STEM science, technology, engineering and mathematics

TD transitive dimension

TINA Thatcherian catchphrase for there is no alternative.

TMSA transformational model of social activity

TR transcendental realism

ZPD zone of proximal development

Abbreviations and publication year of Bhaskar's bibliography

CI 2010 Contexts of interdisciplinarity: Interdisciplinarity and climate change

DPF 1993/2008b Dialectic: The pulse of freedom

Plato, etc. 1994 Plato etc: The problems of philosophy and their resolution

PN 1979 The Possibility of Naturalism

PMR 2002c The Philosophy of Meta-Reality, Vol. 1

RM 2002d Reflections on Meta-Reality: Transcendence, emancipation, and everyday life

RTS 1975/2008a A Realist Theory of Science

SE 2002a, b From science to emancipation: Alienation and the actuality of enlightenment

SRHE 1986/2009 Scientific Realism and Human Emancipation

The glossary is based on Hartwig's *Dictionary of critical realism* (2007).

Chapter 1

Introduction

1.1 Personal background

Allow me to start at the beginning. I was probably "conceived without sin" during a night of great passion, when a couple of attractive juveniles acted on instinct; at least, this is what I want to imagine. Now, let us visualize my mother's attitude, as a typical Hegelian Beautiful Soul, who was a teenager when she found out that she was pregnant with me—something that she repeatedly tried to terminate, but alas, the embryo hung on—so she was unhappily caught in her predicament. My father, an orthodox Marxist, who was a little older when this shocking, life-changing news arrived, unsurprisingly ignored this immediate responsibility, waving the flag of what seemed to be the grand social cause of the late 1970s. It is too easy to speculate as to how my father chose to reference Lenin and his leftist ideals by naming me Iskra; instead, I like to think that it stood for the possibility of something new (created by two, yet belonging to no one). However, this event was something highly traumatic that would disrupt the rest of both of my parents' lives. They knew very well that since they could not just get rid of "it" due to dubious religious and parental injunctions, they had to embrace "it". To cut a long story short, my parents were forced into marriage only a few months after I was born; they tried to get along, but failed, or rather, succeeded, because what they had created, which had abruptly brought them together, also served to liberate them when they finally separated.

I begin with this story not only to provide a personal background, but because it portrays a particular universality. Let us consider my mother as a metaphor for the acceptance of fate (e.g., the Hegelian Unhappy Consciousness), and my father as a

metaphor for the application of orthodox Marxian theory (e.g., as having the belief that there is a historical development or linear evolution of society in the direction of communism). Together, they create the following logic, which is a central and recurrent theme in this thesis: a potentiality that pulsates in all of us, or following my parents, a spark of liberation and a desire for emancipation, which is how I see our individual drive for learning.

In general, my research interests revolve around understanding, solving, and positing problems. In particular, I am interested in the investigation of structures such as reality, mathematics, learning and language to apprehend various problems or reality. In the educational field, I start with an intuition that learning is a cause of change and with the general feeling that it must be a process that goes on all the time to fulfill the desires, hopes, and dreams inscribed in the very fabric of being. In this sense, we can relate to the basic idea that once we have learned, we realize that there is always something new to be learned — the academic journey of a lifetime.

I began my academic journey through higher education with the study of mathematics, which led me to doctoral studies in the intersection of philosophy of science and education, mainly because I perceived a gap between what learning was for me and the pragmatic slogans that resonated throughout my teaching and learning experiences, such as, "encourage women to pursue science and mathematics". Of course, I agree with such slogans, especially when replacing the word "women" with "each other", but my main problem is that they indicate that we live in world in which we need to advertise it, which, in my opinion, is simply inadmissible. In other words, if we take the slogan as an imperative, then it obviously legitimates a background of societal hierarchy and inequality[1], and if we take it as a suggestion, then it sounds ridiculous. Consequently, all of these experiences amounted to a certain imbalance or apprehension — a yearning for the structure of learning — because I saw the world differently.

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[1] I am referring to what Marx called "right of inequality, in its contents, like every right" (Marx, 1891/1972a, p. 530) that takes activity or labor as the (bourgeois) equal standard. What is implied in this right is a background of societal hierarchy and inequality that recognizes that while each individual is endowed with different creativity or productive capacity as his or her natural privilege, it ignores, for instance, social-class differences. Then the application of this natural right (or privilege) consists in setting up an equal standard by which to measure the creative capacity of naturally different individuals. This equal standard becomes then a natural right that justifies, as Orwell (1945/1955, p. 144) puts it: "ALL [INDIVIDUALS] ARE EQUAL BUT SOME [INDIVIDUALS] ARE MORE EQUAL THAN OTHERS", because from such equal viewpoint, an individual is then inherently superior to another as evidenced in what he or she produces.

Aside from these intuitive, causal, and wish fulfillment elements of learning, we find that there are other aspects that can be developed further. I am referring to what Bhaskar (2008b, p. 165) terms "the components of action". Following Bhaskarian dialectics, these components can be correlated with four realms. The 1M or conative domain shelters our will and includes our desires, wants, needs, and motivations to produce our dispositions. The 2E or cognitive domain contains our discursive knowledge in which beliefs (thoughts or un-thoughts) are exerted, in part, by curiosity or our desires, wants, and needs. For example, while the conative level pushes the individual (e.g., our will, desire, or want), the cognitive level points the individual in the direction that he or she should follow when a push is acted on, so that desire and belief, conative and cognitive, form a couple. We also need to consider the 3L or affective domain that is responsible for issuing our emotions, moods, sentiments, and values. Then we have a realm that most philosophers tend to leave out, 4D, which is divided into the $4D_a$: intrinsic and the $4D_b$: extrinsic categories. The first category is the $4D_a$: these are the intrinsic aspects, which is itself composed of two parts: the (1) competences (capacities for actions) and the (2) expressive or stylistic features of action — capacities of actual performance that are always performed in a certain style, emphasizing the role of aesthetics and bodily gestures. The second category is the $4D_b$: extrinsic conditions, which involve a spectrum of various structures, resources, and so on, ranging from those necessitated by the social system to opportunities and circumstances.

All of these components of action constitute our causal powers as learners, but we need to keep in mind that any flourishing action must include competences (e.g., our practical knowledge, skills, wisdom, and tacit knowledge) and access to facilities — e.g., resources and a contingent domain of possibilities. It is important to highlight that all of these components of action, 4D>3L>2E>1M[1], are first learned and are also subject to further learning and development. The significance of these domains is that learning does not just apply to the 2E (cognitive domain) — e.g., the domain of our beliefs; we also learn at the levels of values, desires, and so on. These four domains are illustrated in the following model.

We can easily imagine that we are constantly learning to reproduce reality without even knowing it; or in Marxian terms, if the point (of learning) is to change it, then in either case, we presuppose a structure for reality itself. For me, the discovery

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[1]The reader is referred to the glossary for symbols.

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Adapted from Bhaskar (2008b, p. 165).

of critical realism (CR) is synonymous with finding a structure for conceptualizing learning. In short, CR provides me with theoretical coordinates by which to put into action its claim that it serves as under-laborer for the sciences. Only after putting CR to work was I able to (1) restructure, in retrospect, previous conceptions of learning and (2) create this complete argument, which involves the following:

> the production of something new; but since whatever is already implicitly or potentially in what was there before, i.e. what already was (cf Solomon: "there is nothing new under the sun"), what is created is always a new synthesis of the new and old, of the manifest and un-manifest, of the ephemeral and the eternal. But what is created also transcends, surpasses, negates, (i.e. absents and transforms) what is already there. What is negated is not what was implicit, involved, enfolded or ingredient as a potential in what pre-existed it. It emerges, consisting in the supra-imposition of a transcendent cause upon an immanent ground, taking shape, form. It becomes objective (is made), standing in its own right, and what has been created, shaped or formed, and made or objectified in this way, then returns, reflecting back the intentionality of its maker, whose intentionality it either fulfills or not. Insofar as it does not fulfill the intentionality of the maker, insofar as it does not reflect back on the creator then its stands as an unfulfilled task; so that every action returns in one way of another to its agent, either confirming or disconfirming the purity and fulfillment of the agent's intention. (Bhaskar, 2002b, pp. 105–106)

This is what creativity means! Furthermore, on a theoretical level, the examples that I use throughout the thesis are non-Platonic vehicles that serve to effectively render a point as overabundance in reality, just as I do with my opening story. More precisely, I use CR to develop a theoretical-interpretative scheme, Critical Realist Activity Theory (CRAT), in which I take the Bhaskarian four-fold polysemy (see Table 1.1, p. 12) to propose that each of its moments functions in our conceptualization of learning against dualist and reductionist forms of argumentation in order to give a pluralist, more complete explanation of learning dynamics. CRAT uses critical hermeneutics that does not attempt to simply assign meaning to phenomena; rather, it sees a relationship between the learner and the world that he or she

is studying. In short, the dual nature of CRAT means that I actually learn from the very thing that I am investigating. In this precise sense, this stance is a very humble position that is oriented to the self-emancipation of individuals through learning.

1.2 What is CRAT?

CRAT is a theoretical-interpretative scheme of the conceptualization of learning. It is a full argument that makes use of the idea of learning as a passage through the Bhaskarian dialectical process: "in dialectic, to be is to be able to become" (Bhaskar, 2008b, p. 167) from self-emancipation or emancipatory intentionality > transformative praxis > open expansive transformation or dialectical sublation > process > to product. In fact, CRAT is a form of double hermeneutics for the investigation of the dynamics of learning, i.e., theory as an interpretive scheme and vice versa, meaning that the investigator is necessarily part of the process as an engaged agent, which entails that there is no "God's eye view" of the investigation. In double hermeneutics, the passage through the dialectic is necessarily changed in the object of investigation; in a reversal, this passage is the very investigation of the object itself that opens up the possibility of change in the investigator as a form of self-emancipation.

To motivate CRAT, I investigate four contemporary learning theories: collaborative learning (CL), cooperative learning (Coop), supplemental instruction (SI), and activity theory (AT). I argue that each of the four theories works, in a pluralistic sense, to provide a more complete explanation of learning as a passage through the dialectic. In particular, AT openly recognizes a set of dualisms that it is not able to resolve. CRAT is able to identify the source of these dualisms and, in the following manner, I argue that CR can be employed to resolve it.

- First, CRAT argues that CR can resolve various dualisms from which AT suffers and identify their source, namely, in their failure to adequately engage in a critique of empiricism, and especially, a critique of the philosophy of Hume.

- Second, it argues that CR can also give a superior account of the historical development of concepts that are very important for AT, including the concept of contradiction. AT takes its starting point in the philosophies of Kant (which implicitly presupposes Hume), Hegel, and Marx. Furthermore, CR critiques Hume, Kant, Hegel, and elements in Marx.

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- Third, CRAT argues that CR also situates the critique of Hegel and Marx in terms of the trajectory of Western philosophy. CR takes this trajectory back to the ancient Greeks and takes it forward through the analytical and dialectical wings of Western philosophy. Thus, CR can situate the historical development of Hume, Kant, Hegel, and Marx in a very comprehensive critique of Western philosophy.

Next, I build these different levels of the Bhaskarian polysemy, i.e., 1M: learning as product, 2E: learning as process, 3L: learning as process-in-product, to 4D: learning as product-in-process, to provide a new dialectical conceptualization of learning, which is further supplemented by an account of the philosophy of Meta-Reality (PMR) at the individual level with 5A: learning as emancipatory intentionality. One of the strengths of PMR lies in its further deepening of ontology and the causal relations between philosophy and society. Although this thesis only conceptualizes five levels, PMR can be employed to thematize two further levels, i.e., 6R: learning as re-enchantment and 7Z/A: learning as the unification of splits, which involves the priority of identity over difference and unity over split, levels that I purposefully leave open for the future continuation of this project. It is important to acknowledge that this thesis can be further developed to conceptualize learning from 1M to 7Z/A because, if there is a basic sense in which unification or unity is primary or more essential than split, then we are looking at a possible argument for the resolution of conflicts.

The significance of CRAT is that it critiques previous learning theories. Thus, the guiding research question for this thesis is as follows: what has been left out from a particular conceptualization of learning? Moreover, CRAT has the potential to question theories that have articulated what tends to account for an implicit, "natural" way of looking at learning and knowledge, such as the aforementioned slogan, "encourage young girls to study mathematics and science", via the problematization of what appear to be common-sensical stances in order to offer a more inclusive account of learning. In CR terms, its importance may be summed up as "a prelude to problematizing the problem itself" (Bhaskar, 2008b, p. 167).

1.3   Three-fold motivation for CRAT

The first motivation of this thesis is derived from a review of the literature about the third generation of AT, also called Cultural-Historical Activity Theory (CHAT), where we can find that Engeström (1999) himself, who is its main author, notices parallels with CR and particularly with the Transformational Model of Social Activity (TMSA) or the idea that we are already thrown into a social structure that we did not create, but that has real effects on us. The TMSA denotes a crucial temporal differentiation in which social structure pre-exists agency. However, what I am trying to do with CRAT is more general. I am proposing to ground AT in a CR philosophy in order to transcend its well-known dualisms. It is well accepted by the AT community that there are certain theoretical problems that it has not been able to resolve and Table 4.3, p. 95 summarizes some of the well-known aporias of AT and how I propose that CR can effectively solve them.

We can immediately ask the following: why does AT suffer from these dichotomies in the first place? The manifestations of dichotomies in AT function as signaling devices that point to the fact that something is wrong with it, namely, an implicit ontology that results in a de-agentification of learning that simply cannot be ignored. This question leads me to articulate two further motivations for developing an ontological-grounded theory of activity.

Against de-agentification, CR re-vindicates ontology and with it, agency. Thus, the second motivation for this thesis is to argue that CR can also give a superior account of the historical development of concepts that are very important for AT, such as learning by expansive transformation, via critiques of Hume, Kant, Hegel, and elements of Marx.

I want to highlight that my point is not to defend the orthodox traditions that characterize the idealism of Hegel or the materialism of Marx as all-embracing philosophical systems, but rather, to recognize their limitations with the arsenal provided by CR. This vantage point allows us to critique traditional doctrines on the basis of their incapability to conceive human reality as a phenomenon that also includes falsity and illusion, which, in my case, is very important because it opens a space for critique, especially the immanent or explanatory critical development of theory.

Thus, the third motivation for this thesis is to move away from traditional interpretations of Hegel and Marx, to understand their limitations, and see why their dialectics, as critiqued and developed by CR, are nevertheless still important for a

new conceptualization of learning. To this aim, I argue that CR can situate the Hegelian-Marxian dialectic, which is simultaneously important for third-generation AT, in a very comprehensive critique of Western philosophy, in retrospect, from the ancient Greeks, and looking forward to both the analytical and dialectical branches of Western philosophy.

1.4 Polysemy argumentative outline: learning is a passage through the dialectic

Through CRAT, I provide a conceptualization of learning that is tantamount to the Bhaskarian dialectic itself, and for this reason, I organize the argument of this thesis in the form of a four-fold polysemy. I also employ one of the three ontological levels of the PMR to conceptualize learning as emancipatory praxis, and to trace the path of future research.

In Chapter 2, p. 15, I conceptualize 1M: learning as product. I argue that this level manifests its own lack, i.e., an element that has been left out from the conception of learning, but one that is already inscribed in a need to account for processes. To this end, I review the corpus of literature on three learning theories: CL > SI > Coop and their applications, consisting of the use of small-group schemes in education, where learning as product refers to research outcomes that show that these schemes improve aspects of each of the four (α) cognitive, (β) conative, (γ) affective, and (δ) expressive-performative domains across various settings and group characteristics — e.g., group composition, size, subject matter, etc. However, these outcomes also display their own lack, namely, of process, which is a large element that these theories are aware they have omitted.

Then I investigate 2E: learning as process. At this level, I argue that learning always involves an *apprehension of incompleteness*, which refers to an element of negativity or the Bhaskarian notion of absence. For this level, I use the same corpus of literature as in 1M, but 2E: learning as process refers to various types of experiences that are typically captured by narratives, patterns of conversations, and other qualitative methods. Such research mainly indicates the ways in which small-group schemes help to foster, for example, the construction of mutual consent among group members.

In Chapters 3, p. 34 and 4, p. 70, I investigate 3L: learning as process-in-product.

To this end, I first explain the historical development of AT. An immanent critique reveals the theoretical dualisms of AT and then lays the foundation for an omissive critique via the identification of the main source that is causing such dualisms; that is, it leads me both to identify that AT lacks a critique of Humean philosophy and classical empiricism and to identity some elements of TINA formation by which AT implicitly pre-supposes CR in terms of its praxis. At this level, I argue that the Engeströmian notion of learning as expansive transformation, which in its perfect form yields a dialectical sublation, can be adapted to better conceptualize learning as process-in-product by emphasizing open systems. In addition, 3L remains incomplete until we determine some action or practice at the next level.

In particular, in Chapter 4, p. 70, I present a literature review on the theoretical research across three generations of AT and the empirical applications of AT according to the mathematics educational community. First, empirical investigations indicate the following.

- While educational research agendas and educational contexts can be organized in terms of what I call a *nested mathematics-educational activity system*, I argue that CR can offer a philosophical grounding by which to see this nested system as part of a more inclusive laminated system of educational contexts.

- The use of AT categories (e.g., subject, instrument, object, division of labor, rules, community) is forced into reality by means of what I call a *fill-the-bucket approach*. From the CR viewpoint, I argue that this approach reveals a deep misunderstanding of the nature of reality itself, a Kantianism that collapses the nature of the reality (ontology) into the knowledge of reality itself (epistemology); or to put it in CR terms, the mathematics educational community commits an epistemic fallacy.

- There are two types of contradictions (e.g., primary or inbuilt and secondary when a new component is introduced into the system) that disturb the dynamics of their respective educational systems. I argue that these contradictions appear as the very signaling devices, indicating that something is wrong with the theory (absence or apprehension of incompleteness) in what the previous level 2E has conceptualized. More specifically, I am not just arguing for a further theoretical level; rather, I argue for the need to attend to the next

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level precisely because the absence is causing contradictions, indicating that something is wrong with the theory.

Second, theoretical investigations indicate that activity theorists are very well aware of the dualisms within this theory and are actively seeking to resolve them. Therefore, I am proposing that basic CR can do so more effectively.

In Chapters 5–7, I investigate 4D: learning as product-in-process. At this level, I argue for learning as transformative praxis, including emancipatory praxis. With this intent, I explain basic CR. The purpose of this initial part is to introduce the Bhaskarian philosophical system, i.e., to introduce a transformative element that requires putting CR to work, and to simultaneously argue that it can resolve not just the activity-theoretical dualisms, but also other dualisms that are important for (social) learning theory in general, with an argument that re-vindicates ontology as irreducible and distinct from epistemology.

Then Chapter 6, p. 183 is an appendix to Chapter 5, in which I review some of the applications of CR. I argue for ontological, methodological, and practical reasons in grounding the conception of interdisciplinary activity in the philosophical substance of CR against actualist, reductionist, and mono-disciplinary forms of argumentation. I am treating this chapter (Chapter 6) as an appendix to Chapter 5 because the key issues that it addresses stem from the tenets of basic CR.

In Chapter 7, p. 220, I explain DCR to illustrate the argument for further deepening ontology. I argue for a new conceptualization of learning in terms of a passage through the Bhaskarian dialectic. At this level, my intention is not to embrace but to transcend the orthodox Hegel-Marx dialectic and its notion of contradiction, which is also important for AT, via a Bhaskarian critique of both the analytical and dialectical branches of Western philosophy.

Chapter 8, p. 276 treats the Bhaskarian level of 5A: reflexivity. Hence, it is fitting that at this level, I engage in a reflection and conclusion of CRAT. To conceptualize this stratum according to CRAT, my main concern is the forms of practices that lead to emancipation as the main goal of education. Thus, I engage some aspects of the PMR in order to develop 5A: learning as an emancipatory intentionality. I argue that although learning is a passage through the Bhaskarian dialectic 1M to 4D, we need both a deep ontology (being) and 5A: reflexivity to stress that (1) learning (as emancipation) cannot be forced on an individual, but needs to be a means of self-emancipation, and (2) learning is the unfolding of what is enfolded within each

individual. Simultaneously, PMR opens a window for me to continue to investigate learning at other levels; specifically, I use some elements of PMR to open up an investigative path for future development, 6R: learning as re-enchanted and 7Z/A: learning as unification over splits, beyond this thesis. To conclude, I offer some implications of what is developed here as a CRAT.

Table 1.1: CRAT argument: learning as a passage through the dialectic

	Causal-axiological chain		
	5-fold polysemy	Ontological conceptualization of irreducible elements	Developed in:
1M: Non-identity	product	learning as product	chapter 2
2E: Negativity	process	learning as process	chapters 3 and 4
3L: Open totality	process-in-product	learning as open expansive transformation leading to dialectical sublation	chapter 5 and its appendix
4D: Transformative agency	product-in-process	learning as transformative praxis	chapter 7
5A: Reflexivity	inwardness	learning as emancipatory intentionality	chapter 8
Guiding research question is: what has been left out from learning theory?			
	Corpus of data		
1M	review of small-group learning theories and their applications in the context of mainly higher education CL > SI > Coop		
2E	review of historical development of AT and its application in the context of mathematics education		
3L/4D	engagement with CR: tenets of basic CR and dialectical CR		
5A	engagement with some elements of the philosophy of meta-reality		

Table 1.1 – *Continued from previous page*

	Methods
1M	quantitative, quantitative and mixed methods
2E	mainly interventionist and mixed methods
3L/4D/5A	applied CR, laminated system on the grounds of maximizing unity-theoretical comprehensiveness
	CRAT argument at each level
1M	It is argued that this level manifests its own lack, i.e., an element that has been left out from the conception of learning as a product, but one that is already inscribed in a need to account for processes
2E	It is argued that learning always involves an apprehension of incompleteness, which refers to an element of negativity or the Bhaskarian notion of absence
3L	It is argued for an open expansive transformation, which, in its perfect form, yields a dialectical sublation, as an incomplete until praxis in 4D, which is grounded on the notion of Bhaskarian open totality
4D/5A	It is argued for learning as the Bhaskarian transformative praxis including emancipatory praxis
	CRAT ontology recognizes all moments of learning
1M	at this level, we are concerned with the **product** (e.g., in terms of statistical outcomes, the use of small-group schemes foster e.g., achievement across various settings and group characteristics
2E	at this level, we are concerned with the **process** (e.g., narratives show that experiences in small-group schemes foster aspects of the (α) cognitive, (β) conative, (γ) affective, and (δ) expressive-performative domains
3L	a key characteristic is open expansive transformation, as an ideal form of dialectical sublation when talking about **process-in-product** as a possibility of knowledge as a growing totality

Table 1.1 – *Continued from previous page*

4D	at this point, **product-in-process**, we need practice, in particular, self-emancipatory practice, which is not imposed, but discovered by putting knowledge to work
5A	at this level, there are two key ideas: (1) learning as emancipation cannot be imposed on any individual and (2) learning is the unfolding of what is enfolded; and education occurs because individuals bring about its realization

Adapted from Hartwig (2007a, p. 10).

Chapter 2

Hermeneutical research of small-group schemes

> If these concepts have a meaning at all, they mean, first, that the notion of structure has a structure[1].

2.1 Introduction

This chapter is a hermeneutical investigation of small-group schemes in higher education in order to construct the initial moments 1M: learning as product and 2E: learning as process of a dialectical conceptualization of learning. The focal point of this hermeneutical inquiry is, metaphorically speaking, equivalent to a queen's gambit in chess as a necessary opening movement of the game. It is the initial move that establishes the structure of the first moment 1M: learning as product, but it is also conditional for any causal explanation or act of emancipation. Following

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[1]In Lévi-Strauss' *Structural Anthropology (Vol. I)* (1963, p. 276) the notion of structure appears tautological; however, what is implicit in the tautology of structure is its substance. Using CR, we know that the world is such that it necessitates a structure for its intelligibility. In CR terms, structure is part of the domain of the real in a stratified world. The structures provide the problems to be considered in the realm of substance (ontology). In this manner, CR allow us to vindicate this Lévi-Straussian view of structure, in which our main concern is not to explain how contemporary structures (e.g. social relations) are the result of the old pre-existing substance, but to rediscover the vestiges of substance that otherwise remain unintelligible. This reversal does not lead to the understanding of the structures and thus the quote as a meaningless tautology; instead, it gives an asymmetrical relation that prioritizes the possibilities of the transformation of the structure that is contingent on the foundations provided by the substance (see Robinsonian notion of substance on p. 218).

Bhaskar's (1994) notion of hermeneutics, this chapter needs to be understood as a synchronic or snapshot view of the world, a necessary initial act of interpretation[1].

> Hermeneutics is thus the necessary starting point for any explanation, and a fortiori emancipatory human science. (Bhaskar, 1994, p. 79)

Thus, this opening move begins with the nature of small-groups schemes and the relevance of their causal efficacy for education in general.

Following Jaques' (2001) conceptualization, small-group schemes appear in a variety of sizes, compositions, and across various contexts; however, such schemes contain the following set of general characteristics.

Perception Participants are aware that they belong to the group.

Needs and/or wants Participants join the group in the belief that it satisfies some individual need or want.

Shared aims Participants have ideas, aims, or expectations that bind them together.

Interdependence Participants are affected by events that affect others in the group.

Social organization Participants act as a social unit with shared rules, norms, powers, emotional relationships, and status. Participants influence others by means of communicating.

Interaction Participants influence others by means of communicating.

Cohesiveness Participants want to remain in the group in order to contribute to its well-being, aims, emotional status, and activities.

Membership Two or more participants interacting for longer than a few minutes constitute a group.

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[1] For Bhaskar (1994), hermeneutics is not just the art of textual interpretation, but also a process of four different cycles: 1) an exploratory inquiry, 2) communication (assumed and overt meaning), 3) exploration into the environment or culture of the communicating participants, and 4) exploration of textual objects; however, these cycles are also subject to recursive revisions at a meta-hermeneutic level.

What have collaborative learning (CL), supplemental instruction (SI), and cooperative learning (Coop) research been doing in practice; that is, in their application of small-group schemes, but to accept a critical realist view (see Figure 1.1, p. 4). For this reason, I use Jaques' definition and the four components of action: (α) cognitive, (β) conative, (γ) affective, and (δ) expressive-performative domains to organize the application of three learning theories—CL, SI, and Coop—in order to build 1M: learning as product or outcome and then as 2E: learning as process. Such findings suggest that the application of these theories to small-group schemes in higher education (and some in compulsory education) appear to work across various domains of the Bhaskarian components of action, as shown below.

Table 2.1: The application of CL, SI, Coop theories according to Bhaskarian components of actions

Theory	(α) cognitive	(β) conative	(γ) affective	(δ) expressive-performative
Findings	knowledge, skills, and academic achievement	positive self-esteem, positive disposition, motivation, attitude, and behavior towards a particular subject matter	intellectual solidarity (struggle) as seen in interpersonal bonds, shared obligations, and supportive, inclusive relationships	elaborate feedback and explanations; various types of asymmetries and matryoshka (or nested) view of knowledge in practice. (This perspective is discussed in page 31).
CL	Derry et al. (2000)			
SI	Karsenty (2009)			

Table 2.1 – *Continued from previous page*

Theory	(α)	(β)	(γ)	(δ)
	Oates, Paterson, Reilly, and Statham, (2005); Blanc, DeBuhr, and Martin (1983); Houston and Lazenbatt (1996)			
Coop	Sahlber and Berry (2002)			
	Springer, Stanne, and Donovan (1999); Slavin (1980); Colbeck, Campbell and Bjorklund (2000); Lou, Abrami, and d'Apollonia (2001); Lou et al. (1996)			Webb (1991); Stokoe (2000); Munger (1996)
		Benwell and Stokoe (2002)		

In the first part of this dialectic, 1M: learning as product, I show that quantitative, qualitative, and mixed-method research from the application of CL, SI, and Coop reveals that small-groups schemes are significantly more effective instructional techniques than merely lectures. Indeed, small-group schemes improve aspects concerning (α) cognitive and performative domains (e.g., knowledge, skills, and academic achievement) and (β) conative domain (e.g., positive disposition, motivation, attitude, behavior towards a particular subject matter). In order to answer the guiding question: what has been left out from a particular conceptualization of learning? I argue that this conceptualization of learning explicitly omits the process, the element for developing a product, and implicitly includes it, in terms of the need to account for the process that is felt out, either in terms of historical backgrounds, narratives, discursive patterns, or other methodologies.

Then the second part, 2E: learning as process, accounts for the "lack" in 1M. However, this inclusion does not mean a dead-end attainment of a conceptualization of learning. Rather, I argue that learning is always consequent upon an *apprehension of incompleteness* based on the Bhaskarian notion of absence (non-being). I show that, although quantitative, qualitative, and mixed-method research shows that

small-group schemes are effective in improving aspects of (α) cognitive (β) conative domains, and in further fostering aspects of the (γ) affective domain (e.g., the intellectual solidarity among members of the group) and (δ) expressive-performative domain (e.g., increase of elaborative knowledge in practice) all is not positive. Aside from the positive processes that foster (α), (β), (γ) and (δ), we have other types of negative processes driven by contradictions (I discuss negative processes in section 4.3, p. 86). The gap between positive and negative, for example, is discernible to us through the signaling device of contradiction (or double bind), arising from incompleteness, or through seeking to remedy incompleteness without contradiction.

2.2 Three theories of learning in collaboration

2.2.1 Collaborative learning

Collaborative learning (CL) is perhaps the most recurrent approach in the educational literature concerned with learning in small groups. In broad terms, CL is an all-embracing term under which we can find other small-group methods, such as cooperative learning (Coop) and supplementary instruction (SI). Smith and MacGregor (1992, p. 9) explain:

> "Collaborative learning" is an umbrella term for a variety of educational approaches involving joint intellectual effort by students, or students and teachers together. Usually, students are working in groups of two or more, mutually searching for understanding, solutions, or meanings, or creating a product. Collaborative learning activities vary widely, but most center on students' exploration or application of the course material, not simply the teacher's presentation, or explication of it.

I use the inclusion > (greater-than sign), as such CL > SI > Coop, to emphasize that CL is the all-embracing theoretical framework that contains SI and Coop. The CL approach assumes that learning is an active, constructive, and purposeful process that depends on contextual conditions and learners' diverse perspectives. The main rationale for implementing CL is to reach consensus among students and instructors in order to encourage civil responsibilities that ultimately benefit a democratic society. In particular, Light and Cox (2001, p. 115) argue that in higher education, CL small-group schemes are not simply alternatives or supplements to

lectures, but important learning experiences where undergraduates and instructors come together for an opportunity to explore and change conceptions, away from, as they argue, the "purgatory" of large lectures. Thus, applications of small-group learning theories are worth investigating in their own right.

The application of CL theory shows that small-group schemes improve learning products or outcomes. For example, Derry et al. (2000) applied CL theories to a new statistics course for the undergraduate curriculum at the University of Wisconsin in Madison. The study shows how CL groups improve (α) cognitive domain, particularly students' ability to reason about statistics; however, an inherent problem of grouping is that some students see these schemes as a burden. A major conflict stems from the discrepancy between two types of educational goals: (1) the goal of some students who want to understand, and (2) the goal of other students as consumers who just want a "rapid career entry, efficient credentialing, and strong performance on standardized tests" (ibid., p. 786). On the one hand, the product or outcome of this implementation of CL theory reveals that small-group schemes are vehicles to improved academic skills. On the other hand, such an approach also reveals conflicts and, in particular, shows that there is an omitted element from this conceptualization of learning dynamics; namely the process, as illustrated in their reflection.

> Our interpretation of that [CL] theory in practice involved situating much of the instruction in our class within authentic social problem-solving activities related to students' career goals. *What we failed to realize is that "conventional" instruction comes with a long history of having been situated within powerful cultural contexts that may tend to work against the aims of reform-based instruction.* (Derry et al., 2000, p. 767, emphasis added).

This study exemplifies the logic of product (or outcome) because in their reflection, the authors admit to having failed to account for the process as the context of instruction. Using this example, I aim to illustrate that, although products or outcomes constitute an important synchronic or snapshot perspective of reality to articulate a conception of learning, the very moment learning is conceptualized this way, it presupposes the process, which it does not explicitly articulate or completely theorize—which it therefore "lacks". In the words of Derry et al. (2000, p. 767), such products always come with their own "long history". In this sense, the first level in

our conceptualization of learning, 1M: learning as product includes, as the outcome of learning dynamics is always product plus the omitted or "lacking" element, the need to account for the process. Other similar approaches that fall under the CL rubric and that are relevant to conceptualizing 1M: learning as product, and then 2E: processes are supplemental instruction (SI), and cooperative learning (Coop).

2.2.2 Supplemental instruction

Supplemental instruction (SI) was based on CL theory in the late 1970's at the University of Missouri in Kansas City (Blanc, DeBuhr, and Martin, 1980). Developed by Deanna Martin, the approach aimed to reduce dropout rates by offering tutoring services to advanced undergraduates to students who were at risk of failing their classes. Although SI was initially designed for students in the health sciences, its successful application was extended to other subjects in the sciences and arts; across institutions, it became a cost-effective alternative to one-to-one tutoring, which was made financially inapplicable by budgetary constraints. According to Topping (1996), over 300 US institutions and more than 15 universities in the UK are now doing training in this approach or in other related approaches, such as Coop and peer tutoring.

The very word "supplemental" in the SI title presupposes that there is something systemically lacking that needs to be remedied. Once again, we have the logic of product; however, what exactly needs supplementation? Karsenty (2009) gives an example of non-professional tutoring as a supplemental strategy to raise low-achievement in mathematics at a secondary school in Israel. This supplementation, aside from improving aspects of (α) cognitive, (β) conative domains as seen in increments of level of achievement and attitudes toward the subject matter, also revealed positive outcomes in (γ) affective domain, in terms of shared obligations between non-professional tutors and tutees. This phenomenon extends to higher education institutions where we encounter a culture of remedial mathematic tutorials designed to reach ethnic minorities with academic "deficiencies". The introduction of Treisman's (1985) model, designed at the University of California in Berkeley, exemplifies the shift in perspective that moved "deficiencies" from minority students and expanded the parameters to include a culture of honors programs. This model of undergraduate tutorials was significant because it was more inclusive; it aimed to explicitly affect the (γ) affective domain by attracting all students that could

benefit from problem-solving instructions with expert tutors, such as lecturers or doctoral candidates. Later, variations of this model spread to other departments of mathematics in the US under diverse names such as peer-tutoring or peer-teaching programs, as elaborated below.

Although the idea of peer tutoring is traced back as far as the ancient Greeks, Topping's (1996) literature review provides a topology of ten layers, which can be reduced to the following three general headings.

Tutor-tutee role There is a clear distinction between the job of tutor and that of students, e.g., these roles can range from various types of tutoring groups, ability, years of study, role continuity, and characteristics of tutors and tutees.

Curriculum content concentration Peer tutoring is organized, meaning that there exists an object, project, or outline that is set by the institution and which works as guide to facilitate and delineate the scope of subject matter to be covered or already covered in lectures.

Guided interaction Tutors undergo training by some institution or university on the type of structure of interaction, educational material, and ethical considerations, which tutors and tutees have relative freedom to modify, e.g., there are allocations for specific place and times for tutorials.

As a substantive review of different types of peer tutoring, this study indicates their effectiveness in terms of learning outcomes or gains in (α) cognitive domain in terms of achievement, but remains skeptical about the long-term cognitive impact of these schemes on tutors and tutees' abilities and transferring skills.

For example, Houston and Lazenbatt (1996) report a peer-tutoring study of a first-year mathematical module in the UK. This evidence shows a clash between students' goals of collaboration and completion; specifically, (although outcomes show that small groups promote autonomous learning and achievement) some students are reluctant to accept peer-assessment and are perceived as immature or unaccustomed to engage in such work.

> These reactions can be explained by an understandable nervousness in the face of innovation. Since the majority of students have spent their learning lives in a system which promotes competition, several clearly found difficulty in adjusting to a new system where yesterday's competitors become today's collaborators. (ibid., p. 259).

Thus, the main point is not that it is evident that in peer-tutoring schemes there is a discrepancy between collaboration and competition, which proves consistent with previous conceptualizations of learning as outcomes. Rather, this differentiation illustrates that an element, which in this case is collaboration, has been left out but is simultaneously inscribed into a learning system that has mainly promoted competition in the past, as the authors suggest.

In a peer-teaching related study, Oates et al. (2005), argue for the implementation of small-group tutorials in departments of mathematics, as their effective outcomes demonstrate positive performances from students as well as from tutors, many of whom are working as prospective teachers in a mathematics diploma course. Their perception of outcomes in peer-tutoring schemes follows the slogans of "learning by teaching [and] to teach is to learn twice" (ibid., p. 733). In other words, the moment of conceptualizing a product (of learning) already presupposes a process (of teaching). Such small-group schemes are shown to be mutually beneficial to tutors and students, which also support the view that underneath learning products are inscribed processes as students gain practice with mathematical concepts and procedures, and are ways for tutors to develop insights concerning whether or not to pursue a teaching career.

2.2.3 Cooperative learning

Johnson and Johnson (1999) define cooperative learning as an approach based on Smith and MacGregor's (1992) CL, which is a model for small groups of two to four students working and supporting each other with the purpose of accomplishing a shared goal. Coop refers to "classroom techniques in which students work on learning activities in small groups and receive rewards or recognition based on their group's performance" (Slavin, 1980, p. 315). There are five basic elements that are needed for cooperative groups.

Positive interdependence The establishment of a "mutual learning goal" between all members of the group (Johnson & Johnson, 1999, p. 71).

Individual accountability The responsibility of each of the two to four members in the group, i.e., each member is assessed and overall results are also given to the group.

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Face-to-face promotive interaction Verbal interactions such as assisting, encouraging, supporting, praising, but also includes nonverbal interaction such as body or face expressions.

Social skills Aptitudes that must be taught; interpersonal skills are such particular abilities as trust-building skills, leadership, communication, and conflict-management, to name a few.

Group-processing A reflection on the group performance by engaging each member to identify and solve the problems that prevent the group from working effectively.

The following section illustrates how various quantitative studies based on Coop techniques show how small groups improve (α) cognitive domain (e.g., knowledge, skills, gains in academic achievement) and (β) conative domain (disposition, positive attitudes toward the subject matter) from meta-analysis studies in compulsory education and from grouping students in science, technology, engineering, and mathematics (STEM) programs.

2.3   1M: learning as product

In 1M, I investigate learning as a product. I refer to quantitative and mixed methodological research that examines (α) cognitive and (β) conative domains in terms of students' academic achievement as measured by examinations and positive attitudes as products of learning. These studies are generally quantitative in nature and range across various STEM courses. The purpose of this initial conceptualization of learning as product is to show that it lacks learning as process, and this is a constitutive element of the very investigation and highlights a need for further research.

Sahlberg and Berry (2002) for instance, highlight three general products of the application of Coop theory to small-group schemes in the context of compulsory mathematics.

> [First] small-group learning... will bring about at least equal academic achievement among all students... [when] compared to more traditional methods of teaching... [Second]... working in pairs (as a form of small group) may be particularly effective in learning mathematics... [Third]

small groups are especially powerful in developing mathematical problem-solving skills in school. The role of higher quality interaction and more constructive activities together with increased time-on-task may well explain why this seems to be the case. (ibid., pp. 90–91).

Such products remain consistent since the application of Coop theory in the 1980s. Slavin's (1980) meta-analysis is one of the earliest comprehensive reviews that report that Coop groups are significantly better mechanisms to improve (α) cognitive domain in terms of academic achievement (as measured by examinations) over traditional classroom techniques. These groups also impact the (β) conative domain in terms of concept identification, judgment, analysis of problem, decision-making beliefs, self-esteem, and a like for the subject matter, including the (γ) affective domain, as they promote a consistent effect on mutual consent. However, we see that what is missing from the Coop conception of learning as outcomes is already inscribed in the need for a further level, as articulated by Slavin in the following statement:

> the next steps in research on cooperative learning should be directed at explicating the conditions under which these techniques can maximally influence student outcomes ... Research on cooperative learning techniques represents an unusual event in the history of educational research. The techniques arose out of social psychological theory... there is a need for further [processes such as] investigations of interactions, limitations, and extensions of findings, but the basic model has been validated in classroom settings. (Slavin, 1980, pp. 338–339)

In other words, such reflections reveal an awareness of the need for further research into the conditions for outcomes, interaction, extensions, and limitations, i.e., the processes behind such effective products.

Similar products are reported in Lou, Abrami and d'Apollonia's (2001) meta-analysis of 122 studies of small-group schemes versus individual learning with computer technology (CT). They show that such schemes foster (α) cognitive domain (e.g., the gains in achievement when comparing small groups and individualized settings). The key problem is to find the variables that affect social settings and the optimal conditions for effective small group learning. Their findings are consistent with a study by Lou, et al. (1996), who also found a positive effect on

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achievement. For instance, low-ability students benefited from being in heterogeneous ability groups, medium-ability students benefited from homogeneous ability groups, and there was no significant difference in the group homogeneity for high-ability students. On average there was a small but positive effect in terms of social context on students' individual achievement compared with a moderate effect on group task achievement. In addition, results suggest that small groups gain more CT knowledge than students who work individually, but we also see that students completed tasks faster and got more help from teachers when working individually than in groups. Colbeck, Campbell, and Bjorklund's (2000) analysis of STEM groups also reveals that an important outcome is related to the benefit of (β) conative domain (e.g., students' social cognition, self-esteem, verbal interaction, usage of appropriate strategies, and positive attitudes toward work). Moreover, when investigating the difference in products between small group and whole-class instruction, and also among homogeneous and heterogeneous groups, Lou et al. (1996), acknowledge that their investigation is just an initial state:

> now that we have moved closer to determining whether within-class grouping is effective, when it is effective, and with whom it is effective, it is time to devote greater energy to understanding why it is effective. We hope this review sets the stage for such inquiry. (Lou et al., 1996, p. 451)

To paraphrase the above quotation, the authors' call to understand the reasons why we see such products as a second step or moment in the conceptualization of learning, or what I have termed, 2M: learning as process.

In undergraduate STEM programs, we encounter analogous products. For example, Springer, Stanne and Donovan's (1999) meta-analysis report advances in the (β) conative domain as students' attitudes became more favorable toward the subject matter when they spent more time working in groups. However, these outcomes also show their own void, a major element that the theory takes for granted, but one that is suggested for future conceptions of learning, as exemplified in the quote:

> Much work remains to move beyond a "black box" approach and to gain a greater understanding of how and why small-group learning [or tutorials] is effective... Perhaps *the most important component of future analyzes is the need for more detailed descriptions of small-group processes or procedures by investigators or instructors who report research*

> *on the effects of their work.* (Springer, Stanne, & Donovan, 1999, p. 41, emphasis added).

Good, Mulryan and McCaslin (1992, p. 165) concur with such small-group products and with the need to investigate what has been omitted or left out by making an explicit "call for programmatic research on small-group processes" in the particular context of compulsory level mathematics.

The move from 1M: learning as product (or outcome) to 2E: learning as process requires that we see the importance of the Bhaskarian notion of absence or non-being: the element that has been left out, or in the case of learning, the things that we do not know that simultaneously drive the dialectic of learning forward to register in some problematic or contradictory form, as in the need for processes, which I associate with next 2E level of process.

2.4   2E: learning as process

In 2E, I investigate learning as process. I refer primarily to qualitative research studies that inquire into students' perspectives, verbal interactions, and narratives as processes. The purpose of this second move in the conceptualization of learning as a process is to stress that learning always involves an *apprehension of incompleteness*, which refers to an element of negativity or the Bhaskarian notion of absence or non-being.

In principle, we can distinguish between two types of processes: (1) processes driven by contradictions (e.g., research is illustrated by the application of AT in mathematics education in section 4.3, p. 86) and (2) a purely positive process that is developing but not as a result of being generated by contradictions—e.g., the research that small-group schemes are effective teaching techniques to gain (α) cognitive domain (e.g., knowledge, skills) and (β) conative domain (positive dispositions, attitudes, behaviors). In addition, this section further shows that small-group processes encourage progress at the level of (γ) affective domain (e.g., in terms of the intellectual solidarity and related forms of solidarities such as ephemeral or lasting friendships among members of the group) and (δ) expressive-performative domain (e.g., in terms of various elaborative ways to apply knowledge). The difference between these two types of processes concerns whether such apprehension of incompleteness is brought into being by contradictions or whether we are acute enough

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to be aware of incompleteness of knowledge and concerned to remedy it without the spur of contradiction. More specifically, what is here called an *apprehension of incompleteness* refers to the idea that even in (2) the case when we can learn by advancing without contradictions; we still recognize that there is something more to be learned. In this sense, learning is a never-ending process. In both of these types of processes, namely (1) the case when there is a gap or delay in learning generated by encountering contradictions or some other form of acute negativity, and (2) the case that we learn without contradictions by experiencing a joy in learning, we see that there can be other reasons, such as having an obsession for diligence and discovery. In principle, we always encounter an apprehension of incompleteness because when we learn something, we are always effectively rectifying an absence or an error in our pre-existing knowledge! At a purely theoretical level, we may account for all particular cases that regard learning as complete, as a totality. However, we still want to explore the boundaries of learning to investigate if there are structures that we can identify or apply to other domains. For example,

(a) learning without contradiction generates positive diligence either as a type of joy in discovery or a type of obsession. This diligence is a type of continuous flow of uninterrupted production.

(b) learning with contradiction is the case of coexistence of these two, which generates tension, problems or some other form of acute negativity.

(c) contradiction without learning is the case when there is a contradiction without resolution in learning, which generates a delay and it tends to stimulate more contradictions that produce others, a proliferation of contradiction.

(d) no contradiction and no learning is the theoretical starting point, a type of "Big Bang" point or a Bhaskarian un-thought space[1].

In general, we have an asymmetry[2] in all these elements denoting a gap, even in the case of (a) a purely positive sense, so that we can see that once we learn something

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[1]This un-thought space refers to the idea of retroactively positing the learning process because "nothing new ever comes from thought (of from the past or future), it always comes from un-thought (now), from a space between, behind or beyond thoughts (in the present). It always comes from a suspension of thinking, or a moment of supramental consciousness erupted in space in the discursive process of thought" (Bhaskar, 2002c, p. 105).

[2]For list of the main asymmetries, the reader is referred to Appendix B on page 289.

there is always a new element, (i.e., something more to be learned), and thus when I mean that learning always involves this apprehension of incompleteness, I am referring to such a gap, or what Bhaskar (2008b) calls absence.

To further illustrate this point, I consider the Bhaskarian exposition of the history of scientific revolutions as an example of this dialectical process of learning, which requires that we see the importance of absence in what is here conceptualized in terms of an apprehension of incompleteness. At the time of a great scientific revolution there is a very distinct phenomenon that occurs as follows: normally a new theory will be able to explain almost everything that an old theory could not explain and some even more. However, in the case of science, (and perhaps even more so in the case of art, literature, etc.) often a new theory changes the terms of understanding so drastically that it ceases to be interested in some other aspects of what an old theory explained or appeared to explain. An example of this drastic change is the seventeenth-century scientific revolution headed by Newton, because it revolutionized our perspective of physics and mathematics. However, there were elements of reality in which science cease to be interested, such as the role of intuition in everyday life and lay practices of healing, which according to Bhaskar (2008b), is a point already made by Hegel in *Phenomenology*. In general, we can argue that the history of great scientific discoveries is not an unadulterated gain; but in fact, we lose some aspects of our conception of reality with new theories. This loss of valuable content is what Bhaskar (2008a, p. 195) calls "Kuhn-loss", after the sociologist of science Thomas Kuhn[1], who Bhaskar nevertheless criticizes for exaggerating this phenomena, and for the way he presents it without an explicit ontological realm separate from knowledge. Such realm of knowledge without an explicit ontology results in:

> neither transformation nor discursive intelligence, but an archetypal, intuitive understanding constructing its world in a single synthetic act. (Bhaskar, 2008a, p. 258)

However, in a theoretically perfect form of learning, what Bhaskar (2008b) calls dialectical subletion (Aufheben) we would not leave out, suppress, or forget anything. For example, the loss of content or "Kuhn-loss" is something that disconnects from what we previously knew. When we are studying statistics, for instance, we might

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[1]In Kuhn's *The structure of scientific revolutions* (1962/1996).

forget how to take derivatives. Another example of "Kuhn-loss" is the collapse of the Berlin Wall in 1989, in which people in the Eastern Bloc thought that they were gaining a ticket to freedom, but at the same time arguably, they lost elements of security, healthcare, and education (these are all aspects of positive freedom; so that these people did not perceive the sum or balance of the freedoms they were also losing in gaining aspects of political and economic liberties). With the dawn of modernity, we see that capitalism works very effectively to dissolve such traditional ties, such as bonds of friendship, solidarity, and so forth, but also from this dissolution, a new form of solidarity and struggle needs to emerge.

At this point, I refer back to the application of the CL > SI > Coop theories to show how these new forms of consent and understanding can emerge from research into the level of 2E: process. As we have seen, research into small-group schemes shows effective outcomes in terms of gains in the (α) cognitive and (β) conative domains, and research into various processes mainly shows gains in the (γ) affective and the (δ) expressive-performative domains. For example, Webb's (1991) quantitative review of empirical research shows correlations between verbal interactions and student achievement in small groups of mathematics students at compulsory levels. From a Coop viewpoint, Webb argues that knowledge of processes is needed to understand why positive effects, such as increases in achievement, have been reported in the research. Her correlation analysis indicates that there are certain desired types of verbal interactions. For instance, the types of interactions that give elaborative explanations, detailed rationale, causes, motives behind a topic, and comprehensive feedback, as opposed to other types of exchanges such as non-descriptive verbal assessments that range from a simple "bad" mark to a "good" mark. Thus, the (δ) expressive-performative domain plays a role in which elaborative feedback contributes positively to learning processes, while non-descriptive verbal assessments and no feedback at all contribute negatively to learning processes.

Exemplifying the logic of 2E: process, Smagorinsky and Fly (1993, p. 169) argue that "most research on the effectiveness of small group has examined the products of group work rather than the discourse that takes place with the group". This study examines patterns of talk in various Coop groups following an initiation-response-feedback modelled after Sinclair and Coulthard (1975). The finding reveal similar learning processes that affect the (δ) expressive-performative because they show a dependent relationship between instructor's engagement, clarification, elaboration

of the explanation of procedures and discussions, and the way in which students are able to reproduce verbal feedback among other their peers in small groups. Along similar argumentative lines, Benwell and Stokoe (2002) report that university tutorials have a positive effect in the (δ) expressive-performative domain by means of identifying the underlying pattern. Such pattern, in general, increases in the type of verbal comprehensiveness during an interaction, e.g., from an opening or welcoming remark, a clarification of task, a negotiation of knowledge that is common to both parties, and the elaborative feedback about the task under scrutiny. In fact, Benwell (1999) encapsulates this increasing pattern as a key characteristic of tutorial interactions with the analogy of a Russian matryoshka doll, because the pattern goes from a general introductory topic to more refined topics that require more elaborative feedback in the context of SI small groups. In the context of English university tutorials, Munger (1996) reports on a close examination of akin nesting-like dynamics during interaction, and shows that (γ) affective domain is impacted by means of the tutor-tutee roles, which are not rigid, but rather constantly battling against the construction of their own institutionally set identities in a type of struggle of intellects. In a later study, Benwell and Stokoe (2002) continue to report on the impact of small groups in different university context in the (δ) expressive-performative domain. The study identifies that discursive patterns involve a shift in the asymmetrical interactional dynamics between the tutor-tutee dyads and the "power that is institutionally invested in the roles of the tutor means that rules of politeness that would otherwise hold in interaction between equals are, in context, suspended" (Benwell & Stokoe, 2002, p. 435). Thus we see that research into learning processes is mainly concerned with patterns of verbal interactions between the asymmetrical relations of tutor and tutee(s), which tend to be characterized as the nesting of topics from general to more specific ones; however what is most important is not the pattern per se, but the irreducibility of the asymmetry (of knowledge, age, institutionally invested roles, and so on) of the tutor-tutee dyad. Such irreducibility is important because it opens a space for debate, mutual consent, struggle of intellects, academic solidarity, and understanding of the parties involved, which affect both (γ) affective and (δ) expressive-performative domains.

2.5 Conclusion

In particular, this hermeneutical investigation of small-group schemes reports on the applications of CL, SI, and Coop theories to conceptualize the following levels in the dialectic of learning, 1M: learning as product (or outcome) and 2M: learning as process. The application of these theories shows that small-group schemes contribute to foster aspects of the:

(α) **cognitive domain** The findings that appear to affect this domain include the improvement of levels (rates, etc.) of achievement, various types of knowledge and skills when comparing small groups and individualized setting, large lectures, computer-aided setting, and so on.

(β) **conative domain** The findings that suggest an impact in this domain include positive attitudes such as an increased confidence and self-esteem, and a liking for the subject matter.

(γ) **affective domain** The various tutor-tutee asymmetrical roles, academic struggles, agreements, consent, and solidarity among members of the group are typical findings in this domain.

(δ) **expressive-performative domain** The findings that impact the affective domain refer to the application of knowledge in terms of elaborative explanations and feedback, which tend to follow a nested or matryoshka-like pattern from the general to the specific topic.

I have argued that at the 1M stratum of this conceptualization of learning as product manifests its own "lack", which is an element that has been left out from the conception of learning, but one that needs to be account for, which is the next stratum of process. Further, an important idea is the transition from 1M to 2E, which requires the Bhaskarian notion of absence or non-being. Although this 2E stratum is essentially a dialectical process in which incompleteness or some other problem in existing knowledge is shown to generate contradictions and other forms of inadequacies, which are resolved by a more complete understanding; that is, in terms of the growth and development of learning in pupils, we see that a possible problem with this level can emerge if we follow an orthodox branch of Hegelian-Marxian thought, which would assume that we could not have learning without contradictions. In contrast, CR asserts that it is possible.

Moreover, I have argued that 2E always involves an apprehension of incompleteness. Such apprehension generates (1) negative processes, such as contradictions, dilemmas, and problems (I report on these types of processes, driven by contradictions, in section 4.3, p. 86). It is also possible to see (2) positive processes in the case that the response is not to wait for a contradiction but to realize that our theory or understanding is likely to be incomplete, so that there is a step taken to a more expansive standpoint.

In the next chapter, I engage with the historical development of another contemporary learning theory, Activity Theory (AT), and thus with the move from 2M: learning as process to 3L: learning process-in-product.

Chapter 3

Historical development of activity theory

History is what hurts, it is what refuses desire and sets its inexorable limits to individual as well as collective praxis, which its "ruses" turn into grisly and ironic reversals of their overt intention. But this History can be apprehended only through its effects, and never directly as some reified force. This is indeed the ultimate sense in which History as ground and untranscendable horizon needs no particular justification: we may be sure that its alienating necessities will not forget us, however much we might prefer to ignore them[1].

3.1 Introduction

An effective explanation of Activity Theory (AT) is a hermeneutic task that begins with an examination of its philosophical roots and then traces its development through three generations. This investigation has three parts. First, (1) an immanent critique[2] shows the problems within this theory. A historical account of

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[1] The notion of History is adopted for this chapter here is taken from Jameson's *The political unconscious: Narrative as a socially symbolic act* (1983, p. 88).

[2] Following Bhaskar (2009), the distinction between meta-critique$_1$ (MC$_1$) and meta-critique$_2$ (MC$_2$) is as follows: while MC$_1$, see Figure 6.1 on p. 217, is directed at the identification of ills, absences, constraints, or incompleteness, MC$_2$ is directed at the explanation of the identified ills, absences, etc., such that if it finds a theory that is defective, then MC$_2$ is directed toward explaining the reasons that cause the social reproduction of such false theory. MC$_2$ is a totalizing argument (logical or transcendental) for a Bhaskarian explanatory critique, i.e., a critique of facts

three generations of AT reveals that (1a) several theoretical dualisms were present from the onset; and (1b) further that an implicit ontology allows activity theorists to presuppose Critical Realism (CR) in practice. I claim that the development of AT is marked by an attempt to resolve contradictions, which are a signaling devise pointing to the need for some theoretical expansion. In particular, the enhancements to the unit of analysis, the analytic lens from which learning is perceived, are evidence of the attempts to resolve contradictions. Such attempts to mend theoretical dualisms function with what I term as *patches* because they are mechanisms that sustain gaps in practice. Each of the three *patches* works as (a) an enhancement of the theory in response to contradictions or signaling devices from the previous generation of AT; however, (b) a *patch* is only partially unsuccessful in resolving dualisms, so that after a period of time, it reveal aporias, contradictions, and so on, hence signaling the need for further developments. (c) A *patch* also generates in practice inconsistent TINA formations[1] when are applied. Indeed, (d) the *patch* itself is a type of TINA formation because theorists are committed to sustain it through the history of AT. Then, this immanent critique leads to (2) an omissive critique (or meta-critique$_1$, MC$_1$) of AT. This critique identifies the omitted element (or absence) that is causing the theoretical dualisms of AT; namely, the omission of a critique of Humean philosophy and classical empiricism. After effectively isolating

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and values. In this sense, we find that the identification of absences is prior to their explanation. In other words, explanatory critique is logically contained in their identification, MC$_2$ >MC$_1$. The idea of immanent critique, a type of MC$_1$, involves taking what a theory is and its claims about the world and using it to show that it does not get what it wants. From this perspective, we identify an inconsistency between theory and practice. The classic Bhaskarian example that perfectly illustrates this logic is to refer to Hume, who argued that there are no good grounds for preferring to leave a building by the second-floor window rather than by the ground-floor door, but yet Hume always left such building by the ground-floor door. This example shows a theory-practice gap or contradiction. In other words, we do not externally bring our grounds to the theory, but instead we look at what the theory or the theorist wants to achieve, and then show the impossibility of achieving it, in the way that it sets out to do this. Any critique needs to include a moment of immanent critique; but of course, e.g., omissive critique or the Achilles' Heel critique (AH), a type of MC$_1$, in which we want to find a weak point of a theoretical edifice. Thus, if we have independent reasons for thinking that a theory about the world is false, then we have another form of critique of a purely factual account of the world to an evaluative account of the world in which we come to see that the world is false, wrong, upside down, absent, or negative. In turn, a negative account of the world is the motivation to search for a transformative theory, which will allow us to transform the world.

[1]In CR terms, TINA is an acronym for the Thatcherian slogan "there is no alternative" (Bhaskar, 2008b, p. 113), but does not mean that one follows Thatcherism. This logic refers to an unavoidable necessity for defense, and security mechanisms, formations, and connections that reinforce theoretical dualisms in the form of practicing a false theory.

and explaining the source of theoretical dualisms within AT, I propose a resolution; namely, the grounding of AT in a critical realist philosophy. However, a superior theory is necessary to rectify dualisms, thus I engage in a (3) proto-explanatory critique (or proto meta-critique$_2$, MC$_2$ by utilizing some of the elements of basic and dialectical CR (which are subsequently developed in Chapters 5 and 7, respectively).

In addition, this chapter thematizes 3L: learning as process-in-product as the next level of a dialectical conceptualization of learning. To this purpose, I argue that the Engeströmian conception of learning via expansive transformation needs re-conceptualization on the ground of open systems or realms (e.g., the social world) where Humean constant conjunctions do not occur. I suggest that the open form of expansive transformations yields a dialectical sublation in perfect form, a level that necessitates a further level 4D as transformative praxis. In this context, I discuss forms of intervention and the Vygotskian idea of the zone of proximal development (ZPD).

3.2 Philosophical origins of AT

Cultural-Historical Activity Theory (CHAT, hereafter AT), also referred to as third-generation AT is inspired by two main strands (Engeström & Miettinen, 1999). It is crucial to highlight the fact that the first strand is the philosophical trajectory that begins with Kant and Hegel, and is followed by Marx and Engels, but omits any discussion of Hume or Humean empiricism. In particular, AT omits to critique the Humean legacy to Kant. The problem with this omission is that if we are not critical of Humean classical empiricism, then we commit the error that Kant made.

> Activity Theory has its threefold historical origins in classical German philosophy (from Kant to Hegel), in the writings of Marx and Engels and in the Soviet Russian cultural-historical psychology of Vygotsky, Leont'ev, and Luria. (Engeström, 1999, pp. 19–20).

The absence of a critique of the philosophy of Hume, as we shall see towards the end of this chapter, is the ultimate cause of numerous theoretical dualisms within AT.

The second strand is the development of AT by the three main proponents of the Soviet school of psychology: L. Vygotsky, A. Leont'ev, and A. Luria. The initial

activity-theoretical approach has philosophical roots in Kant, but Hegel is particularly important because, as AT authors claim, he was the first philosopher to point out that the development of human knowledge fuses history with the socioeconomic conditions of people in natural environments.

After Hegel, the meaning of "activity" (or tätigkeit in German) shifts from doing or acting in the world to discovering in the very act of doing why we act. Later, in Marxism, tätigkeit becomes the transformative character of labor, the basic feature of all human activity. A key Marxist idea is that activity or labor is not only performed to transform nature, society, or some other object, but in the process of transforming such objects humans themselves are cognitively transformed under existing material conditions. Hardcastle (2009, p. 184) articulates essentially the same shift as follows.

> This is an important consideration in connection with shifts in the meaning of the term "activity". For Herder and von Humboldt "activity" (*Energeia*) speaks of a Promethean, dynamic, constitutive sense of self-creative processes. Von Humboldt talks about an interactive dynamic between man and his world. Indeed, the German thinker moved beyond the Cartesian separation of mind and body towards a social view of individuation through "acts of conjoining (*Verbindung*) with others". Marx inherited these ideas, but he was critical of the philosophical idealism they represented. Subsequently, especially in Marxist-Leninist theory, the meaning of "activity" was inflected towards a notion of "labour" and the material conditions of human productivity.

This shift in the conceptualization of activity brings with it problems to those unfamiliar with classical German philosophy or Soviet psychology. Schurig (1998), for example, explains that a common error with the English translation of tätigkeit is the tendency to emphasize our activities as simply actions, omitting the conceptual richness behind the German word, which has an emancipatory character.

How can activity (tätigkeit) be emancipatory? To provide an answer, it is necessary to understand the concept's origin by distinguishing between two models: activity as epistemological structure and as tenet of explanation, both of which derive from the Soviet school of psychology. The first model conceptualizes activity as an epistemological structure, a view presupposes that activity is object-oriented labor, as opposed to inherently random—e.g., as in the case of our individualistic

urges, innate free will, or self-determination. In this sense, the investigation of labor is assumed to be purposefully oriented towards the achievement of a motive or object of activity, which includes unknown motivations like in children's play or ill-defined wants as in our responses to global warming. The second model conceptualizes activity as a tenet of explanation. This view presupposes that activity is goal-oriented labor that emphasizes the types of sequential actions that are typically carried out to complete a short-term goal via a sequence of planned tasks with clear beginnings and ends in some specific context.

The main difference between these two perceptions of activity is that the first model, activity as epistemological structure, investigates human labor that is oriented towards the transformative mode in which that very labor is produced and thereby climaxing in the creation of some new object or outcome. In contrast, in the second model, activity as explanatory principle, investigates labor by means of distinguishing one type from all other types (e.g., doing mathematical labor is different from performing a ballet, or writing a novel, a sonnet, etc.), without necessarily inquiring into the transformative mode in which labor is produced. This apparent tautology of activity as concept to explain itself is indicative of the irreducibility of human labor to a series of types of particular activities. These two conceptions of activity further dichotomize the activity-theoretical community, but Engeström (1999, p. 27) insists that

> the concept of activity may be understood either as a principle of explanation or as an object of study [epistemological structure]. Ever since that distinction was made, it has been used in various discussions for various purposes... [the] idea was not to create another dichotomy, in the ensuing discussions this distinction has often frozen into such a fixed opposition.

In AT, the idea of mediation plays a key role to synthesize the Cartesian divisions between such models of activity that favor object-oriented labor (in the epistemic-structural sense) and the model of activity (as an explanatory principle) that favors goal-directed labor.

However, one of the problems with AT is that despite the fact that the idea of mediation unites different perceptions of activity, dualisms remain within it. Engeström (1999, p. 29), highlights the role of mediation, as "not a merely psychological idea [but also as] an idea that breaks down the Cartesian walls that isolate the in-

dividual from the culture and the society". Thus, the idea of mediation is aimed to resolve dualisms; however, it only *patches* them temporarily by mending them, thus allowing dualisms to exist in practice. Engeström, himself is aware of such mending, and articulates this aporia, as follows:

> merely proclaiming that activity is a superior level of analysis does not help... it is not at all clear that those who use the concept of activity actually are able to overcome the individualistic and ahistorical biases inherent in theories of action. (Engeström, 1999, p. 23).

Along the same lines, Foot (2002) also articulates such problem. However, she interprets it as a problem of the English translation of the concept of tätigkeit (which translates to activity) and other important notions such as *gegenstand* and *objekt* (both of which translate to object). The meaning of these terms is, according to Foot, simplified from its original roots in German (or Russian) philosophies, which tend to strip them from their philosophical and historical substance. The intelligibility of such conceptions, as she suggests, requires that we think of each concept as two sides of the same coin—i.e., in terms of a material entity in the world and as a socially constructed notion. The problem with Foot's interpretation is that it does not explain the cause of AT dualisms; it merely displaces it as a problem of meaning lost in translation.

Engeström and Escalante (1996) concur with the idea that there is a problem of language translation and argue that to properly discern the meaning of these terms, it is necessary to conceptualize them against the totality of a context. For example, in order to see what type of role the object of activity is performing (i.e., as a mediator of our labor or activity, object, or as the thing that undergoes a change, gegenstand) we need to place it against a "constellation" of other things that requires us to make reference to the way in which six components of the activity system (e.g., subject, object, community, rules, division of labor, and object) are bound together. The analogy of a constellation helps us to illustrate the idea of mediation in the form of the relational connectedness between all six components of the activity system (Figure 3.3, p. 53). The Big Dipper, for example, is a constellation of seven stars and the intelligibility of its location in the night sky requires us to make reference to the way each of its stars is connected together as a totality. Such a network of interconnected stars forms its "material makeup", which makes it possible for us to see its distinctive figure. In this manner, we can see how these mediating relations

work to form the totalizing background. In AT, the analogy of a constellation of stars works in parallel to understand the totality that makes up the network of six components of the activity system. The meaning of each of its six components, like stars in a constellation, is revealed to us by reference to the totality of its mediating network.

> There is nothing in the material makeup of an object as such that would determine which one it is: object or tool. The constellation of the activity determines the place and meaning of the object. (Engeström & Escalante, 1996, pp. 361–362).

It is precisely the idea of mediation that is a hallmark to understand the meaning of the object of activity by reference to all other relations between components. In this sense, we do not impose meaning on the AT components, (cf. as in the case of Kantian categories) but meaning is brought to light by the interconnected totality. Thus, AT begins with the idea to unify Cartesian-based models of activity with components, in the Kantian categorical sense (i.e., the perception of activity as epistemological structure and explanatory principle). Nonetheless, AT departs from Kant with the idea of mediation between its categories to produce a relational connectedness view of activity by reference to its constellation or totality.

Moreover, one of the most important ideas in the activity-theoretic approach stems form insights in Marx and Engels for whom at the core of human activity we find labor as production. However, activity in the productive sense entails a change in living material conditions, in the very mode or circumstances of production, and thus a change in the mode of individuals' circumstances of production signifying a revolutionary, creative, and self-changing practice in which an individual not only produces conditions necessary for life, but at the same time and under these particular conditions, she or he produces herself or himself. In this manner activity (tätigkeit) in AT obtains its potentially emancipatory character.

Although many writers have contributed to the development of such concepts, the focus here is on the second strand that inspired Engeström (1987) to develop AT. This strand refers to the seminal work of three main authors: Soviet psychologists L. Vygotsky, A.N. Leont'ev, and A. Luria, whose theses are the building blocks from which other contributions stem. In what follows, I trace the evolution of AT through history in order to understand what Engeström (2001) calls first- and

second-generations AT. I will begin with the work of Vygotsky and follow this with an examination of his two main collaborators.

3.3 The first generation of AT: socio-cultural learning

Lev S. Vygotsky is one of the architects of first-generation AT (1978; 1981a; 1981b; 1981c). A. Leont'ev (1977; 1978; 1979) and other collaborators such as A. Luria (Vygotsky and Luria, 1994) develop second-generation AT. Considering the background of Soviet Russia, we can easily imagine that Vygotsky and collaborators were particularly influenced by Marx's idea of instruments of labor in order to create the idea of mediation via psychological instruments (or tools).

> An instrument of labour is a thing, or a complex of things, which the laborer interposes between himself and the subject of his labor, and which serves as the conductor of his activity. (Marx, 1887/1992, p. 125).

To paraphrase the above, we have a triad between the individual, the object that undergoes transformation, and inserted between these two we find the Marxian instrument of labor. Such influence under the particular historical conditions of the time may have helped Vygotsky to introduce a new model to explain human behaviors in terms of a triad of components (see Figure 3.1, p. 42). This epistemic structure is a unit of analysis composed of a triad of interdependent components: subject, psychological tool, and object, which depict "the mediated act" (Engeström, 2001, p. 134). The subject refers to the individual. The psychological tool acts as the mediator of cognitive and behavioral activity. Examples of Vygotskian psychological tools are the means—such as language, sign systems, mnemonic techniques, and procedures for decision-making—by which to change subjects and their conditions to accomplish the object of activity or the object that can be anything in the environment of the subject (e.g., raw materials) to be transformed.

Kozulin's *Psychological tools: a sociocultural approach to education* (1998) is a book dedicated to the role of this Vygotskian concept to compare differences in language and cognitive development across immigrant populations. Its main argument focuses on psychological tools as aids in the transformation of "the unmediated interaction of a human being with the world in mediated interaction" (ibid., p. 4).

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Adopted from Engeström (2001, p. 134).

According to Kozulin, the Vygotskian psychological tools, the mediating intermediaries or means to communicate with others, play a significant analytical role to illustrate cross-cultural differences of how individuals master behavior, language, and other cognitive processes from external sources (e.g., culture, society, etc) as the internalization of such processes, which occur together with the development of the individual. In fact, Kuzolin describes a process of socialization about the affirmation of hegemonic culture, against the atomization of other non-hegemonic (in this case immigrant) cultures. The socio-cultural narratives that employ English vernacular and its proliferation into popular culture, both of which have been appropriated as a way of speech by a hegemonic middle class, is a clear example of socialization.

In contrast, Hardcastle (2009) while not denying that the German philosophers had an influence on the Vygotskian idea of psychological tools, argues that others philosophers of the Enlightenment are its main source, and traces the historical trajectory of such ideas in philosophy. According to Hardcastle, the problem first initiates not as a problem of language or cognition, rather with a rooted concern in "the *origin and nature* of knowledge" (ibid., p. 185, emphasis added). Two main sources in the philosophy of language conceptualize the epistemological role that

signs systems play in order to help us access that knowledge: (1) the Locke and Condillac link and (2) the Herder and von Humbold link. From the first link, we begin with a Cartesian split between cognition (e.g., ideas, thoughts, etc.) and sign systems. Particularly, in the Lockean sense, words are seen as "vehicles" that transport cognition trapped in them, and signification is an essential precondition for consciousness to have emerged, along with the production of signs, which are assumed to play a key role in the development of our mental "faculties" following a gradient from a lower to a higher level of functioning. The Achilles' heel of the Locke and Condillac link is the Sisyphean language problem: how does our language emerge in the first place?

By considering the ontology of the sign, the Herder and von Humbold-link appears to offer a solution. From this view, there is change in the temporal element, i.e., we see a priority of cognition over signs, and signification along with cognition come together as a unit, as two sides of the same coin. The great achievement of the Herder and von Humbold link is also its Achilles' heel. From this perspective, the Sisyphean language problem is not actually resolved, but mended with von Humbold's tautology:

> No matter how natural it seems to suppose a progressive development of language, its invention could only take place all at once. Man is only human through language; but in order to invent language, man would have to be already human. (von Humbold cited in Hardcastle, 2009, p. 192)

This Humboldian tautology means that the Sisyphean language problem is ontologically open. The Herder and von Humbold link paves the way for an epistemological resolution via the Saussurean total system[1]. Hardcastle proceeds to argue that the

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[1]I take the notion of a Saussureian total system from Jameson's *The prison-house of language* (1974) where he argues that Saussure's originality derives from the question that seeks to understand where in history can we find the adequate point of departure in order to study language. One of the main contributions to the study of language made by Saussure is to conceive it as a "total structure": a system that is complete with all its elements at every present moment. Saussure designated this structure with the name "synchronic system" in which language as a system is complete meaning: "a perpetual present with all the possibilities of meaning implicit in its every moment" (ibid., p. 6). This system denotes the connected distinction between synchrony over diachrony, which is illustrated with the paper metaphor: if one side of the page denotes synchrony (the historical phenomena that is external to language such as contingent accidents, etc.) and the other side of the page denotes diachrony (the internal phenomena such as immigration patterns that cause the rules of language to change), then the primacy of synchronic-over-diachronic idea

Vygotskian idea of mediation via psychological tools is indebted to the philosophical links (1) and (2) as its main sources. However, what is important about Hardcastle's study is that he traces this Vygotskian idea of philosophical tools to the beginning in the nature of knowledge, which can also be articulated as "the central paradox of science" (Bhaskar, 2008a, p. 30) or the idea that there are two sides to knowledge: one side created by human beings and the other independent of them.

At this point, we can return to the Cartesian division between different conceptions of activity, which is *patched* via the idea of mediation by psychological tools, which is in fact a problem traceable to the nature of knowledge. On the one hand, Kozulin (1996) claims that Vygotsky used the word tätigkeit to suggest that "socially meaningful activity may serve as an *explanatory principle* in regard to and be considered as a generator of human consciousness" (p. 99, emphasis added), which reverses the order (the external-social is prior to the internal-individual activity) in order to restore the notion of consciousness to Pavlovian-like reflexology research. Thus, Kozulin's interpretation activity (as a tenet of explanation, in which the tautological statement that activity explains activity itself reveals its ontological irreducible character) coincides with the model that favors goal-directed activity or labor. On the other hand, Wertsch (1981, p. 10) points out that Vygotsky did not write specifically about the concept of activity. Rather, Wertsch states, Vygotsky develops the "mediated act", an epistemological structure denoted by a triangular unit of analysis, by which to conceptualize and explain human behavior in a mediated relation to its social-cultural environment (see Figure 3.1, p. 42). Thus, Wertsch agrees that the view of activity is not only a principle of explanation but also as an epistemological structure, which favors both the investigation of object-oriented and goal-directed labor. The crucial idea that temporarily mends such Cartesian

denotes a total system. The implication of the Saussurian total system is "that you *can see only as much as your model permits you to see*; that 'methodological starting point' does more than simply reveal, it actually creates, the object of study" (opt cit., p. 14, emphasis added). For example, my theory of reality effectively permits me to study it, but it does not exhaust it. In education, this notion is advantageous because such an epistemological point of departure as a Jamesonian perpetual present is the best place to study not just language but any object. In CR terms, this place is the uncertainly of our "ground state", which requires that we are open to possibilities and adjustments of change in the present meaning that we must transcend, what Bhaskar (2002b, p. 105) terms "axiological contradiction", which entails living in anxiety about a future that we do not know, or nostalgia about the past. However, we need to recognize that the achievement of the Saussurian "total system" is also its own Achilles' heel precisely because as a methodological (epistemological) total system it does not exhaust reality. It ignores the ontological; in turn, committing what in CR terms in known as the "epistemic fallacy", i.e., the reduction of ontology to epistemology alone (Bhaskar, 2008a, p. 28).

splits is mediation via psychological tools because it posits process socialization, i.e., a two-way flow of internalization of social-cultural stimuli (e.g., the different regulatory way of behaving in society) and externalization via production (which is never equal to what is internalized resulting in an asymmetry), as I explain in what follows.

3.3.1 Externalization and internalization

Perhaps the most recognizable achievement of the Soviet School of Psychology is the process of externalization and internalization, which is summarized by Vygotsky's (1978, p. 57, emphasis added) famous dictum:

> Any function in *the child's cultural development appears twice*, or on two planes. First it appears between people as interpsychological category and then within the child as an intrapsychological category. . . Any higher mental function necessarily goes through an external stage in its development because it is necessarily a social function. . . *Any higher mental function was external because it was social at some point before becoming an internal, truly mental function.*

The externalization and internalization process is a dual movement from an external to internal state. The external state refers to what is obtained from the social and cultural environment. The internal state of this process appears as the means by which the individual has been influenced by cultural surroundings. Then, the individual externalizes those means, in order to influence others. For example, while Wertsch's (1981) interpretation of Vygotskian activity (as both epistemological structure and explanatory principle) sees the externalization-internalization movement mainly as a regulator of behavior, Kuzolin's (1996) interpretation sees this process as mainly a generator of consciousness. In either case, these two interpretations add to further our understanding of socio-cultural theory because they represent two different but non-conflicting views of activity, or two sides of the same coin. However, these perspectives do not help us to answer the guiding question of this thesis: what has been left out from Vygotskian socio-cultural theory? To provide an answer, it is necessary to take this argument to a position where we can see what is omitted from the Vygotskian internalization-externalization process via a philosophical CR vantage point.

In reality, the Vygotskian internalization-externalization idea falls within one of the four dimensions, a space of social relations, of the Bhaskarian social cube (see Figure 4.4, p. 107). This cubic conception of all social life represents "a cubic flow, differentiated into analytically discrete moments, [which are] rhythmically processual and phasic to the core" (Bhaskar, 2008b, p. 146). From a CR perspective, Vygotsky only deals at the level of social interaction between agents, while omitting other levels, such as concept of social structure, material exchanges or transactions with nature, or the stratification of human embodied stratified personality, which are three other dimensions of the ways we interact with the world.

3.4 The second generation of AT: the realist structure of activity

Kozulin (1996) narrates the early history of what Engeström calls second generation of Activity Theory (AT). While first-generation AT is inspired by Vygotsky, who worked in Moscow until his death in 1934, the second generation was inspired by the work of A. Leont'ev and other of his students who continued his research in Kharkov. The Kharkovian group was active from about 1934 to 1960. During this Stalinist period, Kozulin highlights the prevailing pressure to produce a psychology for the Soviets that is closely derived from Marx, Engels, and Lenin. From 1930 to 1950, Vygotsky's writings were blacklisted due to his associations with the West, while Leonti'ev's theory of activity, as the dean of Moscow's University Psychological Institute, became the doctrine for Soviet psychology until about 1970. After Stalinism, critics of AT began to emerge in part due to the re-circulation of Vygotskian texts. Zinchenko (1985), for example, criticizes Vygotsky for reducing aspects of individual's memory to a process of socialization, i.e., to only internal and external functions. In CR terms, what Zinchenko's criticism refers to, is the idea that Vygotsky lacks a concept of an embodied, stratified, and differentiated personality, although this critique is not articulated in such precise critical realist terms. Essentially, Zinchenko identifies a similar conclusion, i.e., that the Vygotskian view of activity lacks one of the dimensions of the Bhaskarian social cube (see Figure 4.4, p. 107).

Leont'ev's *The development of mind* (1979, p. 223) is a key contribution to the theory of activity. It conceptualizes activity as a structure that is composed of three

different levels or distinct units of analysis, activity, actions, and operations:

> the structure of activity as the action's conditions and as the operations meeting these conditions is realized differently...the motives of the activity are realized differently still.

For Leont'ev, each of these units or levels is identified by the specific psychological function at which it is directed. In other words, concepts always appear in a relation with something in the world, as opposed to a Kantian imposed categorization of the world with concepts. Wertsch (1981) gives an explanation of Leont'ev's units as a hierarchical activity structure (see Figure 3.2, p. 47). The top of the hierarchical
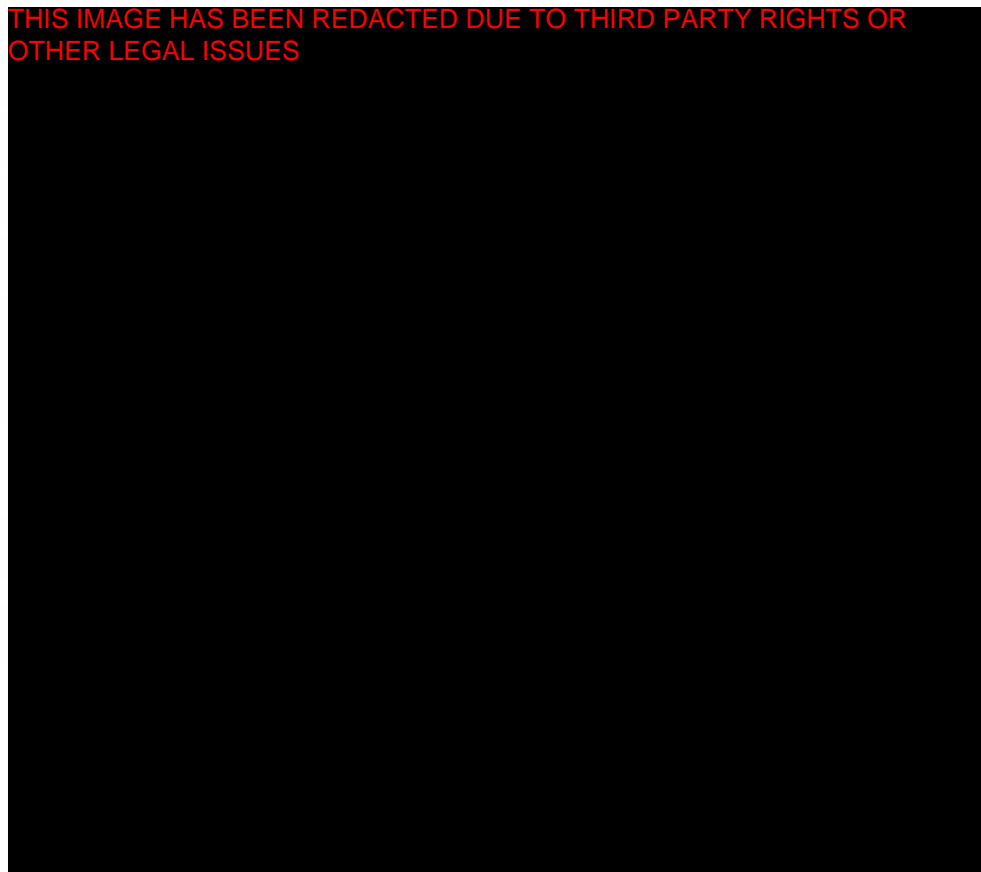
Adapted from Koschmann, Kuutti, and Hickman (1998, p. 29).

structure is composed of activities, which are directed to achieve collective motives. In the middle are actions, which are directed to achieve individual goals, and at the bottom are instrumental operations, which are identified by the (material) conditions in which they are carried out.

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According to Kozulin (1996) and Koschmann, Kuutti and Hickman (1998), Leont'ev sets out the task of developing a theory to explain how the development of consciousness occurring in an individual is the result of entering the world into a system of already established social relations. These social relations are the conditions of life that explain both content and motivation of the individual's activity. For Leont'ev, the pre-existing condition of content and motivation give the individual bearings, as she or he develops obligations as a member of a society. This epistemological structure of activity aims to explain three related sub-tasks:

(1) To elaborate relationships that unite motor activity with psychological processes (e.g., doings and motivations).

(2) To identify and distinguish between a collective and interpersonal motive of the individual in a sociocultural context.

(3) To identify the leading or main activities (and associated motivations) across the life span of individuals and how these relate to psychological processes.

In order to accomplish those tasks, Leont'ev constructs a concept of activity that is grounded in reality. In other words, Leont'ev's activity, according to Blunden's (2009) interpretation, is neither a simple epistemological structure nor explanatory principle, but the general notion of the nature of reality that underlies activity. Blunden is referring to the idea that to understand the nature of activity, it must necessarily follow a structure in order to access it, to understand it. Thus, Leont'ev's theory of activity is a realist one because it conceives nature of activity in terms of its structural character and social relations. To show the hierarchical character of activity, it is worth quoting Leont'ev extensively.

> For man to take on the function of a beater it is necessary for his actions to have a relation that connects their result with the outcome of the collective activity; it is necessary for this relation to be subjectively reflected by him so that it becomes 'existent for him'; it is necessary in other words for the sense of his action to be revealed to him, to be comprehended by him... The different activities are distinguished by their motives. The concept of activity is necessarily bound up with the concept of motive. There is no such thing as activity without a motive... The basic "components" of separate human activities are the

actions that realize them. . . action as the process that corresponds to the notion of the result which must be achieved, that is, the process which obeys a conscious goal . . . Historically, the appearance in activity of goal-oriented action processes was the result of the emergence of a society based on labor. . . But the simplest technical division of labor that arises in this process necessarily leads to the emergence of intermediate, partial results, which are achieved by individual participation in the collective labor activity, but which *in themselves* cannot satisfy the need of each participant. This need is satisfied not by the "intermediate" results, but by the share of the product of the total activity that each receives thanks to the relationships between the participants arising in the process of labor, that is, the *social* relations. (Leont'ev, 1979, pp. 109–408).

This famous primeval-hunt example illustrates key differences between the first and second generation of AT. This differentiation refers to a collective (or group) activity to achieve a shared motive (e.g., the big hunt with assumed benefits for each member of the community) and the particular individual action (e.g., to lure the prey into captivity) caused by the division of labor. A key difference between Vygotsky and Leont'ev's generations is the distinction of collective versus individual activity as unit of analysis. In other words, Leont'ev tries to theorize the activity that is performed in a collective or group via division of labor (or the study of collectivism) versus the activity that is performed individually via psychological tools or other means (or the study of individualism). His theory of activity is an early attempt to grapple with the dichotomy between (methodological) collectivism and (methodological) individualism (which is elaborated in section 5.8, p. 142).

However, one may ask, how does this new insight answer the guiding question: what has been left out from Leont'evian theory of activity? It is easy to suggest that the problem with the second generation of AT is that Leont'ev misinterprets or simply disregards the instruction of his teacher Vygotsky, as Kuzolin (1996, p. 29) seems to argue:

what was missing from Leontiev's model was precisely the stratum of culture, emphasized by Vygotsky and neglected by his followers, which could provide a link between individual action and the social system that gives its meaning.

Kozulin's interpretation is like reducing Stalinism to a simple misinterpretation (or neglect) of Marxian-Leninists theory in practice, when in fact, the analysis of both phenomena requires more attention. Thus, the problem with Kozulin's "resolution" is that it assumes that Vygotskian socio-cultural theory is essentially complete and that there are no problems with it, but as I have seen in the preceding paragraphs, it is possible to show via the Bhaskarian social cube, the incomplete dimensions of the Vygotskian thesis. I want to accentuate that Leont'ev's theory of activity is not simply an advancement of the first generation of AT; rather, we need to interpreted it as an attempt to resolve a problem that was there from the start. In second-generation AT, we see that Leont'ev expands the unit of analysis because elements in Vygotskian socio-cultural theory are omitted, such as the conception of the social structure. It is Leont've's move to account for the social structure that simultaneously brings to light the tacit problem of collectivism versus individualism.

Following Kozulin's argument, we find that there are three reasons from the move from first to second-generation AT: (1) ideological, (2) scientific, and (3) erroneous understandings of the original Vygotskian ideas:

> [1] Ideological caution, [2] honest scientific disagreement, and also [3] a misunderstanding of certain of Vygotsky's ideas all were intricately interwoven in the phenomenon that later became known as Leontiev's theory of activity. (Kozulin, 1996, p. 112).

However, even if these three suggestions hold (or not); i.e., even if one is able to provide substantive evidence for such claims, they would still lack explanatory power by missing what is really important about Leontiev's theory. From this vantage viewpoint, we can provide a more complete interpretation of the passage from first to second generation of AT. To this aim, we need to understand that Leont'ev's theoretical work became part of AT not only because he added the division of labor, but in doing so, he started to grapple with one of the most important problems of AT, and of social theory in general, i.e., the problem between collectivism and individualism. In this manner, we can see that even if (3) Leont'ev misunderstood the ideas of Vygotsky or had any other (2) scientific disagreement, his theory was an upgrade to the original Vygotskian thesis that *patch* it temporarily. Now, to understand (1) the ideological caution of the Leont'evian research program in Stalinist Russia and afterwards, let us resort to the structure of activity (see Figure 3.2, p. 47). For instance, let us assume that at the level of activity we have the collective, repre-

sented by the Russian population. This level is associated with its motive, which is a socialist state. Then at the level of actions we have each particular individual and each action associated with its goal to contribute to the overall collective motive. At the level of operations, we have the existing economic and ideological conditions. We can imagine that it made perfect sense for Leont'ev to inquire into the relationships between these three levels. This research program seems sensible for Stalinist Russia because there was a motive of socialism associated with an existing socialist state apparatus. The same can be said about, for instance, the possibility of such research program in the UK where there is a motive of democracy in an existing democracy.

Now, let us assume a perfect harmony between all levels (the economic and ideological sector, particular individuals' goals as reflected in their actions, and collective as the socialist state machinery). On the assumption of non-dualism between all these levels, we have the historical record that the Stalinist system still managed to break from the inside. (Much like the liberal market in our western democracies, or say, the historical record of UK democracy breaking from the inside as evidenced by the 2011 riots). The point I want to illustrate with this example is that there was already a problem with the system from its beginning in sociocultural theory, which the Leont'evian theory of activity only manages to *patch*.

One may ask: what is a *patch*? It is a mechanism, marked out from the general by a particular characterization, that works to mend gaps or weak points thereby strengthening them in practice. *Patching* is much like upgrading one's computing operating system, we can think of second and third generations of AT as upgrades to the system, i.e., the theory of learning, each of which is aimed to not only solve the bugs of its predecessor, but also adds new applications, while simultaneously generating its own problems. This idea of a *patch* is itself also an example of the Bhaskarian TINA because what these different versions of the units of analysis try to do is to mend fissures within the theory itself, and thus allowing it to continue in practice. To support this claim, I draw upon Daniels' (2004, p. 123) argument that the individual-collective dualism that differentiates preceding units of analysis is progressed with Engeström's expanded, unit of analysis or activity system in order to "enable an examination of systems of activity at the macro-level of the collective and the community in preference to a micro-level concentration on the individual actor or agent operating with tools" and with it, the creation of third-generation

AT is born, or another *patch* to the series of accumulating dualisms.

3.5 The third generation of AT: learning as expansive transformation

Yrjö Engeström is the main developer of third-generation AT, based on the classics of Germanic philosophy: Kant, Hegel, Marx, and the three most recognized figures of the Soviet School of Psychology, Vygotsky, Leont'ev and Luria. The evolution of AT does not remain static; in fact, Engeström (2008a) presents the review of the literature presented by Roth and Lee (2007) where they indicate how research in AT, in different fields, has risen from 1980 to 2005 and it is open to the possibility of a fourth generation. Engeström (2001, p. 133) argues for five tenets of this third generation: (1) activity system, (2) muti-voicedness, (3) contradictions, (4) historicity, and (5) the possibility for expansion in learning, or what he calls "expansive transformation". These principles are interdependent with each other, i.e., each one of them connected and depended on each other, which I outline as follows.

Activity System The triangular array or activity system (see Figure 3.3, p. 53) refers to the structure and its three-fold characterization: collective, instrument-mediated, and object-oriented feature of the activity system. AT uses the concept of activity system to refer to a structure of interconnected components (object, subject, tools, rules, community, and division of labor). The activity system is the analytic lens or main analytic unit by which learning is understood. The activity system has three main characteristics. First, the activity system is collective, which refers to relations that exist between two or more individuals that are seen as connected networks that "realize and reproduce themselves by generating actions and operations" (Engeström, 2001, p. 136). Second, the activity system is object-oriented, which means that is purposefully and intentionally driven towards an object (or objective or motive) of activity. Third, the activity system is tool-mediated, which implies that it uses instruments or tools (both concepts and any other mechanical tools) for the purposes of obtaining its objectives.

Muti-voicedness From an AT perspective, the notion of multi-voicedness means to emphasize the distinction of voice, interests, perspectives, multiplicity of

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Adopted from Engeström (2001, p. 135).

points of view of individuals or groups of individuals. For example, individuals always bring with them their life history and different perspectives, which could represent a source of conflict, but also a demand for negotiation, translation, and tolerance.

Historicity The term historicity in AT, refers to the long periods or stretches of times that is takes for transformation to occur. Historicity is mainly understood against the background of the activity system; at the local level with its own practices, theories, and tools that have shaped its local organization of the activity system. The understanding of local history is the understanding of the accumulation of its concepts, means, and practices through time.

Contradiction The concept of contradiction is, in my opinion, the hallmark of AT. Such contradictions are "sources of change and development" (Engeström, 2001, p. 137). AT makes the distinction between simple conflicts and/or problems and contradictions. According to AT, contradictions are, "historically accumulating structural tensions within and between activity systems" (ibid., p. 137). It highlights that a chief primary source of contradictions in a capitalist society is between the values obtained for a commodity and/or service (the

exchange value) and the utility of that commodity or service (its use value). According to AT, this chief contradiction pervades the six components (object, subject, tools, rules, community, and division of labor) of the activity system. Contradictions always exist in activity systems and the attempts to resolve them may lead to innovation. A secondary type of contradiction that always pervades in AT is when an element from the outside is adopted into it—e.g., the adoption of new technology, the learning of a new language, and so on. Secondary contradictions are important not only because they are generators of problems, conflicts, and disturbances that come from an external source to the internal activity systems, but they also bring with them attempts to innovate, change, and resolve those contradictions.

Learning as expansive transformation The concept of expansive transformation in learning (or learning by expanding) is employed to denote change in the activity system (Engeström, 2001, p. 133). Because the activity system is assumed to undertake a process that takes a long cycle of change or transformation, then during these long cycles, contradictions are accumulated and then aggravated. For instance, when an individual starts to question the gravity of a given situation, the self-reflexive questioning of the status quo or the pre-established norms or rules, and begins to deviate in order to break from the set of established connections. According to AT, an expansive process of transformation can effectively occur when an object of activity is re-conceptualized, i.e., the object of activity is perceived under a different light, which turns it into a new object. This re-conceptualization serves a double-purpose: (1) to furnish individuals with means (conceptual and material forms) by which to transform their own life, and once individuals are equipped with such means, it can (2) open up a space for collectives to move towards the possibility for a resolution of contradictions (double-binds).

Engeström (1987) finds the elements that are missing in the previous two generations and tries to account for the gaps in order to construct a new activity-theoretical approach summarized with the above five principles. The result is reconciliation of both Vygotskian psychological tools, which highlight the externalization and internalization processes, and a Leont'evian theoretical concern with the motive of a community and their division of labor because "the simplest technical division of labor... necessarily leads to the emergence of... partial results..., but which in

themselves cannot satisfy the need of each participant[1]". Thus, we see that the five principles of third-generation AT are, like software *patches*, the upgrade to the existing problems of the previous two generations.

From, a critical realist viewpoint, my main point is to bring to light what is self-evident in every passage from one generation of AT to the next. A key point of this interpretation is that each unit of analysis, i.e., the analytic lens at which learning is perceived, is a harbinger which is necessitated because there is a systemic problem within the theory itself that is signaled by its various dualisms. The different units of analysis are the signaling elements that overtly illustrate the upgrades needed to fix problems within the theory itself. First-generation AT uses Wertsch's (1981, p. 20) "tool-mediated action", a triad of components that remains centered on the methodological analysis of the individual. A closely related unit of analysis that tries to account for the omission of community is Lave and Wenger's *Situated Learning: legitimate peripheral participation* (1991, p. 32) another type of socio-cultural theory, which focuses on a "community of practice": a network of closely related and depended social activities in which learning is viewed as the progressive peripheral shift of the community from novices to masters. In second-generation AT, we see that Leont'ev-inspired theory tries to overcome the methodological limitation that focuses on the individual by articulating a collective activity with reference to a division of labor that exists within a given community. However, a dualism is brought to light, namely the analysis of the individual versus the analysis of collectives. Then third-generation Engeströmian AT, as developed in terms of the above five principles, accounts for and tries to overcome the limitations of previous two generations, but it remains a theoretical open project for investigation. In fact, the

> third generation of Activity Theory needs to develop conceptual tools to understand dialogue, multiple perspectives, and networks of interacting activity systems. (Engeström, 2001, p. 135).

Sawyer (2002) identifies that although all socio-cultural theories agree that individuals and collectives cannot be studied in isolation, but with reference to their social context and practices, they differ in their claims about separability (e.g., the claim that collectives and individuals have different properties) or inseparability—e.g., the claim that collectives and individuals cannot be methodologically distinguished from

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[1]See Leont'ev's (1979) quote on p. 49.

each other. Thus, Sawyer argues that these theories differ in the way they try to grapple, once again, with the central paradox of scientific knowledge (see the discussion on p. 43). Third-generation AT provides various important concepts that other generations lacked, for example, the notion of contradiction (double bind) and the notion of learning via an expansive transformation. As we have seen, all versions of activity theory are *patches*, not only because they are developed into more comprehensive conceptual apparatuses to the conceptualization of learning, but also because in their practice they maintain crucial dualisms that stem from its philosophical roots. In this manner, third-generation AT conceptualizes learning with the idea of expansive transformation, which is important for CR not only because it provides us with a better notion of learning that its predecessors, but also because as its antecedent notions it needs to be "fixed". In what follows, I undertake these two tasks: first, I provide an answer to the question, why does AT suffer from these dualisms in the first place? Second, I mend the Engeströmian notion of expansive transformation assisted from the philosophical vantage point of CR, which is aimed to produce the conceptualization of 3L: learning as process-in-product.

3.5.1 AT's implicit ontology

The reason why third generation of AT suffers from dualisms in the first place is that it does not provide a critique of classical empiricism, i.e., a critique of Humean philosophy, as part of its historical development. According to Engeström (1999), the historical evolution of AT starts with a passage from Kant to Hegel, to Marx. Next, it goes into a Vygotskian-inspired first generation of AT, which is subsequently continued by a second generation as part of the Soviet School of Psychology. Nowhere, however, in its classical formation do we find any mention of Humean philosophy, i.e., classical empiricism.

I claim that it is because AT fails to provide a critique of Hume and empiricism that we see many of its inconsistencies in its classic roots in German philosophy to the present. The result of this crucial omission is a key reason for the accumulation of theoretical splits. This omission is especially important because Hume is responsible for providing the classical and most coherent form of empiricism, which provides the ontological baseline for the philosophies of Kant and Hegel, and to an extent also of Marx and Marxism. To put it in CR terms, Kant committed the epistemic fallacy, i.e., he did not mind the gap between ontology and epistemology. Kant uncritically

accepted (and so inherited) the Humean ontology of empirical realism (which is structured around the Humean theory of casual laws). Since then, most philosophy in the tradition of Kant, Hegel, and classical German philosophy has attempted to mend dualisms on the basis of that Humean ontology. In other words, with a *patch*, we are not able to see what the gap (or problem) underneath is, until we critique the ontology. This critique means that we have to show what is wrong with Hume and Kant's criticism of ontology.

Indeed, the legacy of Hume can be summed up by two central shibboleths of orthodox analytical philosophy: the doctrines of (1) Humean theory of causal laws and (2) Hume's law: $F \nrightarrow V$. (1) The first doctrine is a Humean theory of causal laws, which states that causal laws are simply "constant conjunctions" of atomistic events or merely empirical regularities (Bhaskar, 2008a, p. 57). However, this actualist perspective overlooks that empirical invariances normally need to be produced under experimentally controlled conditions, and are extremely rare outside of them. Following Bhaskar's *A Realist Theory of Science* (2008a), first published in 1975, who shows how this doctrine underpins the entire orthodox philosophy of science, we can show how the Humean theory of causality underpins a theory of explanation, i.e., a deductivist model, which is contemporarily known as the deductive-nomological or Popper-Hempel explanatory theory (Bhaskar, 2008a, p. 119–126). Other theories, including a theory of prediction of events, a theory of a symmetry between explanations and predictions, a theory of the explanation of laws by theories, and so on, consequently follow from it. This deductivist schema[1] is important because it

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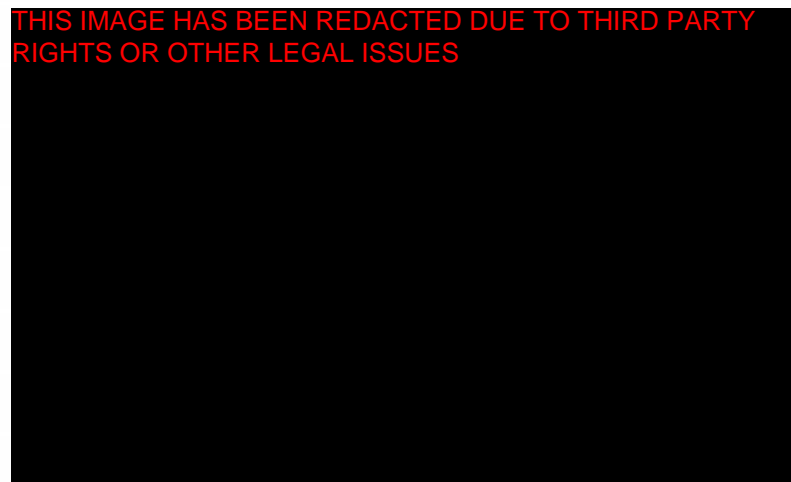
Adopted form Bhaskar (1994, p. 54).

underpins the structure of orthodox analytical philosophy of science, which informs mainstream accounts of knowledge and epistemology. It is the Humean theory of causality, a theory of causally defining an implicit ontology that lays the grounds for these theories of explanation, prediction and falsification that inform orthodox epistemology. Thus, we see the damaging consequences of a Humean account of the world, which is simply wrong because laws cannot be interpreted as empirical generalizations or constant conjunctions, but must be rather seen as tendencies of mechanism or structures which are normally out of phase with patterns of events.

The critique of these two Humean-based doctrines is crucial for a non-empiricist account of all sciences; specifically, my criticism in the sublation of AT under CR stems from the first point of actualism. Aside from these central shibboleths we also find other problems such as that reasons for actions are detached from our causes, i.e., the denial that our reasons can be causes is the denial or our intentional causality, which leads to the de-agentification position, and goes together with a denial of the view that consciousness as a non-reducible emergent power of our material brain, which in CR is denoted with the term Synchronic Emergence Powers Materialism (SEPM). Therefore, the philosophical development of AT carries with it an implicit ontology that is unable to sustain its own theory. We see a symptomatic result of such implicit ontology in the form of theoretical splits that should (and to some extend do) signal to the activity-theoretic community the need to find a resolution. In section 4.4, p. 93, I develop such a resolution by arguing that the philosophy of CR provides an ontological essence that resolves not only AT dualism, but problems prevalent in social science.

I turn now to the conceptualization of 3L: learning as process-in-product; however, before going into learning, it is important to keep in mind that education and

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[1]More specifically, in *A Realist Theory of Science*, Bhaskar (2008a) gives a number of theories in the Appendix: Orthodox Philosophy of Science and the Implications of Open Systems that depart, in the sense of that they stem from this deductivist model: if we can deduce from an initial set of conditions, $C_1 \ldots C_k$, and all the $L_1 \ldots L_k$ which are constant conjunctions of atomistic events or empirical regularities, then we can know the event, E. Initially, the L's give rise to and also underpin the Human theory of causality. Then, we have a theory of the explanation of events, but with it, we can also have a theory of predictions of events because if we know the initial conditions C's before, then we can see how the event E is going to occur. Subsequently, we have a theory of the asymmetry between explanation and prediction. A theory of how we can explain laws follows because we have explained E in terms of other higher order universal laws, then in terms of theories that are understood. What follows from this is a theory of a reduction of sciences, and then theories of what is scientific vs. unscientific, which ends with theory of direct or indirect corroborations or falsifications of actual (or possible) counter-instances.

educational context occur in open systems, i.e., dimensions where Humean constant conjunctions (of events) do not occur. In terms of learning, the consequence of an implicit ontology, and what is crucial for this investigation, is that AT cannot explicitly locate learning as a self-emancipation pulse that is an intrinsic part of the individual; rather it posits learning as a potentiality of actions of a group of people. More specifically, learning in AT is expansive transformation, i.e., "collectively generated as a solution to the double bind potentially embedded in the everyday actions" (Engeström, 1987, The zone of proximal development, para. 16). The problem with this conceptualization, once again, is that learning is displaced to a superstructure position of collectives or groups rather than the individual; in other words, in AT learning is not fully articulated as an unfolding self-emancipating process or pulse that is enfolded in the individual. Rather we see it only as an effect, a symptom, or a manifestation of an invisible structure that generates it. To put in Bhaskarian terms, we need a better theory of reality; we need something more than third-generation AT to bring the concept of learning down from its superstructural position in order to re-conceptualize it, re-inscribe it as emancipatory practice and as this pulsating core of each individual.

3.6   3L: learning as process-in-product

At 3L: learning as process-in-product, I am concerned with those processes that are either generated on the basis of contradictions or that are generated by themselves. In particular, third-generation AT is important because its employs a key characterization of learning as articulated by the Engeströmian idea of expansive transformation (also known as "learning by expanding"), which is described as follows.

> A full cycle of expansive transformation may be understood as a collective journey through the zone of proximal development of the activity: it is the distance between the present everyday actions of the individuals and the historically new form of the societal activity. (Engeström, 1987, p. 137).

The notion of learning as expansive transformation already conceptualizes all the previous levels in 1M: learning as product, e.g., the outcomes of activity, including

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2M: learning as process because processes are effects that arises out of the conceptualization of contradictions and leaves a space open, i.e., learning as a potential for expansion. Engeström (2008b, p. 27) argues that such expansive potential is "best discovered by means of interventions which open up the zone of proximal development of the activity system".

This expansive transformation is understood not only at the individual level but as a collective journey that starts at the level where individual actions are not limited to the situation in which they are bounded, but as the events that do not have momentary impact, but each individual action has impact and is impacted by the wider society. Expansive transformation as learning is the possibility that individuals can radically transform their previous mode of activity into something new with the aid of, but not limited to, interventions. In this manner, we have seen that AT provides a conceptualization of learning as a potential for expansion precisely because it moves beyond learning as products and learning as processes. The next step is to see how the idea of expansive learning can be seen as learning as 3M: process-in-product. In what follows, I take the idea of expansive learning as an incomplete form of dialectical sublation, but it is also based on the development of the transformational model of social activity (TMSA), which is a point of commonality between AT and CR.

However, in order to create something new out of this conception to fit CRAT we need to "fix it" by taking the following steps. First, we start with Brown's (2009) "learning environment", where we take the idea that education and educational contexts always occur in open systems, hence I reframe the above Engeströmian concept as open expansive transformation to emphasize the open-systemic and laminar paradigms. Second, we take this notion of open expansive transformation and juxtapose it with the Bhaskarian idea of dialectical sublation also in theory, in order to realize that the former is an ideal form of the latter.

In Bhaskarian dialectics the idea of dialectical sublation refers to as a complete passage through the dialectic, in other words, it is "a dialectical result or outcome of a dialectical process (which then becomes the starting point in a new process, recursively); or as the process itself" (Hartwig, 2007h, p. 449). As a first step, I turn to an understanding of Engeströmian dialectics, which is a logical process of expansion that is designed as a developmental research project, and I also identify what is missing in this logic. In short, open expansive transformation in its perfect

form, yields a dialectical sublation, which is certainly incomplete until we reach some action or praxis in 4D.

Let us contrast the Hegelian and Bhaskarian dialectic in order to further illuminate this third level of 3L: learning as process-in-product level. As we shall see, the Bhaskarian dialectic is not totally preservative; while the Hegelian dialectical sublation (Aufheburn) is preservative as in "threefold meaning to cancel, preserve and transcend" (Bhaskar, 2008b, p. 404). For Hegel, the process of dialectical learning as a totality is a closed structure where the outcome is a reconciliation of contradictions in thought. For Bhaskar, the process of dialectical learning as a totality is an open structure, in which a product is recursively a point to start a new process. Nonetheless, Hegel's preservative sublation of totality "truth is the whole, the whole is a process and this process is reason" (Hegel cited in Bhaskar, 2008b, p. 22) affords us an ontological view of our world.

We can begin to justify this 3L: learning as process-in-product level by imagining that a learner is in a constraint-free, real-sense, non-dualistic, egoless, state of being, a Bhaskarian ground state.

> Our ground states are intrinsically fields of possibilities, some of which must be actualized, but which, and in what form, depends upon what other forces and bodies, charges and constraints there are in the field of their actualization, which field out embodied personality and its context. (Bhaskar, 2002d, p. 86).

Then, all of the sudden something clicks and there is a moment of eureka. This eureka-instance is the point of discovery, which is typically followed by fantastic progress without any contradictions. Certainly, we may conceive learning without contradiction, but this is not in the category of 2E: negativity where contradictions and problems are involved. Learning without contradictions can be associated with the following 3L as a possibility of knowledge as a growing totality leading to dialectical sublation, which is a possible part of the joy of knowledge as a real experience. Thus, 3L: learning as open expansive transformation leading to dialectical sublation is a point where we need something else, we need practice. In particular, the move from learning as process-in-product to product-in-process requires a further level 4D: learning as product-in-process or transformative praxis. However before going into this level it is important to identify the means by which AT engages with interventions as a means of praxis that can be open to transformation with the notion of

zone of proximal development (ZPD). In what follows, I explain how, the notions of mediating interventions and ZPD are in AT and how we can incorporate these terms under a CR philosophy, and thus under a CRAT conceptualization of learning.

3.7   Interventions and ZPD

The activity-theoretical approach developed as part of the Center for Research on Activity, Development, and Learning (CRADLE) argues for interventions in order to resolve contradictions. Interventions not only focus on an linear evolutionary view of how an individual develops into what she or he is; it also takes into account how real-world objects and structures (e.g., activity systems) are newly created and have been created by individuals, i.e. how activity systems are developed continuously. Because we are no longer dealing with a single dimension or a linear learning process, AT argues for interventionist approaches in order to include a second dimension that allows for a conceptualization of learning in both horizontal and vertical planes as a transformative expansion. Thus, two notions are important to highlight in developmental research: **(I)** the method of interventions and **(II)** the Vygotskian idea of zone of proximal development (ZPD).

(I) Methodologically, AT emphasizes the distinction between a linear intervention and a re-mediating intervention. A linear intervention is modeled by experiments that are typically conducted in fields such as medicine, epidemiology, agriculture, and more recently in randomized control trials in education as the "gold standard" adopted by the US Department of Education (Engeström, 2008a). For instance, if a piece of research wants to test whether a particular measure (e.g., a drug or educational reform) is effective on a given population, the measure is randomly assigned to experimental conditions. Next, the measure is monitored and compared to see if there are significant differences between a control group (e.g., a population that is given a placebo) and experimental group—e.g., a population that is given the measure to be tested. The key idea is that with a linear intervention, the researcher knows the desired effect of transformation as measured by the outcome that the researcher wants to implement. Such interventions lead to the paradox of the search: if something is known, then there is no reason to search for it, and if something is unknown, then we do not realize that we need to search for it. From an AT perspective, there is a concern to search for an unknown, which is to question

what is possible. On the other hand, a re-mediated intervention involves a transformation from something that is already known or a pre-defined object to something unexpected or newly created, which is a move in knowledge from stabilization to the possibility of invention. This process is reflective in the sense that a transformation involves the move from what is known to what is possible to create.

> In radical transformations aimed at the creation of qualitatively new patterns of activity, opening up and blending existing categories are not enough. What is needed is re-mediation by new theoretical concepts that serve as "germ cells" for expanded horizons of possibilities. (Engeström, 2008a, p. 12).

The method by which interventions take place in Engeströmian AT is based on the work of G. Holzkamp and may take three analytic phases: (1) object-historical research, (2) theory-historical research, and (3) actual-empirical research. However, Engeström and Kerosuo (2007) explain that AT is mainly about but not completely restricted to re-mediated interventions, and that it is also a framework for observational and historical studies. Longitudinal interventionist investigation, as they argue, remains the main approach by which to study agency, creations, inventions, or what is known as the process of externalization (as discussed in section 3.3.1, p. 45) by the following set of three methodological rules:

(1) Object-historical research The researcher needs to follow or trace the object (or objects) of activity in their context of temporal/socio-spatial courses of development. The aim is to identify secondary contradictions that give rise to a new transitional phase, and to analyze the continuous developmental phases, a process called periodization of objects or structures such as, e.g., activity systems.

(2) Theory-historical research The researcher needs to develop epistemic structures: theories, models, and knowledge to give the object (or objects) a means of communications, a voice, by involving the subject of activity who are individuals, agents, participants, clients, users, and so on. This voice serves as a common platform to share a dialogue by which the object surfaces, acquires visibility, articulation, and thus can be negotiated.

(3) Actual-empirical research The researcher needs to expand the object (or objects) by means of organizing interventions. These interventions can be

sessions, spaces to hold dialogue, assignments, or other arrangements where the subjects of activity can construct new objects, such as concepts, models, or instruments to serve their aims and perhaps resolve contradictions. This part is important because (1) and (2) are insufficient in the application of research.

Whereas the Bhaskarian dialectic is a four-part movement from 1M to 4D, this three-part analysis of object-theory-actual research refers to Engeströmian dialectic or "the logic of expansion... An expansion is essentially a social and practical process, having to do with collectives of people reconstructing their material practice" (Engeström 1987, Dialectics of substance, para. 20). The main purpose of this Engeströmian dialectical analysis is to deal with inner contradictions (double binds) in activity systems and in the logic of such contradictory structures. A second aim is to furnish participants with the newly created structures, i.e., new means, instruments, language, conceptual models, and so on, by which individuals themselves can resolve double binds. In short, this three-part interventionist method functions to bring to light systemic contradictions and thus make participants aware them, which can be collectively reformulated in terms of a double bind or "essential dilemma that cannot be resolved through separate individual actions alone but in which joint co-operative actions can push a historically new form of activity into emergence" (Engeström's, 1987, How the new is generated, para. 5). The main point about the AT interventionist approach is that an implicit ontology allows it to presuppose CR in practice.

Once again, I want to highlight that in third generation of AT there is a danger of over-exaggerating contradictions and falling into an orthodox Marxian view of reality. In contrast, what I want to show with the help of CR is that contradictions are a real and prevalent case in science, but also that there are numerous other ways[1] in which absence and incompleteness can take a challenging form.

(II) An equality important part in developmental research is the notion of zone of proximal development (ZPD) because it points to another implication of the Engeströmian logic of expansion. Originally, ZPD was drafted from the original thesis of Vygotsky (1978) but Engeström (2001, p. 137) gives it an additional dimension.

It is the distance between the present everyday actions of the individuals

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[1]In Appendix A on p. 287, I make reference to the Appendix: Explaining Philosophies in Bhaskar's *Plato, etc. (1994)* where we find a list of oppositional notions other than contradictions, which are negative and responsible for causing challenges end up rendering transformation ultimately unsustainable and thus are the "backbone" of ideologies.

and the historically new form of the societal activity that can be collectively generated as a solution to the double bind potentially embedded in the everyday actions.

The concept of ZPD is used to further illustrate expansive transformation as learning. From an AT view, this concept is differentiated from the original Vygotskian notion, which denotes the theoretical distance that a novice needs to reach, usually with the help of a more knowable other, in order to achieve development in a progressive manner.

Although Wood, Bruner and Ross (1976, p. 91) do not make reference to the Vygotskian thesis, the scaffolding metaphor that they employed has been appropriated in the educational literature to illustrate the notion of ZPD. In short, scaffolding as a process consists "essentially of the adult controlling those elements of the task that are initially beyond the learners' capacity". In compulsory mathematics education, this metaphor tends to convey the idea of how a tutor enables students to move up a scaffold, i.e., to solve problems or tasks that would otherwise be beyond their reach (see, e.g., Goos, 2004; Hardman, 2005; Ozmantar and Monaghan, 2005). Theoretically, if the ZPD distance between a more knowledgeable tutor and the novice learner is theoretically closed (or surpassed) at one stage of development, then learning is claimed to have been achieved and the learner can advance to the next stage of development. Hence, we have a problem when a learning process is scaffolded, as it were, in a vertical manner from a one level to a higher level of development, in that

> one cannot always know that a child [student] is in fact simply ignoring a suggestion, whether, he is systematically misunderstanding or what... Where the human tutor excels or errs, of course, is in being able to generate hypothesis about the learner's hypotheses and often to converge on the learner is so crucial to the transactional natural of tutoring. (Wood, Bruner & Ross, 1976, p. 99).

In this manner, the problem with scaffolding adequately illustrates the need for a two-way, "transactional" process of tutorials, what is known as externalization and internalization (as discussed in section 3.3.1, p. 45), which is what the original Vygotskian thesis was concerned with.

AT does not restrict the view of learning to a vertical dimension in the closing or crossing of the ZPD distance, but it includes a horizontal dimension. Although

Engeström (1987) uses the original ZPD terminology, he does not interpret it as a distance that needs to be reached or closed by the individual in order to progress. From an AT perspective, ZPD is a dimension in which collectives, i.e., the social relations between individuals, can explore and dwell in.

What Engeströmian ZPD is effectively conveying is that this zone exists between the present and the future, so that it starts in the present in daily actions that have an impact in the future. However, as we can see, the Engeströmian ZPD lacks reference to the past, what is in Jamesonian terms the historical absent cause and in Baskarian terms the notion of absence or non-being (elaborated in section 7.4, p. 224). While the Vygotskian ZPD can theoretically be closed (or surpassed) as a novice moves closer from a centered novice position to a peripheral knowledgeable position, the Engeströmian ZPD remains theoretically open (i.e., the present cannot catch up with the future), but the gap is the possibility of co-operation between individuals so that double-binds or contradictions can be resolved. In the present, the Engeströmian zone is a dimension that is never empty, but a place that individuals inherit with invested interests, histories, and boundaries as others occupied it in the past. The ZPD is the journey into a collective potential or temporary resolution in everyday praxis to what are double-bind problems. In short, the ZPD is a move towards something that is possible, a journey that is required in order to go beyond the present conflicting state. This journey may lead to something new, which Engeström (1987) calls expansive transformation as learning, a new collective understanding of this dimension, but as new understanding at the same time can potentially create new conflicts. From this view, learners achieve a new level of knowing when conflicting boundaries, which are always present in this zone, begin to collide. In this manner, the metaphor of expansion also occurs, as it were, in a horizontal manner that moves away from old conflicts towards new ones.

From a CR viewpoint, the notion of ZPD as developed by AT is also very important because it allows us to re-conceptualize knowledge, as an attempt to solve the central paradox of scientific knowledge (see discussion on p. 43 and p. 56). In CR, the dimension of knowledge (epistemology) is always different from ontology. In terms of the individual learning who is working with a more knowledgeable other, in the Vygotskian sense, CR allows us to see individual knowledge as a virtue that is part of us, but also as a something that we ourselves need to produce in our creativity. This CR view of knowledge is utterly different from other conceptions of

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knowledge, such as the reified theories that see knowledge as facts, information, etc.

Following the distinction between ontology and epistemology and Bhaskarian dialectics, we can make four key distinctions related to knowledge by passing through four movements, in what we can call the quadruplicity of episteme:

1M: data At this level we have a simple product, e.g., the facts available in all forms of archival material.

2E: information This is the level of process, which entails a group of data and facts of information about a topic, e.g., the networks of facts that we obtain doing a search on the Internet.

3L: knowledge At this level, process-in-product, involves the understanding of mechanisms or structures that produce and explain 2E: information, and orders the 1M: data that we have available, e.g., the theory of gravity, the periodic table of elements, and so on.

4D: wisdom This is the level of product-in-process, or the integration of knowledge of the mechanism or structure with our values, practices, and life generally. Wisdom is a unity of theory and practice that is reflected in our knowledge with the correct values.

In our present state, we are at the levels of 1M and 2E, so that we need to make further steps to the level of understanding generating mechanisms and structures, and finally wisdom. The notion of ZPD in AT does not allow us to see the enormous differentiation between 2E and 3L. In other words, in our society what tends to pass for knowledge is actually data. For instance, data that is available through the Internet, the media, and institutions of education. I want to stress that this CR is a very humble position because it questions what tends to account for learning, a move equated with information. CR allows us to conceptualize knowledge in a radical manner: knowledge is ontological, is an irreducible part of being or in Bhaskarian: knowledge is not only of being, but it is being!

3.8   Conclusion

This chapter describes the historical development of Activity Theory as having origins in Germanic philosophy and subsequently evolving through (1) first, the phi-

losophy of Kant, Hegel, and Marx and (2) three generations of the Soviet School of Psychology. The purpose of this chapter is to show that every passage in the historical development of AT, from first-generation AT to the next, is a harbinger analogous to an upgrade of a preceding generation necessitated because there is a systemic problem within the theory itself that is signaled by the contradictions and problems it generates. And that requires remedying by the enhancements provided by each successor or partial resolution. This partial resolution leads to attempts to enhance the theory, as evidence in three unit of analysis. The cause of the problem, the various activity-theoretical dualisms, is the omission of a critique classical empiricism, most systematically expressed in the philosophy of Hume, which is the ontological baseline for Kant, Hegel, and Marx, and subsequently the three generations of AT.

Nonetheless, AT provides a conception of learning as expansive transformation that is very useful after a few amendments. Engeströmian dialectics refers to a logical process of expansion; we can re-conceptualize it as an instance of a perfect dialectical sublation. Whereas the Hegelian dialectical sublation yields a closed structure of reality, for Bhaskar it is the opposite. The Bhaskarian 3M: product-in-process gives us the key characterization of an open reality, a totality that does not stop there but necessitates a further level 4D: learning as product-in-process (transformative praxis).

Although it is important to understand the historical foundations behind AT concepts, it is equally important to understand their application, i.e., how these concepts have been operationalized[1] and theoretical problems. In the next chapter, I review theoretical and empirical literature on AT. In reviewing the empirical literature, I focus on the field of mathematics education that ranges from compulsory levels to higher education, but mainly the latter, in order to answer the following question:

(1) Since contradictions are the diving source of activity systems, how does the mathematics educational research community operationalize concepts of activity systems and contradictions?

(2) Since the third-generation AT is an evolving framework subject to further developments, what are the current theoretical problems or dualisms of AT? Or

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[1] Following Wengraf (2001), the idea of operationalization refers to making inferences and decisions that are required when linking concepts to empirical data.

to phrase it in the terms of guiding questions: what has been left out from AT?

I shall address (1) empirical research and (2) theoretical research by exemplifying AT from the viewpoint of Critical Realism (CR).

Chapter 4

Applications and theoretical dualisms of activity theory

> True universalists are not those who preach global tolerance of differences and all-encompassing unity, but those who engage in a passionate struggle for the assertion of the Truth which compels them[1].

4.1   Introduction

This chapter presents a literature review on empirical research associated with the applications of Activity Theory (AT) in the field of mathematics education in order to provide examples of 2E: learning as process; in particular of those processes driven by contradictions (double binds). Then, theoretical research associated with three generations of AT identifies various dualisms within it. First, however, the argument for 2E follows in three parts:

- After organizing empirical investigations according to what I call nested mathematics-educational activity system (see Figure 4.1, p. 72), I argue that Critical Realism (CR) provides a philosophical grounding through which we can conceptualize this particular nested system as part of a more inclusive Bhaskarian laminated system or the idea that "different levels necessary for the understanding of the result may be conceived as interacting in coalescing" (Bhaskar, 2010, p. 5) in educational contexts.

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[1]This idea of true universalists is taken from Žižek's *Carl Schmitt in the age of post-politics* (1999, p. 35).

- In particular, the operationalization of the six categories (e.g., object, subject, instruments, object, division of labor, and rules) of the activity systems, according to the mathematics-educational community, is accomplished by means of what I call a *fill-the-bucket* approach. From a CR viewpoint, I argue that this method reveals a Kantianism, a deep misunderstanding of the nature of reality itself since empty buckets stand for categories about being (ontology) that are "filled" with sense-experience data that reflect how reality is imposed to fit the buckets with a best-fit rationale from the perspective of the researcher (epistemology). From a CR viewpoint, this Kantianism yields the epistemic fallacy, the collapse of ontology to epistemology (Bhaskar, 2008a).

- Moreover, evidence about contradiction identification in mathematics education suggests that there are primary (or inbuilt) and secondary contradictions (when a new component is introduced into the system), which in turn disturb the dynamics of their respective educational systems. These contradictions may be seen as signaling devices revealing that their corresponding activity systems are in crises, and so incomplete equivalent to what is conceptualized as an *apprehension of incompleteness* in section 2.4, p. 28—a state in which processes driven by contradictions necessitate a continuous process of what Engeström (2001) calls learning as expansive transformation.

Second, the argument for a CR resolution to dualisms of AT is summarized with Table 4.3, p. 95.

4.2 Applications of AT according to empirical research in mathematics education

The application of an activity-theoretical framework in various disciplines usually takes the form of case studies; they vary from pure observational studies to historical research to the interventionist approach, advocated by Engeström (1987). In the particular discipline of mathematics education, empirical research into AT shows us that the activity system is situated within three different levels depending on micro, institutional, and cultural-historical educational contexts of study. In order to visualize the nested nature of such levels of activity, I have organized them in terms of three concentric circles or nested mathematics-educational activity system (see

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Figure 4.1, p. 72). The micro-relational, institutional, and socio-cultural-historical

Figure 4.1: Nested mathematics-educational activity system
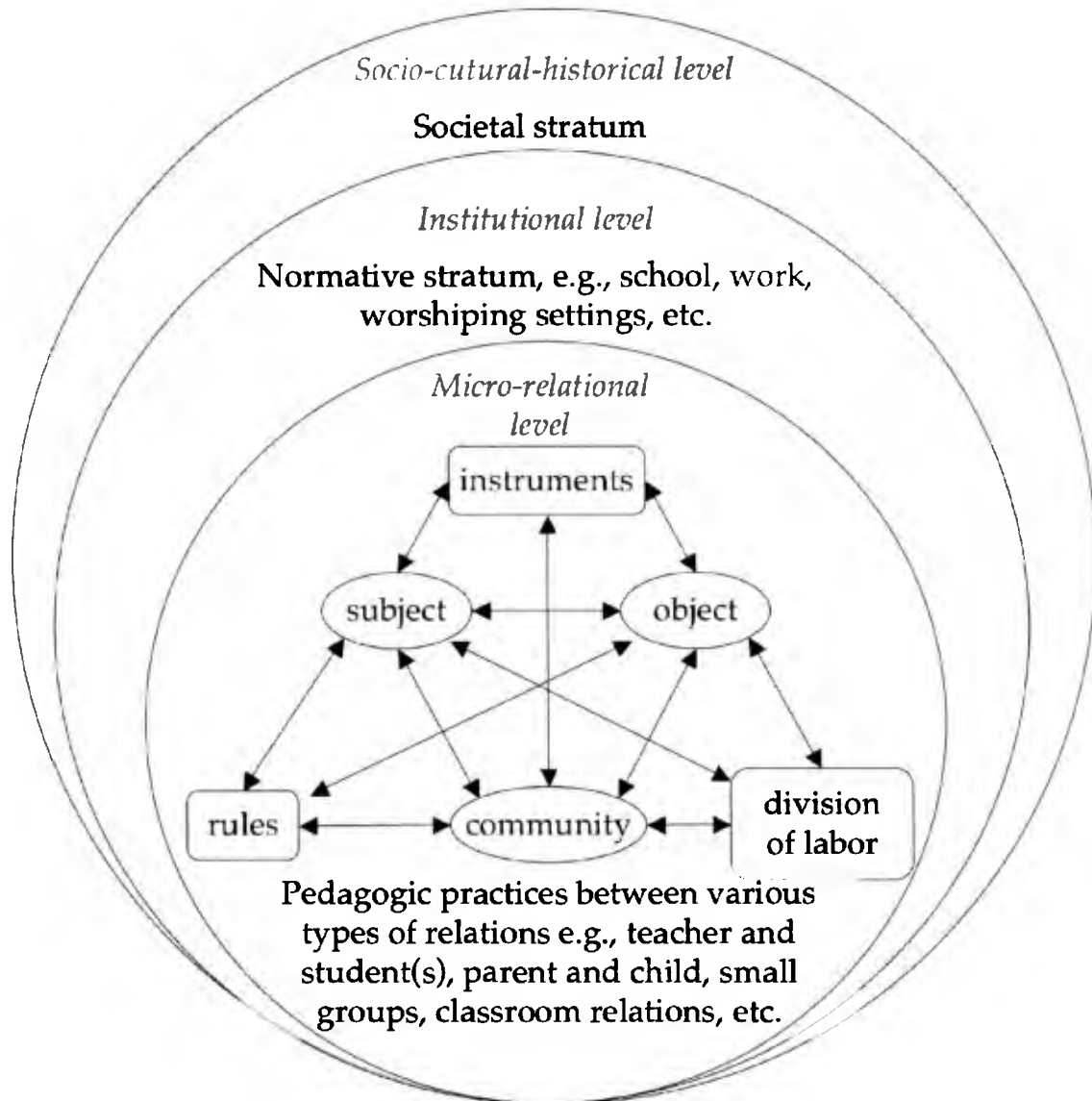
levels of the nested mathematics-educational activity system provide us with a stratification that summarizes how this particular research community understands educational contexts in general. However, in order to expand our perspective beyond this nested model, one can argue that CR allow us to conceive these levels as part

of a larger type of laminated system (Bhaskar, 2008b), what I term an *open learning environment* (see Table 4.1, p. 75) by following Brown's (2009) notion of how mathematics-educational contexts and other educational contexts in general can be conceptualized. The most salient point is that any educational context must be understood in terms of laminated systems, which expresses the idea that all phenomena need to be analyzed in terms of non-fusing elements and irreducible ontological levels that make up the totality of significant mechanisms required for their explanation.

Brown (2009, p. 6) develops the idea of a "learning environment", which in CR terms is an example of a mixed laminated system consisting of these irreducible layers in the discipline of educational studies into which mathematics-educational research falls. He argues for such an open-systemic view of reality in terms this idea:

> [it is] not as a process grounded in empiricist or idealist conception of knowledge, but as emergent from the ontology: a phenomenon emergent from an ensemble of causal mechanisms... the learning environment is more than merely the location of learning as it is commonly construed. It is the total set of circumstances that enable and constrain learning: the totality of causal powers, ways of acting, tendencies, and susceptibilities whether or not they are exercised as events, and events whether or not they are experienced by actors or agents in the learning environment. (ibid., pp. 6–20).

This ontological spin is directed at the educational community so that it might move beyond objectivist (including behaviorist) and instructionalist perspectives that are idealized and foregrounded in contemporary learning theories. On the one hand, objectivism is a positivist-infused idea that sees learning in terms of a one-way transmission of facts from teacher to pupil. For example, objectivism sees learners like sponges, in terms of being passive recipients that soak the benefits of instruction. A close relative of this approach is behaviorism; the idea perceives learning as being homologous with ways of behaving that can potentially be trained by stimuli such as routines, rewards, self-discipline, and punishment. Thus, we see that behaviorism equates learning, as with Pavlov's dog, with ways of behaving as something that can be trained via stimuli. To simplify, while the objectivist is concerned with questions such as: what materials, academic curriculum, practical skills, and behavioral norms among others, are being taught in institutions, the behaviorist asks: how are such materials being taught? The application of CR to education, according to Brown,

allows us draw upon elements of these two main approaches in order to shift from closed and one-dimensional theories of learning.

A common problem between objectivism and behaviorism lies in the closeness of the conception of learning that they employed—particularly in the idea that learning can be controlled under experimental type conditions. In other words, if learning is effectively a closed system, then it can be encapsulated within intuitional settings that are responsible for delivering outcomes; it can be replicated on the assumption of homogeneity of knowledge acquisition and a uniform access to educational resources, and it can be relied upon to deliver a desired maximized cognitive and behavioral outcome via curriculum and other teaching materials. A problem emerges when the outcomes do not go as planned; for example, when the curriculum is not a guide to promote, learning, but a rubric to be ticked off. In this manner, objectivism and behaviorism see a problem, as opposed to a consequence, in the unintended outcomes that result from applying a closed-systemic theory of learning.

On the other hand, instructionalism is an embodiment of social-constructivist principles that view learning as a mental construction of knowledge acquisition through social and linguistic meanings. This approach is concerned with providing conditions so that learners can construct and bring out their inner (mental) creativity, intellect, potential, and so on. A problem with instructionalism lies in its one-dimensional view of learning where meaning is constructed without depth, and for this reason it cannot account for the variability of individual interpretation or reference to something outside meaning or language itself. In other words, it lacks criteria by which to judge a mental state over another different one and a way to support references to real objects and factual statements such as broadly accepted scientific and mathematical knowledge. From this views learners are constructors of their knowledge via linguistic meanings and social interactions; this paradigm is epitomized with Sfard's (2008, p. 81) conception of learning where she fuses two dimensions with "commognition", a neologism that homologizes cognition with an "individualized version of (interpersonal) communication". To simplify, given that we speak and not the world, an instructionalist asks: for whom and what purpose is the material being taught? Or methodologically, the instructionalist asks: what communicative activity or "patterned, collective doings" (ibid, p. 157) are identified in interaction? Such questions reflect an underlying pragmatism. The other side of this type of linguistic paradigm is what Chouliaraki and Fairclough (1999, p. 63)

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refer to as an analysis of the various ways of talking and perceiving by asking: how are "questions of power linked with questions of ideology"? Some examples of such questions inquire into who are the beneficiaries (or not) from what is being taught, who and how is control over production, consumption, distribution of a commodity or service being exerted, just to list a few.

To transcend these perspectives, I put forward a mixed laminated system, fit for open systems that enables us to identify and relate the various mechanisms, at different levels of reality, which enable and constraint learning. The notion of mixed laminated system refers to a mixture of levels from the other Bhaskarian four types of laminated systems, i.e., the (ontological) level, (social) planar, (social) scalar, and the emergent spatio-temporality (see section 6.3.3, p. 195). This mixture does not mean that the levels are uniformly or linear with respect to size—e.g., the physical level is not necessarily smaller than the biological one; in fact, some of the levels are not scalar and some do not have a physical location, e.g., the moral/political level. The key idea when constructing a laminated system is that there is no a priori way in which reality produces complexity, hence the building of a laminated does not follow a particular ordered fashion for formation of its levels; rather, its formation is in direct relation to one's explanatory concerns and the reality that determinate them. This laminated system is paraphrased and amplified from Brown's "learning environment" with an explanatory concern for a very important level that denotes the socio-economic relations (which Brown's original idea leaves out) as shown Table 4.1, p. 75.

Table 4.1: Open learning environment in education—a mixed laminated system

Stratum	Description
micro-relational level	it takes into account various type of pedagogical relationships such as pupil-pupil, pupils-educators, pupil-administrators, educators-administrators relationships in terms of their morphogenetic transformations, and stratified characteristics in order to give a wider explanatory mechanism for the potential of knowledge.

Continued on next page

Table 4.1 – *Continued from previous page*

Stratum	Description
laminar and emergent level	it highlights a range of multi-causal mechanisms that operate at various strata in an interactive manner to determine the conditions for learning, but also learning as emergent from such conditions, which cannot be collapsed to any single stratum or cannot be predicted to a definite outcome.
normative level	it accounts for the non-homogeneity in individual meaning production caused by the input of the curriculum and other materials.
socio-cultural-historical level	this level is concerned with relations between individual pupils and groups (or collectives). It includes the group dynamics of pedagogical relations, classrooms, etc, and extends to parental cultural and educational beliefs.
socio-economic level	this level is concerned with the social and economic material relations that exist between pupils and their families. It is not limited to economic relations, but other asymmetries such as ethnic and gender relations. At this level, we see the effects of the social structure in the classroom and in all other learning environments. We cannot implicitly adopt the view that society ends where the classroom begins, for certainly, the social structure runs through it. The wealth of families is an enormous factor that impact all other layers of learning, which is facilitated, to put it in Bourdieuian terms, by social, cultural and economic forms of capital; For instance, the simple fact that a pupil has a private room to study as opposed to the family kitchen table makes us aware of this systemic impact.
psychological level	it includes the learners' psychology, e.g., attitudes, motivations, confidence, maturity, and so on.

Table 4.1 – *Continued from previous page*

Stratum	Description
biological level	it is concerned with the spectrum of conditions for the essential support of growth of pupils. This level sees whether learners range from a state of nourishment to hungriness, alertness to distractedness, vision-and-hearing health to disease. Hence it gives a general range from a state of wellness to illness.
physical level	it deals with the physical structure and spatial layout of an educational institution such as a classroom, e.g., it looks to see whether the environment has adequate lighting, heat, desks, etc.
open or quasi-closed system only	it emphasizes the variability and individuality of learning and a multiplicity of mechanisms operating in pupils' response to the educational input (e.g., curriculum, assessments, etc.) it might be quasi-closed in the sense that the curriculum is centralized with little option for student's decision, but it cannot be deterministic or prescriptive.

Table 4.1 – *Continued from previous page*

Stratum	Description
moral-political level	this stratum is partially normative because it entails direct decision-making actions that explicitly reflect what is to be learned and taught in educational institutions; thus, it depicts what is expected from pupils, teachers, and administrators even when the outcomes reflect unintended consequences. The moral-political position is not just a philosophical stance, but it is the space of ideological debate about values in education that correlate with particular teaching approaches and curriculum preference. For example, while western democracies value open-ended classroom discussions, negotiable approaches, multiculturalism in educational setting, etc., the other side of this coin shows that their philosophical stance is rooted on ruthless pragmatism as evidenced by the specific aim of science, technology, engineering, and mathematics (STEM) educational programs, which reflects utilitarian principles that interest national security, liberal market economy, competition, and a globalization of non-local cultures via an appropriation and adaptation of local ones, etc.

Adapted and expanded from Brown (2009, p. 23).

However, we cannot help but wonder why Brown (2009, p. 23) omitted an important level, and hence the problem with this laminated system is that it leaves out a socioeconomic level, which I have included as a way to amplify the important notion of an open learning environment. This stratum is particularly important to be accounted for in education because it implies that we must see society and its inequalities as running through the world of classrooms, so that they do not stop at the school gates, but enter through them.

After seeing how the nested mathematics-educational activity system is a subset of a more inclusive open learning environment, I show how the mathematics-educational research community operationalizes the activity system. In this sense, Hardman (2005), Ho (2007), and Zevenbergen and Lerman (2007) operationalize the micro-relational level of the nested mathematics-educational activity system in

terms of local interactions of pedagogical practices[1] between teachers and students in
the classroom or computer laboratory. Fitzsimons (2005a, 2005b), Goodchild and
Jaworski (2005), Roth (2003), and Williams, Wake, and Boreham (2001) include
manager-laborer pedagogical practices in various workplaces. Beswick, Watson, and
De Geest (2007) and Venkat and Adler (2008) operationalize the institutional level
of the nested system by looking at departments of mathematics. Flavell (2004)
includes investigation across schools, and Lim and Hang (2003) adds the entire min-
istry of education. At the cultural-historical level, we have what Kanes (2001),
for instance, operationalizes as conceptions such as the notion of numeracy. For
Jurdak and Shahin (2001), and Jurdak (2006), the activity system is taken to be
problem-solving theories. Thus, the activity system, as operationalized by mathe-
matics education, reveals a three-layer stratification of education, namely as in the
levels of Figure 4.1, p. 72.

In particular, the operationalization of the six components of the activity system
(subject, object, instruments, rules, community, and division of labor) in mathematics-
educational research literature, elicits the "bucket"-metaphor employed by Barab,
Evans and Beak (2004) who conducted a comprehensive review of the literature on
the applications of AT in the field of technology and communication studies. Below, I
show how a similar *fill-the-bucket* approach appears in the mathematics-educational
research literature:

> the researcher then mines collected data to determine the content that
> they view as constituting a particular component of the triangle with the
> goal of developing a triangular characterizing of activity. These compo-
> nents ... [are] used as "buckets" for arranging data collected from needs
> and task analyses, evaluations, and research. (ibid., p. 207).

The bucket-metaphor is used to describe how each of the components serves as a
label and a container to be filled with sense-experience data that the researcher
extracts from the investigation. Each bucket is labeled with the name of one of the

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[1]I use the term pedagogic practices in a Bernsteinian sense, i.e., these practices are relationships
that are not confined to educational institutions between a teacher and a pupil or parents and
children, but in a wider sense they are asymmetries "those practices between doctor and patient,
the relationships between psychiatrist and the so-called mentally ill, the relationships between
architects and planners. In other words, the notion of pedagogic practice...[is] a fundamental
social context through which cultural reproduction-production takes place" (Bernstein, 2000, p.
3).

six components that constitute the activity system and is allocated data according to the perspective of the researcher on the grounds of best-fit purposes for a particular category. For instance, a bucket with the label of instruments tends to be filled with data that have been categorized by the researcher to describe instruments such as computers.

Jonassen and Rohrer-Murphy (1999, p. 62) suggest a six-step *fill-the-bucket* approach that they call a social-constructivist method to extract and fit data into each of the six categories as a way to apply AT to educational studies and to design or construct what they term "constructivist learning environments" (CLEs) based on the rationale that AT agrees with social-constructivists" assumptions about learning because

> the assumptions of activity theory are very consonant with those of constructivism, situated learning, distributed cognitions, case-based reasoning, social cognition, and everyday cognition that underlie CLEs. (ibid., p. 62).

From a social-constructivist perspective, learning always occurs in the context where meaningful activity occurs as the learner makes the gradual centripetal step from novice toward a center position that is occupied by the community of experts; thus, the activity system (as context) is a crucial element to take into account when designing instruction, in part, because it includes both categories for the subject (or novice learner) and the community (of experts). The importance of context is clearly conveyed with the following quote.

> *Activity cannot be understood or analyzed outside the context in which it occurs.* So when analyzing human activity, we must examine not only the kinds of activities that people engage in but also who is engaging in that activity, what their goals and intentions are, what objects or products result from the activity, the rules and norms that circumscribe that activity, and the larger community in which the activity occurs. (opt. cit., p. 62, emphasis added).

In order to create the CLEs, each of the components of the activity system represents an empty bucket that stands for a category to be investigated with the answers to a set of questions. I paraphrase the CLEs six-step interrogative method as follows.

1. **Clarification of the aim of the activity system(s)** To explain what the context is, this step answers questions such as what are the conflicts, problems, situations, settings, communications, tasks, conditions, within which local interaction occurs.

2. **Analysis of context** To understand the subjects' motivations, this step answers questions such as what expectations, beliefs, motivations, and objectives contribute to the overall dynamics under investigation, and who sets those objectives?

3. **Definition of each component of the activity system** To decompose the context, this level answers questions such as who stands for the subject and community. For each motivation, what are the observed actions, goals, and operations? For whom are they performed?

4. **Definition and analysis of each mediator in the activity system** To answer: what are the rules, physical instruments (machines, for example), cognitive instruments (signs systems, procedures, formalisms, methods, laws), and divisions of labor or tasks? What is the role of mediators?

5. **Analysis of the context** To assess perceived contradictions, this level answers questions such as what are the shared beliefs, assumption, theories, and methods of the group. Are tasks dictated or allowed to emerge within the group? How are groups working toward the main object?

6. **Analysis of the dynamics of the context** To formulate a description and assessment of how each of the components affects the entire dynamics, this step answers questions such as what are the conductors of change. What interrelationships between components exist and how are they changing with time?

In order to show how this *fill-the-bucket* method functions, suppose that in step one, I clarify the purpose of my investigation as the Arab Revolutions within the context of the events in Tunisia and Egypt (activity system). Then, according to social constructivism and other learning theories[1], I cannot understand or analyze the

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[1]Other theories that share similar assumptions are: Vygotskian-inspired sociocultural theories such as Lave and Wenger's (1991) situated learning including, Rogoff and Lave's (1984) everyday cognition theory, the behaviorist approach of Bandura's (1969) social (cognitive)-learning theory, Aamodt and Plaza's (1994) summary of the retrieval, re-utilization, revision, and retainment of

Arab Revolution outsize its own context because "theories that are not associated with activity have no meaning" (Jonassen and Rohrer-Murphy, 1999, p. 68). From this view, the detachment between theories (mind) and activity (body) renders it meaningless since these "learning theories claim that learning occurs only in the context of meaningful activity, [hence] it is important to analyze the activity and the context as part of the instructional design process" (ibid., p. 62). However, it does not follow that the Arab revolutions cease to exist or are meaningless outside my theories of learning about it. The construction of concepts, models, or theories rightly depends on society and the context in which it unfolds; however, the categorical error of these learning theories is to conceive that objects of investigation are meaningless or do not exists outside the social construction of reality; for example, there is much more to the Arab Revolution than the conceptual models and theories that we are able to design about it.

Consider another example to illustrate the inadequacy with the *fill-the-bucket* approach. Suppose that Marie Curie had been born in Mexico as opposed to Poland. We can speculate that today we would have mexiconium as opposed to plutonium in the periodic table; however, this speculative change does not mean that the causal effects of radioactivity are not out there in reality. Causality does not cease to exist when our theories do. If we did not exist in the world, then it does not follow that the category of, say radioactive chemical elements, would cease to exist with us. First, the example illustrates that our categorization of the world is assumed, so that the task of scientific investigations is to discover such independent pre-existing categories. Second, the example illustrates that our categorization depends on the constructions of words, concepts, theories, contexts, activities, systems, models, and more used to describe reality; however, categories do not exhaust reality itself. From a CR perspective, this categorization of reality is crucial because the designation of erroneous, mystified, or illusory categories of reality (as well as accurate ones) is, in fact, the "backbone" of ideologies (Bhaskar, 2009).

I want to stress that in reality, categories are not empty buckets waiting to be filled with sense-experience data. If we simply use these buckets as labels and containers for events or phenomena in the world, then we are imposing categorization on reality, when in fact we have the reverse. From a CR viewpoint, we find it possible to construct real categories about reality because reality is, in fact, differentiated and

learning to problem-solving theory, which is a theory recognized with the name of Case-Based Reasoning, and also Distributed Cognition theory as explained by Rogers and Ellis (1994).

structured in such a way, and not just because we are able to construct categories on the grounds of a best-fit purpose.

> People have a misunderstanding of the nature of categories, they think, like Kant that categories are things we impose on reality; but to the critical realist, the transcendental realist, the categories, if they are real are constitutive of reality itself. That is, causality is no schema we impose on reality; it is actually out there...Ideology is a categorically confused reality. It is real but it is false. This is a possibility in social reality. The true nature of social reality is there...it is fine to have an interpretation which is distinct from those categories, or to have a very radical interpretation, but the question is can you leave it out?...if you adapt a purely Kantian interpretative approach, is that you are failing to satisfy the reflexive criterion of philosophy, which is the capacity to situate and to sustain your own content you own condition of possibility of being. (Bhaskar, 2002a, pp. 54–78)

The immediate question that follows is: how does the CR categories and the Kantian categories relate to the historical development of the activity-theoretical approach? We may recall that AT has ancestry in the philosophy of Kant whose view of the categorization of reality is particularly important for this thesis. Following Bhaskar's (2009) reading of Kant, we see that a Kantian category is one that cannot be penetrated, understood, or transcended because it is "locked" in its own enclosure as a "thing-in-itself". According to Bhaskar, we can recognize a Kantianism if the categories of methods, models, and theories yield the truth about the nature of reality (or the idea of epistemic relativity), as opposed to categories of real things denoting the limits of our reality, (or the idea of ontological realism). From a CR perspective, the intelligibility of reality does not depart from a list of "locked" categories that cannot be understood or empty buckets waiting to be filled. Rather, reality must be such that it necessitates categorization in order to be accessed effectively. On the one hand, if we fail to posit a difference between real categories and the philosophical ways we talk about categorization, then we are committing a Kantian error. On the other hand, if we completely ignore a crucial category of reality such as the omission of a dimension of nature in some vulgar forms of Marxism or the omission of the social structure in Vygotskian socio-cultural theory, then we are unable to sustain unity between our theory and practice.

In what follows, I show how the mathematics-educational community has drawn upon AT by means of an imposed categorization parallel to Barab, Evans and Beak's (2004) buckets-metaphor, which yields a Kantianism. I focus only on the micro level of the classroom to illustrate how the components of AT are used as "buckets" according to the mathematics research community, resulting in the epistemic fallacy.

4.2.1 The empty bucket of the subject

Jonassen and Rohrer-Murphy (1999) regard the subject component as an analytical anchor to construct the entire activity system. According to Engeström (1987), the subject is defined as an individual or individuals involved in the activity system under investigation. In student-centered mathematics, educational research, Flavell (2001), Jurdak (2006), Williams, Wake and Boreham (2001), and Zurita and Nussbaum (2007) conceptualize the subject components as individual students or groups of students ranging from primary to university level. In teacher-centered investigations, Hardman (2005, 2007) and Jaworski (2003) regard the subject as the educator or educator-researcher. For Fitzsimons (2005a, 2005b), Roth (2003), and Venkat and Adler (2008), who study the micro context of workplaces, the subject bucket tends to be filled with educational worker(s) such as numeracy coordinators, mathematicians, and administrators to name a few.

4.2.2 The empty bucket of the object

Kaptelinin (2005, p. 5) argues that the object of activity that tends to go into the empty bucket of the same name is "the 'ultimate reason' behind various behaviors of individuals, groups, or organizations". The object as "sense-maker" bucket in mathematics-educational investigations tends to pertain to long-term goals such as improving teaching, learning mathematical practices, or developing the motivation and technical skills of students in Hardman (2005, 2007), Kanes (2001), and Venkat and Adler's (2008) teacher-centered investigations. In student-centered investigations such as those conducted by Flavell (2001), Jaworski (2003), Jurdak (2006), Roth, (2003), Williams, Wake, and Boreham (2001), and Zurita and Nussbaum (2007), we encounter the view that this bucket tends to be filled with data that describes short-term goals—e.g., practicing algorithms, preparing for formative assessment, or solving assigned mathematical problems.

4.2.3 The empty bucket of instruments

Kuutti (1996, p. 14) explains that the empty bucket of instruments (or tools) tends to be filled with "anything used in the transformation process, including both material tools and tools for thinking". In mathematics-educational investigations, Jurdak (2006), Roth (2003), and Williams, Wake and Boreham (2001) fill this bucket with data that shows how psychological tools such as language or mnemonic techniques help in the transformation of behavior. Coupland and Crawford (2006) and the investigations of Groves and Dale (2005) fill the instrument's bucket with data documenting how mechanical tools like calculators and mathematics software aid in the transformation of the environment. Others like Hardman (2005) and Zevenbergen and Lerman (2007) use a combination of both types of instruments.

4.2.4 The empty bucket of the community

For Engeström (1996), the community is composed of the relations between subjects and other individuals that are brought together by a shared object usually organized to meet at a common place and time. In mathematics-educational research, Hardman (2005) and Jurdak (2006) fill the community's bucket with a teacher and students in a typical classroom. In a larger macro context, Flavell (2001) uses data that includes families, friends, other educational officials, and industry workers to fill this bucket, and others such as Venkat and Adler (2008) include policy makers. The community binds individuals together through socially implicit and explicit rules and a division of labor among its members.

4.2.5 The empty bucket of rules

Engeström (1998) argues that rules represent norms, conventions, or social traditions that are established by the community to govern its members. In particular, rules for Yackel, Rasmussen, and King (2000, p. 458), in the mathematics classroom, are those "sociomathematical norms" that set permissible or impermissible behavior in order to regulate the community's argumentation and opportunities for discussion in the classroom. Examples of data that go into the implicit-rules bucket are Hardman's (2005) rule of raising one's hand, asking for permission to speak, as opposed to shouting out, and Jurdak's (2006) rule to speak in English as a mandated language of classroom communication. Jaworski (2003) and Jaworski and Potari (2009) fill

the explicit-rule bucket with assessments, curriculum protocols, and algorithms, while Kanes (2001) adds teachers' probing and questioning, Williams, Wake, and Boreham, (2001) include writing in the correct genre, and Flavell (2001) and Venkat and Adler (2008) extend the explicit rules to whole class groupings by ability.

4.2.6 The empty bucket of division of labor

For Engeström (1987), the division of labor component refers to the splitting-up of human labor among members of the community depending on vertical and horizontal dimensions. The horizontal dimension refers to negotiations of basic tasks and responsibilities between the community's members. Asymmetrical relations of authority and responsibility define the vertical dimension. Hardman (2005), Jaworski, (2003), Jurdak (2006), Flavell (2001) and Jaworski and Potari (2009), provide evidence that fill the division-of-labor bucket with the assignation of task, interventions, collaborative agreements, validation of solutions, and hierarchies of authority ranging from students and teachers to educational coordinators and curriculum managers.

After we have seen how the mathematics-educational research community commits a Kantianism that is revealed when these six categories of the activity system are imposed in reality by treating each of them as empty buckets to be filled with sense-experience data, I now turn to what Barab, Evans, and Beak (2004) call "gap analysis", or the process that employs the activity system for purposes of identifying contradictions (double binds), dysfunctions, and conflicts within mathematics-educational research.

4.3 Engeström on contradiction: driving transformation of activity systems

The concept of contradiction in AT is the source driving development and change of a central activity under investigation (Engeström, 2001). This concept is directly influenced by the Marxian analysis of the capitalist system and the Il'enkovian analysis of the dialectical system, where the commodity is a key "contradictory unit of use value and exchange value" (Engeström & Miettinen, 1999, p. 5). From its Marxian roots, the activity system is analogous to a capitalist mode of production since

it is conceptualized to be in a contradictory state, in a type of perpetual crises that renders its normal functioning invisible. In order to resolve its systemic contradictions, this system needs to be in a constant state of expansion and rejuvenation, which is the reason that contradictions are seen as "the driving force of change and development in activity systems" (Engeström, 2001, p. 135). Theoretically, it follows that attempts to overcome contradictions are critical to generating change in a system.

Contradictions in AT are always present, although not always perceivable. They should not be conceptualized as everyday solvable problems; rather their resolution can lead to transformation. Contradictions in AT differ from a "common-sense" understanding of the word in that they are long term and systemic formations that occur within systems.

> Contradictions are fundamental tensions and misalignments in the structure that typically manifest themselves as problems, ruptures, and breakdowns in the functioning of the activity system.(Virkkunen & Kuutti, 2000, p. 302).

Engeström (1987) argues for four levels of contradictions (see Figure 4.2, p. 88). In Engeström's schema, inner or primary contradictions occur within each of the components, and secondary contradictions occur between the components of a central activity system. If there are two or more activity systems, a tertiary contradiction could also occur between the object of activity in a central activity and the object of "culturally more advanced" activities. A quaternary contradiction may occur between the central activity and neighboring activities.

According to the mathematics-educational community, the potential of this concept lies in the identification of areas of conflict, which could serve as possible places for intervention and change. However, we need to keep in mind that while contradiction identification is important in order the make explicit the paradoxical nature of a particular problem, there is also a danger in that we may incorrectly perceive contradictions as ubiquitous. I turn now to analyze the types of contradictions that are identified in the mathematics-educational literature utilizing Engeström's four-level approach.

Adapted from Engeström (1987, Inner contradictions of human activity, para. 18).

4.3.1 Contradiction identification: secondary contradictions in mathematics education

Research on the identification of contradictions falls into two overall categories: studies that introduce a new instrument and studies that introduce a new object into the activity system. Both illustrate that the introduction of a new instrument or new object from the outside into the central activity system disrupts the dynamics among components creating secondary contradictions, and between micro and institutional levels creating tertiary contradictions.

In empirical studies where an instrument was introduced to the central activity, researchers have mainly identified secondary contradictions between the components of an activity system. Focusing on the micro context of the mathematics classroom, Zevenbergen and Lerman (2007) found that the introduction of interactive whiteboards as instruments produced secondary contradictions. The teacher or subject of activity, for example, expressed these secondary contradictions as conflicts in time-management between the time dedicated for the lesson and the time needed to have the technology ready. In a similar study, Hardman (2005) found analogous contradictions across the contexts of the mathematics classroom and he computer laboratory.

Other secondary contradictions between components are echoed in the studies that use AT to analyze the introduction of a new object into the activity system. For instance, Goodchild and Jaworski (2005, p. 46) use an activity system located at the institutional level (a), to describe contradictions between

> the stated desire to be part of the project community [object] yet an apparent distancing of themselves [the mathematics teachers] from sharing the responsibilities of the community [mathematics teachers and university researchers] as a whole [division of labor].

Venkat and Adler (2008) advance contradiction identification by adding tensions between the actions of two different subjects (numeracy coordinators) in two different mathematics departments (two interacting activity systems). In theory, these subjects have a common object (KS3 national policy); but in practice, they implement the national policy in different ways. In turn, these studies show that secondary contradictions are inconsistencies between theory and practice, which were possible to identify by looking between the components of a single level in what I have termed

the nested mathematical-educational activity system.

Contradiction identification that results from the analysis of a micro activity system such as a classroom nested within broader institutional activity systems such as a ministry of education is exemplified by Lim and Hang (2003) who pointed the way to mathematics-educational researchers in a study about integrating technology (ICT) in schools. For instance, the object of the classroom to provide students with "higher order skills" in ICT is differentiated from the object of the school and the ministry of education, which is to increase school ranking by improving examination results. Although this study is not situated in the mathematics classroom, it offers an exemplary analysis of tertiary contradictions that appear across the three micro, institutional, and societal levels. In this manner, we have seen how nested mathematics-educational activity system based on the applications of the activity system in mathematics education from the literature review influence each other in terms of contradiction identification.

4.3.2 Contradiction identification: primary contradictions in the transfer between school and work mathematics

In the previously stated literature review conducted by Barab, Evans and Beak (2004) on the applications of AT to technology and communication studies, the authors show that another way to carry out contradiction identification is by "gap analysis" because this type of research aims to close the gaps that exist when moving from one educational context to a different one. The term "gap analysis" refers to analysis in two different settings; it is also evident in the educational literature aimed at investigating the mathematics required for competence in the workplace. This particular set of research investigates "the gap" between college mathematics and the mathematics needed in the workplace.

In the "gap analysis" of the transfer from school to work, Roth (2003), Williams and Wake (2007), and Williams, Wake and Boreham (2001) examine how mathematics curriculum copes with the demands of the workforce market. These types of studies are important because contradictions are not identified in terms of components, as in the research reviewed in the previous section; instead, the subject "embodies the contradictions of the two systems, as do we all in general when we cross barriers" (Williams, Wake & Boreham, 2001, p. 79). In other words, a primary contradiction is always present; it is built-in, which is usually phrased in terms of the

subject having a double way of knowing mathematics. The theoretical mathematics learned in school and the practical mathematics learned at the workplace form this double knowledge. In these studies, there is a default or internal contradiction that is built-in as part of the subject when she enters the new environment of the activity system of a new workplace or a new situation. In these types of studies, contradiction identification of subject-related internal contradictions is purposefully done to give recommendations aimed at changing the mathematics curriculum to resemble the needs of workplaces. Shore and Wright's (1999) analysis of Neo-liberal marketization of higher education in the field of anthropological studies reveals similar results in which such recommendations, e.g., changes the curriculum, admissions requirements, and so on, goes together with the rationale to produce an employable workforce for a market that is able to compete in global capitalism. In such cases, market-like mechanisms are able to audit institutions of higher education according to recommendations of workplaces and markets.

Overview of the AT applications according to mathematics-educational empirical research The reviewed body of literature points to a distinction between the methodology by the mathematics-educational community and the interventionist approach indented by Engeström (1987). I focus on how the mathematics-educational community has implemented the concepts of contradiction and the activity system. The evidence presented here suggests that the activity system has can be model as a nested mathematics-educational activity system, which is in turn a subset a type of mixed laminated system, an open learning environment.

The mathematics-educational community identifies primary (or within a system) and secondary (between the components of a systems) contradictions, summarized below:

(1) Introduction of a new instrument: the introduction of technology such as the case when a teacher or student experiences problems with a whiteboard or calculators, gives rise to a paradox that while new technology is designed to facilitate pedagogies, its initial implementation is a slow process that tends to create chaos since it requires training, necessitates accelerated instruction, and thus tends to produce time-management conflicts.

(2) Introduction of a new object: the adoption of a new school policy (as the new object) often appears as a discrepancy between what is theoretically conceptualized as the object and the different ways in which the members of the

community (who share this object) actually implement it or carry it out in practice.

(3) The transfer to a new context or situation: when a student transfers from applying mathematics in college to applying mathematics in the workplace, the move can generate a primary or inner contradiction in cases where there is a need to re-learn practical aspects of college mathematics at work, even if a student is theoretically proficient.

The corpus of this empirical research into contradiction identification gives us an example of what I have conceptualized as 2E: learning as process using Bhaskarian dialectics in section 2.4, p. 27. The processes identified in (1), (2), and (3) are examples in the literature of an apprehension of incompleteness since contradictions or some other form of acute negativity generates them; they are also the reason why Engeström conceptualizes learning in terms of the activity system as a continuous process of expansion, what he calls "the expansive learning approach" (Engeström, 1996, p. 168). The importance of the identification of contradictions is that it makes us aware that we cannot follow two paths simultaneously. In colloquial language, this double bind refers to the one cannot have-one's-cake-and-eat-it-too principle. From a CR viewpoint, these processes generated by contradictions are indications that there is something wrong in ontology (being); that is why we need to expand the conceptual system to remedy the absences that explain the contradictions. This necessitates a further level of 4D: learning as product-in-process following Bhaskarian dialectics (in 7.6.1, p. 244).

Despite a reliable body of research on AT in mathematics education that spans decades, its methodological approach differs from Engeströmian dialectic, or what he calls "the logic of expansion. . . [where] expansion is essentially a social and practical process, having to do with collectives of people reconstructing their material practice" (Engeström, 1987, Dialectics of Substance, para. 21), which is mainly, but not limited to interventions. Roth and Lee's (2007) educational review shows that interest in AT has increased and expanded since the late 1980s to non-participant observational and theoretical research, and currently remains open to further development. In fact, Engeström (2008b, p. 382) himself suggests that AT "is an evolving framework which needs to the developed further as it is applied in empirical studies", encouraging new researchers to explore it. It is from here that I can make an original contribution by grounding AT in a critical realist philosophy. In what

follows, I continue with the guiding question: what has been left out of this particular learning theory? In order to provide an answer, I now refer to the theoretical research within three generations of AT.

4.4 Theoretical dualisms as potential for a fourth-generation AT

Theoretical research in AT is difficult to encapsulate, and just as empirical research, it varies across multiple disciplines. This type of research has two main aims:

(A) to understand the intricate character of new objects by developing new conceptions, while a second related purpose wants

(B) to understand and overcome the nature of dichotomies or dualisms that AT suffers from. Such theoretical problems perhaps imply "a need for a fourth generation of Activity Theory" (Engeström, 2008a, p. 10).

I take this issue seriously in order to make, what is to the best of my knowledge, a humble contribution to knowledge, entitled the Critical Realist Activity Theory (CRAT).

(A) Recently, theoretical research in AT has turned to understanding what Engeström (2008a, p. 3) calls "runaway objects" because of their monstrous and volatile character, but also because of their immense potentiality to drive innovation. Some examples of these objects are global warming, open-source software, neo-liberal economic policies, health-related pandemic diseases, and so on. Activity-theoretical concerns involve the creation of ideas that seek to grasp the nature of new complex communities. For example, the Linux group and WikiLeaks exhibit the complexity of a new type of community because they are difficult to bound due to their heterogeneous membership and difficult to eliminate since they thrive from making strategic, "mycorrhizae-like" partnerships with other communities (Engeström, 2006, p.1784). I want to emphasize that the only way to study Engeströmian runaway objects is through an interdisciplinary investigative program that combines various sciences (elaborated in Chapter 6, p. 183). In a related theoretical article, Blunden (2009) arrives at a similar reflection.

> In investigating the basis for an "interdisciplinary" concept of activity, the aim is (1) to construct a richer definition of activity as a premise for

both psychological and sociological sciences, and (2) focus on those problems lying on the boundary between psychology and sociology. (Blunden, 2009, p. 5).

I dedicate the Chapter 6: an appendix to Chapter 5, to elaboration of the idea of interdisciplinary activity grounded in CR because the issues concerning interdisciplinarity, in AT and in general, stem from the tenets of basic CR.

Aside from the study of runaway objects, Warmington (2005) argues that the study of activity systems should be the study of contradictions located within labor activity of production and reproduction. Others such as Blackler and McDonald (2000) focus their activity-theoretical argument around the concept of power relations in the work place. We can immediately ask, what does it mean to conceptualize power relations today? CR is able to illuminate AT in this regard by explicitly distinguishing between empowering transformative capacity (or $power_1$) and the concern with any form or relationship of exploitation, domination, and other forms of oppression such as exclusion (or $power_2$). We clearly want of $power_1$ toward a greater enabling capacity to transform $power_2$, to enable the oppressed or victims of $power_2$ to be self-empowered, together with a transformation of the very relations of domination that are in need of abolition, so that a new class of exploiters does not manifest itself. While $power_1$ is a resource denoting our basic ability to act in the world, $power_2$ stems from or constitutes what Bhaskar (2004) calls master-slave relationships[1]; the way to transform the latter is by augmenting $power_1$ to abolish or transform $power_2$, as summarized in the following.

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[1]Bhaskar (1994, p. 2) derives master-slave relations from Hegel's philosophy, which denote the struggle between a pair of self-aware individuals that fight for recognition, but whoever wins cannot achieve recognition from a dead opponent. The victorious one is the master who opts for enslaving as opposed to killing the looser. The master appears to have recognition and freedom, while the slave is succumbed to discipline and harsh labor. However, the slave sees herself or himself in the object of activity (as a reflection in the objectification of her or his labor) and in this manner, the slave succeeds to a greater extent than the lazy master does "in removing the externality of the world".

Table 4.2: Manifestation of $power_1$ and $power_2$

Power	Manifestation
$power_1$ as transformative capacity	It refers to our capacity for change that is intrinsic to human praxis. The autodidactic capacity of an individual for reflection can be seen as an example of $power_1$. All $power_2$, relations of oppression, can also be used as transformative. $power_1$—e.g., slavery was used as workforce to develop the cotton industry. In this sense, $power_1$ is a more inclusive concept, where relations of oppression may be relations of transformation but the opposite does not hold.
$power_2$ as oppression	it refers to any form of oppression, control, exploitation, abuse, and how power functions for ill treatments.

Adopted from Bhaskar (2008b, p. 60).

(B) A second part of the AT theoretical research deals with understanding and overcoming the nature of various dualisms from which AT suffers, as shown in Table 4.3, p. 95.

Table 4.3: Dualisms of AT and their resolution via a philosophical grounding on CR

Theorist	AT dualism	CN resolution
Engeström (1999) Davydov (1999)	the dualism between mediation via sign systems and mediation via instruments or the dualism between communicative interaction and instrumental activity (in general terms)	transcendental realism, referential detachment, and rejection of the linguistic fallacy
Sawyer (2002)	the individualist-collectivist dualism	social relationism

Continued on next page

Table 4.3 – *Continued from previous page*

Theorist	AT dualism	CN resolution
Engeström (1999) Davydov (1999) Daniels (2004) Blunden (2009)	the internalization-externalization dualism: a code for the pair of structure-agency and individualism-collectivism dualisms	Transformational Model of Social Activity (TMSA); social relationism
Zinchenko (1985) Davydov (1999) Engeström (1999) Davydov (1999) Daniels (2004) Blunden (2009)	dualism between psychic (or goal)-related process and object (or motive)-related activity dualism: a code for the pair of mind (or mental)-body and reasons-causes dualisms	Synchronic emergent powers materialism (SEMP), ontological materialism and a robust theory of causality, including intentional causality
Engeström (1999)	the relativist-historicist dualism	the "holy trinity" of CR: accepts (a) ontological realism and accepts (b) epistemic relativity, while opening up the possibility of judgmental rationality.

These unsolved dualisms fall within the micro and macro aporias of social theory (see Table 5.1, p. 118), which suggest that AT can benefit from a firm philosophical grounding in order to resolve them. I shall argue that Critical Realism (CR), as a philosophical system acting as under-laborer for the social sciences, can provide the conceptual tools by which AT can transcend the identified dichotomies. By identifying the fallacies of various false dualisms in social theory, CR is able to reject them and postulate a more complete account of reality.

One may ask: what is wrong with dualism? At this point, it is convenient to explain the difference between dualism and duality. While duality signifies a non-pejorative, valid category that denotes how concepts are related but distinct, dualisms encompass a false fission between them. The duality of theory and prac-

tice, for example, encompasses the existence of interdependent and fundamentally different correlatives, which typically (although not always) may be perceived from the single facet of the other concept. One may perceive theory as practice and vice versa under what CR denotes as a "perspectival switch" (Bhaskar, 1998b, p. 15). Other non-pejorative dualities are hiatuses showing an irreducible distinctness between both concepts: social structure and agency, the intransitive dimension (ID) and the transitive dimension (TD) of knowledge, beliefs and meaning, or the components of the activity system, to name a few. Examples of pejorative dualisms are summarized in Table 5.1, p. 118 in the philosophy of social science. And the dualisms between the real non-actual causual law and the empirical regularity in the philosophy of science, which is manifested in the problems, such as the problem of induction, see 5.3.2. Wheareas in the philosophy of social science, problems manifest as dualisms, in the philosophy of science, they manifest as aporia—e.g., such as the problem of induction, transduction, fetishism, and the epistemic and ontic fallacies[1], including the linguistic fallacy[2]. Both of these fallacies are founded on an anthropism meaning that they place human beings at the center stage of reality. Against anthropism, MinGyu (2008) argues that CR, in its basic and dialectical forms, identifies the fundamental anthropic error of western philosophy as based on a misunderstanding of ontology (being), and provides a resolution to this error based on the bedrock of unity and non-identity (duality) in the philosophy of meta-reality (PMR).

According to Bhaskar (2008b) what underpins dualisms is essentially an implicit acceptance of (or explicit indifference to) dialectical contradictions, which are mainly expressed as relations of subjugations or master-slave relations in society between individuals or entire nations. In section 7.8, p. 266, I further explain Bhaskarian dialectical contradictions; for now, I continue with the exposition of theoretical literature on the dualisms that AT suffers from and suggest a CR-ontological resolution.

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[1]The ontic fallacy is the consequence of the epistemic fallacy because when we define reality implicitly in terms of our knowledge (or similarly, in terms of language) such definition means that what we know about reality is just reality itself, which presupposes that our knowledge of reality is correct (Bhaskar, 2008a, 2008b). In this sense, reality is collapsed to a single dimension in which our objects of activity (or investigation) move from our knowledge to the world.

[2]The linguistic fallacy is a version of the epistemic fallacy, which analyzes phenomena in terms of language, which is tantamount to analyzing all phenomena in terms of knowledge (Bhaskar, 2008b).

4.4.1 The dualism between mediation via sign systems and mediation via instruments or the dualism between communicative interaction and instrumental activity

Engeström (1999) argues that third-generation AT suffers from various dualisms, among which we find the dichotomy between mediation-by-signs and mediation-by-instruments, a derivative from conflicting interpretations of both Vygotskian and Leont'evian theses. He suggests that while third-generation AT sees that mediation by semiotic means, including language, is an inherent part of all human productive activity, a rigid interpretation on either a Vygotskian or Leont'evian side dichotomizes the AT theoretical field.

However, in section 3.5.1, p. 56, I put forward a different reading by suggesting that the dichotomies generated from a passage from one generation of AT to the next, are not due to conflicting interpretations. More precisely, the theoretical problems of AT are not caused by favoring a Vygotskian reading over Leont'ev (or vice versa); rather we must view this passage from the onset as a harbinger of each developed version, which is necessitated because there is a systemic problem within the theory itself that is signaled by its various dichotomies. And I have argued that a first dualism is signaled with the notion of a unit of analysis. In Vygotsky's *Thinking and speech* (1987), this theoretical unit refers to an irreducible whole or cell containing all of its parts but is irreducible to them, as follows:

> word meaning is a *unit of thinking*, it is also a unit of both these speech functions ... *Social interaction presupposes generalization and the development of verbal meaning...* Therefore, it may be appropriate to view word meaning not only as a unit of thinking and speech but as *a unit of generalization and social interaction, a unit of thinking and communication.* (ibid., pp. 48–49).

The problem is that while a strand of sociocultural theorists takes word meaning as an analytical unit to mediate the relationship between cognition (or thinking) and speech with others or with the self in terms of *thinking as communicating*[1], a different strand of sociocultural theorists takes this unit as Wertsch's (1981) tool-mediated action (see Figure 3.1, p. 42), while Zinchenko (1985) and Blunden (2009)

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[1]To coin Sfard's book title *Thinking as Communicating: Human Development, the Growth of Discourses, and Mathematizing* (2008).

insist that word meaning is only a part of a larger genus that needs to include liberation and collaboration as a human project. Engeströmian AT is closer to this latter view by arguing that word meaning can be merely a unit of analysis that lacks an object of activity. We can shed light into the problem of units of analysis by differentiating between (1) the object and its methods of investigation, including our (2) knowledge and discourse about it.

Let us suppose that X is our object of scientific study. From a CR vantage point, we cannot equate our analysis of X, such as our discourse, methods, or knowledge about X to X itself. (2) If we reduce X to discourse, then we are committing what, in CR terms, is known as the linguistic fallacy and (1) if we reduce X to our knowledge, beliefs, and methods about it, then we are committing the epistemic fallacy. In section 5.2, p. 119, I argue for transcendental realism as the stance to reclaim ontology in order to elucidate and resolve this dualism between mediation by signs and mediation by instruments.

Generally, Davydov (1999) situates this dualism within the broader realms of communicative interaction and instrumental activity, which is the idea that all human activity is a prototype of labor aiming at production. While AT stresses that human activity is linked to different forms of communication, such communication-instrumental dualism occurs if the two notions are opposed or homologous to each other. Davydov articulates his resolution:

> [the] notions of activity and communication must not be opposed. At the same time, one cannot study communication and evaluate its role in peoples" lives without examining their activity. Communication only gives form to activity. (ibid., p. 47).

However, what is missing is the domain that is detached from the other two—a referent to an external real world. I argue that CR provides a resolution to the communicative interaction-instrumental activity dualism with the Bhaskarian idea of (1) referential detachment:

> the argument for referential detachment is the argument for existential intransitivity and, in science, is the ground for the argument for the stratified, differentiated, and changing ontology which critical realism has hitherto deployed. And to speak of the "ontic content" of a proposition is merely to indicate the ontic referential aspect of the 'referential-

expressive' duality of function, which is a necessary component... of an adequate theory of truth. (Bhaskar, 2008b, p. 40).

In short, referential detachment is an argument parallel to the re-vindication of ontology, which can pictorially be seen in terms of the Bhaskarian (2) semiotic triangle, as shown in Figure 4.3, p. 100. Thus, the couple (1) and (2) help us to resolve the
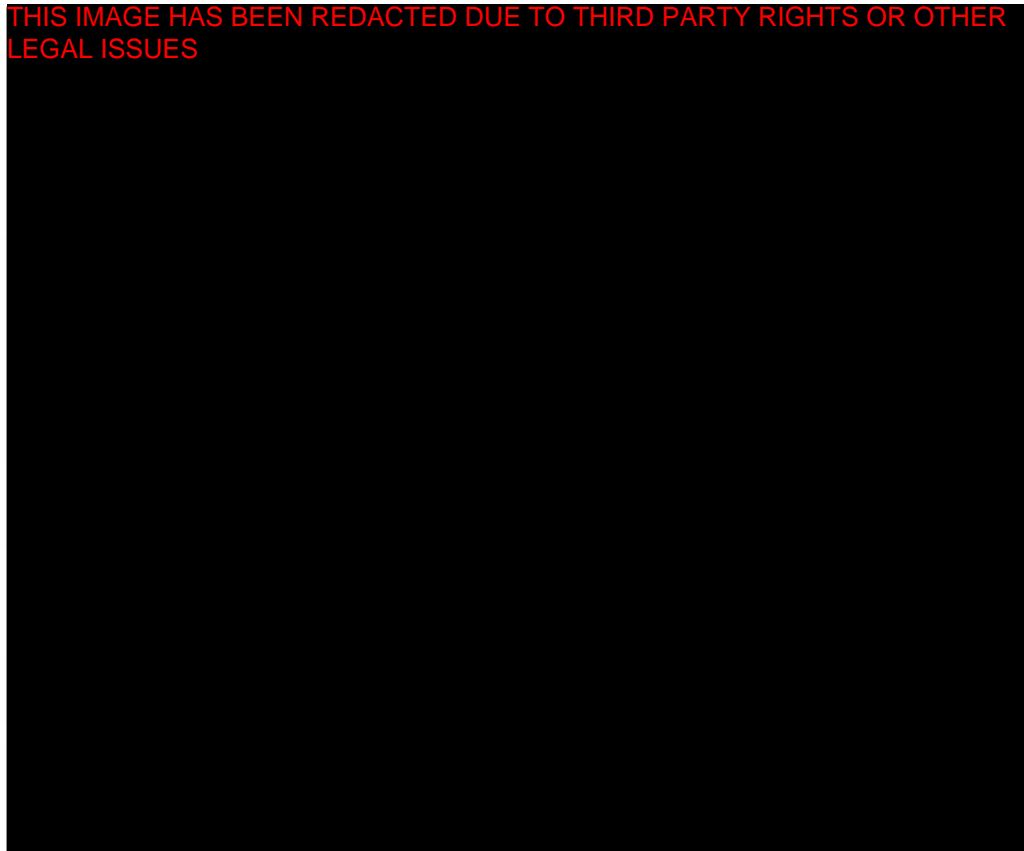
Adopted from Bhaskar (2008b, p. 223).

communication-instrumental activity dualism. From a CR perspective, reference is to the external real world, such that the referent, to which the thing, object, or state of affairs in the real world belongs is the intransitive dimension of the objects of scientific investigation, which exist and act independently of our knowledge of them. For instance, when communicative interaction is linked to human activity, language provides us access to individuals' consciousness, perceptions, wants, desires, and beliefs; however, without an external referent point, we cannot adequately theorize their independent existence and causal efficacy. Metaphorically, we can imagine that

the lack of such an independent dimension generates a perception of frankensteinian-type of individuals that have a body without a mind. A different problem arises if language is detached from this communication-activity link, in which case, we fall into a post-modernist perspective, which is the view of reality as exhausted by concepts, as if language appears to enslave the individual[1].

Without collapsing reality into dualisms, CR allows us to understand the triad of relations among (1) the realm of communication that includes language in broad terms or what in the semiotic triangle is denoted as signifier, (2) the realm of epistemology, the objects and methods of knowledge, or what in the semiotic triangle is denoted as signified; (3) the realm of ontology, the referents which are the external and real objects of science, such that these objects are detached from the other two realms. According to Bhaskar (2008b), to refer raises the possibility of opening a debate about some referent, something in the world, and the possibility of referents that are yet to be discovered. However, this possibility does not eliminate or exhaust the field of external referents, hence the importance of an argument for or about ontology.

4.4.2 Individualist-collectivist dualism

Sawyer (2002) identifies an unresolved tension in first-generation AT, namely, the dichotomy between methodological individualism and methodological collectivism. This dichotomy refers to the problem of an individual versus a group of individuals as a unit of analysis, which as we will later see, extends to third-generation AT. Following M. Archer, Sawyer (2002) suggests that sociocultural theorists should resolve this problem by adopting analytical dualism, which refers to an analytic separation mode that does not collapse "the hiatus-in-duality of agency-structure and other dualities" (Hartwig, 2007e, p. 150). From this perspective, properties of collectives or groups, which refer to group type, size, hierarchical composition, and so on, are analyzed separately from those individual properties, which refer to gender, age, socio-economic background, and so on. He highlights that such ability to separate is inconsistent with a "process ontology", the idea that "holds that only processes are real; entities, structures, or patterns are ephemeral and do not really exist" (Sawyer, 2002, p. 2). In other words, "process ontology" is not a

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[1]To refer to the metaphor and title of Jameson's *The prison-house of language: A critical account of structuralism and Russian formalism* (1974).

theory of being that puts forward the grounds on which methodological separation is consistent without falling into inseparability claims, which suggests that society and the individual cannot be distinguished from each other.

Although analytical dualism is proposed, there is still the need to see how a two-way causality between the social structure and agency can happen. The important point is that we cannot have agency without structure, and in any conceptualization of the social structure, nothing can happen without agency, so that when we make an explanation in social science, we normally need to refer to both structure and agency. Thus, we see that a crucial element, as argued by Archer (1982) on the thesis of analytical dualism, is not to conflate these two terms. CR agrees with Archer's argument in the sense that, analytically, the individual and society have to be kept separated because these notions refer to different objects of study. The analytical-dualism issue is to perceive structure and agency as a problem of analysis, when for critical realists they are clearly different but related, in terms of the Transformational Model of Social Activity (TMSA). CR argues that structure and agency are not two different perspectives of reality, while the analytical-dualism perspective encourages it.

4.4.3 Internalization-externalization dualism: a code for the pair of structure-agency and individualism-collectivism dualisms

Although I began with dualisms that pervade first-generation AT, as we will see, third-generation AT also suffers from the same and other dichotomies, as echoed by various major theorists in the different field (see Davydov, 1999; Engeström, 1999; Blunden; 2009). For example, Engeström and Cole (1997, p. 304.) have suggested openly that the activity-theoretical approach "may be seen as one attempt to overcome the dualisms of collective- and individually-based units of analysis", but there are still theoretical issues that remain unresolved within this framework. Daniels (2004, p. 313), for instance, is very clear when remarking that Engeström's activity system is collective referring to social practices of individuals and organizations, whether these practices "are performed individually or with others"; he recognizes that it is methodologically difficult to capture evidence from the community, their rules, and their divisions of labor, so as to emphasize the individualist-collectivist

dichotomy.

Although AT is concerned with relations between and within structures of activity systems, the way in which AT conceptualizes relations continues to create dualisms, which suggests that we can ground AT on CR philosophy. In other words, it is possible to exemplify the individualist-collectivist dualism that pervades through generations of AT from CR via social relationism. I shall expand on the AT dichotomy between individuals and collectives and their CR resolution via social relationism below, and fully in section 5.8, p. 142.

The second unsolved problem of AT, as identified by Davydov (1999), deals with the differentiation between what is externally changing versus what is internally changing. From first-generation AT, we have seen that Vygotskian-inspired socio-cultural theory postulates a two-way movement between individuals and their social and cultural environment, but unknown mechanisms that characterize this difference pose a problem for AT. Engeström (1999) echoes this problem of transformation as the classic dichotomy between internalization and externalization. To reiterate from section 3.3.1, p. 45, internalization refers to the key mechanism that has dominated socio-cultural learning theory; it was discovered by the Soviet school of psychology in which Vygotskian research demonstrated that children's acquisition of knowledge was facilitated with the aid of more advanced peers or adults, which is the theory of the Vygotskian zone of proximal development (ZPD). Whereas internalization deals with the role of psychological tools and other instruments, externalization deals with invention or creation in order to facilitate a task; that is, it deals with one of the most important aspects of human activity, which is its ability to create and go beyond given constraints. From an AT perspective, there is a duality of internalization and externalization because both of these processes can occur together by having feedback effects on each other.

> Whereas internalization is related to reproduction of culture, externalization is the creation of new artifacts that makes possible its transformation. These two processes are interpretably intertwined. *Roy Bhaskar, elaborating on the notion of emancipatory social activity, comes to essentially the same conclusion.* (Engeström, 1999, p. 10, emphasis added).

From the above quotation, we see that AT agrees with Bhaskarian CR in the duality of internalization and externalization as distinctly intertwined processes. Thus, it

is a good way of showing how the theoretical leaders of AT are starting to move towards CR, and the point of CRAT is to illuminate such a move.

However, if internalization and externalization are perceived as completely separated processes, a false dualism grounds both of them, what Davydov (1999) calls mechanist activism. From a mechanist activism viewpoint, nature and society are explained by how they are brought about in accordance to familiar models of machinery, which tend to posit internal change as having no origins in external human activity—e.g., the heart as a pump, brain as computer, to name a few. An opposite facet of mechanist activism is to perceive change as a sponge that only saturates by absorbing from external human activity. Against mechanist activism, Davydov suggests that AT needs to develop new conditions of reality in which it can be possible

> for people not to disfigure nature and society. But often there are not adequate conditions for the realization of this possibility... This is vitally important in order to show how narrow is the idea that humans must only understand, explain, and make themselves in the world, not change it. (ibid., p. 43).

In short, what these "adequate conditions" refer to the need for an ontological theory of reality that adequately considers the conditions for the possibility of nature and society as distinct units without encapsulating collapsing internal to external activity in terms of mechanistic activism (or vice versa). As before, I shall argue that Critical Realism (CR) is such a theory because it explicitly develops an ontological view of reality. Paradoxically, mechanistic activism shows necessarily the idea of external change is constructed from the fail attempts that try to overcome its deficiencies in the view of internal change only.

It is important to clarify that under the internalization-externalization dualism, there are actually two dualisms at work. The first dualism is between social structure and agency. The second dualism is between the methodological collectivism and individualism, as discussed earlier; it also pervades the first generation of Vygotskian-inspired sociocultural theories. While the CR idea of Transformational Model of Social Activity (TMSA) resolves the first main structure-agency dualism, what resolves the second collectivist-individualist dualism is the idea of social relationism that states that the subject matter of social science, our society, is constituted by relations between the individuals that compose it.

First, we have a CR critique of the structure-agency dichotomy as resolved with the TMSA model, and then the development of CR embeds this model in four-planar social being (Bhaskar, 2009). Second, we have the CR critique of the individualism-collectivism dichotomy as resolved in social relationism, which is embedded in the notion of seven-scalar social being to emphasize the point that we are dealing with relations and entities at a number of ontological irreducible different levels, (which is an idea that I have discussed with Figure 4.1, p. 72 in this chapter, as a mixed laminated system to organize the application of the AT in the field of mathematics education according to the micro, institutional, and cultural-historical levels). In particular, the resolution to the second dualism, the split between the individual and the collective, makes use of the TMSA, and the idea of social relationism. According to CR, social relationism has a dual-character that pervades all aspects of the social sphere. Social relations are both virtual and material; for example, the idea of a family is a virtual structure that we do not see; but what we see is the effect that this virtual structure leaves on material thing, say a graduation portrait of one of its members. The idea of social relationism is a virtual-material characterization of our daily interaction with people, that

> exists only in virtue of material things, possessing no material substance of their own (i.e., they are "VIRTUAL"or "ideal") and so are in principle imperceptible (non-empirical), hence can only be ascribed as real causally, by their effects on material things. Or their material presence consists only in their effect on material things. (Hartwig, 2007g, p. 410).

Moreover, we can build on the idea of social relationism to understand that social structure and agency, in terms of what CR denotes, is a laminated system in terms of various levels of scale.

To return to the first structure-agency dualism, Blunden (2009) argues for an interdisciplinary view of AT, the idea that takes various disciplines such as sociology, political science, and psychology in order to use activity as a meaningful scientific concept. The main aim of such interdisciplinary projects is to appropriate conceptions from a variety of scientific fields that are concerned with social phenomena. Then, in a reversed move, this appropriation can foster links by which different disciplines can communicate with each other, and in this way AT can "contribute to overcoming the individual-society dichotomy" (ibid., p. 2). On the interdisciplinary conception of human activity, I shall argue that CR allows us to see that Blunden's

proposed resolution of an interdisciplinary project of collaboration is an TMSA-entailed viewpoint of practical materialism, which is constellationally overreached or englobed by (3) ontological materialism > (2) > epistemological materialism > (1) practical materialism (Bhaskar, 1994, p. 226). In this manner, CR moves the discussion on interdisciplinarity and the types of materialism forward, which I expand below and in more detail in Chapter 6, p. 183.

Moreover, Davydov (1999, p. 44) suggests a resolution to the structure-agency via the thesis of Émile Durkheim in order to argue for a conception of "collective subjects": a social structure that can be "imagined in the form of some totality or group of persons". The immediate question that follows is to question a Durkheimian model of structure in order to find out it limitations. From a CR viewpoint, we can articulate the error of a Durkheimian collectivist's conception of society that combines a positivist-methodological approach, which allows collective subjects to be conceived as a reified version of the conditions, for instance, of collectiveness, consciousness, solidarity, and altruism, that compose such "totality or groups of persons" without accounting for agency. In turn, we have a one-way feedback effect from the social structure down to the agency. I shall argue that CR not only allows us to critique Durkheimian stereotypical conception of social structure, but also allows an opposite error or stereotype reification; namely, a voluntary one-way effect from agency exerting influence on the social structure (see Figure 5.3, p. 147). In other words, we can resolve the classic dichotomy of social structure and agency that AT suffers from via TMSA. After we have understood the structure-agency dualism and its unique resolution in TMSA, the next step is to situate the discussion in what Bhaskar (2008b) calls the four-planar social being, which is itself a type of planar laminated system consisting not only of [b] a dimension of our social interactions with other people, and a [c] dimension of social sphere or the social structure, but also of [a] a dimension for our transactions with the biosphere or nature and a further [d] dimension that deals with the stratification of our individual embodied personality, depicted in Figure 4.4, p. 107. From a CR viewpoint, agency plays a role in all of [a]-[d] planes of reality, but each plane is the object of study of some particular discipline, e.g., plane [a] is the object of study of disciplines like ecology, geography, and climate sciences; plane [b] is studied under micro-sociology; plane [c] is the object of study of the more macro social structure, e.g., sociology, economics, political science, but also cultural and linguistic anthropology, each of

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Adopted from Bhaskar (2008b, p. 60).

these study different aspect of the social structure, and plane [d] is the object of investigation of psychology. For instance, in the simple act of buying coffee we are involving those [a]-[d] planes from, in production, consumption, and exchange and in a very intricate way with those material transactions with the raw materials of nature. Thus, the importance of this planar laminated system consisting of four dimensions is that they are part of our agency, i.e., they are involved in whatever activities involve us.

4.4.4 Psychic (or goal)-related and process-object (or motive)-related activity dualism: a code for the pair of mind (or mental)-body and reasons-causes dualisms

Another problem of AT is the dualism between psyche (or goal)-related activity and object (or motive)-related activity (Davydov; 1999; Engeström, 1999). It is important to discern the two dualisms underpinning this unresolved theoretical issue. The first dualism at work is the classic mind-body dichotomy, and the second one refers to the dichotomy between the study of mental processes such as beliefs, motivations, and the study of social processes, such as doings, activities, practices, and interactions.

Zinchenko (1985, p. 115) argues that

> [it] would be naïve to expect a chapter of this kind to resolve the numerous problems that arise in connection with a taxonomy of the unit of analysis of mind... [One can] only attempted to reconstruct Vygotsky's ideas on unit of analysis and to show that the requirements he formulated for these units are requirements for current and future efforts in psychology.

To expect the unexpected, I shall be arguing that CR provides unique and robust resolutions to these problems.

Engeström (1999) identifies that one of the unresolved theoretical issues of third-generation AT lies at the heart of the mind and body dualism, but coins it as the dichotomy between psychic processes (mind), which are processes of the mind which are plastic, flexible, not completely understood, and diachronically continuous or always uninterrupted, and object-related activity (body), which are processes that are discontinuous with clear beginnings and ends and directed towards the

achievement of some goal or object. He points out that one of the implications of this dualism is that object-oriented activities may come to be seen as secondary by-products of the continuity of the mental psychic processes. In other words, Engeström is referring to a problem of reductionism in which a body is an incidental result of mind.

> [There] is a theoretically much more interesting disagreement that concerns the relationship between object-related activity and psychic process... The problem here is that the origin of activity seems to be rooted in an individual internal psychic source. This would eliminate the fundamentally cultural and social nature of activity so powerful emphasized in the principle of object relatedness of activity. (Engeström, 1999, p. 22).

I shall argue that AT can also benefit from grounding this mind-body dualism versus reductionism in CR because it identifies it as rooted in the classical conflict between those of idealistic versus materialistic dispositions. CR equips us with the philosophical concept of Synchronic Emergence Powers Materialism (SEPM), by which to resolve the issue. On this particular dichotomy, as well as with the previously stated ones, we find the importance of CR in the identification of their grounding errors and their sublation; namely, the key oppositions between idealistic versus materialistic grounded stances by (1) practical materialism: the assertion of the key role of human agency by either reproduction or transformation of the social sphere (or TMSA-entailed viewpoint); (2) epistemological materialism: the assertion of the independent existence of those objects of science that can also act independently of scientific thought (or TR-entailed viewpoint); and the assertion, not of mechanical or reductive materialism, but of (3) ontological materialism with the notion of emergence which asserts the priority of nature upon any social phenomena or more specifically:

> the unilateral dependence of social upon biological (and more generally physical) being, and the emergence of the former from the latter. (Bhaskar, 2009, p. 76)

In other words, because (3) ontological materialism > (2) > epistemological > (1) practical materialism, we cannot have mind without body.

On the mind-body dualism, Davydov (1999) argues that the problem is based on the fact that third-generation AT does not explicitly account for psychological

processes, e.g., motivation, drive, un-consciousness, emotions, beliefs, and so on, which are the very ideas with which second-generation AT was concerned. In this sense, we have a structure of human activity as body without mind. To resolve this dualism, he suggests incorporating mind into body, so that if we add these psychological processes (mind) as components to the AT structure (body), then we are required to accept their existence.

From a CR perspective, we see that what Davydov is referring to is in fact, the reason why the Bhaskarian notion of intentional causality is important. Intentional causality makes it clear why social forms such as mind, thought, language, theories, motives, desires, etc, are crucial for the development and learning of human beings. These social forms are what produce our manifestations in reality since we cannot simply "jump" from social structure to reality. Even if this "jump" is mediated by human beings, we always have a passage through intentions and agency. What intentional causality means for social science is that our understanding of intentions can play a role in actually producing change because the causality of our reasons is what provides us with the connection between the objects with which psychology is concerned. For example, why a person has a particular motive or reason, what happens when we perform actions in an activity or practice as we reproduce the social structure? The critical role of causality of reasons, when we act upon psychological objects (motives, beliefs, etc), becomes intentional causality that enables the social and the psychological sciences to be linked together. Thus, we have appropriate grounds by which to account for psychological science.

4.4.5   The relativist-historicist dualism

Another theoretical problem with AT, as identified by Engeström (1999), is the dualism of relativism against historicity. Whereas relativism argues that all beliefs and practices are equally valid, historicity argues for the understanding of an object by tracing it from genesis. This tracing is the identification of the object's inner contradictions (double blinds) through manageable units of time (or periodization). Historicity refers to the methodology that requires the analysis of the object's historical development, such as I have done in Chapter 3, p. 34, with the historical evolution of AT. However, it does not necessarily reduce historical development to its ontogeny, evolution, or biography; rather, it deals with the identification or the isolation of the key historical elements. Moreover, Engeström (1999) rejects rela-

tivism because it ignores the differences in reality and its incapacity to furnish the social sciences with conceptual tools other than comfortable academic discourse, by which to make value judgments. In addition, he accepts historicity as a key methodology for what he calls "expansive cycles" that refers to

> a developmental process that contains both internalization and externalization... It requires reflexive appropriation of existing culturally advanced models and tools that offer ways out of the internal contradictions. (ibid., p. 33).

On the dualism between historicity and relativism, I shall argue that CR is capable of offering a firm philosophical grounding to better understand and resolve this problem. In particular, Bhaskar (1979) develops the conceptual tools by which social science and philosophy are in a relation with its object of study.

The "holy trinity" follows shortly from the initial argument for a new ontology, i.e., the distinction between the transitive and intransitive dimensions, the critique of the epistemic fallacy, open and closed systems, and the stratification of reality, which consists of the distinction between the realm of the real, the realm of the actual and the realm of the empirical. From this new argument for ontology, we have: (a) ontological realism: the dimension of intransitive objects of knowledge, which exists and acts in an independent manner from our theories about them, the transitive space. CR accepts (b) epistemic relativity: the idea that beliefs are products of society, which implies that all knowledge is a historically transient entity; in other words, our criteria for truth and values are not externally situated from our particular historical time as we see that our knowledge changes through time. Epistemic relativity also includes fallibilism, the idea that our beliefs may turn out to be false. In addition, CR opens a space for the possibility of (c) judgmental rationality: the idea that individuals can make decisions between relative beliefs, which itself assumes both epistemic relativity and historicity. CR and AT reject relativism which state that we cannot know which belief is better and its judgmental version, the idea that holds all beliefs are equally valid because, as suggested by Engeström (1999), "people have to decide where they want to go, which way is up" (p. 26). From a CR perspective, (b) we only know reality under approximate, historical and temporary descriptions of such objects of knowledge and (a) those objects of knowledge live and act, in the intransitive space, independently of theories and descriptions we create about them.

CR can transcend the historicist-reductionist dualism since it argues that the pair denoting (b) epistemic relativity and (a) ontological realism is accepted and that each concept assumes each other in both the natural and social sciences. According to Bhaskar (2009), we have a historical Kantianism if (b) epistemic relativity denotes the truth, and then (a) ontological realism denotes the limitations. This pair (a) and (b) is what Bhaskar (2009, p. 99) calls the "duality of truth" since it captures two features of truth, an epistemic feature and an ontic feature. In the epistemic feature, the notion of truth is used to report and-or assign claims, values, and judgments, and to report conditions, circumstances, or states of affairs. In the ontic aspect, the concept of truth is used to designate such conditions, circumstances, or states of affair s that are derived from such claims, values, and judgments as "true". According to Bhaskar (2009, p. 78), the "duality of truth" is skewed, in the sense that it is derived from the fact that "truth (unlike being per se) is always tied to the possibility of language, theory and human practice". We can say that from a CR viewpoint, truth functions to (1) designate; that is, "truth-judgments", "truth-values", and "truth-claims", and also this truth (2) lives and acts independently of human beings; that is, "true-conditions" or "true-states of affairs". To understand the ontic state of truth we can think of the objects of knowledge that reside independently of our theories about them. In short, the "duality of truth" is parallel to the divide of the transitive (the epistemic aspect) and the intransitive (the ontic aspect) dimensions of knowledge, which I argue is capable of providing the philosophical grounds for AT and the dualism between relativism and historicity.

I want to go a step further in order to situate the duality of the conception of truth within a "dialecticzation" of truth not just in terms of basic CR, but also in dialectical Critical Realism (DCR forthcoming in Chapter 7, p. 220). Bhaskar's (2008b, p. 106) argues for what he terms truth tretrapolity or a more "adequate theory of truth" (p. 106), which consists of four main components; I now paraphrase and provide examples of this dialectical theory of truth:

- The first component is what he calls truth as (a) normative-fiduciary: the idea of truth as a social bond. For example, if a teacher asks a student to read a certain book because it is informative on a particular topic, which for the teacher is true at the social level, it can be interpreted as "trust me", "take my advice", or "take my word for it", etc. Of course, this social level is not to say that the teacher may be right, but this is to show an aspect of truth

conceived in the first level.

- A second aspect of truth is what Bhaskar terms as (b) adequating: the idea of truth as an epistemic-warrant, when a proposition or belief has been subjected to scientific scrutiny and there are sufficient elements or grounds for it. For instance, truth in the statement: penicillin kills most of bacterium in an infected host.

- A third component of truth is very interesting because it straddles the epistemic-ontic divide. Bhaskar (2008b, p.157) calls this notion of truth the "epistemic-ontic" duo (or expressive-referential). An example of this (c) expressive-referential term is when we say that the sky is blue, the color of the sky is perfectly expressed by the statement: *the sky is blue*, so that it refers (e.g., an expressive part) and simultaneously conveys (e.g., a referential part) truth. *Tarski's Theory of Truth*[1], the idea that truth is redundant because we are just expressing what we know about the world and we do not really need to use the term truth, captures this third component of the truth tretrapoly. These three philosophical ideas do not state that they are pretending to be the whole true; rather, they capture parts or aspects of truth.

- The fourth component of truth is what Bhaskar calls true as (d) alethic or ontology. Bhaskar derives alethic truth from the Greek word that means real. The classic Bhaskarian (2008a) example in basic CR is that when emeralds show a color green with light reflecting on them, it is a particular property that is manifested in the nature of their molecules and the structure of the crystal or whatever structure that composes it. While AT has various implicit aspects of truth, CR openly theorizes that truth is a structure in nature or in society. This fourth-sense of truth is, in CR terms, truth as natural necessity or stratification, which is of great importance because it conveys the external and real stratification of our world, independently detached from our language or theories. Following the DCR Bhaskarian argument, we need all four senses of truth.

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[1]I borrow the title of Field's (1972) analysis of the Tarskian model.

4.5 Conclusion

In this chapter, a first proposal of CRAT gives an example of the 2E: learning as process where processes are generated by contradictions with the corpus of literature provided by the applications of AT to mathematics-educational research. Using critical realism, I reveal a Kantianism about the categorization of the activity system; nonetheless, with a three-layer laminated system that I call nested mathematics-educational activity system, it is possible to discern the levels of reality at which this research community operates and the types of contradictions that pervade their respective activity systems.

In Chapter 5, p. 116, a second proposal of CRAT is to answer the guiding question by addressing dichotomies that AT suffers from. This project is in tune with both AT and CR, as articulated by Engeström and Miettinen (1999, p. 5) when they identify that

> transcending the dualism between thought and activity, theory and practice, facts and values has much in common with the theoretical aims of Activity Theory.

Thus, an activity-theoretical aim is aligned with basic CR, which aims to overcome macro dichotomies: (1) Collectivism (holism)-individualism; (2) Reification-voluntarism (society-individual); (3) Naturalism-anti-naturalism (positivism-hermeneutics); and micro dichotomies: (4) (Body-mind) Dualism-reductionism and (5) causes-reasons. Thus, I shall expand on the ways by which CR can deal with some identified dualisms and unsolved problems of AT.

In the following chapters, I illustrate how (1) basic CR resolves the activity-theoretical aim of transcending such dichotomies (in Chapter 5, p. 116) and (2) show how the argument for a deepening of ontology, dialectical Critical Realism (DCR) allows us to conceptualize 4D: learning as product-in-process by providing us with a broadened understanding of Hegel-Marx dialectic via a critique of both western and dialectical branches of philosophy (in Chapter 7, p. 220).

Chapter 5

Tenets of basic critical realism

The commonwealth of learning is not at this time without masters-builders, whose mighty designs, in advancing the sciences, will leave lasting monuments to the admiration of posterity: but everyone must not hope to be [that]... and in the age that produces such masters... it is ambition enough to be employed as an *under-laborer* in clearing the ground a little, and removing some of the rubbish that lies in the way of knowledge[1].

5.1   Introduction

Roy Bhaskar is the principal creator of the philosophical system entitled Critical Realism (CR). The main concern of this philosophical project deals with "the natures of, and prospects for, human emancipation" (Bhaskar, 2009, p. 103). As the CR project continues its under-laboring in the sciences, many other authors continue to contribute to it, as is customary in the classic CR texts, we must distinguish three key phases of the Bhaskarian philosophical thesis: basic critical realism (BCR), dialectical critical realism (DCR) and the philosophy of Meta-Reality (PMR). Within basic CR there are three main groups of theory: transcendental realism (TR), a philosophy of science, critical naturalism (CN), a philosophy of social science, and the theory of explanatory critique (EC), a philosophical theory of value.

This chapter explains basic CR by restricting its focus to: BCR = TR +

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[1]In Critical Realism, the idea of philosophy as under-laborer of science makes reference to this excerpt in Locke's *An Essay Concerning Human Understanding* (1690, p. 15, emphasis added).

CN + EC using Bhaskar's *Scientific Realism and Human Emancipation* (SRHE) (1986/2009) > *The Possibility of Naturalism* (PN) (1979) > and *A Realist Theory of Science* (RTS) (1975/2008a)[1]. Such substantive introduction of the principles of BCR is not to be taken as a trivial overview; rather, it is the injection of a transformative element into the investigation of the next level of this new conceptualization of learning. Following Bhaskarian dialectics, the new level is 4D: learning as product-in-process, which is uniquely characterized by the Bhaskarian transformative praxis, or agency. What example of learning at the transformative-praxis stratum requires agency? I argue for putting BCR to work in order to resolve not just the dualisms of Activity Theory (AT) but also the resolution of other dualisms indispensable for social theory in general, doing so with an argument that begins by re-vindicating ontology as irreducible and distinct from epistemology.

The term Critical Realism came about as a running together of transcendental realism (TR) and critical naturalism (CN). In particular, the "critical" part in CR is twofold (Bhaskar, 1998, p. ix). First, "critical" refers to Kant's transcendental arguments. A transcendental argument may be defined as an examination into the necessary conditions of possibility for some human activity as conceptualized in our experience. In transcendental arguments, we could also be looking at ontological, epistemological, or axiological conditions in respect to action. For example, we know that a "being" exists in the world, but by establishing a transcendental argument, "non-being" is also constitutively necessary to "being", and thus, we find that "non-being" (or absence) is a condition, or necessity, for being (Bhaskar, 2008a, p. 50). Another example is that we cannot have presence without absence. Second, "critical" refers to the transition from a factual account of the world to an evaluative account of the world—that is, the transition from facts to values, which is elaborated in EC (section 5.13, p. 172). This twofold critical part is set up in BCR. In general terms, BCR is a critique of pre-existing philosophies, one that began around 1975 by identifying that other philosophies had left out ontology from their conceptualization of the world, which BCR sets out to re-vindicate.

Now, we have already seen that Activity Theory (AT), as it has been developed up to now, leads us into certain dualisms. Critical Realism, contains a philosophy of social science, which is understood or characterized as critical naturalism (CN). This allows us to deal with such macro-dualisms as between (1) collectivism and individ-

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[1]The reader is referred to the glossary for the abbreviations and symbols used in this work.

ualism, (2) social structure and agency, and (3) naturalism and anti-naturalism. Underlying these macro-dualisms, we find certain micro-dualisms, such as those between (4) mind and body (together with reductionism), (5) reasons and causes, and, of course, (6) facts and values. I discuss the macro-dualism first, followed by the micro-dualisms—in terms of the resolution of the mind-body problem—with the theory of intentional causality, which takes this discussion uniquely into what becomes the Bhaskarian theory of explanatory critique by focusing on the derivation of values from facts. These six dichotomies are the prevailing antimonies from which social theory, and to a specified extent AT, suffer. The main argument here is that CN provides a unique resolution of these dualisms, enabling us to transcend them, as synthesized below.

Adapted from source (Bhaskar 1998, pp. xii-xiv cited in Hartwig, 2007d, p. 92)

5.2 Critical realism - transcendental realism

CR explicitly theorizes ontology by asking: "what the world must be like for science to be possible" (Bhaskar, 2008a, p. 36). It asserts that the world, the subject matter of ontology, is an intelligible place for human beings such that science is possible, from which the only premises are what we recognize as scientific activities. The assertion implies that reality exists independently of our conceptualization about it. To understand knowledge of reality, CR differentiates between the transitive and the intransitive dimensions of science.

5.2.1 Mind the gap! Between the transitive and intransitive dimensions

CR argues that the transitive dimension, or epistemological space, is the dimension in which "the object of knowledge is the material cause or antecedently established knowledge which is used to generate the new knowledge" (Bhaskar, 2008a, p. 17). This transitive realm is the dimension of knowledge, and it is concerned with transitive objects, such as theories, models, concepts, and anything that we may use to understand the world. In addition to transitive objects, there are those objects that we are trying to obtain knowledge of—intransitive objects, in the intransitive dimension (ID). The intransitive dimension, or ontological dimension, is the space in which "the object is the real structure or mechanism that exists and acts quite independently of men and the conditions which allow men access to it" (ibid., p. 17). The intransitive dimension is the dimension of real objects, such as structures, mechanisms, tendencies, and causal relations. The intransitive dimension consists of real objects that exist and act independently of how human beings think about them in natural science. In social science, how human beings think about the social world comes to affect the reality around them. Moreover, the differentiation between epistemology and ontology implies a differentiation between the ID and the typically knowledge-dependent TD. There is always a differentiation between the transitive and intransitive dimensions (the distinction between our knowledge and what our knowledge is of); that is, the two dimensions are in a relation of interaction when viewed over time. The transitive dimension of knowledge is also part of the intransitive dimension of being and therefore must be included within ontology too. TD is the realm of scientific process, scientific beliefs, and so on, and the ID, the

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knowledge-independent realm is the world outside of those beliefs. This differentiation between the transitive objects and the independent intransitive objects of science provides the point of departure from which CR argues for ontology. Following BCR, the crucial distinction between the transitive and intransitive dimensions allows us to give an account of science in a non-empiricist way. Thus, it is important to distinguish the Bhaskarian argument for transcendental realism from two classical views in traditional philosophy, classical empiricism and transcendental idealism, as follows.

5.3   Three philosophies of science: differentiating transcendental realism from two traditional philosophies of science

> Transcendental realism, starting from the premise of the contingency of
> our own experience, sees nature as real; and science as our persistent
> effort to understand it. (Bhaskar, 2008a, p. 229).

Transcendental realism is the CR stance in Bhaskar's RTS (2008a). It argues that ontology is necessary in order to sustain the concept of science. This necessity implies that the causal laws of the world that are identified in experimental conditions (closed systems) may hold but also that they are not empirical regularities. Rather, these causal laws hold in open systems, outside experimental conditions. Moreover, causal laws have to be analyzed as tendencies. Causal laws can act and exist without being perceived, and they can act without manifesting in a particular outcome. Transcendental realism establishes the conditions for the irreducibility of ontology so that science can be understood as a social process that is dependent on human activity. From this viewpoint, reality is stratified and differentiated into three different overlapping domains (the real, the actual, and the empirical). Following RTS, I begin by differentiating transcendental realism from two philosophical traditions of science: classical empiricism and transcendental idealism, which lack an ontological dimension capable of sustaining the dialectic or process-in-motion of the logic of science, as shown in Figure 5.1, p. 121.
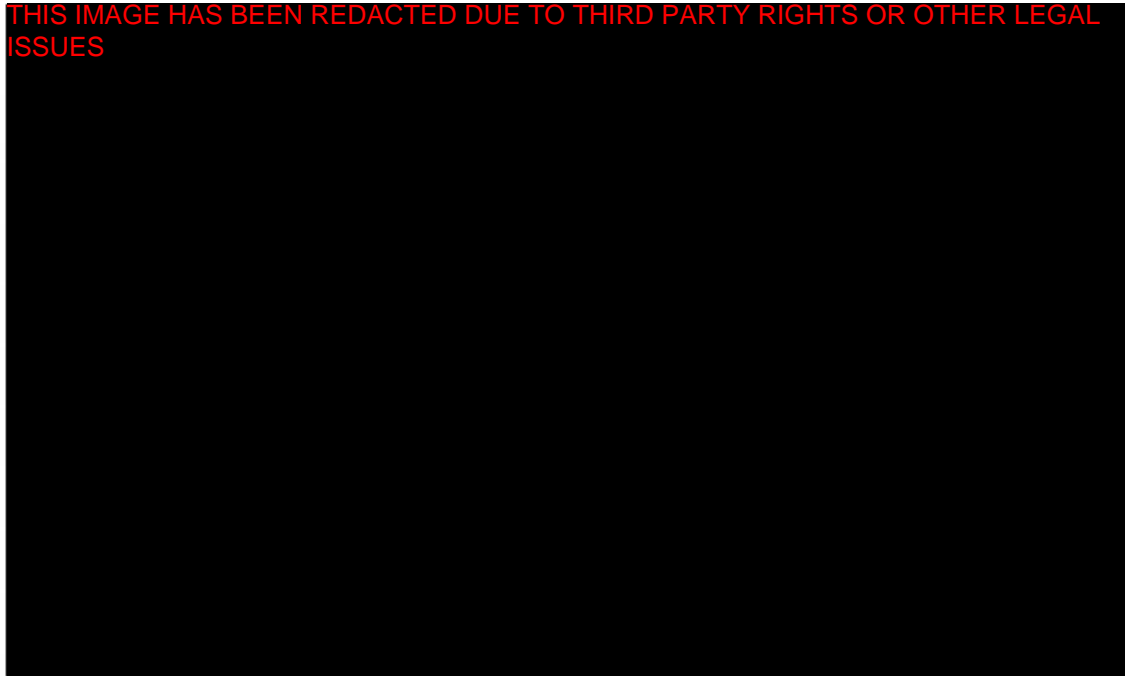
Adopted from Bhaskar (2008a, p. 15).

5.3.1 Classical empiricism

Classical empiricism as represented by the philosopher David Hume and his subsequent disciples may be understood as "a radicalized version of Locke's own principle of empiricism, namely that all knowledge of "matters and facts of existence hails from sense-experience alone" (Bhaskar, 2009, p. 30). From this perspective, knowledge is seen as the mechanical effect of objects—which exist outside, in reality—and is exclusively attainable through the senses. Classical empiricism stops at stage (1) in Figure 5.1, p. 121, of the dialectic of science, in which the results of the phenomena under scrutiny are identified as universal regularities or sequences of events. Since classical empiricism sees scientific knowledge as derived from the category of sense-experience, it is incapable of providing an accurate account of science because it ignores the ontological dimension. From a classical empiricist's perspective, we see two main occurrences: the first is the homology between world and sense-experience, and the second is the implicit use of knowledge to constitute the world itself. In other words, when we are referring to empirical realism, we are talking about the reduction of being (ontology) to knowledge (epistemology), and the implicit definition of knowledge especially in the form of experience.

[A] Humean or classical empiricist account of science ... [is] a fusion of the world and experience, encapsulated in the doctrine of empirical realism (empiricist ontology); and a reduction of our knowledge to the level of experience which, as constitutive of the nature of reality itself, is held to be certain (reductionist epistemology). (Bhaskar, 2009, p. 38).

The important aspect to highlight is that the condition of being in relation to knowledge is the absence of the work of scientific activity because, on the one hand, there is no more to being than knowledge, and, on the other hand, there is no more to knowledge than its reflection on the surface of being. Therefore, according to this ideology, knowledge does not involve work, and the world does not involve structure. From this viewpoint, there are two important consequences: a destratification in the realm of ontology and a dehistoricization in the realm of epistemology. The destratification of knowledge refers to the presupposition of an unstructured reality, and the dehistoricization of knowledge refers to the assumption that, generally, epistemology must stand as "the *guarantor of justified belief*"[1] (ibid., p. 38, emphasis added), necessitating the creation of foundations of knowledge and the inclusion of closed systems (where universal regularities of events occur), as opposed to the means by which we can understand activities. Against a classical empiricist point of view, transcendental realism argues that we only get an accurate account of science when we hold the TD and ID together and that to see science as purely transitive or intransitive is erroneous. In short, classical empiricism (1) ignores the ID—the real objects of scientific knowledge that cannot be reduced to the level of sense-experience, i.e., the empirical, and (2) it ignores the stratification of reality (and hence also our knowledge). This dual error, i.e., a reality without ontology and without stratum, gives rise to such problems as the problem of induction. Below, we can elaborate on the problem of induction in order to further clarify the erroneous stance of classical empiricism.

5.3.2   Riddles of induction

The problem of induction is the "problem of what warrant we have for reasoning from particular instances to general statements (induction proper) or from observed to unobserved or past to future instances (eduction)" (Bhaskar, 2008a, p. 207). In

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[1]This phrase is, in my opinion, one of the most concise ways to describe the idea of ideology.

short, induction makes inference from particular to general statements[1]. Following RTS, the classic all-emeralds-must-be-green example can be used to elucidate this idea.

Imagine that every emerald that we have ever encountered is green. Humean skepticism prompts us to ask: how do we know that the next emerald is not going to be different? An empiricist answer to this question is that we do not know, as a good Humean skeptic. This logic is representative of the problem of induction. Induction compels us to speculate that if every emerald that we have seen up to now is green, then, by induction, all emeralds must be green. The reason why CR allows us to see why all emeralds must be green is because we can effectively identify the structure that makes them green. As long as structures have the structure that they do—for example, as long as emeralds remain emeralds—then they must appear green to any observer under reasonable conditions because the crystallization of chromium-rich particles in the composition in the stone is the underlying deeper structure that gives emeralds their green property. This is a deeper level of structure is what explains the green appearance of emeralds. Thus, we do not have to test every single emerald in the world to see if they are all green because such explanation of the mechanism or structure is at the level of the real behind such green appearance. So that this logic gives the general form of resolution of the problem of induction!

CR resolves the problem of induction[2] because it describes the generative mechanism or structure that explains phenomena in such a way as to deduce the property from it; consequently, induction does not play a role in the movement of science towards understanding what lies behind and explains appearances.

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[1]Induction can be distinguished from eduction, or inference from a particular to another. If one sees a white swan, for instance, then by induction, one can speculate that all swans must be white. Now, if one sees that this swan is white, then by eduction, one concludes that that other swan must be white, too. Eduction is a subset of induction, i.e., usually, eduction is not performed unless there is already an induction occurring; the alternative is deduction—that is, inference from a general principal to a particular. For example, if all swans are white, then by deduction, this particular swan must be white.

[2]In Bhaskar's RTS (2008a), we also find other problems that stem from relying on particular instances for evidence-based science and that remain trapped in their explanation of causality at a single level of reality without involving other levels, e.g., the problem of *subjective conditionals*, which is the problem that asks, if a causal event was observed yesterday, is it the case that it still holds today? A different example is the distinction between a necessary and an accidental sequence. Although for these purposes, the only two philosophies that are discerned here are empiricism and transcendental idealism, we can also resort to Bhaskar's (1975) for an analysis of post-modern philosophies of science. This analysis of Feyerabendian- and Bachelardian philosophies show its origins, along with a critique of Kuhn's paradigms and Popper's models of explanations, among others in which, as in classical empiricism, remain "stuck".

> If generative mechanisms and structures are real then there is a clear criterion for disguising between a necessary and an accidental sequence: a sequence $E_a.E_b$ is necessary if and only if there is a generative mechanism or structure which when stimulated by the event described 'E_a' produces E_b. If we can have empirical knowledge of such generative mechanisms or structures then we can have knowledge of natural necessity a posteriori. (Bhaskar, 2008a, p. 31).

To paraphrase, if generative mechanisms do not exist, i.e., if all we know about the world is what we can apprehend through sense-experience, then we can never make a universal statement because it would presumably be about what we can perceive and/or experience.

Bhaskar (2008a), expanding on the problem of induction, also refers to the so-called new "riddle" of induction formulated by the philosopher Nelson Goodman, who was concerned with conundrum such as, what is to prevent nature from changing? In the Goodmanesque version of the problem of induction, Goodman coins artificial predicates such as "grue" and "bleen", which are defined so that, all emeralds are, for example, "grue" up to some arbitrary time in the future, e.g., January 1st 2012, and blue thereafter. This Goodmanesque account is a paradox because, say now after some time, the evidence that we have is equally consistent with all emeralds are 'green" and also for all emeralds are"grue". In opposition, CR argues that the understating of evidence does not depend on a particular number to be found or on the lapse of time because we can explain the reasons why, for example, emeralds have to be green. This new "riddle" is just a new variance of an old problem, both of which are erroneous, given that the mere continuation of time cannot establish a cause. Thus, the main error of the problem of induction and its Goodmanesque variance is that they remain "stuck" at the level of surface appearances. In contrast, science investigates beneath surfaces to see why the properties of appearances hold, then by doing so, science moves to a deeper level of structure.

5.3.3   Transcendental idealism

The transcendental idealist viewpoint originated from the philosopher Immanuel Kant, and has more recently received an impetus from the latter writings of Ludwig Wittgenstein. This viewpoint sees human beings as active in the production of knowledge. In Kant it is the application of knowledge, and more recently, by a

process of synthesis knowledge. The way in which human beings are conceived to be active, in Kant is by the application of the categories to the manifold of sense-experience, and more recently, by a process of synthesizing knowledge by means of the construction of a model or epistemological structure. For instance, the difference between the regularities of empirical patterns and causal laws is that in the case of causal laws a structure is imposed on an empirical regularity. This transcendental-idealist viewpoint is an improvement on classical empiricism because it allows for a model or an epistemological structure. The aim of the epistemological structure is to enable the scientist to imagine the generative mechanisms that may cause the phenomena under scrutiny. However, transcendental idealism is still subject to the same problems of empiricism because it does not allow for an ontological structure. We see that transcendental idealism stops at stage (2) in Figure 5.1, p. 121. Transcendental realism agrees with the idea that scientists employ an epistemological structure and other various cognitive models in order to make sense of the world. However, these models need to be tested in order to empirically identify intransitive objects, such as generative mechanisms and structures. Transcendental idealism sees plausible explanations of generative mechanisms as merely imaginary and not as objects that might be real. From a CR point of view, there is then a distinction between the imaginary and the imagined, for "what is imagined may be real, but what is imaginary cannot" (Bhaskar, 2008a, p. 146). It is in this sense that CR, in the form of transcendental realism, argues for the need to appeal to the world in order to test theories and be able to decide between them. Thus, transcendental idealism posits an epistemological structure but lacks an ontological structure.

5.3.4 Transcendental realism

The third position in Figure 5.1, p. 121 refers to transcendental realism, the CR vantage point in the philosophy of science. In orthodox philosophies of science, Humean classical empiricism and Kantian transcendental idealism assumed the implicit ontology of the empirical realist perspective, in which "the real objects of scientific investigation are defined in terms of actual or possible experience" (Bhaskar, 2009, p. 5). Empirical realism is what (1) classical empiricism and (2) transcendental idealism have in common. This involves the reduction of the domain of the real to the domain of the empirical, i.e., to experience or to what is experienced. It is the idea that reality is just a reduction to the actual and the empirical. In short,

empirical realism is what we get when we reflect on the identification that classical empiricism makes between the world and experience. However, transcendental realism argues that there are other levels of the world that are not experienced see Table 5.2, p. 127). In addition, empirical realism differs from transcendental realism regarding the interpretation of results from experimental procedures. Whereas from an empirical-realism perspective, the interpretation of results is nothing more than empirical universal regularities, from a transcendental-realism viewpoint, results are not regularities but the invariance of a result produced in experimental conditions. Just like transcendental realists, empirical realists see the importance of creating epistemological structures or models by which to explain the world (the move from (1) to (2) in Figure 5.1, p. 121. The importance of the epistemological structures is not what can potentially result from them but, leading us to explore whether what is possible in the scientific imagination is real or not, i.e., we explore whether the epistemological structure we imagine reflects some ontological structure in reality.

5.3.5 Mind the gap! Or else, the epistemic fallacy

Critical realism, in the form of transcendental realism, rejects these two philosophical viewpoints, classical empiricism and transcendental idealism, on the grounds that they are incapable of sustaining both transitive and intransitive objects of knowledge. In particular, argumentation that results from answering questions about the nature of the world only in terms of its knowledge perpetrates a fallacy, the epistemic fallacy:

> [It is] the view that statements about being can be reduced to or analyzed in terms of statements about knowledge; i.e., that ontological questions can always be transposed into epistemological terms. The idea that being can always be analyzed in terms of our knowledge of being, that it is sufficient for philosophy to "treat only of the network, and not what the network describes", results in the systematic dissolution of the idea of a world ... independent of but investigated by science. (Bhaskar, 2008a, p. 36)

The epistemic fallacy is what occurs when we do not mind the gap between ontology and epistemology, i.e., it reduces the intransitive to the transitive dimension. This mistake in argumentation often results in methodological inconsistencies or views

that are irrelevant to science because the transitive dimension of knowledge is based on the implicit category of sense-experience. In opposition to the epistemic fallacy, CR re-establishes the ontological dimension of science as an explanatory conception of the stratified and differentiated world, which I elaborate upon in the following section.

5.4   On stratification and differentiation of our world

CR argues for ontology by establishing a distinction between the transitive dimension (TD) and the intransitive dimension (ID). It argues that science needs to be understood as a social process that investigates aspects of the world that exist independently of it with the Description-Retroduction-Elimination-Identification-Correction (DREI(C)) model of knowledge production. It is here that Bhaskar (2008a) argues by means of two moves. The first move is the stratification and differentiation of the world, and the second move describes the logic of the move from knowledge of one stratum to knowledge of the next.

CR conceptualizes the world as stratified into the overlapping domains of the real, the actual, and the empirical, as shown below.

Table 5.2: The stratification of reality ($d_r \geq d_a \geq d_e$)

	d_r=domain of the real	d_a=domain of the actual	d_e=domain of the empirical
mechanisms	√		
events	√	√	
experiences	√	√	√

Adapted from Bhaskar (2008a, p. 56).

The stratification of reality is designed to show that causal laws, mechanisms, and other objects of scientific knowledge cannot be reduced to domains of the actual or the empirical. The real, the actual, and the empirical are three overlapping domains of reality. The Bhaskarian formula $d_r \geq d_a \geq d_e$ is very useful for conveying the mutual inclusions between the three domains. The real is the all-containing domain of reality. This domain contains mechanisms, events, and experiences. Mechanisms

"exist as the powers of things and act independently of the condition that enable us to identify them" (Bhaskar, 2008a, p. 186). Such mechanisms generate events and experiences, which constitute the domain of the actual. The actual consists of events and experiences. The domain of the actual gives rise to the empirical. The domain of the empirical consists of experiences. These three overlapping domains are not independent of each other but are in a one-way relation to each other. In other words, we do not have events without mechanisms, and we do not have experiences without events.

5.4.1   Open and closed systems

In addition, stratification also leads to a differentiation in both the natural and social sciences. The former is concerned with understanding reality manifested in natural phenomena, and it employs the capacity of experimentation to allow for the observation of a single mechanism (in closed systems). It is in this sense that natural science allows us to empirically access the deep structures of reality. Social science is concerned with understanding reality in terms of the mechanisms that produce and manifest natural and social phenomena (in open systems).

Only under experimentally controlled (closed) conditions are the domain of the real and the domain of the empirical in one-to-one alignment with the domain of the actual. This is because outside the experimentally closed condition, we are always dealing with a multiplicity of generative mechanisms, which makes it difficult to predict anything at the level of the actual. The point of an experiment is to isolate a single mechanism and observe its action free from the effects of other mechanisms. Because we only study a single mechanism under such closed conditions, then we can precisely describe its effect, whereas in an open system, we do not know if a particular result is due to a mechanism, interacting confounders, factors, or other causes. Outside closed systems, what is actualized depends on all the mechanisms in effect.

The question that follows is: how do we derive new scientific knowledge from existing knowledge? Following the Bhaskarian DREI(C) model of scientific discovery, science can be perceived as an iterative process-in-motion of knowledge production. The model may be seen as building on knowledge from one stratum to a more complex stratum. I paraphrase the meaning of the model below:

D stands for description. The first step in the process of discovery is description of

the phenomenon. This initial stage is concerned with providing a description of that which is under investigation. An example of this would be the description of behavior that follows a law-like pattern.

R stands for retroduction. The next step, retroduction, is the process of imagining possible mechanisms that, if they were real and acted in the postulated way, would account for the phenomena in question. It requires making hypotheses, imagining, exploring, and posing analogies. For example, during scientific investigation, the first part, discerning X, involves thinking about all possible mechanisms that might account for X.

E stands for elimination. This process consists of testing the previously imagined process. It is aimed at the eradication of false theories through processes of elaboration and through the eradication of alternatively erroneous explanations.

I stands for identification. It refers to the identification of the plausible mechanisms responsible for generating the phenomena. At this level, we want to fully understand everything about the identified mechanism(s) so that we can describe how it behaves, what it does, etc. In this way, the process of discovery starts again.

C stands for correction. It refers to the need to make corrections according to new evidence.

The DREI(C) model shows how theoretical explanations build upon scientific knowledge, which moves from one level (e.g., stratum I) to a deeper level of explanation (e.g., stratum II) in a continuous, iterative manner. Bhaskar (2008a) provides an example in the field of chemistry and other examples in physics because these two sciences are often regarded as paradigmatic fields in the tradition of the philosophy of science, as shown below in Table 5.3, p. 129.

Table 5.3: Example of the multi-tiered stratification of scientific knowledge

stratum I	$2Na+2HCl = 2NaCl + H_2$, explained by	

stratum II	Theory of atomic number and valency	mechanism 1
stratum III	Theory of electrons and atomic structure, explained by	mechanism 2
stratum IV	[competing theories of subatomic structure]	mechanism 3

Adapted from Bhaskar (2008a, p.169).

This multi-tiered model is meant to illustrate that the reason why experimentation (or analogous procedures) is that we have many competing theories that describe many possible explanations about a particular phenomenon. We use such multi-tied models to test scientific knowledge in order to arrive to underlying structures and mechanisms. To recall, Kantian transcendental idealism argues that in order to have scientific knowledge, we need some kind of epistemological structure–e.g., a model. Transcendental realism agrees with this notion of epistemological structure, but it also see that there is a potential plurality of possible models of epistemic structures, so that we need to know which, if any, of the models which are historically generated are correct. Since there is no straightforward answer, there is a need to test plausible explanations.

At this point, it is convenient to distinguish between three senses of the stratification of reality. Firstly, there is the sense of the distinction between the domain of the real and the actual, in which we differentiate structures or generative mechanisms from the events they generate. Secondly, there is the sense of the multi-tiered stratification of reality, as exemplified by $d_r \geq d_a \geq d_e$ in Table 5.3, p. 129.

5.4.2 The importance of emergence

CR argues that emergence is understood in terms of a set of criteria which go together, as shown in Table 5.4, p. 131.

Table 5.4: Three criteria and one consequence for emergence

	3 criteria + 1 consequence = emergence
criterion	the higher order phenomena is (1) unilaterally existentially dependent on a more basic ("lower") order, domain, or level, e.g., we do not have mind without matter,
criterion	the higher order phenomena is (2) taxonomically irreducible to it, e.g., we cannot study the level of mind or its products—as social structures, actions, rules, conventions—solely by using concepts from the domain of matter; and most importantly,
criterion	the higher order phenomena is (3) causally irreducible in the level or domain of phenomena from which it initially emerges, e.g., once we have mind, then mind becomes causally irreducible in the domain of matter; another example is that once we introduce the impact of human beings, then they may affect the climate of the planet, or when human beings perform actions, such actions always involves interference in the world of matter.
consequence	the lower level must (4) already contain the higher level as a possibility, e.g., the lower order implicitly contains the higher order enfolded within it as a possibility, as in the Darwinian theory of evolution, in which human beings are implicit or enfolded as a possibility in the ape.

Adapted from Bhaskar (2009, p. 76).

The first three criteria of the concept of emergence are the most important, at least fro BCR, which I illustrate with further examples:

(1) Unilateral existential dependence A way to state the structural level's unilateral existential dependence on nature is to say that the social presupposes the existence of the material (but the opposite does not hold). The dictum given by Marx and Engels—"as man is only human, he must eat before he can

think" (Bhaskar, 2009, p. 76)—can be taken to illustrate how this unilateral priority of existential material is asserted before the dependence of the social is brought into being. This unilateral existential dependence also applies to the way in which the natural and social transform so that every social transformation implies natural transformation, but natural transformation does not automatically imply a social one.

(2) Taxonomic irreducibility The word taxonomy refers to conceptual systems we use to classify or describe phenomena, and its irreducibility implies the need for new concepts to render classification of phenomena accurately with the already existing concepts. Consider the example of asking someone to turn on a light switch. Although it could be argued that the action of turning on the light switch depends upon an individual's physiology, it must also involve having an intention for doing it. The description of this action cannot be reduced to mere psychological concepts, but there is also a need for concepts that relate to intentionality, especially when explaining human actions, which is what taxonomic irreducibly means.

(3) Causal irreducibility Intentional activity presupposes causal efficacy of intentional actions for bringing about transformations in the physical world. Climate change, for instance, produces changes in the material world as an unintended result of the burning fossil fuels that produce greenhouse effects, which ultimately raise the temperature of the planet; similarly, everyday human actions produce intended (and unintended) physical change in the world. This is what causally irreducibility means.

5.4.3 Mind the gap! Between d_r: the domain of the real and d_a: the domain of the actual. Or else, actualism

Actualism is the reduction of the domain of the real to the actual (Bhaskar, 2008a, p. 81). Empirical realism is the identification of d_r: the domain of the real further with d_e: the domain of the empirical. In short, empirical realism involves actualism. In the Bhaskarian $d_r \geq d_a \geq d_e$ three-level strata, actualism is a collapsed of the real to d_a: the domain of the actual, and empirical realism constitutes the identification of the real by the empirical.

The Humean theory of causal laws identifies laws as "constant conjunctions" of events or universal "empirical invariances" Bhaskar (2008a, p. 54). Causal laws are powers (or tendencies) of generative mechanisms or structures, which operate at the level of d_r, the real. The great error of the Humean theory is that it identifies the generative mechanism with actuality and our experience of it; it identifies the mechanism with what is produced by the mechanism, e.g., $d_r = d_a$, or level of the empirical—e.g., $d_r = d_a = d_e$. This Humean account puts forward such a theory by tying causal laws to the closed conditions in which empirical invariances occur. In open systems, we only have the possibility of misconstruing d_r and d_a when the system is closed so that there is only a single constant conjunction to analyze because as soon as there are two or more constant conjunctions, they are no longer constant, and thus the system is not close, but open.

Causal laws are the workings of mechanisms, at d_r: the domain of the real, not patterns of evens, at d_a: the domain of the actual. Hence, constant conjunctions of events are insufficient and unnecessary for scientific laws. Bhaskar (2008a, p. 28) uses the term "natural necessity" to describe the very necessity in open systems, which exists independently of our activity and us. The problem with actualist theory is that laws and mechanisms are identified as the invariant regularities of empirical patterns. Such identification means that actualism considers only one level of reality, the actual, and assumes that this level is going to remain constant all the time. From a CR-stratified view of reality, we know that all phenomena, social and natural, vary both according to context and over time. Thus, actualism fails because it remains stuck at a single level of reality by equating laws with their constant conjunctions, i.e., with what is used to identify or test a hypothesis about laws. We see that empirical invariances are important but only under scientifically controlled conditions so that if they are to apply outside those conditions, laws cannot be constant conjunctions. In short, actualism confuses causal laws with empirical regularities, or Humean constant conjunctions of events, i.e., it confuses the laws with their empirical laws, i.e., which can be used under experimentally closed conditions to identify them or test them. The immediate question is: how do phenomena from experimentation need to be analyzed?

5.5 Causal laws are tendencies, not universal empirical regularities!

Once we see that there is a need for experimentation or analogous procedures in a stratified view of reality in order to test scientific knowledge, then our ability to understand experimentation makes an assumption about the objects that are yet to be discovered. In this way, Bhaskar (2008a, p. 31) argues, that "the intelligibility of experience in science itself presupposes the intransitive and structured character of the objects to which, in scientific experience, 'access' is obtained". Such stratification and differentiation of reality from which we can understand science is conveniently conveyed with the Bhaskarian formula $d_r \geq d_a \geq d_e$, and it also can help to illustrate what happens when this overlapping does not hold. First, we can consider the case $d_r = d_a = d_e$, to be the assumption of an empiricist ontology that sees that the analysis of the object to be discovered in experimental conditions is derived from sense-experience. CR sees that the object to be discovered is presupposed but that it belongs to the intransitive objects of science. In this sense, experimental conditions (closed systems) allow us to identify the pattern of events that leads to the object of scientific discovery. From a CR perspective, intransitive objects are objects yet to be discovered, causal laws, and are independent of the experimental patterns or regularities of events that they produce. Second, the case that $d_r \neq d_a$ (e.g., the detachment of generative mechanisms from events, including experiences) implies that generative mechanisms cannot be reduced to their qualities, and $d_a \neq d_e$ (e.g., the detachment of events from experiences) implies that generative mechanisms cannot be investigated in terms of inherent qualities. CR argues that causal laws of the natural world are not statements of any form, i.e., causal laws are not empirical, universal, experiential, or a priori statements.

In an open system, we never find a single mechanism acting in isolation; rather, we encounter a flux of multiple mechanisms acting upon phenomena, this flux being one of the reasons why empirical results cannot be guaranteed in open systems, given that we may have many mechanisms operating in various contexts. In a closed system, we are able to isolate one mechanism operating on a certain phenomena. Then we can make and test conjectures about that particular mechanism given that it should always operate in the same way in nature. Thus, one of the reasons why we cannot set up a closed system to test human affairs is that people tend to adapt and

act in different ways over time. From a CR viewpoint, we want to explain causality not in terms of the Humean constant conjunctions but in terms of tendencies.

5.5.1 Tendencies

As with many BCR concepts, the notion of tendency is developed extensively throughout the history of this philosophical system. In RTS, Bhaskar (2008a, p. 223) differentiates between two types, tendency$_1$ (t$_1$) and tendency$_2$ (t$_2$). On the one hand, tendency$_1$ describes the activity of the exercised power or workings of a mechanism. Such mechanism will work in such a way regardless of other conditions. For example, the effects of alcohol on human beings illustrates t$_1$ because after alcohol consumption, individuals will always tend to get drunk, regardless if they are actually behaving drunk or not, which depends on other physiological factors and counter conditions—e.g., the interaction of coffee with alcohol acts as counter agent to diminish its effects. Tendency$_1$ is the exercise of a power "normically qualified" at the level of the real that does not automatically translate to the level of the actual. Thus, the first and basic concept of t$_1$, a tendency that is always a "transfactually efficacious" law (Bhaskar, 2008b. p. 223), is always in operation at the level of the real. However, the actuality of what occurs at the level of the actual may be different as it depends on various other factors.

On the other hand, the concept of tendency$_2$ (t$_2$), which is like t$_1$ with some of the conditions already satisfied. A t$_2$ exists when most of the stimulated and releasing conditions are already satisfied. For example, not only does a kleptomaniac have the possibility of stealing but also his or her tendency is oriented to steal. To illustrate this point rigorously, I refer to Bhaskar's (2008b) explicit explanation denoting that entity or thing X has a t$_2$-type causal power to perform behavior ϕ if the following three conditions hold (see Table 5.5, p. 135 right below).

Table 5.5: Explanation of tendency$_2$

(i)	X has the power (or liability) to do (or suffer) ϕ;
(ii)	X is in an enduring condition to do ϕ, i.e., it is predisposed or oriented towards doing ϕ;
(iii)	X will do ϕ given an appropriate set of circumstances, in virtue of its predisposition, and in the absence of intervening or (countervailing) causes.

Adopted from Bhaskar (2008a, p. 223).

From the above explanation, we see that to state that X has t_2 to perform ϕ is also to state that X will perform ϕ under appropriate conditions and in virtue of its particular nature (e.g., its structure). It is important to differentiate t_2 from t_1 because in an open system we need to note that although X has a tendency, this does not mean that it will exercise this tendency or realize it. The main point to make about distinguishing between t_1 (e.g., transfactually efficacious laws) and t_2 (e.g., "ready" intrinsic, enabling laws from constraints) is that there is a real difference in the behavior and nature of entities or things. Some examples illustrate these ideas:

- A morbidly obese individual is one who has had the tendency to consume more calories than he or she uses daily (the exercise of this t_1 is something than persists, as shown by the effects of an excess of adipose tissue that accumulates over time).

- A kleptomaniac is one who has or had an insistent tendency to steal (even if the exercise of this t_2 may be suppressed or unsuppressed).

- A dog has a generic tendency to bark (the exercise of this tendency t_2 depends on the conditions under which the dog barks, such as when playing, when fearful, etc.).

To sum up, Bhaskar (2008a, p. 181) argues for an analysis of causal powers as tendencies in open systems. Such a distinction is blurred in a closed system because experiments create artificial conditions in order to trigger a tendency by means of a "stimulus", but in an open system the realization of a tendency is not guaranteed. Even in the case that we restrict ourselves to closed systems, there is still a difference between (a) the operation of a generative mechanism (at the level of the real) and (b) the production of a result (at the level of the actual); however, these two, (a) and (b), are in a one-to-one relationship. Thus, unless we have an ontology, which explicitly minds the gap between the real from the actual, such difference between (a) and (b) might be blurred or confused, as to think that (b) always holds.

Why do we want to explain causal powers in terms of tendencies? We can see that a problem arises if we suppose that behavior is rule bound or that events do not have causal reasons. The Bhaskarian argument states that in treating causal powers as

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tendencies, we are opening a space in order to make reference for explanations of generative mechanisms. We can explain causality in terms of tendencies to avoid a trivialization of explanations—such as the ones made by a Popper-Hempel model, also called the "deductive-nomological theory of explanation" (Bhaskar, 2008a, p. 61)—rendered by the way explanations of a certain phenomenon require it to either subsume or always make reference to generalizations.

The Popper-Hempel theory of explanations makes a fatal double error of supposing that: (1) explanations always include causal laws, and (2) such laws are given in terms of empirical universalized generalities (Bhaskar, 2008a). Contrary to this model, CR asserts that the identification of causes is never necessary or sufficient for science because scientific activity is not merely concerned with listing causes or with their fulfillment but with the way causes relate (even if such relations appear contradictory). In short, Humean constant conjunctions of events are not necessary for causal laws because there are no instances of genuine universal empirical regularities; we could only have such universal regularities if the world was a closed system, so the very fact that we need to establish closed systems (or other means to identify them) means that outside these conditions, the world is an open system.

For example, a researcher may not be scientifically interested in the suppression or non-suppression of kleptomania. Rather, he or she may be instructed in the reason for it and for the generative mechanisms that cause or produce it. From this perspective, the notion of causal powers as tendencies serves the important role of a place holder for scientists, such that: "when we know what a thing is we know what it will tend to do, if appropriate circumstances materialize" (Bhaskar, 2008a, p. 230). In other words, once we attribute a causal power to a thing or entity, then we have assumed that there is a real foundation for such a thing, independent or not of its realization, which is a scientific explanation that is capable of satisfying the principle of natural necessity.

In *Dialectic: The pulse of freedom*, Bhaskar (2008b, p. 414) further elaborates upon the concept of tendency in a matrix of a-d types of tendencies. Tendency$_a$ is code for t_1 and denotes a power that is "normic", or usually qualified, and acted upon, or "transfactually efficacious", which differs from a power that is "ready" to be executed, or tendency$_b$ (or t_2), and it expresses the direction of a certain process in terms of a "geo-historical trajectory" (or whether its intrinsic type of enabling conditions are fulfilled). Drawing upon such differentiations, Bhaskar (ibid., p. 415)

distinguishes between further types of tendencies. One such tendency is a "prone" tendency$_c$, which is executed (or its extrinsic type of enabling condition is fulfilled). For example, children are prone to eat ice cream. It expresses the mediation of a certain moment, a motivated tendency$_d$ (or its intrinsic type of stimulating and also releasing conditions is fulfilled). To summarize the above discussion, I refer to Hartwig's (2007i) tabular representation of tendencies$_{a-d}$ as part of a dialectical matrix (see Table 5.6, p. 138).

Table 5.6: Types of tendencies, the concrete-universal chain, and the ontological-axiological chain

concrete universal = singular	universality	processuality	(particular) mediations	concrete singularity
	tendency$_a$ (transfactual efficacy)	tendency$_b$ (directionality)	tendency$_c$ (mediation)	(generic) tendency$_d$ (combined tendential effects in any outcome)
ontological-axiological chain	1M non-identity tendency$_1$ (transfactual)	2E negativity tendency$_2$ (ready)	3L totality tendency$_3$ (prone)	4D transformative agency tendency$_4$ (motivated) (e.g., a human disposition)

Adapted from Hartwig (2007i, p. 458).

The four types of tendencies (transfactual, ready, prone, and motivated) are not the only ones. Moreover, Bhaskar (op. cit., p. 415) also develops three other notions of tendencies, starting with the fulfillment of extrinsic-type but not intrinsic-type releasing conditions, or "lapsed" (delayed) tendency$_e$ (or tendency$_5$). A power that is realized under all open circumstances is tendency$_6$. Finally, the last, which is synonymous with empirical universal regularities that are assumed under all closed

conditions, is tendency$_7$.

Now, I want to review the above discussion on tendencies and fuse it with section 5.2, p. 119 of this chapter. The importance of the concept of tendency, as developed in all its seven types, marks a clear point of difference between transcendental realism and empirical realism (including its version of positivism). On the one hand, transcendental realism posits that intransitive objects, the objects of scientific investigation, exist and act quite independently of our knowledge of them, objects which are acquired in open systems and are subject to interference and interaction between various causal mechanisms. Following Bhaskar (2009, p. 242), we can ask: what is the social function or role (the ideological effect) of Humean constant conjunctions?

> [This logical form serves] to conceal the reality of structures irreducible to events, and more particularly of social structures to human actions and of societies to individuals... it defuses the possibility of science... of the conditions and possibilities of change in the unwilled structures at work in social life, the only possible ground of human emancipation.

Above, Bhaskar argues that the logical form of Humean constant conjunctions follow an equivalent logic to the Marxian wage form because although there is nothing mysterious about their intention, both logics function to conceal the world of causal mechanisms and structures via the formula "whenever x then y" (Bhaskar, 2008a, p. 59) for determinism. For the capitalist, the logic of wages disguises the origin of surplus value—whenever I work one hour overtime, then I earn one and one-half of $7.25—and for the classical empiricist, causal laws are constant conjunctions— whenever I see an emerald, then the green color is its law-like property—both logics are as irrational as they are necessary and also sufficient conditions for universal laws.

Adapted from Bhaskar (2008a, p. 115).

Table 5.7, p. 139 shows that classical empiricists posit that Humean constant conjunctions (of events) are both necessary and also sufficient for causal laws. In contrast, for the transcendental realists, it is not sufficient—since it is equivalent to the problem of induction—and it is not necessary—otherwise, why would we then need to set up closed systems? It cannot be necessary because there are no universal empirical regularities! Then, the transcendental idealists continue with the same problem, as they try to use Kuhnian paradigms, categories, or models to argue that it is sufficient. The transcendental realists agree that there is a need for such models but criticize transcendental idealists because they are unable to justify one paradigm over another. Thus, besides epistemic relativity, we also need judgmental rationality.

5.6   A critical-realist account of science

Science cannot be justified by any account that reduces it to its methods. Science needs to distinguish between transitive and intransitive dimensions and needs the means by which to create new scientific knowledge.

> [Without] the support of a revised ontology, and in particular a conception of the world as stratified and differentiated too, it is impossible to steer clear of the Scylla of holding the structure dispensable in the long run (back to empiricism) without being pulled into the Charybdis of justifying it exclusively in terms of the fixed or changing needs of the scientific community. (Bhaskar, 2008a, p. 10)

To paraphrase the above quote, we need a third option in order to avoid choosing between two monsters; the practice of science cannot be justified without a revised ontology. Since science is a socially dependent enterprise, its justification depends on social matters. In addition, the CR account of science points to two moves that are necessary. First, given that scientific activity occurs, the world needs to be thought of a system that is structured such that science can be possible in order to understand it. Second, science belongs in the transitive dimension; it is not an independent category of human activity but is human activity. We see that science is dependent on human activity; thus it is scientific activity that makes possible the conceptualization of the structure of the world.

At this point, it is important to revisit the tenets of CR. From a CR point of view, there is always a gap, a distinction between the transitive and intransitive dimensions (TD-ID) of both the natural and social sciences. Thus, mind the gap! The TD-ID gap points to the difference between ontology and epistemology, but what is then the ontology of reality? CR argues in two ways, both of which are implied by experimental activity. A single instance establishes two arguments namely (1) the separation of ontology from epistemology and that (2) the ontology of a structured world, e.g., $d_r \geq d_a \geq d_e$, in which the real is irreducible to the actual, and in which there is a differentiation between open and closed systems. The Bhaskarian argument is established by an immanent critique of experimental activity. This is an immanent critique because it selects as premises features which classical empiricism and transcendental idealism regard as very important in science and proceeds to show that given an analysis of the feature; namely, experimental activity, such positions are unsustainable.

If we do not mind the gap, between the intransitive and the social transitive dimensions, then we commit an error in argumentation namely, the epistemic fallacy. And if we do not mind the gap between the realm of the real (d_r) and the actual (d_a), then commit the fallacy of actualism because we fail to see the irreducibility and multi-strata of our world—i.e., $d_r \geq d_a \geq d_e$. Moreover, if we fail to analyze the subject matter of social science, society in open systems as tendencies (e.g., t_a-t_d), then we commit the Humean error of equating constant conjunctions of events with laws, which closes the gaps by treating the world as if it were a closed system. These two big gaps, the TD-ID difference and the d_r - d_a distinction are in principle distinct but connected, form part of the arsenal to understand reality from the viewpoint of critical realist ontology.

5.7 Critical realism - critical naturalism

Critical naturalism is the CR stance in Bhaskar's *The Possibility of Naturalism* (PN) (1979), which explains that the philosophy of social science (and to an extent substantive social theory) is characterized by various dichotomies and provides the means to resolve them. We can refer to Table 5.1, p. 118, in order to recall the macro-dichotomies—e.g., collectivism vs. individualism, structure vs. agency, and naturalism vs. anti-naturalism—and the micro-dichotomies—e.g., mind vs. body,

reason vs. cause, and facts vs. values—of social science. While the immanent critique in transcendental realism is, in the first place, of experimental activity (but later also of applied activity) because this is the key topic that classical empiricists and transcendental idealists consider important. Now the immanent critique in CN, the philosophy of social science, is of the transcendence of dualisms. There is then a hermeneutic struggle in the philosophy of social science and social theory over existing dualisms; CR renders the resolution for the each of these dichotomies, which are also already identified in the activity-theoretical approach. This argument does not imply that one side of the dichotomy (e.g., structure) is more important than the other (e.g., agency) but that there is a need to understand the relations between them as a unified account which does justice to each of the terms.

5.8 The dichotomy between individualism and collectivism (or holism)

The dichotomy between methodological individualism (or individualism for short) and methodological collectivism (collectivism or holism for short) is transcended with social relationism, or the idea of a "relational conception of the subject matter of social science"—that is, our contemporary society (Bhaskar, 1979, p. 31). On the one hand, we have a view of society that states that to understand social behavior or phenomena generally depends on understanding the behavior of individuals. The main purpose of individualism is to affirm that the explanation of social behavior or phenomena generally is only a matter of explaining individual behavior. This idea is very important because it highlights that the problem with this doctrine as involving a double reduction of (1) society to individuals (i.e., methodological individualism) and (2) of all being to behavior—i.e., all phenomena is behavior without relations and without social structures. Another way to think about individualism is see it as equating the terms "individual" and "behavior". On the other hand, the counterpoint to individual behavior is group or mass behavior, or collectivism (or holism). The purpose of collectivism is to explain the behavior of individuals in groups or to explain the behavior of the masses. The key problem with collectivism is that it mistakes the subject matter of social science with the study of behavior in groups or the behavior of groups. In this manner, we see that the shared problem of individualism and collectivism is to misconstrue society as behaviors or events.

An important implication of these doctrines can be traced to the development of social theory. Both individualism and collectivism make the homology between society (in terms of individuals or masses) and behaviors. This homology together with an empiricist ontology (the view that knowledge can only be obtained from sense-experience) is responsible for creating a theory of society in which its laws are derived from the conjunction of patterns in social events-behaviors and which are validated by an implicit logic of common sense: the theory of positivism. This point is illustrated in the following diagnosis:

> it is this couple (empiricism-individualism) that I think must be held largely responsible, or rather acts as the metatheoretical trustee for the practices responsible, for the social scientific malaise. (Bhaskar, 1979, p. 25)

Schematically, Bhaskar (1979) illustrates in more detail the limits of both individualism and collectivism by reviewing four different attempts to conceptualize society, as shown below.

Adapted from Bhaskar (1979, p. 39).

Three of the four perspectives of society use behavior as the main unit of analysis, the other, the Marxian theory, which does see society as relational and from a realist viewpoint. The first, utilitarianism, is yet another instance of the empiricist-individualist pairing. This utilitarian doctrine is contemporaneously popular, as the so-called rational choice theory (the application of neo-classical economics to social life), follows the same lineage that favors rationality, a commonsensical approach, to explain behavior for its own sake as the main driving force to acquire its ends—such as passions, feelings, the idea of common good, etc.—and one in which reason

is always an a priori assumption. Second, in Weber's neo-Kantian view of society, we see that society remains individualistic, given that the individual's intentional behavior is conceptualized to construe society via our willpower. This model remains committed to epistemological structures to a degree of epistemic stratification. Last, the Durkheimian view of society, termed the "conscience collective" (Bhaskar, 1979, p. 38), refers to various types of solidarities, such as altruistic behavior derived from the individual's connection with the social space in which ideas, attitudes, behaviors, and cultures are shared.

In section 4.4, p. 93, we saw that Activity Theory suffers from this individualism-collectivism dualism. To transcend this limit, CR proposes going beyond a behavioral unit for analyzing society. From a CR perspective, behavior belong to the realm of the actual, so that what is ruled out is the real. Behavior is only a superficial aspect of society, so the aim of CR is to explain in terms of the structures or mechanisms that generate it. Thus, CR proposes seeing society in terms of its relations: "the relation of production of various kinds" (Bhaskar, 1979, p. 56) and at its core we have the Transformational Model of Social Activity (TMSA). The concept of society as heterogeneous relations of production allows CR to transcend the dichotomy between individualism and collectivism.

CR does not identify society either with individual behavior or mass behavior—e.g., crowd behavior. Rather it proposes a relational conception of society or social relationism, which entails a look at relations between individuals. More specifically, CR defines society as the object of study that is "necessarily theoretical, in the sense that it cannot be empirically identified independent of its effects, so that it can only be known, not shown, to exist" (Bhaskar, 1979, p. 57). This view of society is concerned with relations that persist between people, such as the variety of often asymmetrical relations between males and females, old and young, and between oppressors and oppressed. For Bhaskar, the idea of accentuating enduring relations is because such relations are the generative mechanisms of social science—e.g., the structural relations of husband and wife, speaker and listener, Member of Parliament and constituent, manager and workers, supervisor and student, parent and offspring, etc. More specifically, the structure of society is:

> the persistent relations between individuals (and groups), and with the relations between these relations (and between such relations and nature and the product of such relations). (Bhaskar, 1979, p. 36)

To further understand the CR relational conception of society, it is necessary to see it against the background of other models of society. Following PN, I shall show such background in terms of four different conceptions of society and their respective relations to agency.

5.9 The dichotomy between reification and voluntarism (structure-agency)

Bhaskar (1979) develops the Transformational Model of Social Activity (TMSA) to deal with the dichotomy between agency and structure. The agency-structure dualism also represents a problem for activity theorists, as shown in section 4.4, p. 93. In CR terms, agency refers to human praxis, both conscious substantive transformative production and typically transformative unconscious reproduction or transformation of structures, i.e., the conditions and means of substantive production. We have first-order production and second-order reproduction or transformation of structures, which govern the production of structures and relations. The term "structure" refers to social objects or products that are relatively autonomous, given that they exist only as a consequence of human praxis—e.g., social institutions, language, culture, and so on.

To transcend the agency-structure divide, a CR viewpoint begins with an analysis of its four models of society based on the work of Weber (Voluntarism, Model 1, Figure 5.2, p. 146), Durkheim (Reification, Model 2, Figure 5.3, p. 147), Berger and Luckmann (Illicit-identification, Model 3, Figure 5.4, p. 147), and Marx (Model 4, Figure 5.6, p. 151); Bhaskar (1979) stresses that Marx is on a different level, given that he develops elements for a realist ontology and a relational view of society). In Model 1, the structure is simply the product of agency. In Model 2, the structure exists independently of agency. Model 3 combines the two previous models so that the individual produces society (as in Model 1) and so that the society, so produced, feeds back to produce the individual (as in Model 2). In this way, the individual internalizes society and externalizes agency, e.g., the individual attributes in society. In Model 3, agency is an internal form, and the structure of society is an external form of the individual, and as we shall see with Figure 5.4, p. 147 such idea is also found in Engeströmian structure of learning activity (compare with Figure 5.5, p. 149).

I provide diagrams and extended descriptions of all three models, which serve as the introduction to the concept that resolves the agent–structure divide, Model 4: the Transformational Model of Social Activity (TMSA).

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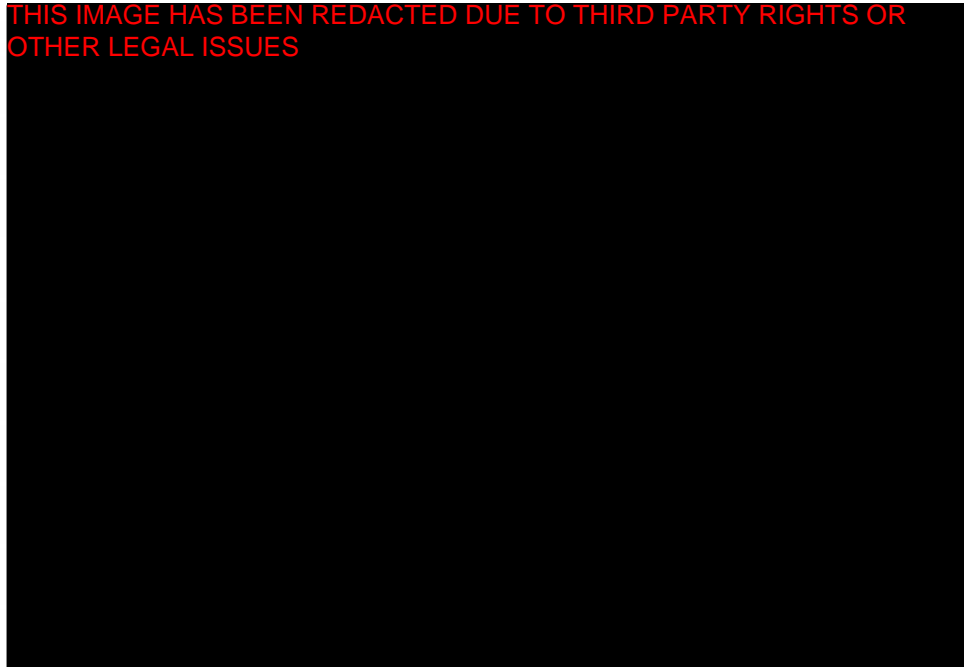
Adapted from Bhaskar (1979, p. 40).

Bhaskar (1979) describes Model 1 as a stereotypical Weberian perception of society combined with voluntarism conceptualization. From this viewpoint, society is formed by the wishes and wills of individuals, but the model does not account for the initial conditions that are available to the individual from society for the production of her wishes and desires. In this sense, we see that in this model, "there are actions, but no conditions" (Bhaskar, 1979, p. 46). The upward arrow is meant to illustrate how society is constituted, from an individualist viewpoint, with those objects of social knowledge that are the consequence of the individual's intentional behavior and meaningful actions.

Bhaskar (1979) describes Model 2 as a stereotypical Durkheimian conception of society that is the result of combining a positivist methodology with a collectivist view of society. The reification model combines concepts of a collective (e.g., masses of people or groups) with an idea of natural relationships (e.g., collective consciousness, solidarity, altruism, etc.). The problem with reification is that it reduces the

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Adapted from Bhaskar (1979, p. 39).

individual to conditions of natural relations without allowing for the efficacy of individual's actions, which might impact the initial conditions. Thus, we see that "there are conditions, but no actions" (Bhaskar, 1979, p. 89). The downward arrow is meant to illustrate how society is constituted with those objects of social knowledge that are external to and pressing on the individual.

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Adapted from Bhaskar (1979, p. 40).

Bhaskar (1979, p. 42) argues that Model 3 is a correct conceptualization of society, insofar as it both conceives of the structure as preceding the agency and describes society as "always already made". However, Model 3 shows externalized individual agency as society and, then, society as being internalized by individuals, which conflates these two because agency is seen as the inner form of society and society is the outer form of agency. According to Bhaskar (1994), this model is inadequate because, just as with Anthony Giddens' theory of structuration, a type of illicit-identification, we find that if agency externalizes society then there is nothing more to society than there is in individuals. However, it is clear that, say capitalism is more than what is internalized by particular capitalists because it has a whole logical system that cannot be reduced to its particular types. In Model 3, the zigzag arrows are meant to illustrate such internalizing—externalizing movement. The diagonal upward arrow indicates that society provides the conditions from which individuals obtain structures by a process of internalizing society. The diagonal upward arrow indicates that the individual goes on to (re)produce society in a process of externalizing the produced society. According to Bhaskar (ibid., p. 35), this model is advocated by Berger and Luckmann and their associates, and to describe it, he coins the term "illicit-identification model" because its two-way flow between society and individuals provides a very attractive pseudo-dialectical conception. In short, the conceptualization of this model, which posits an internalization—externalization dynamic (i.e., society being internalized in agency and agency being externalized in society) is superficially attractive but ultimately erroneous.

We may recall from section 3.5, p. 52, that Activity Theory uses a type of Model 3, as shown with the Engeströmian structure of learning activity in Figure 5.5, p. 149.

For Engeström, the structure of learning activity is equivalent to Figure 5.6, p. 151, because it illustrates the internalization-externalization process, which, signifies that

> Learning activity may be conceived of as expansive movement from models to the methodology of making models and back...But learning activity is more than this. It is true development of instruments: "purification"by elimination of secondary or accidental features, variation and enrichment, testing novel connections and disconnections. By bringing the products of science and art into a new type of formative contact with

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Figure 5.5: Engeströmian structure of learning activity

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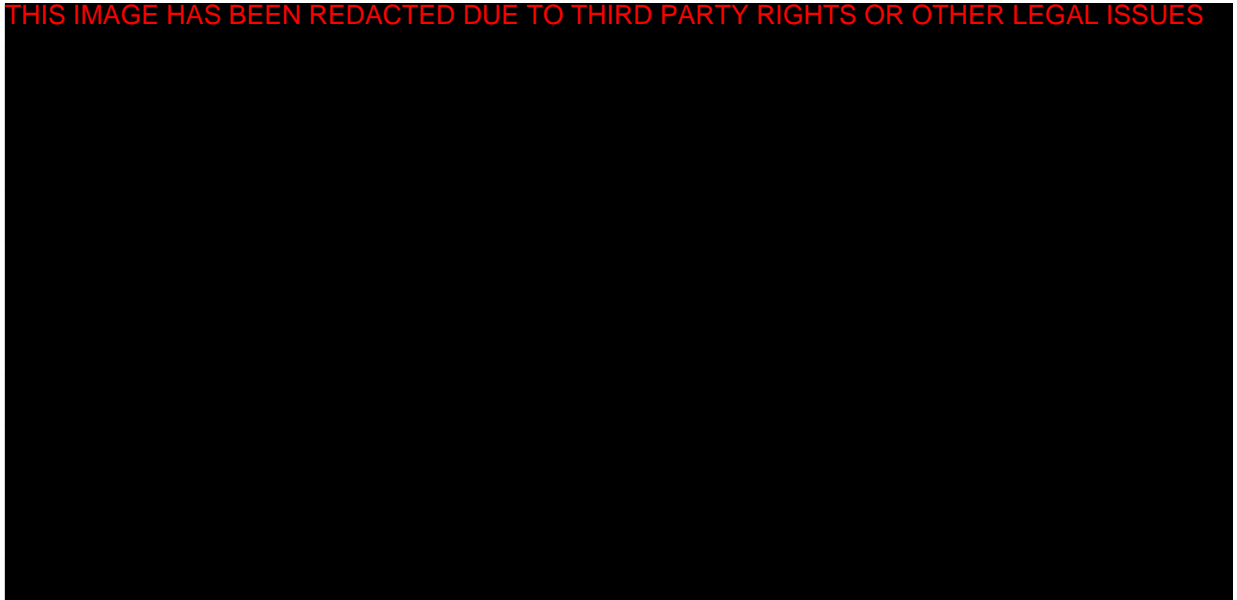
Adopted from Engeström (1987, *The structure of learning activity*, para 12).

> productive practice, learning activity introduces a new creative moment
> into the activities of science and art themselves. In other words, learning
> activity never leaves its instruments qualitatively intact. It is not just
> consumption of instruments given from outside. (Engeström, 1987, *The*
> *structure of learning activity*, para. 8–10).

Thus, there is a conceptual and graphical mirroring between Model 3 and the above learning activity because in the consumption of epistemic models given from social outside, agents reproduce that the social structure. In their creation of new epistemic models, agents also transform the structure. However, AT do not take into account (1) the temporal element in which structure precedes agency and it does not take into account that (2) the actions of agents still serve to reproduce the social structure (of learning activity), albeit unwillingly.

A CR view of society agrees with the internalization-externalization process that occurs between society and individuals. However, there are two main problems with Model 3. First, societies and individuals can be shown to have very distinctive qualities and properties, yet this model does not articulate the relationship between the two. To illustrate this point, in Model 3, we see that society has all

the characteristics (e.g., consciousness, desires, and praxis) of a human being and that the individual has all the characteristics of society, but society is an abstract, theoretical, unconscious object incapable of having human characteristics. Hence, illicit-identification is a crude model of society. Second, the model assumes a symmetrical temporal element between the structure and agency by which both occur at the same time. For example, it does not recognize that for any particular instance of agency in time (e.g., an individual's birth, youth, mature life, etc.) there is always a pre-given structure—e.g., language, political system, cultural context, and so on. Bhaskar (1979) gives an example that clearly illustrates why Model 3 is wrong: suppose that an individual goes to sleep at night, and then, the next morning, when he or she decides to change society, the societal structures are still there to struggle against. If society were simply the externalization of agency, then attempting to change structures would not be a problem.

Thus, we see that all three sociological models lack an asymmetrical temporal element in which structure pre-exists agency, but this argument does not imply that structure determines agency. In this sense, the agent's response cannot be predicted from the structure alone. For instance, individuals can shape the given structures of the world, e.g., through learning a language, education, changing government policy, an institution, etc. To recall, Models 1, 2, and 3 address the structure-agency problem in different ways, but all of them lack the dimension of temporality in which society pre-existed the individuals. The CR solution to this problem is that the agency is posterior to the structure. Given this, it is wrong to say that the individual creates society because society exists prior to any round of agency and any individual's conceptualization of it.

From a CR viewpoint, the existence of society is not disputed; what is disputed is the individual's role in it. The agent can either transform it or reproduce the social conditions in which he or she lives. In this manner, there is always a structure there, as given, and individuals have to use the structure. Therefore, what happens by virtue of using the structure is that individuals reproduce society or transform it, shown by the Bhaskarian TMSA, (see Figure 5.6, p. 151). The TMSA must always be perceived as involving two levels: (1) the level at which the agent is producing or a achieving a certain result (e.g., the marriage of two people), and (2) the level of the social structure, in which in their substantive activity, agents reproduce or else transform it. This re-production is, for the most part done unintentionally, or to put

it in Bhaskarian: people do not get married to reproduce marriage or the family; people do not work to reproduce the capitalist wage-labor relationship; people do not go to Mass to reproduce Catholicism; people do not study higher degrees to reproduce the university institution; similarly, people do not speak to reproduce a language, and so on. Rather, these are the unintended products of the social structure or what in colloquial terms is, the enduring relationship's collateral damage or byproduct. The Bhaskarian TMSA graphically conveys these two levels in which (1) is the level of the agent (individual) and (2) is the level of the social structure (society). TMSA takes the connection between social structure and agency as one

Figure 5.6: Transformational model of social activity or TMSA (Model 4)

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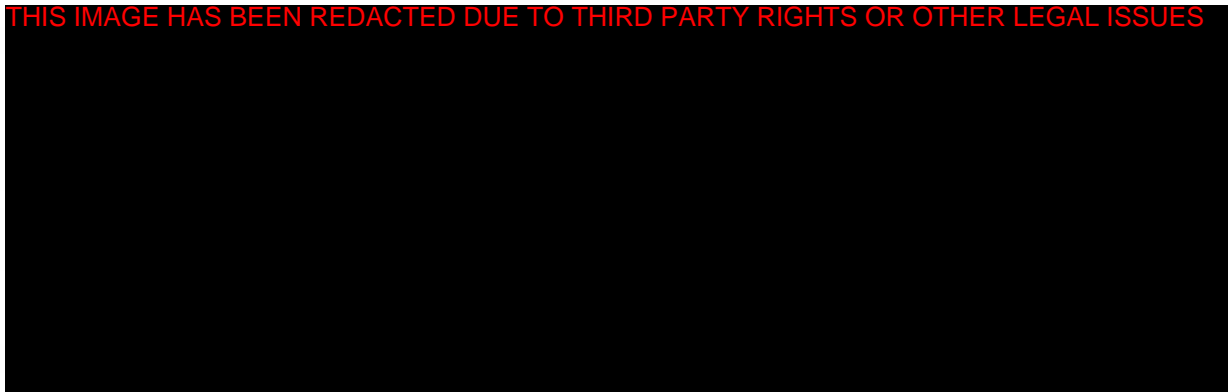
Adapted from Bhaskar (1979, p. 46).

that has always existed. The parallel arrows between the society and the individual show how the pre-given society is the theoretical, unperceivable object of inquiry that cannot be characterized independently of the effect it produces. The downward arrows indicate that it operates on individuals through *inter alia*, a process of socialization. The upward arrows indicate how the individual can operate on society by either transforming or reproducing it. This connection is clearly summarized as follows:

> people do not create society. For it always pre-exists them and is a necessary condition for their activity. Rather, society must be regarded as an ensemble of structures, and practices and conventions, which individuals produce or transform, but which would not exist unless they did

so. Society does not exist independently of human activity (the error or reification). But it is not the product of it (the error of voluntarism). (Bhaskar, 1979, p. 46).

From a CR viewpoint, there is a split between structure and agency such that they are irreducible: the notion of irreducibility means that one term, such as the social structure, cannot completely be explained using the other term, such as "agency", and vice versa, so that agency cannot be completely explained in terms of "structure". Rather, there is always a gap between these two terms. The property of being irreducible is equivalent to stating that we cannot regard agency as internalization and that we cannot regard society as externalization because they are different objects of investigation. Because of this, in any concrete explanation, we need to refer to both.

Now, we have already seen that Activity Theory employs an erroneous internalization-externalization conception of society. CR proposes Model 4, which resolves the structure-agency dualism by elaborating upon the connections between them in such a way that we recognize both irreducible terms to be necessary. Thus, we see that we cannot explain phenomena in the world without involving structures, while simultaneously we cannot give explanation without involving agents.

In order to better differentiate between the TMSA and Model 3, it is important to clarify both their shared and distinctive features. A feature that these two models share is the condition for the continuity of society. This model is also discussed in Bhaskar's *Plato, etc.* (1994), in which the TMSA model is compared to Anthony Giddens' model, and we see that it, too, has this feature in common. In other words, society can only continue insofar as agents act or produce it, so that society does not exist without individuals' actions. The most important feature that distinguishes this model from previous ones is the temporal asymmetry[1]. that exists between agency and structure, a mind-the-gap! principle[2]. From a CR viewpoint, the structure is always there, so that when any act is being contemplated—that is, when any initiation of agency is beginning—the agent is always acting on the basis of the presence of the past. This reference to the past signifies a reference to the

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[1]See Appendix B for other asymmetries, p. 289.

[2]This mind-the-gap! principle is a type of, what Bhaskar (2008b, p. 205) calls, a hiatus, which requires us to conceptualize it in two related but different dimensions (the gap as a type of gulf in the spatial dimension and a split in the temporal dimension) as "necessitating the constellational dislocated duality social structure and human agency".

structures that the agent inherits and employs in life.

The previous dualism of reification and voluntarism is resolved with the TMSA, Model 4, by (1) insisting on the temporal element, in which society is always prior to agency; however, (2) in using the structures, human agency (both individual and collective) reproduces or transforms it. In using these structures, agency itself gets transformed, and what transforms it is human agency. In this manner, the dependency on human praxis implies that reification is not possible. At the same time, voluntarism is not possible because individuals do not create the social structure, the structure is presupposed, and thus the best they can do is to transform it. Thus, the TMSA avoids the problems of reification and voluntarism. Moreover, after we have resolved the dichotomy of structure and agency and explored the TMSA, the next step is to situate it in what Bhaskar (2009, p. 68) calls four-planar social being. (For an explanation of this (social) planar laminated system see Figure 4.4, p. 107 and section 6.3.3, p. 195). In the four-planar social being allows us to recognize, first, that agency plays a role in all of the planes and, second, how particular domains of study focus on a single plane. For instance, the fourth plane is the stratification of the embodied personality, which is the object of the study of psychology. Micro-sociology is concerned with the second plane (social interactions with people) and macro-sociology is more concerned with the third plane (the social structure). In this manner, I have shown how CR provides a more holistic account of these concepts, which are also important for Activity Theory, in order to consider social explanations without falling into dualisms or reductionist arguments.

5.10 The dichotomy between naturalism and anti-naturalism (positivism-hermeneutism)

The central question that Bhaskar (1979, p. 1) addresses in order to transcend the dichotomy between naturalism and anti-naturalism is: "To what extent can society be studied in the same way as nature"? On the one hand, naturalism claims that all sciences come together according to positivist principles, and its logic can be traced back to the European Enlightenment. In particular, the positivist view of knowledge holds the priority of reason to be a rational, common-sense assertion that can be justified through scientific, sense-experience verification, from which positivism derives its authority and legitimacy. (In SRHE, Bhaskar (2009) argues

that positivism works as an ideology of science and of other social practices). On the other hand, anti-naturalism is concerned with the interpretation of objects of study in social science. This theory of interpretation (or hermeneutics) has been found to have originated from a concern to interpret the scriptures. Hermeneutics is already present in the Viconian tradition, which claims that it is possible to know objects that are created by human beings. In particular, a Viconian view of knowledge holds that it is possible for human beings to understand the objects they create but that since the natural world is the creation of God, that world itself lies beyond human comprehension. For example, we can understand the things we create because we are the authors of them, but we cannot understand the things created by God. In order to resolve the dualism between naturalism, as embedded in positivist principles, and anti-naturalism, as embedded in hermeneutics, Bhaskar (1979) proposes a critical naturalism (CN) by arguing that both society and nature can be studied in (1) essentially the same manner, i.e., the study of generative mechanisms of social or natural phenomena in general, but (2) using specific methods for each discipline[1].

The main purpose of CN is to "vindicate naturalism against hermeneutics on the basis of a non-positivist, specifically realist, account of science" (Bhaskar, 2009, p. 81). It is differentiated from reductionism—the argument that proposes that the study of one, for example nature, can be identified with the other, for example the social, by reducing the social realm to the natural realm, or vice versa—and scientism—the argument that proposes that both subject matters can be studied using the same methods, thereby denying the significant differences in the nature of their respective objects of investigation. In contrast to both reductionism and scientism, critical naturalism aims to give a more appropriate and specific account of the methods by which natural and social sciences can be distinguished. To this aim, the argument is grounded on three main considerations that place limits on the possibility of this project by looking at the similarities and differences between subject matters. Bhaskar (ibid., p. 56) calls these three considerations ontological, epistemological, and relational limits; more specifically, these three barriers are called "the limits of naturalism" because they define the extent to which social science cannot be like (i.e., must be different from) natural science.

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[1]As we shall see in the next chapter, these two ideas refer to what Bhaskar (2010, p. 20) calls (1) the axiom of meta-theoretical unity: the possibility of an essential unity of the natural and the social, which differs in the specific way in which these fields produce science; (2) a methodological specificity: the idea that asserts that the natural and social sciences differ in some of their methodology (compared with Table 6.6, p. 215).

From a CR perspective, I want to highlight that the nature of the object of study, in fact, determines the type of possibility for its scientific investigation. This point is a hallmark of CR, and it means that the way we study any object pertaining to the social or natural realm is grounded in what it is. For example, we can interview people, but we cannot interview the objects with which natural science is concerned, e.g., we cannot interview the weather. The nature of the object of study determines its mode of inquiry. This vindication of the ontology of the object of investigation means that although it is critical of anti-naturalism, CR can argue that hermeneutics is an important part of the method of social science. The study of the three main limits of naturalism, outlined below, is the study of the conditions that make social science possible. These three limits are important because they have methodological implications, which, in turn, are due to the fact that the possibility of applying those methodological conditions depends on practice, as tabulated by Hartwig (2007c) with the following Table 5.9, p. 155.

Table 5.9: Limits to naturalism

Type	Derivation	Limits
ontological	Transformational Model of Social Activity (TMSA) (CN) four-planar social being (or social cube) (DCR)	social, unlike natural, structures are (1) concept-dependent, entailing a hermeneutical starting point for social science; (2) activity-dependent, entailing (quasi)-autopoiesis (or partially self-created); (3) more space-time specific, entailing relative transience (geo-historicity)
relational	TMSA (relational character of social life entails causal interdependency of social science and its subject matter)	social-relational dependence: social, unlike natural, structures are causally impacted by science.

Table 5.9 – *Continued from previous page*

Type	Derivation	Limits
relational	TMSA (relational character of social life entails causal interdependency of social science and its subject matter)	social-relational dependence: social, unlike natural, structures are causally impacted by science.
epistemological or methodological	TMSA (openness of social systems, impossibility of closure)	absence of decisive test situations for social sciences
critical	TMSA (unacknowledged conditions, unintended consequences, tacit skills, unconscious motivation of agency)	social, unlike natural, objects included beliefs about themselves; situates the possibility of explanatory critique of consciousness and social forms

Adapted from Hartwig (2007c, p. 93).

5.10.1 Ontological limits of naturalism

The ontological limit refers to the differences between the subject matter of social science (social structures) and the subject matter of natural science (natural structures). The ontological limit is derived from the emergent properties of social structures in open systems. We can recall from TMSA the definition of a social structure (e.g., language, theories, institutions, etc.); it is itself a social product that is susceptible to transformation because it is created by social activity. In SRHE, Bhaskar (2009) gives four initial ontological limits: (1) activity-dependence, (2) concept-dependence, (3) time-space-dependence, and (4) social-relational-dependence. These four ontological barriers are paraphrased and illustrated with salient examples that pertain to both the social and natural worlds.

(1) Activity-dependence The existence of social structures is dependent but irreducible to the social activity that creates and regulates these structures. For example, an educational institution exists because of the activity generated in it, but it cannot be identified as the sum of the individuals who compose it.

By contrast, the existence of natural structures is independent of human activities. In nature, for instance, plutonium exists independently of its utility; thus, the activity-dependence that we are referring to here is human activity.

(2) **Concept-dependence** The existence of social structures is dependent but not exhausted by individuals" conceptualizations of them. All activity that is intentional occurs at the interception of reasons and causes, i.e., intentional activity is informed by beliefs and wants/desires. Hence, social explanation needs reference to social parameters, which denotes the dependency of social structures on concepts. For example, the structure of a war depends on the notion of war, but war is about much more than the concept. Alternatively, when we turn to the natural realm, we see that natural structures exist independently of our conceptualization of them. For instance, gravity existed in pre-Newtonian times, before the concept was discovered. The need to invent concepts to understand both the social and natural world does not reduce these worlds to mere concepts. In particular, in the case of the social world, it has an irreducibly material dimension, i.e., it involves flesh-and-blood bodies as well as material objects, such as trees, and so on.

(3) **Time-space-dependence** Because social structures are created by human activity, they are social products. As social products, social structures exist for agents in a particular time and place and can be reproduced and-or transformed within a particular range that corresponds to agents' spatio-temporality in history. For example, the abolition of slavery in Western Europe occurred in a particular spatio-temporal range, about a century prior to the abolition of slavery in the Americas. Natural structures, though, appear to endure as greater space and time universals because it is very probable that all natural structures are subject to change after long periods of time. An example of a natural structure is the cosmos; something that came into being and has its own geo-history, but it is a very slow one, un-perceivable in comparison to how human beings perceive everyday time.

(4) **Social-relational-dependence** The existence of social structures as social products depends on the activity of agents to effectively reproduce or transform the structure. Agents occupy a particular position when they are engaged in a network of social relations that enable, and also govern, the practices needed

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for such reproduction. To a minor extent, agents also transform the structure. Thus, the network of relations is a necessary condition for the continuity of the structure and the identity of agents. As an example, we can say that a teacher occupies a particular identity and position with respect to the network of relations that define a classroom. However, with respect to the natural world, natural structures exist independently of social relations, although social relations can create products that affect natural structures. For instance, pollution affects the atmosphere.

Aside from all these differences between social and natural structures, Bhaskar (1979) identifies three more limits: (5) relationality, (6) internal complexity, and (7) interdependency, but we see that although (5)-(7) apply to social structures, they do further differentiate social structures from natural structures, as shown below.

(5) Relationality Social structures are not perceivable, but they are materially manifested in the present as the result of individuals' actions. Thus, social phenomena must be perceived as the resultant effect of various causes. Social structures as social effects imply that there are relations between individuals' actions, relations that transform or reproduce these actions. For instance, we cannot perceive the structure of slavery, but we perceive the relations between master and slave that produce it; similarly, we cannot perceive the structure of a family, only the relations between its members.

(6) Internal complexity and (7) interdependency Generally, social structures display a type of internal complexity because we do not see them from their genesis; rather, they are manifested as the result of processes. Interdependency refers to all the conditions that need to come together (e.g., agents, relations between agents, modes of production, etc.) to create such internal complexity. To further illustrate, complexity and interdependency are very much a function of the fact that the social world is essentially an open system, but most of nature is an open system as well. We can recall that open systems are domains where empirical regularities do not occur.

In addition to ontological limits, there are those barriers that are denoted by the methods employed to study both natural and social structures (i.e., epistemological limits). The connection between social knowledge and social theory and their conceptualization, which are part of the subject matter of social science, also includes

facts and values (see section 5.14 on p. 176 of this chapter) as part of what I had discussed in the previous section, i.e., relational limits.

5.10.2 Epistemological limits of naturalism

Let us recall that the objects of study of social science are not perceivable, but we can perceive their effects. We can recall the example of a family in which we cannot perceive the social structure—that is, the network of relations between the adults, the father and mother, and the children. However, the nucleus of the family is what we use to denote the effect of the unseen network of such relations. Effects only manifest in the presence of open systems, where patterns or regularities from experiments are not manifested. The reason for this manifestation is that we cannot do experiments in social science, or at least anything that seems to be an experiment, because it cannot result in a regularity, which reflects the operation of a law. In general, we do not get regularities in open systems. The patterns that are found are done so somewhat by chance because it is impossible to do experiments in social science. In order to do an experiment, we need to be able to close the system that we are dealing with, which we cannot do in the social world. In other words, we cannot close the system of the social world. To reiterate, the objects of social science, social structures, cannot be closed to experimental conditions.

Now, we cannot do experiments with study social structures without encountering two main problems: measurement and irreversibility. The first problem deals with taking measurements. In social science, we often see that we cannot adequately measure concepts—e.g., race, socioeconomic status, and so on). According to Bhaskar (1979), the use of language as a measure stands as the structure (parallel to geometry in physics) that allows the social structure to give an accurate meaning of definitions employed in social theory. In other words, the analogue of measurement is meaning. For instance, since we cannot measure concepts; what we can do is give a precise characterization of the situation. However, meaning is not a measurement but a statement about a situation. A second problem deals with irreversibility, which allows social science to give an accurate account of definitions it employs. According to Bhaskar (1979), irreversibility (as parallel to entropy, the theory of increased disorder in the natural science) presents us with the problem that both quantitative and qualitative notions change over time. For example, entropy is the opposite of negentropy, or dialectic (a more comprehensive account of

the dialectic is given in Chapter 7, p. 220); dialectic is progressive change to a more comprehensive structure. Negentropy, or dialectic, is an increase in order and form, whereas entropy is an increase in disorder. In this manner, we see at least two different ways to characterize change over time: as the increase of chaos (entropy) or as the increase of order and form (dialectic). For instance, the second law of thermodynamics says that physical systems show an increase in disorder. Now, there are various phenomena in the natural world to which this increase in disorder does not apply, such as the evolutionary process of some plants, like orchids, which developed from more primitive forms to their current orderly state. In short, entropy is not a generalized truth in natural science. Analogously, the irreversibility of both quantitative and qualitative conceptualizations is not a generalized truth regarding increased disorder in social science. These two problems are manifested in social theories that try to convey an adequate account of social structures but that are ultimately limited. I give examples of such limited theories by referring to Bhaskar's RTS, in which he shows how certain theories do not apply in natural science and in social science because they rest on two main principles of orthodoxy, which he calls P1 and P2:

- P1= empirical-invariance, i.e., laws are or depend upon empirical regularities, and

- P2= instance-confirmation (or falsification), i.e., laws are confirmed (or falsified) by their instances. (Bhaskar, 2008a, p.117).

According to Bhaskar (2008a), the orthodox philosophy of the natural and social sciences is grounded in Hume's theory of causality underpinned with principles P1 (empirical-invariance) and P2 (instance-confirmation), which are based on the assumption of a single level of an undifferentiated world, and thus all these theories (1-10, below) yield a closure. Bhaskar gives two conditions for closure:

> "B1" the absence of powers, which is dependent upon the absence of intrinsic structure (implied by atomicity), and B2" the constancy of powers, which is dependent upon the constancy of intrinsic structure". (ibid., p. 68).

From a CR point of view, reality is open but susceptible to closure. The Bhaskarian view identifies a number of theories, including theories of explanation and prediction.

All these theories ultimately do not yield the presupposed closure, and they are all presupposing an analysis of explanatory structure or generative mechanism as being Humean constant conjunctions, either these constant conjunctions (or empirical regularities) are both "necessary and sufficient" (op. cit., p. 118) or they are necessary, i.e., as in transcendental idealism, but not sufficient. The crucial part is the assumption that they are necessary because such presupposition ties the generative mechanism to the level of actuality and empirically. For critical realists, Humean constant conjunctions are neither necessary nor sufficient, as illustrated with Table 5.8, p. 143. These theories are paraphrased as follows.

A theory of deductivism uses the term deductivism to refer to theories that act on the grounds of "P1: empirical-invariance" and "P2: instance-confirmation". These theories include those that auto-denominate themselves under the titles "instrumentalism": the idea that questions the interpretative descriptions of laws but fails to question their argumentative logic, and "inductivism"—the idea that makes an inference of general from particular instances; it presupposes a confirmation of law which aims to give rise to. Inductivism can be considered deductivism in its practice. The underpinning logic of deductivism is the argument understands the world as reducible to a surface structure. This logic reduces everything to the surface so that there is no deep structure in the world.

The P1: empirical-invariance principle at work (1) As previously discussed, Hume's theory of causality sees causal laws as events. Since it is possible for such relations to be constant—that is, either causal laws depend on circumstances or causal laws depend on events—then we have the P1: empirical invariance, and thus a closure. (2) Bhaskar (2008a, p. 118) sees two instances of that general argument which identifies causes in the form of "X causes Y": (2a) a theory to find meaning, i.e., events are explained by the pairing of X and Y, and (2b) a theory for justification, i.e., events are provided a rationale by the pairing of X and Y. For these (2a-2b) theories, the events can always be substituted for a weaker version under a different set of descriptions.

A theory of explanation (3) The Popper-Hempel theory is a theory of explanation. It is a deductive-nomological theory that explains an event by subsuming it deductively under a universal empirical generalization or narrative. From

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a Popper-Hempelian perspective, events can be explained by including them in a single universal law, also referred to as the "covering-law requirement" (Bhaskar, 2008a, p. 119), or by subsuming them into a set of universal laws and their initial conditions. Nomological deductions (or D-N: meaning deductive and nomological, or universal law-like statements) fall under this category because these types of explanations aim to deduce something under a universal law when the law is interpreted as an empirical regularity. A nomological account implies a universally and empirically truthful account. It is most frequently justified by reference to Hume's theory of causality, so such an account stands or falls with this theory. This D-N form takes two prerequisites: (3a) reducibility—a requirement which states that we are able to deduce the things that we want to explain (explanandum) from the explanation (explanans), i.e., explanans → explanandum—and (3b) covering law—as explain above, this requirement subsumes events under at least a single universal law understood actualist or as a universal empirical regularity.

A theory of prediction As the name suggests, theories of prediction argue that events are effectively predicted by a deduction from their initial conditions and from a set of universals. In such cases, predictions mean that the explanation of events lie in the future, which is differentiated those that are in the past. (5) A theory of symmetry of (3) explanation and (4) prediction, in which a D-N explanation can be a D-N prediction if in the implication explants → explanandum, the explanans are known and accounted for as cited evidence at an earlier time. (6) Theories in which the explanation of events, laws, and science lies in hypotheses or principles that use descriptive, fictional, or instrumental interpretation follow a D-N form, and thus have closure along with Humean theory. (7) The explanation of scientific theories is done in terms of a linear evolution of science; it includes (7a) scientific theories in which truth—value and meanings remain unaffected by change and (7b) new theories that remain invariant under other established theories. These theories, according to Bhaskar (2008a), take the form of what Kuhn meant by "normal science", which are also a type of D-N form of closure.

P2: The instance-confirmation principle at work (8) The explanation of science-theories-laws is done by confirmation or corroboration with actual or possible

sense-experience. (9) The explanation of science-theories-laws is done by falsification with a counter object or the example of an actual or possible sense-experience. (10) The criteria for what is regarded as scientific (an agreed observable situation by which to refute a theory) and unscientific.

To sum up, such theories in orthodox philosophy of science make a fatal presupposition of actualism and implicitly they also presuppose a closed system. We can recall that in open systems, theories of explanation and predictions do not provide the bases for justifications because they lack invariance or empirical patterns. The P1: empirical-invariance principle is at work in theories of prediction and causal identification (e.g., see numbers 2, 4, and 5), which result in a closure. In D-N arguments (e.g., see numbers 3, 6, and 7), we see that they are grounded in Hume's theory (1), and thus they give a closure. Now, the instance-confirmation principle (P2) is at work in theories of confirmation, corroboration, falsification, and a criterion for what is regarded as scientific or unscientific (e.g., see numbers 8, 9, and 10), which gives a closure in open systems. However, they are possible in closed systems. Thus, all these orthodox theories assume actualism or empirical realism and therefore presuppose a closed system, therefore they are all false!

Now, it is important to explain the role that experiments play in natural science from a CR perspective. The role of an experiment is to allow us to test a hypothesis regarding the operation of a structural mechanism by creating a situation in which we observe or can measure the effect of the mechanism acting alone—that is to say, without interference from other mechanisms and structures.

5.10.3 Relational limits of naturalism

According to CR, social science has an "internal" relationship with its object of inquiry, but natural science does not. For example, social science uses concepts, explanations, laws, and theories that are susceptible to its own field, which is not the case for natural science. Social objects of knowledge are linked by their interdependence with social activity. What this internal relationship means is that the researcher is part of the subject matter that he or she is trying to describe when studying social science. The researcher's social activity is interdependently contained as part of the social object of his or her investigation. In other words, the investigator is included as part of social science, whereas in studying natural science, the investigator is not included. For instance, if a scientist is giving an account of

the theory of electrons, he or she is not internal to that theory; in other words, the discourse employed in the social activity is not internal to that theory in a way that it is internal when giving an account of, for instance, an anthropological description of a community.

In contrast, in natural science such objects of knowledge exist and also act independently of whatever knowledge we are capable of producing about them. It is here, that Bhaskar (1979, p. 60) distinguishes between processes of "causal interdependency" and "existential intransitivity". The former refers to a contingent characteristic of production, and the latter is an a priori condition applicable to both social and natural spheres. First, we can explain causal interdependence by reference to the connection between social theory and society. This internal link makes us aware that theory does not exist without society. Second, we can explain existential intransitivity by considering any object of investigation, O, in the natural or social spheres. This O exists; viz., it has been produced. It is in a state of "being", and thus it is subject to investigation. Bhaskar (1979) points out that the existence of the object is the same for both the natural and social sciences but that objects O differs precisely because of the mode by which the existence of O is investigated.

We can now return to the opening question of this section, which aims to transcend both naturalistic and anti-naturalistic views. We see that the main error of positivism is its disregard for existential intransitivity. And the main error of hermeneutics is that it does not account for it. In turn, social knowledge and social theory and their relational conceptualization are part of the subject matter of social science so that if we have a theory that is capable of explaining social phenomena then it may help to transform it. For instance, if we are in possession of a theory about how to stop people from being unemployed and then we act on it, it opens up the possibility for the theory to reduce the level of unemployment, and in this manner the theory reduces the practical problem.

Following Bhaskar (1979), we have seen is that there are similarities and differences between social science and natural science. These sciences can explain phenomena by reference to generative mechanisms and structures; however the methods by which explanations are achieved differs in both cases. Whereas in natural science, experimentation may allow for structural discovery, in social science, hermeneutics plays an important part. In Bhaskarian terms, social reality is pre-interpreted! We

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do not have social reality unless it is already interpreted in some way. Social science begins by investigating it hermeneutically, the pre-interpretations of its subject matter. This pre-interpretation means that if we want to investigate people's actions or belief systems, we must obtain their interpretations or ways of seeing reality in the first place. For Bhaskar, this is the idea of hermeneutics, a critical one. Then after this initial inquiring into the perspective of people, then we can critique it.

The problem is that orthodox hermeneutics fails when it argues that the hermeneutic moment, which is not found in the natural world, exhausts the social world meaning that interpretative theory completely explains the social. For CR, the social world is concept dependent, which the hermeneutics usually argue, but concepts do not exhaust it. For instance, we can recall classic Bhaskarian examples in which there is more to war and hunger than the mere notions of war and hunger, but what is the "more"? From a CR viewpoint, we can describe the "more" as the material elements in social life. For instance, the material element in the case of war is the actual fighting between people, deaths, destruction, etc., and the material element in the case of hunger is the actual feeling of emptiness due to the lack of food. In short, concepts come into the social world, but we cannot explain the world via means of concepts alone. In this manner, it is important that I highlight that hermeneutics is necessary, but not sufficient, in social science. For example, interviewing a family about their relationships is a way to get to the structure and character of such relationships. Thus, hermeneutics in a CR is an initial step in the process to get to explanatory structures in social life.

5.11 The dichotomy between dualism (body-mind) and reductionism

Critical Realism (CR) transcends the classical dichotomy between dualism and reductionism with the concept of Synchronic Emergent Powers Materialism (SEPM). On the one hand, dualism is the position that argues for the separation between mind and body. From this perspective, mind is seen as an intangible and mysterious entity that leaves the nature of consciousness unexplained. On the other hand, reductionism is the doctrine that argues that mind is neither the inner adaptation or response to the environment nor the outer expression of behavior; rather, mind is a material substance whose workings are identified as functions of the brain. From this

viewpoint, human experiences, intentions, wants, and other functions are not simply an outcome of the brain, but these functions are reduced to their identification to particular areas of the brain that seem to produce them. However, this causal viewpoint does not account for consciousness, intentionality, desire, or pain and their location in the brain. Whereas dualism argues for the split between the physical body and its non-substance mind, reductionism considers the mind-body unity to be a material substance, but it ignores consciousness, from which the initial questions about the nature of mind and body first came. To transcend the dualist-reductionist problem, CR conceives mind "not as a substance, whether material (reductionisms) or immaterial (dualistic idealism), but as a complex of powers" (Bhaskar, 1994, p. 102). From a CR perspective, mind and body are part of a single unified material power in which the functions of the brain are real and causally efficacious but irreducible to identification by their locations in the brain. Bhaskar's original SEPM idea proposes the following:

> I want to leave open the questions as to whether there is a bearer or substance whose powers they are; and, if there is, as to what its identity is. That is, it will remain possible that mind just is a complex or set of powers, as far as we know, historically emergent from and present only in association with (certain complex forms of) matter. But it will equally remain possible that there is a substance, whose nature is at present unknown, which is the bearer of those powers. (Bhaskar, 1979, p. 124).

This powerful position and argument for it, resolves the mind-body dualism (together with reductionism) of Activity Theory. In light of current developments in neuroscience and other disciplines, our understanding of the how the brain has evolved and keeps evolving needs to be expanded. The particular idea of synchronic emergence is compatible with the evolutionary explanation of the origin of the brain as the medium of mental processes, what is termed "diachronic explanatory reductionism" (ibid., p. 25). But even though the brain provides the basis for the possibility of the existence, identification, and exercise of mental powers, these cannot be completely reconstructed or explained in terms of the governing elements that compose the brain. In short, while synchronic emergence means that that brain is irreducible to a lower level of its functions, diachronic emergence means that its evolution cannot be predicted from analysis of its current functions. CR provides us with SEPM, an ontological point of view that remains historically consistent

with the evolutionary genesis of mind, while accounting for mind's dependency as an emergent power, but at the same time neither avoiding the collapse of our understanding of those powers of the brain into the pure identification of physical, chemical, and behavioral conditions (a reductionist point of view) nor covering it with purely mystical, and indescribable ideas (an idealist point of view).

5.12 The dichotomy between reasons and causes

SEPM provides a "robust theory of intentional causality" (Bhaskar, 1994, p. 76), which is what other theories of mind, such as AT, lack. To explain intentional causality, Bhaskar (1979, p. 88) aims to give an affirmative answer to the philosophical question, "Can reasons be causes?" In particular, SEPM accounts for the intentional behavior of people by grounding causes in reasons. When something is done for a reason, this is an instance of intentional causality. We see that it is only because our behavior is always caused by some reason that we can properly identify it as intentional. Otherwise, when something is caused by no reason, we characterize such an event as accidental, a contingent event. Another way to restate the proper characterization of intentional behavior is to say that if we do not have a reason for behaving or acting in a particular way, then we do not say that that behavior or action is intentional. However, intentional behavior is not obvious. Let us consider another example in which we need to redefine a behavior in order to see the intentionality. Suppose that we describe the action of eating a plate of peas. Then, we find that there is no answer to the question regarding the reasons why a person eats peas in particular. It might be the case that peas are the only source of food available for a hungry person. Given that, there is no particular reason attached to the cause illustrated with the simple description of the behavior, e.g., eating peas. What this example is trying to convey is the redefinition of the action in order to see the intentionality.

5.12.1 The theoretical robustness of intentional causality

The theory of intentional causality is an argument that implies that though people are not always knowledgeable of the reasons for their actions, when they are acting intentionally; there is nevertheless always a reason for their action. For example, people are capable of giving reasons that explain some behaviors or actions, but these

reasons are only available in terms of their physiological, social, and psychological mechanisms. In this way, the Bhaskarian intentional causality argument is also aimed at re-vindicating psychological science with the hypothesis of naturalism that considers that "there are generative structures, knowable to men, producing the manifest phenomena (in this case of consciousness)" (Bhaskar, 1979, p. 102). By re-vindicating psychology, I mean that the science of psychology is well worth the many efforts to understand human beings, motives, reasons, etc., and only possible if we have a stratified notion of reality. Thus, investigation of social, psychological, and neural-physiological states can be understood because the mechanisms that affect individuals' reasons operate in open systems (non-experimental conditions).

In addition, SEPM accounts for the notion of consciousness as an irreducible property of the brain that is conceived as an emergent power. Bhaskar (1979) is committed to showing that there exist certain powers that people exercise in consciousness. The existence argument is shown compared to the problems of idealism. These powers are irreducible to the physical operations that turn into actions, which is an argument against both materialism and behaviorism. To further understand Bhaskar's argument, we start with the definitions of what are meant by mind, person, praxis, and human praxis from a CR viewpoint.

5.12.2 Persons and praxis

When a person acts, he or she is always both (a) performing a social act and (b) producing a physical effect (or change). We have that (a) when a social act is performed is typically done by (b) producing an effect in the material world. In addition, the notion of praxis has two aspects. The first aspect of praxis is intervention in the world. This intervention is temporally inferred by both phylogenetic relations (e.g., developing from a birth state to a branching process) and ontogenetic relations (e.g., developing traits or characteristics) of human development, and it normally has a physical form (e.g., production). For example, when we have a conversation, we are intervening in the world of matter by producing sound waves, as the physical bases of our utterances as they are being interchanged with an interlocutor. Under other conditions, the physical form might be of primary importance, such as in the case of a hungry person, where the exchange of food is important. The second aspect of praxis is the reflective capacity of people for intervention, which is related to the state of being aware of an intention; we can recall that this involves consciousness.

In fact, self-reflexivity is necessary in order to define the conscious state of any entity. From a CR point of view, reflexivity is a "necessary condition for any discursive (non-intuitive) intelligence" (Bhaskar, 1979, p. 190). Such reflexivity allows a person or entity to comment about reality and to causally intervene in the world.

5.12.3 Activity

With respect to human activity, CR points to the distinction between what agents do (which are actions) and what happens to people (including agents). The generic term "behavior" includes intentional actions and things that happen to people but are not intentional (contingent events). Consider the case, for example, in which we are trying to catch a bus; it is normally intentional. However, catching a cold is not an intentional event but a physical result. To further illustrate this double aspect of human activity, Bhaskar (1979) provides the following points. The first is that there is a distinction between behavior and intentional action. If an agent holds his or her hand up, then the raising of the hand is done because something caused it. But there is a distinction between the behavior (the mere movement) and the intentional action (raising the hand). The second point is that in the case of intentional behavior, such behavior is not intentional under all descriptions. To return to the example of the plate of peas, it is intentional under some descriptions—for example, we are eating peas because we are driven by hunger. To take the example further, if we were to drop the plate of peas, this might set off a different response, an unintended consequence of actions. The crucial idea is that when there is intentional action, there is a reason.

According to Bhaskar (1979), there is a correct way to describe an action, and it depends on context as well as on the purposes that inform it. However, we can make an appropriate decision to determine if the action, under some description, is intentional or not. Although some actions may be considered basic acts (e.g., moving an arm), this type of basic behavior may nonetheless be performed intentionally. The difference between a basic act and a non-basic act is that in the basic act, we do not perform it by doing something else. For example, for most adults, walking and tying shoelaces are basic acts, whereas for a toddler, walking and tying shoelaces are non-basic, given that performing them requires conscious attention until, gradually, the act becomes basic, as if it were performed without thinking. The notion of a basic act is particularly important in learning because the more we know about a

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particular domain of reality, the more we can perform basic acts.

In addition, the action may also be mis-described by both the agent and the observer of the action. As we have seen, we can distinguish between what the agent performs and what is performed in the action. For instance, if as a person performs the action to make a right turn but due to a traffic jam finds himself or herself on a different road, then driving into the traffic jam is the result of an action but is not what was originally intended. The explanation of an action will always involve cognitive (e.g., beliefs) and cognate (e.g., desires-wants) aspects. Aside from these necessary components, we may return to the Bhaskarian components of action (shown in Figure 1.1, p. 4) to recall all other aspects that need to be satisfied for an action. Moreover, in the description of an action, if one of these two aspects is mentioned, then the other is presupposed. Therefore, if an action is done for a particular reason, then that reason causes it. A CR viewpoint argues that the concept of causality is vital in order to assess the causal efficacy of any type of reason. Without the idea that a reason causes an action, there are no grounds for saying the action is intentional!

5.12.4 A cause for what?

It follows that we need to ask: what is a cause? In our daily experience, we refer to a cause when such thing is de facto perceived as a factor affecting the circumstances that resulted in a deciding what has "tipped of balance of events" (Bhaskar, 1979, p. 91) that made the difference of some known result or outcome. What is characteristic of CR is that it looks for the underlying mechanisms without denying that other phenomena are also important. Reasons function in CR as causes, and it is possible to have empirical knowledge of reasons because they are refutable by means of reference to the totality of what a person does. In order to show that reasons can be causes from which empirical knowledge can be discursively derived, Bhaskar (1979) rebuts previous arguments that deny this and shows why if naturalism is possible, then reasons need to be seen as causes.

According to Bhaskar (1979, p. 95), one of the strongest arguments against anti-causality is the "logical connection argument". This argument maintains that (a) there is a separation between causes and effects but also that (b) reasons are homologous to actions. In other words, reasons are the same as the actions they aim to explain. In turn, (c) there is a distinction between reasons and causes. From

a CR viewpoint, these premises are faulty because an effect can successfully be identified (or described) with reference to its causes. For instance, Bhaskar (1979, p. 95) presents an example using the statement "toast as burn"; that is, when we describe toast by referring to its state of being burned, then what we are doing is re-describing it in terms of the causes of its present condition, denoted by the burn-as-adjective effect. It is not sufficient to say that a cause is always logically different from an effect because the way we describe the effect is precisely in terms of its cause. In this way, the identification of a cause logically entails its effect. To give another example, consider the statement, "Tom drinks coffee". We may describe drinking as a non-intentional action, but normally we assume that when we drink coffee, we are doing so intentionally. In this manner, causality is ordinarily attributed but in the context of another environment (e.g., prison, hospital, etc.), drinking coffee might not be intentional but forced.

Regarding the notion of a cause, "it has to be a cause for something" (Bhaskar, 1979. p. 94). If we have X, a cause, then it needs to be attached to some want or action so that we see an internal connection between X, a cause, and causing X. To return to the example, the reason for wanting (the illumination of a space) is internally connected to causing it (turning on the light). If reasons are not causes, then what is at stake is the notion of decisions, accountability, justification, and rationality for accepting one explanation over others, illustrated as follows:

> unless reasons were causally efficacious in producing one rather than another sequence of worldly movement, sounds or marks, it is difficult to see how there can be grounds for preferring one reason explanation to another. (Bhaskar, 1979, p. 103).

To paraphrase, what Bhaskar is effectively saying is that unless we understand reasons to be potential causes, we cannot distinguish between an explanation, in terms of a reason, that is true and another that is false. Moreover, when we speak about intentions, generally there must be a belief (something cognitive) and a want and-or desire (something cognate) and further aspects, as seen in the Bhaskarian components of action (Figure 1.1, p. 4). The intentionality fuses the desire-want and the belief. We can think that belief is what guides a person to satisfy a want-desire. If there is only belief itself, i.e., a belief for its own sake, then it does not necessarily issue an action; it needs to be accompanied by the want-desire, i.e., we need to want something for the action to be intentional. Therefore, CR argues that

reasons and causes cannot be differentiated on the grounds of their explanations or the differentiation of their effects. Reasons are not just justifications; but rather are the necessary conditions for the adequacy and accountability of any action.

5.13   Critical realism - explanatory critique

This section illustrates one of the most important tenets of BCR: explanatory critique. The concept of explanatory critique is how Bhaskar (1979) resolves the dichotomy between facts and values. The dualism between facts and values starts with Humean theory that proposes it is inadmissible to go from "is" to "ought"—e.g., F $\nrightarrow$ V: it is inadmissible to transition from factual statements to evaluative propositions. In opposition to Hume, CR argues that it is possible to transition from "is" to "ought" from facts to evaluative statements. I will illustrate the argument in three simple stages by making reference to daily examples. The first stage is concerned with (1) the CR commitment to critiquing false beliefs. The second is related to (2) the critique of the action that is always grounded in the belief, and the third is concerned with (3) the removal of the causes of false belief.

(1) **The commitment to critiquing false beliefs** From a CR perspective, to criticize a belief is to commit oneself to an evaluation that is aimed at removing that belief. For example, if we criticize the belief that witches exist, then we are simultaneously committed to an evaluation not to believe that witches exist. From a critical-realist viewpoint, every time we criticize a false belief, such as the belief that witches or ghosts do not exist, we are simultaneously committed to its evaluation, that because witches do not exist, one should not hold that false belief. The critique not only is a criticism that highlights what is wrong with a false belief but also is an explicit or implicit commitment to the evaluation either that the belief is wrong and therefore should be changed.

(2) **The critique of those actions that are always grounded in the belief** To illustrate, if an individual has a false belief and he or she acts on it, then someone who criticizes the belief is also implicitly criticizing the action insofar as the action is informed by the belief. In other words, the critique of the belief is also an implicit critique of any action informed by that belief. Let us suppose, for example, that an individual believes that witches exist and that

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this individual acts on this belief, e.g., through various forms of worshiping, such as the offering of scarifies, cleansing spells, etc. We can criticize the belief in witches as a false belief by saying that witches do not exist. However, this criticism is also implicitly saying that the individual should not act the way he or she does (by worshiping or doing any with any other action based on the belief in witches) because all actions are informed by both beliefs and wants. In other words, there is no action without a belief. Thus, the second point states that to criticize a belief is not merely a suggestion to get rid of it. Rather, it criticizes any physical or other type of action that is informed by that false belief.

(3) The eradication of the identified causes of the false belief For example, if we are able to identify the causes of a false belief, then saying that that belief is false not only is an implicit criticism of the actions but an commitment to changing the mechanisms that are generating them. For example, if we think that believing in homeopathy is caused by, for instance, a lack of education that then causes people to believe in certain mechanisms with curative powers, then we are implicitly criticizing whatever actions that produce the false belief, thereby demonstrating a commitment to eradicating the structures that support the practice of homeopathy. In this way, we see that to move from the critique of a belief to the causes of a belief already opens up the space to explanatory critique. At the heart of this discussion is Hume's theory, the central doctrine, or orthodox analytical philosophy, of science that states, as its first argument, that individuals cannot make a transition from a fact to a value position, e.g., Hume's Law: $F \nrightarrow V$. In other words, when we are confronted with facts, we can we are still free to adopt any value position. For example, a fact that associates cigarette smoking with a high risk of getting cancer is quite irrelevant given that there are values we can choose in order to ignore this fact. Regarding the transition from fact to value, CR objects to it on the grounds that the process of learning about mechanisms of the world is constantly shaping our understanding of it and therefore continuously shaping our values. A second argument states the reverse: that we cannot make a transition from values to facts, e.g., scientism: $V \nrightarrow F$. Regarding the transition from value to fact, CR does not dispute that a value position often influences a factual one; however, it insists that factual findings can also influence val-

ues. In this way, there is no vicious argumentative circle. Critical realists are interested in knowing whether scientific knowledge can help humanity resolve moral disputes, which is the more powerful connection that departs from the orthodox philosophy of science. The orthodox school of thought holds that there is no judgmental rationality, an undecided position on the matter.

I have already illustrated the Bhaskarian explanatory critique with the three stages and the examples above. Now, I move to a comprehensive explanation in more general terms, as denoted by the inference scheme (IS), below.

Table 5.10: Explanatory-critique inference scheme (IS)

(i) $T > P$ (ii) $T \exp 1 (P) \rightarrow$ (iii) $V (S \rightarrow I(P)) \rightarrow$ (iv) $V_{\phi - *}$

Adopted from Bhaskar (1991, p. 152).

Bhaskar (1979) develops the concept of explanatory critique to deal with the problem of facts and values. Why do we need to explain false beliefs? The answer is that otherwise, a false belief might not change since humanity is unable to produce an explanation that without it, the powerful social conditions that hold some belief in place cannot be changed. For example, suppose that I have a rational belief in the power of the Pope, the king of England, the tribe chief, or the banker, then I am unable to change such way of thinking until I also question and get rid of the social structure—i.e., religion, the monarchy, the tribe, capitalism and so on. The key question is: why do I believe that? In Bhaskarian, if we cannot explain why there is false belief that, for example slavery is an adequate practice, then we there is little possibility of changing it. We can make a clear case when we characterize a system of beliefs as a false consciousness or ideology. The three-part argument of explanatory critique is illustrated as follows.

The main idea of explanatory critique is denoted by the three-part argument in which T denotes a theory or set of theories that are able to explain P, a belief that is held about some object. I paraphrase each of the three stages from Bhaskar's PN (1979) as follows:

(i) $T > P$, the theory T is superior to a belief P, and

(ii) T exp l (P), the theory T explains the very illusory character I of a belief P. In other words, T is explaining why people have certain false beliefs or illusions. The important implication of parts (i) and (ii) is to criticize a belief as false; that is, to say why false continuousness is held is to explain the practices or actions that sustain such a false belief. In other words, the critique of action entails an explanation of the belief that sustains such an action. It is followed by:

(iii) -V (S → I(P)), a negative evaluation -V that explains why false beliefs are necessary, an explanation sufficient for social relations S to account for the actions sustained by illusion of belief I(P) as a dissonance between reality and belief. Smoking can be seen as an example illustrating this point. Smoking has been shown to be a significant cause of various types of cancer, yet it remains prevalent in society. In this sense, we have a negative evaluation of smoking. The last part of the explanatory critique is, then,

(iv) $V_{\phi-s}$, the positive evaluation that aims to change the source of false belief. In other words, positive evaluation states that we need to get rid of structures that produce illusionary beliefs, $\phi - s$. To return to the example of smoking, the positive evaluation not only is meant to insist in the explanation that smoking causes cancer but also is a motivation to get rid of the cause, which requires a critique of the actions and structures that go with it, such as the act of smoking. To get rid of smoking, we need to ask, why do people want or feel the need to smoke? The key idea here is that until people change their perspective and thus practice, they will go on smoking.

The development of Bhaskar's (1979) explanatory critique, as presented in IS, is not a straightforward refutation of Hume's laws, i.e., F ↛ V, and it is not an argument that advocates radical political practices. It is an argument that is aimed at explaining why practices are held and backed up by false belief. Given that explanatory critique is grounded in the explanation of the needs, wants, intentions, aspirations, illusions, and, potentially, belief and in the critique of the actions that inform them, we can raise the following question.

Why is explanatory critique important for social science? Explanatory critique attempts to explain why people hold illusory or false beliefs. It becomes necessary for the transformation of any society. Another way to illustrate the critique of

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false beliefs is with the example of people who have obsessions, such as people who constantly wash their hands. What we need to do is to understand the reasons why such people have the compulsion to wash their hands, what they believe, and what is causing that action. From a CR perspective, if we are concerned with social transformation, then we need to understand the causes of false beliefs. To reiterate from section 5.12.1, p. 167, actions do not exist without beliefs. All human action can be subjected to criticism, explanation, or justification, which involves getting to the root belief that informs the action. The argument of explanatory critique in the Inference Scheme (see Table 5.10, p. 174) is the theoretical means by which to explain false continuousness. This concept of explanatory critique becomes necessary for any society because it is through practice that false beliefs are held, and practice is necessary for the continuity of any society. From the perspective of CR, if the individual agent is able to explain the rationale of his or her belief, then there is a possibility of transforming it. It is important to note that beliefs cannot be described as being grounded in total voluntarism because action is always intentionally grounded in belief.

5.14 The dichotomy between facts and values (and that between theory and practice)

> [Social] science is non-neutral in a double respect: it always consists in
> a practical intervention in social life and it sometimes logically entails
> value and practical judgments. (Bhaskar, 2009, p.158).

We have already seen that the dichotomy between facts and values is centered on the idea of "no ought from an is" (Bhaskar, 1994, p. 83), developed by Hume as the central doctrine of the orthodox analytical philosophy of science, e.g., Hume's Law: $F \nrightarrow V$. In opposition, Bhaskar's (1991, p. 115) argument as developed in IS is the following that (i) T > P. (ii) T exp 1 (P) $\rightarrow$ (iii)-V (S $\rightarrow$ I(P)) $\rightarrow$ (iv) $V_{\phi-s}$ can be contrasted against other sociological arguments, e.g., scientism, Hume's Law, Taylor's argument, Searle's arguments, and Prior's argument, as illustrated in Table 5.9, p. 155, in order to identify their shortcomings from which we can further discern why explanatory critique is important for social science. What is crucial to emphasize is that from a CR perspective, our factual statements have critical

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evaluative implications for the transformation of societies in general.

Table 5.11: Arguments to override the fact-value dichotomy

Scientism: V$\nrightarrow$F
Hume's Law: F$\nrightarrow$V (positivism and its displacements)
Charles Taylor's argument: T $\leftrightarrow$ F $\rightarrow$ V
John Searle's arguments: I.F. $\rightarrow$ V
A. N. Prior's argument: F.F. $\rightarrow$ V
Bhaskar's argument: (i) T > P. (ii) T exp 1 (P) $\rightarrow$ (iii)-V (S $\rightarrow$ I(P)) $\rightarrow$ (iv) $V_{\phi-s}$

Adopted from Bhaskar (1991, p. 155)
where V = values, F = facts, T = theory, P = practice, S = causal reasons.

First, Bhaskar (1991) starts with the distinction between the first two propositions—(1) selection of problems (e.g., facts cannot be derived from values) and (2) Hume's Law: F$\nrightarrow$V (e.g., values cannot be derived from facts)—in which his main argument is directed against Hume's Law, but he also rejects scientism. It follows that in refuting scientism, Bhaskar accepts the dependency between facts and values. More specifically, Bhaskar (1979) shows that the transition from value to fact (scientism: V$\nrightarrow$ F) has been traditionally analyzed from different perspectives.

1. The perspective of the subject (the subject matter of social science)

    (a) in relation to the subject's selection of problems

    (b) in relation to the subject's conclusion

    (c) in relation to the subject's relative standards of inquiry

2. The perspective of the object of investigation

3. The perspective of the relationship between the subject and object

1. From the perspective of the subject, it is argued that social science is concerned with "value-free" objects but is in need of "value-relevant" objects of study. (a) First, the selection of problems in social science is guided by this value bias.

The social object of study is motivated by practical reasons (e.g., technical, industrial, or medical concerns, etc.), and the natural object of study is motivated by theoretical reasons that seek to understand mechanisms that describe the natural object. The problem with the perspective of the subject is that it confuses practical applications with purely theoretical interests. From this perspective, for example, we can justify the investigation of the natural object (e.g., the study of cells) with theoretical reasons—e.g., to understand uncontrolled division of cells. Similarly, the social object (e.g., the study of social drives of smoking) can be justified for practical reasons—e.g., to sell more cigarettes. Then this perspective leaves unexplained what constitutes the "value-relevant" objects of study. (b) Second, the concern with the conclusion posits a powerful "interface" between the subject's interest in and knowledge about the object of study. Bhaskar (1979, p. 63) suggests that the "interface" could operate consciously (e.g., lying), semi-consciously (e.g., optimistic wishful thinking), unconsciously and by rationalization (e.g., mystifications or ideologies that could be regarded as necessary). Thus, rationalization presents a problem of value bias in the sense that a rationale presupposes knowledge about values and society in general. With respect to all these modes of "interface" he suggests that these are modes of avowal, which are unnecessary and misleading. (c) Third, in order to avoid making a selection between these modes of "interface", CR accepts that all beliefs are social products (e.g., what he calls "epistemic relativism", which implies that the knowledge derived from scientific inquiry and the truth—value criteria for its rationality do not exists beyond its history. In addition, Bhaskar rejects the idea that all beliefs, values, and knowledge about the object of investigation are equally valid (e.g., what he calls "judgmental relativism"). Therefore, I want to emphasize that a CR critique of social science in relation to the three perspectives of the subject (e.g., when the subject of social science is concerned with the selection of problems, conclusions, and standards of investigation) is grounded in accepting epistemic relativity: the idea that beliefs are socially produced, and rejecting judgmental relativism: the idea that all beliefs as equally valid, but that is accepting judgmental rationality: the idea that an individual can choose between beliefs.

2. The perspective of the object of knowledge: social science requires that we be able to evaluate means of communication in order to give an accurate account of the object under investigation. From this perspective, "value impregnation" is required to stress the dependency between the subject matter (social science) and

its object (the knowledge of its values). Once we agree that social-scientific discourse is not neutral but is saturated with value, what follows is an inquiry into the descriptive accuracy of such evaluative descriptions—e.g., the Bhaskarian accuracy of description, Table 5.12, p. 179, illustrates the range in which values permeate discourse.

Table 5.12: The accuracy of description in value-impregnated social-scientific discourse

During Nazi-ruled Germany
(a) The country was depopulated
(b) Millions of people died
(c) Millions of people were killed
(d) Millions of people were murdered

Adapted from Bhaskar (1994, p. 110).

A hermeneutic description of these statements tells us that regarding the period of Nazi-ruled Germany, the statements (a) to (d) are all accurate. However, statement (d) is, at the same time, more factual and more precise because it renders a better description. Thus, the perspective of the object that says social science needs to be able to evaluate its means of communications fails to provide criteria for the accuracy of the descriptions of values that better explain the object of study. We see from this perspective that the accuracy of hermeneutic description is necessary but remains an insufficient condition, as illustrated by Bhaskar:

> In general, one can say that the most adequate description of a phenomenon will be that entailed by the theory which *maximizes explanatory power*, for which hermeneutic adequacy is necessary, but not a sufficient, condition. (Bhaskar, 1994, p. 110).

A hermeneutic perspective can be taken as a staring point, given that it is necessary to maximize explanatory power for any phenomena, but it does not completely explain the world. For example, knowledge is a necessary condition for transforming the world, but it is insufficient on its own.

3. The relationship between facts and values stresses the dependency of **2.** and entails the "contingent necessity for value-laden descriptions" (Bhaskar, 1991,

p. 155). The problem with **3.** is that, just like **2.**, it lacks criteria for accurate descriptions. To illustrate, the arguments by Taylor, Searle, and Prior show ways in which one may try to override the fact—value dichotomy; their summary and rejection, according to Bhaskar (1991), are as follows.

- Taylor's argument T ↔ F → V states that theories create values, but it is rejected on the grounds that it fails to provide criteria for deciding among theories. Otherwise, we would be able to favor any theory that produces the desired values.

- Searle's argument I.F. → V states that values can be derived from institutional facts (I.F), but it is rejected on the grounds that it fails to question the moral grounds or criteria of institutions. To give a simple example, the argument says that if we make a promise, then we must do what we have promised. Of course, the promise can be made tactically with the aim of benefiting particular interests, and in this sense, there is no constraint to keep to what was promised.

- Prior's argument F.F. → V states that values are derived from functional facts (F.F), which makes a distinction between "good facts"—facts under which societies flourish (e.g., knowledge about the mechanisms that cause disease)—and "bad facts"—those under which societies decay (e.g., systematic plans for extermination, culling, etc.). However, it is rejected on the grounds that it fails to ask the question, does the flourishing of a society occurs as to cause harm to or neglect of other societies?

Although I have summarized how Bhaskar rejects the arguments by Taylor, Searle, and Prior, this not does immediately mean that one can argue for the transition from facts to values because social science is informed by both the values and practices that motivate it. More specifically, we can recall that the argument for explanatory critique is not merely a refutation of Hume's Law or of scientism. Rather, there is a dependency between facts and values, which Bhaskar (1991) demonstrates with the following Figure 5.7, p. 181. As denoted by the diagram, Bhaskar (1998) looks at the asymmetrical relationships between facts and values. The Figure 5.7 on p. 181 shows how the move from facts to values entails it. In other words, scientific facts call for certain values. For example, our scientific knowledge about smoking-related causes of cancer calls for an attitude of worth and importance towards health,

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Adopted from Bhaskar (2009, p. 161–162).

second-hand smoking, economic repercussions of tobacco plantations, etc. As well, in going from value to fact, according to Bhaskar, values motivate and pre-dispose certain factual findings, but they do not entail it. For example, societies value the banking system, but they do not call for facts (say into bank bonus for top executives); there remains an irreducibly empirical element necessitating investigation into what reality shows.

5.15   Conclusion

The principal concern of this chapter is to conceptualize the new level of Bhaskarian dialectics 4D: learning as product-in-process. In doing so, I have investigated learning as a transformative praxis by means of the introduction to BCR. Simultaneously, this introduction functions as the main conceptual means by which CR resolves various dichotomies of Activity Theory and social theory in general.

Moreover, this chapter needs to be understood as a first of three parts under the conceptual umbrella of 4D. The second-part is the following Chapter 6 on p. 183 is an appendix to Chapter 5, where 4D: learning as product-in-process means by putting CR to work on the issue of interdisciplinary activity. I first identify what does interdisciplinarity mean for AT, and in general; second, I show what has been omitted from it. Then I shall argue for ontological and epistemological reasons in order to properly ground interdisciplinarity, in a CR philosophical substance, against actualism, reductionism, and mono-disciplinarity.

The third part is Chapter 7 on p. 220, where 4D: learning as product-in-process means introducing dialectical CR and putting it to work. I shall argue that DCR can render a superior account of the historical development of concepts that are very important to AT (e.g., the concept of contradiction) by giving an in-depth a critique of the philosophical roots of Hegel and Marx from which AT initially stem from. As with AT, dialectical learning is also inspired by Hegel, but in DCR, it lacks Hegelian closure in thought.

Chapter 6

An appendix to Chapter 5: Applied critical realism and an interdisciplinary conception of activity

> Verse, they tell us of One Greater To whom the dying appealed; Verse, as one our fates are sealed: We are damned or saved together![1]

6.1 Introduction

Interdisciplinary activity[2] refers to the "integration of a number of disciplines into a research cluster which provides, or purports to provide a new, framework for understanding" (Hartwig, 2007f, p. 259). Climate and cognitive, or the learning sciences, can be taken as contemporary examples of such activity. From a critical realist (CR) perspective, in order to provide an original framework for understanding an object of investigation, interdisciplinarity requires insights from a range of dissimilar schools of thought (Bhaskar, 2010). With that, there is an additional possibility of conflict due to the inherent nature of such interplay between different disciplines. An immediate question thus arises: what is the platform of civility, values, accepted customs,

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[1] A translation of José Martí's *Versos sencillos* by M. A. Tellechea (1891/1997, p. 123).

[2] I am using the principal of division in discussing Critical Realism (CR); i.e., I am concerned with basic CR, then in this chapter I am dealing with the issues that stem from it. Those issue mainly deal with interdisciplinarity. For this reason, Chapter 6 is called Appendix to Chapter 5.

or conditions by which multiple disciplines of distinct domains of knowledge can generate successful interdisciplinary activity? I argue that because it attempts to provide a conceptual under-laboring foundation for what is often an arbitrary pooling of multiple disciplines, which lack an adequate scientific ontology, CR offers a philosophical platform that advances interdisciplinarity.

> The trouble with [interdisciplinary research], for example, is not that it has no (or too many) paradigms or research programmes; but rather that it lacks an adequate general conceptual scheme. (Bhaskar, 2008a, p. 194).

Allow me to begin by explicitly differentiating between related multi-, cross-, and post-disciplinary research activities or projects. Multidisciplinary activity involves research, which in order to understand some object of investigation, draws upon multiple fields of knowledge without challenging their identity or their methodological boundaries. Price (2010), for instance, argues that while, in the last decade, we have experienced an increase in multidisciplinarity-related research and teaching, e.g., in universities that award multidisciplinary degrees, US agencies, and recognized institutions, such as the World Health Organization, which have embraced research under this flag, the actual meaning of this term remains a contested issue. This is because, in general terms, multidisciplinary is justified as a mixed methodology, which has a tendency to unify quantitative and qualitative research without regard for their incommensurability. Kuutti (1996) and Nardi (1996), for example, apply Activity Theory (AT) as a multidisciplinary framework that draws upon cognitive and computer sciences under a mixed methodology in order to study the relationship between the learner as user and machine in terms of human-computer interaction research. Cross-disciplinary activity refers to research exemplified from the viewpoint of another discipline; for instance, a facet of this thesis, i.e., Critical Realist Activity Theory (CRAT) can be seen as research of AT that is exemplified from a philosophical CR viewpoint. Transdisciplinary activity refers to research that provides a transportable model or framework to cross boundaries from one discipline to another. For instance, Hadorn et al. (2008) provide a general three-phase model, as described by (1) an initial identification and structuring of the problem (e.g., poverty, hunger, land degradation, diseases, or more specifically, the economic and ecological problems caused by the biotic invasion of, for example, non-native grey squirrels into coniferous landscapes populated by red squirrels in Scotland and the

UK). This is followed by an (2) analysis of the problem, and a final (3) bridging of conclusions to fruition. Post-disciplinarity additionally denotes research that envisions the end of disciplines as we currently know them, and advocates for a new form of research freedom as an eclectic unity.

Following Price (2010), we can reserve the word interdisciplinarity for critical-realist philosophically grounded activity. Multidisciplinarity is always referred to as non-critical realist and mixed-methodology research with outcomes that resemble a "pastiche" of various pieces of autonomous research stories without the advantage of seeing a potential of contradictory outcomes that may result from a single, solid "laminated" explanation. Price isolates a range of methods of justification (which claim to be multidisciplinary investigations) that are provided in the literature. They are paraphrased under the four general titles that follow.

First as qualitative, then as quantitative In other words, first a hypothesis formulation, which is followed by a hypothesis testing rationale. This justification consists of two phases. While the first phase uses qualitative methods (e.g., case studies, interviews, etc.) to aid in the formulation of a hypothesis, the second phase uses statistical methods to test it. The basic dilemma with this method is that there is no system to account for exceptions to the rule, as in the case of the problem of induction (discussed in section 5.3.2, p. 122), when in fact the exception makes the rule.

A multi-case study sampling rationale This rationale provides a justification for multiple-case studies that are treated as a sample pool of a whole population. In this case, the researcher needs to argue for a literal-theoretical replication of each case study in the sample pool, i.e., case studies need to be homogenous enough to utilize statistical inference in order to draw predictive conclusions.

> [A] *literal replication* stage, in which cases are selected (as far as possible) to obtain similar results, and a *theoretical replication* stage, in which cases are selected to explore and confirm or disprove the patterns identified in the initial cases. (Zach, 2006, p. 9)

The problem with this approach is that it fails to notice that the uniqueness in every individual particular (e.g., structure, event, case study, etc.) can offer insights of some universal (e.g., a generative mechanism, a law, etc.).

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A blurred qualitative-quantitative methodological rationale This is the typical use of statistical methods on categorical data, for instance, the use of non-parametric statistics in the case of the assumption of a normal distribution is not satisfied. This claim of interdisciplinarity is based on the grounds of a vulgar-pragmatism "best-fit purposes" that fail to resolve the incommensurability of two different types of data and methods.

Waving the interdisciplinary flag Such "waving" means to gather a research report, under the title of interdisciplinarity, investigations from different disciplines about a single topic. This type of justification refers to gathering information from different fields to make a report in order to "guide" investigators regarding best methods. For example, the topic of climate change has been studied under a number of different disciplines; say mathematics (e.g., it uses weather models to fit recorded global surface temperature) and geography (e.g., it uses theoretical investigations of glacial periods from the starting premise of the earth's expansion of massive continental glaciers). Such claims of interdisciplinarity are founded on a skeptical post-modernist approach, which rationalizes its report as follows: (a) the best thing to do in qualitative research is to fully describe or communicate the status quo. Nonetheless, it forgets that the issue is often to change it; and (b) the best thing to do in quantitative research is to make predictions with computer simulations as if the world were a closed system. On the contrary, CR posits that there are no (epistemically significant) closed systems in the social world and generally, it is only in the laboratory that we have epistemically significant closed systems in the natural world[1].

CR currently sees the importance of maximizing "explanatory power" (Bhaskar, 2008b, p. 123) in a totalizing of traditional disciplines (e.g., sociology, history, mathematics, philosophy, etc.) and non-traditional ones (e.g., discourse analysis, educational studies, or cultural analysis) without claiming post-disciplinarity (e.g.,

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[1]There are spatio-temporal restricted; but, which are very long standing closed systems; for example, the solar system since we can accurately predict the position of say, a planet on a precise date such as May 15, 2016. Critical realists have argued for a degree of openness of systems. In other words, some systems are more open than others. For example, Brown (2009) refers to the school environment as a quasi-open system, and the same could be argued about a prison, because although they are socially open system, our knowledge of the mechanisms that regulate or tend to control them allows us to make certain predictions (or educated guesses). Such tendencies that the quasi-open system exerts is be simply overridden by other countervail ones in most cases.

research that does not consider particular disciplines, but rather it sees it as different discourses[1] in the surface events of reality), and without resulting in anti-disciplinarity (e.g., research that at the expense of universalizing, ends up dissolving disciplinary boundaries and creating a crisis of identities because it lacks an apt philosophical foundation). Following Bhaskar (2010), disciplinarity is necessary because it allows the opportunity to move from the surface of reality, for instance, from events to deep structures and generative mechanisms, so that what is needed is a dialectic of disciplinarity and interdisciplinarity. Disciplinarity is essential because of the depth it affords toward the understanding of how the different mechanisms work together. Interdisciplinarity is similarly requisite to providing an integrated account of such phenomena.

Although it is most prevalent in the social sciences and humanities, in the natural sciences we find a variety of examples of these inter-, multi-, cross-, and post-disciplinary projects. They frequently emphasize an epistemologically oriented nature of research, while CR emphasizes that knowledge cannot be reduced to its methods: epistemology is included in ontology.

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[1] Following Chouliaraki and Fairclough (1999, p. 38), the term discourse refers to the "semiotic elements of social practices". This semiotic reference is to various forms of language such as verbal and non-verbal communication, and visual images. Since social practices (e.g., human production) are seen as articulating together various elements of social life, then discourse as different ways of perceiving the world is also considered a means to depart from the deterministic view, which reduces human production to purely economic-related deterministic practices. The main problem with a post-modernist view is that it homologizes the different disciplines (e.g., physics, politics, mathematics, etc.) with genres, which are "the particular discoursal parts of manners of interacting and acting in social events" (Fairclough, 2003, p. 31). Hence, the post-modernist' analytical argument is that semiotic analysis is necessary to account for interconnections between orders of discourse: which are "the socially ordered set of genres and discourses associated with a particular social field, characterized in terms of the shifting boundaries and flows between them" (Chouliaraki and Fairclough, 1999, p. 58). The argument is that analysis of any type of discourse should include both "structural" and "interactional" dimensions of a network of social practices. The structural dimensions refer to ways in which interaction is constrained by the orders of discourse. The interactional dimension refers to way in which that social network is capable of re-construction through the articulation of its resources. Thus, there is then a feedback from the international to the structural dimension. In other words, the analysis adopts both a view of "insider" and "outsider" suggesting that the research is involved practically in the issue of distribution and appropriation of resources, and theoretically in the issue of describing those resources. Although this structural-interactional element is consistent with the Bhaskarian TMSA; in general, the post-modernist view claims explanation phenomena in terms of language in the broad sense of the term without a referent to the world outside, implying that disciplines become a mismatch of genres. In general, various disciplines, as we know them, are extremely useful because they provide explanations of mechanisms that generate phenomena outside the mere invention of terms, which is what is lacking in a post-modernist account of scientific disciplines.

> The analysis of open-systemic phenomenon establishes the characteristic multiplicities of causes, and *a fortiori* mechanisms and therefore, potentially, theories (of these mechanisms)...a further ontological feature besides complexity is required: this is *emergence*, more specifically the emergence of levels. (Bhaskar, 2010, p. 4).

In this approach, CR attempts to transverse fields of knowledge without dissolving the differences in the methods of the various disciplines by considering the nature of the object of study in an open system. One such example is the view of reality as an open system from which a multiplicity of generative mechanisms emerge at different levels, as a means of establishing a case for interdisciplinary activity. From a CR perspective, we can deploy a variety of different perspectives on the object of investigation without collapsing different methods of investigation to maximize analytic power.

We can turn now to a relationship that conceives the interplay of a range of dissimilar disciplines under a successful disciplinary activity. This is completed in terms of the ontological and epistemological consideration of activity as interdisciplinarity, which is elaborated in sections 6.3, p. 191 and section 6.4, p. 203, respectively. Such exemplification not only grounds AT on a CR philosophical platform, but CR can simultaneously provide concepts and conditions for a successful realization of interdisciplinary activity in more general terms, as discussed in section 6.5, p. 215. In order to sublate it under a CR philosophy, in this endeavor, I begin by identifying how the idea of activity as interdisciplinarity in AT came about in the first place.

6.2 The search for substance in AT: the conception of activity as interdisciplinarity

Blunden (2009, p. 5) initially found that within the AT tradition, there is no serious engagement with the question of ontology or substance, as he calls it.

> [No] writer in the CHAT tradition has broached the issue of substance. Outside the domain of psychology and small group interactions, CHAT theorists generally are generally naïve realists in respect to formations outside the domain under study. Such an approach does not give a means of *critically* appropriating from other disciplines.

In particular, Blunden suggests the idea of activity as interdisciplinarity by arguing that this term should not be mono-disciplinary and thus confined to the field of psychology. Instead, he held that, (1) the concept of activity, and (2) the problems of AT are of an interdisciplinary nature because they are part the world. In the previous chapter, it was argued that critical naturalism (CN) can resolve not just (2) the dualisms of AT; but, more broadly, other classic dichotomies of social theory as well, thereby grounding AT on a critical realist ontology. I turn now to the question that delves into (1) the concept of activity and its interdisciplinary nature. Specifically, what is the philosophical nature, the ontological case, for an interdisciplinary conceptualization of activity? Blunden provides a starting suggestion that requires a new ontology (or substance). This ontology as substance can conceivably be the theoretical ground of all sciences:

> A common foundation for all the human sciences, underpinning concepts
> of, for example, state and social movement equally as, for example, learn-
> ing and personality. For this is needed a clear conception of the "unit
> of analysis" of activity, i.e., of what constitutes "an activity", and a
> clear distinction between *the unit of analysis* and *the substance*, i.e.,
> ultimate reality underlying all the human sciences... [such] foundations
> from which the various societal phenomena can be rendered in terms of
> the same unit of analysis: project collaboration. (ibid., pp. 1-26).

In effect, Blunden appropriately argues for the need of a new foundation of reality, an ontology that underlies all sciences; however, he conceives this new foundation in terms of what he calls a "project collaboration" or foundation in interdisciplinarity as:

> the artifact-mediated collaboration of individuals in common projects... To
> be clear, "project collaboration" is not something different from activity,
> but simply a unit of activity, a unit of joint mediated activity. Social
> life is a tangle of interactions, both formal and informal, between in-
> dividuals, both friends and strangers; what is being suggested is that
> "projects" are the threads from which the fabric of social life is woven
> and may be analytically unstitched. (op. cit., p. 19–20).

According to Blunden, his notion of "project collaboration" differs from Leont'evian structure of activity in that it is subject-centered as opposed to merely object-

oriented. Specifically, subject-centered indicates that it conceptualizes "project" as a historical pre-existing, consciousness -formation part of the individual, and it agrees with Leont'evian activity in the sense object-centered, as a system of social relations is directed toward the achievement of some collectively defined ideal. For example, a Western society is involved in "project collaboration" toward the idea of democracy or a pair-wise collaboration between a supervisor and student is directed toward the idea of a thesis.

First, although his notion of collaboration is not ontologically developed, Blunden sees the need for what in CR is termed as under-laboring for and of the human sciences. In contrast to AT, CR re-vindicates an argument for ontology. As shown in Chapter 5 (sections 2-6), the CR research program is aimed at the removal of false dualisms as under-laborer for an emancipatory society. It accomplishes this through transcendental realism (sections 2-6), which elaborates a non-Humean, non-positivist, critical ontology, which is different from orthodox analytical philosophy; and, in the form of critical naturalism (sections 7-12), removes dichotomies in the social sciences. Moreover, this critical philosophical program of-for the sciences provides an explanatory critique (sections 13-14), which is indispensable for research openly aimed at the emancipation of human beings by a critique of false theories, which was lacking in AT since its historical development omits the philosophy and impact of Hume.

Second, although Blunden argued for an interdisciplinarity conception of activity with the notion of "project collaboration", it remains a limited project. Although it can be seen as only one of several requisite conditions needed to pool the knowledge fields for a successful interdisciplinary project, it is undeniable that this collaboration is an important factor. Consequently, we see that a collaboration project is indeed an epistemological case, which omits the ontological case completely and the ontological questions generally. Once again, Blunden is referenced, this time it is at the point where he begins by arguing that since most AT theorists are "naïve realists", within the AT tradition, there has not yet been a serious engagement of ontology[1]; however, Blunden himself has not sufficiently theorized ontology, as is show below (and in Chapter 5, sections 2-6). Nonetheless, although it is developed from a CR perspective, Blunden's idea of the conception of interdisciplinary activity as substance is taken seriously. This thesis argues for (α) ontological and

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[1]See Blunden's quote at the beginning of section 2, p. 188.

(β) epistemological considerations by which CR under-labors for activity in AT as interdisciplinarity and in general.

(α) In the ontological considerations, it is argued that CR provides the substance (ontology) for interdisciplinarity. (1) The implications of complexity are illustrated in the CR terms of the multiplicity of generative mechanisms, which both exist and additionally act independently of our theories. They are further illustrated in (2) the implications of emergence at various levels of reality, which, in CR terms, provides a more inclusive account of it without privileging any particular mechanism (a move that is left to be determined in each particular case of investigation). In this approach, CR pinpoints two of the foremost errors that affect contemporary interdisciplinary activity; and, in fact, these errors underpin the irrealist philosophy of science: the epistemic fallacy and the fallacy of actualism (Bhaskar, 2008a). Therefore, in order to avoid partial augmentative positions that tend to privilege only one causal mechanism and explain phenomena in terms of a single level of reality, CR distinguishes the need to differentiate ontology from epistemology and anti-reductionism. The following from (1) the implications of complexity in section 6.3.1 on p. 191, and of (2) emergence in section 6.3.2 on p. 193, CR argues for (3) the Bhaskarian idea of laminated system, (as elaborated in section 6.3.3 on p. 195), which seeks to aid the maximization of explanations beyond the reductionist arguments. Subsequently, the question that follows is: how do we re-constitute the real problem in knowledge into a unified account as successful enterprise?

(β) Although it is capable of providing conditions to make interdisciplinarity a successful enterprise, in the epistemological considerations, it is argued that, with the idea of the RRREI(C) schema and the heuristic device of laminated systems, CR is an advance over reductionism. Following the Bhaskarian (1) cross-disciplinary understanding, (2) a referential overlap between disciplines, and (3) effective epistemic integrations. All of these conditions work together within particular disciplines to integrate the problem that reality has produced in terms of a unified phenomena.

6.3 Ontological considerations

6.3.1 The implications of complexity

A CR account of science for interdisciplinary activity starts by characterizing the world, for the most part, as an open system from which we can see how the complex-

ity of a multiplicity of generative mechanisms together with the notion of emergence allows these mechanisms to interact at various levels of reality. This study of complexity necessitates multidisciplinarity in science as "ontologically grounded in the need to refer to multiplicity of mechanism at different, including emergent levels of reality" (Bhaskar, 2010, p. 4). This requisite is illustrated in the two-fold core argument of basic critical realism (CR), which was discussed in the previous chapter. Interdisciplinarity is thus advanced with an original argument for the re-vindication of ontology as differentiated and irreducible from epistemology; if this is omitted, we commit two tremendous errors.

The first error is the epistemic fallacy, which involves the reduction of ontological to epistemological questions (Bhaskar, 2008a, p. 27). A critical ontology is particularly important since interdisciplinary research has principally considered epistemological questions related to the methods and types of knowledge (Bhaskar, 2010). The recognition of the epistemic fallacy in interdisciplinarity works simultaneously to lead us into the first condition for successful interdisciplinary activity, i.e., the distinction between ontology and epistemology. This distinction occurs because in interdisciplinary activity, the same object of investigation is referred to in a range of ways via different descriptions of dissimilar disciplines. The CR ontological case for interdisciplinarity means that disciplines are epistemic, and thus the terminology that explains the same object in different ways lacks its ontological counterparts. The fundamental idea here is that when dealing with interdisciplinary research, an awareness is needed that the terminology has many fallacies built into the words and thus there is the need to distinguish between ontology and epistemology. Instead, what normally happens is that there is no differentiation between the mechanisms and structures in the world (e.g., ontology) and the knowledge about them (e.g., epistemology), which is a completely normal outlook. In Bhaskarian terminology, such a stance denotes a "natural attitude", in which:

> you don't posit ontology on the one side and epistemology on the other side: you just have knowledge and you take it that that knowledge is of the world. Ontology only becomes relevant when you are not satisfied with knowledge, when what passes for knowledge is patently wrong or absurd [and I would add, when knowledge passes for common-sense]. Thus when I came to understand the necessity to argue for ontology explicitly and to re-vindicate it as a subject, it was because I was then

very dissatisfied with the implicit ontology in social science and in the philosophy of social science. (Bhaskar, 2002b, pp. 192–193).

Following Bhaskar, it can be seen that this "natural attitude" is the reason why philosophers like Hume and Kant, where they are seduced into thinking that they did not need to refer to the world as distinct from knowledge. However, we observe that referring to the world as separate from knowledge becomes absolutely essential when there are completing claims to knowledge of the world; at that point we have to differentiate knowledge from the world.

> [1] Ontology is always in principle distinct from epistemology, even where our knowledge of the known world is unquestioned [as in our natural attitude]; and that [2] structures, mechanisms, processes, fields and the other intransitive objects of scientific knowledge are always distinct from, and irreducible to, the patterns of events they generate, even in experimentally closed laboratory situations. (Bhaskar, 2010, p. 2).

Specifically, there are three main instances when there is a need to differentiate ontology from epistemology: (1) at the level of contentious knowledge, i.e., in cases dealing with a contentious area, like the social sciences, in which theories and knowledge claims are often disputed; (2) at the level of important periods of scientific change or revolution, i.e., where there is a question regarding changing beliefs such as in scientific revolution, and (3) in interdisciplinary activity, i.e., which involves the investigation of an object of study that uses different descriptions from different disciplines. Hence, from a CR point of view, we are concerned with both ontological and epistemological forms of inquiry.

6.3.2   The implications of emergence

It is important to note that because a multiplicity of generative mechanisms is independent from our knowledge of it, and since we are in an open system, it does not need to involve different levels. For instance, a multiplicity of mechanisms can all be identified as being either biological or physiological, so we need to introduce emergence as a conception that implies the interaction between different levels of reality. Once emergence is introduced, we include a multiplicity of generative mechanisms of different types, which are all assumed to interact at different levels of reality, and

thus the need for different fields, disciplines, and theories capable of explaining such mechanisms and how they interact at different levels.

Emergence is probably the best argument against reductionism and for the complexity of dynamical systems that start from simple rules, but emerge to create complex and unpredictable dynamics. In the social world, for example, we see emergence in language and the movement of crowds; while in the natural world, it is in the formation of snowflakes, termite colonies, the weather, etc. Let us recapitulate the main criteria for emergence, from Table 5.4, p. 131.

(1) unilateral dependence of the higher level on the lower level,

(2) taxonomical irreducibility of the higher level terms and concepts, and

(3) causal irreducibility of the higher level in the lower level.

These criteria allow us to differentiate, not just between the emergence of levels, which refers to ontological emergence of a unilateral multiplicity of generative mechanisms consisting of higher order levels, such as in the case when we explain human beings as having irreducible biological, social, and psychological mechanisms, but including the emergence of outcomes or intradisciplinarity, to use CR terminology. In short, when mechanisms interact together, they behave in a very different and complex manner. To capture such complexity, CR goes beyond reductionism by making an argument for emergence as part of a philosophical argument that distinguishes ontology and epistemology for interdisciplinary activity.

Why is there a tendency for reductionism in the sciences? The answer is found in basic CR, in the critique of actualism, which Bhaskar develops in *A Realist Theory of Science* (2008a). As is illustrated in the previous chapter, we know that reducing the real domain to the actual results in the tendency to construct abstract universals or mono-disciplinary concepts, such as grand narrative or other master means by which to interpret and signify phenomena. There is also a tendency to reduce the actual domain to the empirical level, which results in empirical statements in which the structures of society and nature are identified as empirical universal regularities. From a CR perspective, we have an analysis of the social and natural phenomena from a non-orthodox account of science, in which reality is differentiated into a multi-layered stratum; that is, the all-containing real domain, which includes the actual and the empirical domains. The importance of the CR account of science for interdisciplinary activity, is thus characterized by open systems from which we

can see how the complexity of a multiplicity of generative mechanisms together with notion of emergence allow these mechanisms to interact at various levels of reality. What subsequently follows from the need to differentiate ontology from epistemology and anti-reductionism is the notion of a laminated system. We can turn now to the literature on applied CR in order to illustrate how the concept of laminated system has been used across disability research, women's studies, and climate science, to name a few.

6.3.3 The idea of laminated system

Critical realism advances interdisciplinarity beyond reductionism with the idea of a laminated system, the notion of ontologically different and irreducible levels for the analysis of social and natural phenomena. The analogy of a lamination helps us to imagine a hard but flexible structure made up of various ontological levels that cannot be separated and cannot be dissolved into each another. Although this critical realist notion was introduced with Table 4.1, p. 75, in the context of educational studies with an amplified model of Brown's (2009, p. 5) "learning environment", in what follows, a more general account is provided of the four types of laminated systems: the (ontological) level, (social) planar, (social) scalar, and emergent spatio-temporality, along with contemporary applications to interdisciplinary research. In the following, the first three types of laminated systems are discussed and examples are provided.

Table 6.1: Four types of Bhaskarian laminated systems

(1) An (ontological) **level** laminated system is more general since it is employed when referring to the different kinds of mechanisms as studied by the various scientific disciplines, e.g., a case-specific disciplinary ensemble (or CSDE).
(2) A (social) **planar** laminated system focuses on the four dimensions of which human beings are a part, e.g., the four-planar social being.
A (social) **scalar** laminated system emphasizes social relationism e.g., the seven hierarchical levels of scale or seven-scalar social being.

Table 6.1 – *Continued from previous page*

(4) An emergent spatio-temporality laminated system refers to different space and time together in the same dimension, e.g., the buildings in the city of London in which the very architecture, including its techniques and materials show vestiges of past epochs together with the most advanced ones. Another example is the different methods of producing commodities or services, from simple trading, to the invention of portable currency, and the contemporary credit card, which emerge in various epochs and remain alongside all the other forms.

6.3.4 (Ontological) level laminated system: case-specific disciplinary ensemble

Bhaskar and Danermark (2006) developed the first type of laminated system, i.e., (1) the case-specific disciplinary ensemble (CSDE) or mix of irreducible levels of being with distinct kinds of mechanisms studied by different scientific disciplines. In their study, Bhaskar and Danermark make two important separate but related moves on the subject of reductionism. The first move is a critique of reductionism, which argues that we cannot privilege any particular level in the way that reductionist views approach disability studies. The second move is to construct a (ontological) level laminated system, a case-specific disciplinary ensemble, for one specific case of dysphagia, a particular eating disorder in which it is difficult to swallow liquid or solid food (see Table 6.2, p. 196).

Table 6.2: Case-specific disciplinary ensemble (CSDE) for dysphgia to evaluate reductionist phases of disability research

CSDE
1. Physical level
2. Biological
3. Psychological
4. Psycho-social

Table 6.2 – *Continued from previous page*

CSDE
5. Socio-economic
6. Cultural
7. Normative types of mechanisms

Adopted from Bhaskar and Danermark (2006, p. 12).

In Bhaskar and Danermark's analysis of interdisciplinarity, the authors start by providing a critique of reductionism. This critique examines three different reductionist phases of disability research. The first phase, which was prevalent during the 1950s and 60s, saw the dominance of a medical model, it tended to associate disabilities with physical phenomena that merely require medical treatment. The second phase occurred during the late 1960s and 70s with the introduction of the socio-economic model of disability, which identified disabilities with a question of resources. For example, if everyone who needed a wheel chair had appropriate access to this resource, then there would be no need to make distinctions between individuals based on their disability. This phase brings to light the necessity to make resources not just available, but also accessible to everyone. The last phase, which occurred during the late 10s and 90s-onward, introduced a cultural or linguistic model that associated disabilities with the idea of language since it involves the construction of the concept of disability according to the perception of a particular society. From a CR perspective, we see that in the case of complex phenomena such as disabilities, we cannot emphasize a single mechanism, but we need to construct a laminated system, such as Bhaskar and Danermark's second move, in order to understand all physical, socio-economic, and other levels, in terms of a coalescent totality.

In a subsequent move, Bhaskar and Danermark constructed the seven levels of the case-specific disciplinary ensemble (CSDE). The main point to remember about this model is that we cannot state a priori account for the importance of a particular level or the number of levels needed in a particular investigation. Specifically, the number of levels is a toolkit, which is not set, but depends on the object of study of a particular structure, phenomenon, event, or situation under inquiry and thus it is subject to change. Nonetheless, these levels do not exhaust reality. In the case of

investigating what AT calls a run-away object such as climate change, for example, the researcher might want to include additional levels such as (viii) a political level, aside from the (ix) socio-economic one, and a level of (x) international relations as well. It is also important to note that the concept of laminated system has very broad categories. The purpose of the CSDE is to ontologically underpin a critique of historical research in disability studies. For this particular study, the levels represent a fruitful device for talking about the object of study (e.g., the case of an eating disorder in this research). This type of laminated system consists of irreducible levels of scientific ontology (being) as defined or understood by the scientific fields of the day. For instance, the field of chemistry might identify one type of mechanism, while those in biology might identify another completely different mechanism.

The CSDE is the most basic anti-reductionist system since it depends only on complexity and emergence and applies to purely natural phenomenon irrespective of the social world. In this basic type of laminated system, there can be any number of levels. It is important to distinguish that the CSDE is not the same as the seven categorical levels of deepening ontology, e.g., 1M: non-identity—7Z/A: non-duality, which are the categorical development of philosophical ontology. Whereas the 1M-7Z/A categorical levels of deepening of ontology refer to general features of reality, the different levels of CSDE refers to various kinds of mechanisms, which are characterized by emergence relations. In fact, any CSDE can be constructed with as many levels as needed by the analyst. To illustrate the CSDE, suppose that we want to explain the event in which a meteorite strikes the ground of some uninhabited planet. Although this phenomenon does not involve the social realm, because of the multi-causal mechanisms such as the physical, chemical, biological, etc., interacting at various levels of reality: it would still have to be explained in an interdisciplinary way.

Another application of this laminated system to interdisciplinary research is Hoyer's (2010, p. 51) investigation of climate science where he differentiates a laminated system consisting of seven thesis about CO2-reductionism in order to go beyond it and to sketch out what would be fitting in what he calls a "post-carbon society", which is the idea of a liberated society from its fossil-fuel cage in which we can think of sustainable human interactions with nature.

6.3.5 (Social) planar laminated system: four-planar social being

Bhaskar (2009) develops the notion of four-planar social being from the simpler transformational model of social activity (TMSA), which was discussed with reference to Figure 5.6, p. 151. In short, the TMSA model states that agency is in a relation to a structure that pre-existed it. The crucial temporal differentiation is that social structure always pre-exists individual agency, and then the role of such individual agency is to reproduce or transform the structure. Therefore, no structure can exist without human activity since structure always pre-existed agency. Then, in Bhaskar's *Scientific realism and human emancipation* (SRHE) (2009), the basic idea of TMSA is dialecticized and generalized into a four-planar social being, which is illustratively encompassed into what he terms the Bhaskarian social cube, which is a schema to understand the multiple dimensions of our social existence (see Figure 4.4, p. 107). Thus, the move from TMSA to a four-planar social being does not involve the conception of the former as intrinsically flowing in a geo-historical trajectory. More specifically, this notion is conceived by rejecting the idea that human nature is purely positive; rather, with this cubic model, "all decisive moments in social life are negative" (Bhaskar, 2008b, p. 160).

The cubic model is generalized in the sense that it conceptualizes the inclusion of all social life in terms of its four planes. The examples below will facilitate a better understanding of each plane of the social cube:

plane [a] is a dimension that accounts for ecological interactions between humans and their natural surroundings;

plane [b] is a dimension of interactions between people, for example, communication, discourse, and so on;

plane [c] denotes the dimension of social structure, for example, economic structure, linguistic structure, cognitive structure, etc.;

plane [d] is a dimension of stratification (biopsychosocial) of our embodied personality (Bhaskar, 2008b, p. 68), which incorporates the various strata of individuals.

For instance, in section 3.3 on p. 41, it is shown how the Vygotskian thesis falls within one of these four dimensions of interaction between agents; but lacks a clear

conception of social structure, material exchanges, or transactions with nature. Furthermore, although he accounted for culture, a full stratification of the human bio-psycho-social embodied personality was also missing from this theory. Thus, whereas social scientists tend to think only in terms of structure and agency, we can broaden how we perceive the four-planar conception, which introduces four irreducible dimensions by which to conceive all social phenomena as a planar laminated system.

6.3.6 (Social) scalar laminated system: seven-scalar social being

The (social) scalar and (social) planar laminated systems are applied in various fields by researchers to explain complex phenomena, but this is only done in the social world. In particular, the second and third models do not refer to a particular type of mechanism. The four-planar social being is a planar laminated system of four irreducible levels or planes that can be situated in its context, but also in terms of the idea of a hierarchy of various levels of scale. Historically, the idea of a hierarchy of various levels of scale comes from the classical dualism between (methodological) individualism, on the one hand, and (methodological) collectivism on the other, which was previously addressed in section 5.8, p. 142. From a CR perspective, what social scientists are particularly interested in are neither individuals nor groups of individuals, but in their relationships. In the family, for example, we have enduring relationships between children and parents; or; in the economy; we have relationships between workers and managers. Then the key idea is to further develop the resolution to this dualism in social relationism by allowing for investigations at different orders of the hierarchical scale. Thus, Bhaskar (2010) shows seven levels of agency, which are illustrated with examples, in the following Table 6.3, p. 200.

Table 6.3: Seven different hierarchical levels of agency

Hierarchical level	Example
(1) The sub-individual psychology	This level includes structures within the individual human being such as the unconscious, motives, and objects of discourse.

Table 6.3 – *Continued from previous page*

Hierarchical Level	Example
(2) The individual or biography	This level is concerned with stories of people, narratives, and biographies, such as the typical sagas that appear in novels. The analytic style of J. P. Sartre and A. Camus are examples of agency at this level.
(3) The micro-level is investigated, ethnomethodologists, to give an example, and others	Bhaskar (2006) gives the example of E. Goffmann's micro-sociology, which is applied to face-to-face performance interaction to illustrate a typical object of study for this level.
(4) The meso-level is concerned with persistent relations between asymmetrical functional roles.	This level is the classic dimension at which sociologists work such that they are concerned with persistent functional relationships within certain kinds of society. The classic example at this level is the role of the worker and the capitalist, or the common citizen and a government representative
(5) The macro-level investigates whole societies, regions, or economies.	The British economy is one example. Contemporary capitalism is an example of the "whole" structure at which this level is concentrated.
(6) The mega-level is concerned with entire civilizations and traditions.	For instance, the history of medieval religion or the tradition to speak a particular language.
(7) The planetary (or cosmological) level is concerned with the whole universe or planet.	This level may include historical and-or theoretical studies about the cosmos such as its beginnings and continuity.

Adapted from Bhaskar (2010, pp. 9–10).

From a CR point of view, what is important to note is the interplay of the levels. In other words, when we refer to something at any particular level, we find that the

level above it and the level below are involved, but irreducible to each other. For this reason, we can also regard these seven levels of scale as a laminated system.

To give an example of the scalar type of laminated system, without reverting to reductionism, we look at Price's (2010) seven levels of scale to explain the mechanisms of women's oppression in South Africa. This seven-layer explanation is paraphrased as follows.

Table 6.4: Case-specific disciplinary ensemble (CSDE) for dysphgia to evaluate reductionist phases of disability research

Levels of scale
1. Level of conscious-unconscious-motivation is concerned with women's narratives of personal history.
2. Level of human-material interactions deals with economic research that relates variables of poverty and oppression.
3. Level of human interaction at the small scale refers to socio-economic research that relates variables such as, the rate of HIV infection and violence to men, women, and their community, etc.
4. Level of structural characteristics of society provides theoretical explanations of the impact of structures such as the purchase and sale of wives or the theory of men as sexual predators.
5. South African society as a whole focuses on characteristics such as tribalism, female discrimination, and the rise of higher paying jobs for men throughout the society.
6. Geo-historical trajectories of South African society where we find the history of colonization, geographical location, and the move toward independence as key instances that continue to affect this society.
7. Global trends are concerned with the phenomena of globalization of less developed countries and their rapid growth.

Adapted from Price (2010, pp. 18–21).

Price's (2010) seven levels of scale model are used to provide explanatory mechanisms for the oppression of women in South Africa. She additionally explains how the

original term of laminated system was introduced by Andrew Collier who wanted to defend Althusserian Marxism against a reductionist-vulgar version that subsumes all explanatory societal mechanisms to economic determinations by grounding anti-actualist and anti-reductionist explanations on Bhaskar's (2008a) RTS. In particular, Althusserian Marxism could be construed as a Bhaskarian anti-reductionist type of laminated system where the realm of economy is not a privileged mechanism to explain society, rather there are other realms such as that of politics, culture, ideology, religion, that affect it. Another example of a scalar laminated system mixed other (ontological) levels in the field of education is the idea of an open learning environment (see Table 4.1, p. 75).

Thus, CR interdisciplinarity with the concept of laminated system, as shown with many of its different types of application that successfully move from mono-disciplinary activity because they cut across disciplines without resorting to single explanations privilege a single explanatory mechanism. The explanatory result may include possible contradictory results in a solid, "laminated" unit.

After exemplifying the ontological consideration of CR for the advancement of the interdisciplinary conceptualization of activity, we now turn to an explanation of the epistemological consideration and how CR is simultaneously capable of providing concepts that produce the conditions for its successful realization of interdisciplinary activity. To this end, we can recall the RRREI(C) schema and we can additionally anticipate the idea of the Bhaskarian dialectical process, which is the process of "absenting absence" (Bhaskar, 2010b, p. 176), to be developed in Chapter 7, p. 220. Such dialectical process is a driving force of change to repair remediable constraints, lack of freedom, and all other ills. In basic CR, we see the re-vindication of ontology, and in dialectic critical realism (DCR), we shall see the re-vindication of negativity (absence) by a deepening of ontology. For now, in order to widen the perception of interdisciplinary activity by deriving the conditions for its successful realization, it will be demonstrated how the Bhaskarian dialectical process can be applied to the RRREI(C) model.

6.4 Epistemological considerations

In the epistemological consideration, this study demonstrates that CR can advance interdisciplinary activity by avoiding partial positions that explain phenomena in

terms of a single level of reality via a heuristic method to conceive theoretical and applied scientific explanations to the RRREI(C) schema, i.e., resolution-redescription-retrodiction-elimination-identification-correction model, as is paraphrased below. It is subsequently demonstrated that the various justifications of interdisciplinary activity are epistemic. In conclusion, the question is asked under what conditions interdisciplinary activity can flourish. In answer to that, it is shown that CR uniquely proposes ontological conditions for the successful interdisciplinary conceptualization of activity.

RRREI(C) schema of applied scientific explanation In the previous chapter, it is illustrated how Bhaskar (2008a) develops the DREI(C) schema (i.e., description-retrodiction-elimination-identification-correction model) of theoretical scientific explanation. Now, we turn to the Bhaskarian model for applied scientific explanations, namely the RRREI(C) schema of applied explanations as follows:

R The first R in RRREI(C) schema stands for resolution. It is the resolution of phenomena into partial totalities of separate components (or causes). This condition means that when analyzing any concrete phenomena or event in open systems we see it in terms of its effects, so that it answers the question: what separate components (or causes) constitute the phenomena under investigation? At this first level, we want to analyze the exact nature of both determination of and what interaction occur in the formation of the object of study, which is never an isolated component (or single cause of the event), but involves partial totalities of the separate causes that compose it.

R The second R in this applied explanation of complex phenomena stands for re-description of such separate components (or causes) in theoretically viable terms. This re-description takes into account the geo-historical processes and mediations that make up its background.

R The third explanatory condition stands for retrodiction. This level answers to the question: what might have caused the phenomena under investigation? It involves working out the possible "solutions" to components (or causes) by looking at the way they were set off by conditions during the interaction that created the phenomena under inquiry. Retrodiction takes us from investigating the level of the empirical, i.e., from a component suitably re-described of the complex situation or event, via structures and generative mechanism, to the

antecedent causes.

E This explanatory condition stands for the elimination of alternative antecedent causes of such event or situation.

I This level stands for identification of the antecedent state of factual affairs, which means that at this level, after we have analyzed or resolved a component, and redescribed it, we use the generative mechanism to infer back to what conditions would have initially set it off or stimulated it. For instance, suppose that a friend is sick with a cold; we can infer that at some point our friend was exposed to a germ that triggered an immune response. Following a trace of events, we learn that not long ago our friend passed through an airport, and since airports are highly populated areas with possible contagious people, this event represents such a condition that might have initially triggered the cold. In turn, everything that happens in our concrete world is a coming together of generative mechanisms of different levels of reality; but each mechanism is assumed to have an initial condition, and that is what the RRREI(C) model seeks to pinpoint since we are ultimately interested in determining the main cause of a complex situation or problem of investigation.

C The C stands for correction of phenomena in the light of new, further analysis, or evidence. The letter C is in brackets to denote that this process will normally involve iterations of complemented analysis in a regressive movement that takes us back to the re-description of phenomena after new causes have been corrected and identified. To return to our example, suppose that our friend goes to the doctor because her flu-like symptoms not only persist, but also worsen. From the results of her medical exams, our friend discovers that her illness is caused, say by E. coli 0157: H7, from eating contaminated burgers during her recent travels.

From a CR perspective, our interest in the RRREI(C) schema is to identify what that is in the world has resulted in the problem of investigation; say, the collapse of a bridge, a fine ballet performance, an outbreak of E. coli, etc. We are interested in the factors of the world that have contributed toward generating either a problem or a fine activity. In the DRIE(C) model, our interest is to "excavate" into ever deeper structures in order to pinpoint the generative mechanisms. However, in the RRREI(C) model, we essentially take the generative mechanisms for granted, and

use them to determine what it was in the world that set such generative mechanisms off in the first place, which is essentially the reason why the latter is a schema of applied or concrete explanation as opposed to the former theoretical explanatory model. In this manner, CR provides a clear epistemological advantage for interdisciplinary activity that goes beyond reductionist argumentation by providing us with the methods to analyze an emergent multiplicity of generative mechanisms in open systems. While the DREI(C) model gives us a means to build a theory of generative mechanisms, the RRRIE(C) method allows us to use it to find out what was trigged such mechanisms. We now turn to the methods through which the interdisciplinary conceptualization of activity has been justified in the literature and further illuminate the CR ontological conditions needed for its successful realization.

6.4.1 Real-world problems in interdisciplinarity

What is the justification for interdisciplinary activity? This question is the starting point of Hansson (1999), who reviews how interdisciplinarity is justified in the literature by identifying three main augments in favor of it and three arguments against it. Although all of the arguments are one-sided, the author argues that each of them captures some aspect of interdisciplinary research capable of contributing to our understanding of how it is justified. The arguments in favor can be reduced to two, and are summarized as follows: (1) the nature of the problem of study, i.e., an ontological argument, and (2) the nature of scientific breakthroughs, i.e., an epistemological argument. What CR does is that it provides a strong ontological argument, which is missing from these six positions. We shall see that although various views favor interdisciplinarity, they do not explain what is it about the world that makes it necessary and possible to do interdisciplinary research.

In short, (1) the first ontological argument conceives the idea of interdisciplinarity as a means by which the science can advance from an abstract discipline to a more concrete one. (2) The epistemological argument about scientific breakthroughs posits the history of discoveries, such as the Newtonian theory of gravity, to conceptualize interdisciplinary activity as a tool to enhance a scientific subject, its competence, and our overall understanding in historical context. This epistemological argument is captured by the Bhaskarian transdisciplinarity, i.e., what is in an RTS, Bhaskar (2008a, p. 150) calls a "paramorphic model-building", i.e., when a new model is constructed of the unknown mechanism from radically different sources

in the retroductive moment of scientific discovery. Hence, there is a new model of the unknown but real mechanism that produces the phenomena. This transdisciplinarity is a vital moment in creative science. On this position, Hansson's main contribution relates to an epistemological circumstance, which she highlights with a paradox between mono- and interdisciplinary work in which great scientific discoveries that are based on successful interdisciplinary research are those that have radically transformed the field into a new discipline, which can be seen as a move back toward mono-disciplinarity. The last argument for interdisciplinarity is (3) the possibility of combining new theories, which is exactly like the one in argument (1), where interdisciplinarity is taken as the means to advance knowledge from an abstract theory to a concrete outcome.

The counter arguments against interdisciplinarity focus on (4) its parasitical dependence on other fields of knowledge. Specifically, this argument is the opposite of the third position, (5) its sinking properties with respect to the traditional scientific system; i.e., interdisciplinary tends to be perceived as a less rigorous field than traditional single disciplinary, and (6) the overriding of the idiosyncratic nature of creative ideas. The purpose of Hansson's exploration is not to impart criticism on each of the six found arguments, but to contribute to the understanding of the ways in which it tends to be justified in the literature. In particular, the six arguments illustrate the ontological dimension, i.e., the very nature of interdisciplinary research, and the epistemological dimensions, i.e., the involvement and exploration of multiple and pre-existing resources such as, different theories, conceptions, cognitive models, etc., drawn from a variety of disciplines, creates its own requisite conditions of possibilities and challenges. These conditions can be taken as arguments either for it or against it. The problem with interdisciplinarity does not depend on taking sides to justify it as either in favor of or against it. Irrespective of our alliances for or against it, since it is already a phenomenon of collaborative efforts, which exists to create new knowledge, it simultaneously creates challenges. Given that interdisciplinarity arises out of the need to deal with problems in the real world and it already presupposes a structured reality; the current challenge is to interrogate the starting premises, so that the next step is to investigate under what conditions interdisciplinary research can be a successful enterprise.

I argue that CR is capable of moving the interdisciplinarity discussion forward by providing a strong ontological argument. CR regards interdisciplinary research as

necessary for ontological reasons because ontology is distinguished from epistemology in the first place. CR argues that orthodox justifications of interdisciplinarity leave out the ontological case. From a CR perspective, what makes interdisciplinarity necessary is: firstly, the fact that we have open systems, meaning that we have both multiplicity and complexity without reductionism or actualism; and secondly, we have emergence in both outcomes and mechanisms. Moreover, along with these two ontological and epistemological considerations, CR posits the principles that are capable of sustaining a successful interdisciplinary activity. Following Bhaskar (2010), it can be argued that what we need for successful interdisciplinary activity is (1) cross-disciplinary understanding, (2) a referential overlap between disciplines, and (3) effective epistemic integration. The relationship between the three Bhaskarian terms is that of mediation, i.e., (2) referential overlap mediates between (1) and (3), but when (2) is lacking from a discipline, then we need immanent critique and development to effectively open up a discipline. Although the next section is dedicated to explaining immanent critique, the differences in the three Bhaskarian ideas, which were previously mentioned, will be examined first.

From the point of view of interdisciplinarity, there is the immediate rise of a problem of communication between two or more scientific disciplines. CR argues that the initial step needed to solve this problem is (1) cross-disciplinary understanding, which means there is a human relationship between two interdisciplinary researchers, each of which is a specialist in their own discipline. In some cases, there could be a situation with a single interdisciplinary worker. In either case, the interdisciplinary investigator needs to understand the implications for what is being investigated by other disciplines different from their own. For example, a mathematician needs to understand the implications of what is being said by those in disciplines such as sociology or political science. This initial moment encapsulates the first step needed in interdisciplinary understanding. Given that for interdisciplinarity, it is not sufficient to possess knowledge or a mere understanding of two different disciplines, but what is needed is an integration of the two or more knowledge bases; the second step of successful interdisciplinary work is what Bhaskar (2010) encapsulates as an (3) effective epistemic integration. However, in disciplines such as economics, the second step, which requires integration of knowledge, is very difficult to obtain because economics does not have an open space for other disciplines. In such cases where there is no clear opening to integrate other disciplines, we find that even if

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we have a clear understanding of the discipline, we cannot "fit it" together with our own primary field of research, so we end up with no integration. According to Bhaskar (2010), what is needed to open the space of a discipline is an immanent critique, i.e., a critique of both the theoretical and practical inconsistencies, and development. In short, interdisciplinary researchers need to critique a discipline in order to open it up until a Bhaskarian (2) referential overlap, which is the idea that disciplines overlap in what they are referring to, is obtained. For instance, if we are able to see what an economist or mathematician is talking about on our conceptual map of the word as a sociologist, and vice versa, then we have a mutual reference between interdisciplinary workers.

How can we understand two different disciplines, when they seem like two worlds apart and as if they were two completely different cultures?[1] It could be argued that there is an un-bridgeable gap for an individual attempting to understand a particular field in which they are initially untrained, say for a mathematician who is trying to understand a philosopher: it might seen as akin to a different "breed" of human species. To transcend the two-culture divide, CR argues for two main principles, P_1: universal solidarity since it can help motivate the reflective capacity of human beings to remove such dualisms and for the need for P_2: axial-rationality because it plays a crucial role in the self-development, growth, and learning of each individual (Bhaskar, 2010), as shown in the following table.

Table 6.5: Two principles in the philosophy of meta-reality (PMR)

PMR principles
P_1: universal solidarity
Denotes the possibility for any human being to empathize and understand, in principle, with any other fellow human being.
P_2: axial-rationality

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[1]Bhaskar (2010s) cites the idea of *The Two Cultures*, a term coined by C. P. Snow, to illustrate this divide between humanities and the sciences. The two-culture divide is a major problem; for instance, in the area of climate studies, because social and natural scientists typically have problems understanding each other.

Table 6.5 – *Continued from previous page*

PMR principles
Denotes a basic capacity for learning, e.g., how to deal or cope with our material reality (e.g., to cook, to read, etc). This capacity can be applied and accessed by various communities, irrespective of differences in language, culture of linguistic, cultural, etc.

Adapted from Bhaskar (2010, p. 18).

We can anticipate the Bhaskarian philosophy of meta-reality (PMR), where these two principles are fundamental to understanding the priority of unification over splits, and for theorizing resolution to conflicts. Since, in order to understand it, we can argue for a view in which disciplinary divides are a constellationally englobing reality; for now, we can sustain the idea of successful interdisciplinarity with these two principles—P_1: universal solidarity and P_2: axial-rationality, which are both grounded on PMR.

The first principle, P_1: universal solidarity, effectively underlies (1) cross-disciplinary understanding, which is a powerful principle that can effectively be used when dealing between two different cultures. In a nutshell, P_1: universal solidarity says that in principle, people who come from a particular culture have the capacity to understand any other culture. Informally, we can initially justify this principle by imagining that instead of being born under the particular set of circumstances (e.g., time, place, "thrown" into a particular structure or set of circumstances, etc.), there is a contingent event that can change the specifics of such circumstances, which cause a shift from what could have happend under the original circumstances. The change of circumstances implies a change in the influences due to our environment. A classic Bhaskarian example is to imagine that a person who to be born in, for instance Japan, but something happens and instead, grows up in Mexico, is exposed to different structures such as languages, beliefs, and culture. Now, even if this person has a different life, which is influenced by a particular social structure; but the same beliefs, which were appropriated by rationale inspection and the elimination of false beliefs, then the individual will have arrived at those same beliefs by a different process. From a CR perspective, this is essentially true since it begins to suggest that human beings are capable of understanding others who are very different from themselves. The logic is that individuals can arrive at similar shared

beliefs by a process of rationally inspecting them to eliminate false beliefs, by various routes, independently of structure, time, and original point of departure. This idea suggests that anyone has the capacity to identify with all other fellow human beings, and that includes different cultures, tribes, etc. While this principle underpins general understanding, it does not imply that people will understand each other; but it does assume that there is a principle, so that they can. For example, in the conflict between two cultures, it is important to say that it does not matter what the conflict is, as is the case with the divide between the Israelis and Palestinians; but, in principle, they can identify and empathize with each other. In this manner, people can begin to empathize with those who are continually regarded as other. It is important to emphasize that this principle says that an individual can understand the other, but it does not say that they can come to an agreement with it. For instance, in principle, we can understand Hitler, but that does not mean we can come to an agreement with him. Thus, the first principle, universal solidarity underpins (1) cross-disciplinary understanding.

The second principle, P_2: axial-rationality, underpins coming to an agreement, i.e., (3) effective epistemic integration. This principle states that whatever culture we encounter, we see that at a very basic level people in any culture have to cook, bring up children, learn to build houses, use iPads, etc. This describes a common feature that all individuals, irrespective of culture, have a basic level of competence in relation to their common material world. What we are describing by basic competence is a process of learning that is not innate, but rather in the course of this process, we learn by making mistakes and correcting them. This process provides us a basic logic for learning, so that self-correction is part of it, and we gradually learn when we do make a mistake. For instance, it is possible that interdisciplinarity with the pooling together of various disciplines attempts to explain the same world in which we all live, so this principle posits a method with which they can arrive at an agreement.

To give an example of P_1: universal solidarity and P_2: axial-rationality, I refer to Bhaskar's *Theorising Ontology* (2007), in discussing these two principles of interdisciplinary activity, he states that because difference presupposes identity "criteriologically, there is no difference between us and the other" (p. 201). In other words, from the point of view of our criteria, of judgmental rationality, Bhaskar is saying that the other thinks that she or he is rational (just as we tend to think that

our position is a rational one). Let us suppose that we tend to demonize terrorists because, for example, they commit suicide bombings in the name of a political, religious, or scientific cause. However, in terms of their actions, this argument states that there is no difference between the other and ourselves because, e.g., terrorists or persons that we tend to demonize have, what they take to be good reasons for committing those actions. This argument is not relativism, i.e., it is not saying that such reasons are actually good, but that these people think these are good reasons. From the viewpoint of judgmental rationality, for example, these reasons for terrorism are false. The argument is not homologizing people under a universal common ground, but recognizing their concrete singularity from which there is space to establish solidarity. In fact, it is this gap or space within difference without collapsing or homologizing identity that allows for P_1: universal solidarity, so that we can see that it is because unification of the other and us is implied and that universal resonance of solidarity is hence possible.

From a CR perspective, judgmental rationality, the idea that it is possible for human beings to arrive at decisions between relative beliefs, represents an implicit form of P_2: axial-rationality, the crucial reasoning in natural and social sciences founded on the principle that before we encounter difference, there is an element of unity or an explanation for it. For example, let us suppose that without loss of generality, X is not Y, then there is a difference between X and Y, which is neither nothing nor zero. For the non-trivial case, there is a difference between X and Y, and this is something other than zero, say Z. We can take this example and apply it to the height of two cavemen. To emphasize that this capacity takes us back to a primitive time, we can imagine that X and Y are a couple of Neanderthals of different heights. This fact presupposes that there is a standard point of reference, e.g., height, in common, by which the measure of difference is not zero. In short, we cannot say two things are different unless they have a point of reference, e.g., a point in which they are the same. This search for identities and relevant differences, according to Bhaskar (2007), are found across all cultures.

It is important to pursue P_2: axial-rationality because if we can show arguments why unity is basic and more important for social life than split, then we might expect to find something like a logic for resolving conflicts, which is a current topic of the Bhaskarian philosophical project. In this manner, the philosophy of meta-reality (PMR) claims that it has a logic for conflict resolution. This is fundamentally a

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logic for resolving antagonism since this argument emphasizes the notion that our human species is bounded by these two principles or transcendental capacities to identify with other fellow beings, which is based on P_1: universal solidarity and P_2: axial-rationality, and thus identify, recognize, and reconcile with others.

In our daily communication, for example, we experience conflicts and disagreement about culture, language, and plain semantic utterances. In such instances, from a PMR perspective, although we have two opposites fighting for their distinct interpretations, there is at least a unity, or something that these two are fighting about, as a point of entrance to understanding each other. This idea is crucial before any change can be possible. Specifically, understanding presupposes a structure about itself, and what we want is entrance to map such structures, so that we can begin to conceive how change might be possible in the other. The colloquial phrase is to "try to get into the shoes of the other" and that is no easy task, especially when we perceive the other as impenetrable, foreign, and irrational; and that is in addition to the situations in which we have ideological disagreements. To return to the example where Bhaskar (2007, p. 201) emphasizes the attempt to understand why a person becomes a terrorist:

> this depends upon, the extent to which we can put ourselves in the place of the other. It is not only that we must feel as if we could have been the other, but that actually *we could have been the other.*

The main point, according to these Bhaskarian principles, is to highlight that identity, recognition, and reconciliation with the other involves practice in the form of commitment to act upon our altered views.

Now, let us consider an interdisciplinary example to illustrate P_1 and P_2. Suppose a medical research team (e.g., doctors, nurses, epidemiologist, patients, medical advisor, etc.) has a real health problem, e.g., the European outbreak of a new strand of E. coli, which may depend on different aspects that concern the various members of the team, and may even concern patients themselves, since they are often excluded from such teams. The first half of the problem is to be able to establish communication between team members, i.e., to lay the foundations for (1) cross-disciplinary understanding. After this is done, the second half of the problem rests on the need to provide an explanation for it, i.e., to lay the foundations for (3) effective epistemic integration. What this example attempts to illustrate is that a health problem in the real world can be seen as an integrated challenge so that what is needed is an

integrated resolution (e.g., a course of action, a policy, and so on). The important point about such an integrated resolution is that we need to integrate the various partial explanations of the members of the interdisciplinary research team, so that we have a unified explanation of the phenomena. Frequently, resolutions to real life problems take a multi-dimensional form that involves models, theories, or a variety of different conceptual resources from various realms of knowledge, i.e., mediation by (2) referential overlap. From a CR viewpoint, what is important for interdisciplinary studies is to integrate various forms of understanding, but they also need to be aware of the implications. Such an integrated understanding, for instance, requires that an individual must be able to perform as, for instance, an epidemiologist, an economist, biologist, etc. This is done by dropping disciplinary labels in order to achieve the end result, which seeks to give an integrated explanation to a real world problem, which requires "taking a system of thought on its own terms, showing how it involves various internal contradiction and aporiai" (Bhaskar, 2010, p. 21). For instance, in the sense that social interaction does not fit the determinations made by economic models; and in a way it goes even further because there is no possibility of referring to other or very little aspects of social life; a grounding error of traditional economics is the exclusion of social relations, i.e., it is a closed field that lacks (2) referential overlap. What I want to illustrate with the example is that for CR, to explain a real life problem is to criticize it; that is, to isolate its source of imputed fallacy and the causal explanation for which a defective fallacy is socially reproduced, as opposed to a mere criticism in which judgments and condemnations of real life problems are causally imparted without any type of causal foundation. Although the implementation of critique is a difficult task, (social) scientists need to be able to understand a problem as a first step before they attempt to resolve it. Analogously, CR provides a first step for conceptual under-laboring of various scientific disciplines since at the level of meta-critique the ideal of interdisciplinary activity is not possible unless there is a real world problem to resolve (e.g., the contradiction between human beings who continue to rely on fossil fuels for energy and human sustainability as a species in the planet).

Now, problems in interdisciplinarity are encountered when a discipline is closed, meaning that there is no (2) referential overlap between other disciplines level of understanding or level of agreement. According to Bhaskar (2010), in this case, what is needed from interdisciplinary research is to open such discipline by doing

an immanent critique and development. In basic CR, Bhaskar (2008a) makes the distinction between the intransitive dimension (ID) and the transitive dimension (TD). The next step in the CR philosophy of science is to add a third space, which Bhaskar (2009) terms as "the meta-critical dimension (MD) of discourse" (p. 17); which, for instance, incorporates both philosophical and historico-sociological expositions of science in order to perform a meta-critique of assumptions of traditional arguments such as empiricism, positivism, and absolute idealism. In general terms, meta-critique:

> typically aims to identify the presence of causally significant absences in thought, seeking to elicit, for instance, what cannot be said or done *in* a particular language or conceptual system about what is said, done, known, implied or presupposed *by means* of it; or more broadly, what cannot be said in a scheme about what is *done* in the practice into which the scheme is connected (ibid., p. 18).

In the formal sense, in order to differentiate his position from other criticism of the orthodox philosophy of science, as we can see from the following topology, as shown below in Figure 6.1, p. 217. In Chapter 3, p. 34, we see an example of how in this thesis I engage with MC_1 of Activity Theory and some elements of MC_2.

6.5 Under what conditions can interdisciplinary activity flourish?

Because interdisciplinary activity deals with real-world problems, including what in AT terms are called run-away objects, its successful realization depends upon conditions that affect practitioners as theories or vice versa. In particular, Bhaskar (2010) proposes conditions for successful or ideal interdisciplinary activity. These conditions are also applied to the researcher as an individual.

Table 6.6: Conditions for ideal interdisciplinarity

The flourishing of interdisciplinary activity requires:
(1) disambiguation of ontology and epistemology

Table 6.6 – *Continued from previous page*

The flourishing of interdisciplinary activity requires
(2) anti-reductionism
(3) the idea of explanation in terms of a laminated totality
(4) the idea of explanation in terms of a laminated totality What may be called the "holy trinity" of interdisciplinary research: (4a) meta-theoretical unity, (4b) methodological specificity, and (4c) theoretical pluralism and tolerance Dissolution of barriers e.g., of career, financial, administrative, and ideological ones.

Adapted from Bhaskar (2010, p. 20).

I want to begin with (4) the "holy trinity" of interdisciplinarity. Fundamentally, (4a) meta-theoretical unity is the level of philosophy where meta-theory is the philosophy relevant for this level: At the level of meta-theory, it states that successful or ideal interdisciplinary activity is not possible unless there is a real world problem to resolve, e.g., the contradiction between human beings who continue to rely on fossil fuels and their sustainability as a species on the planet. It is important to emphasize that the interdisciplinary researcher needs to be committed to (1) the distinction between epistemology and ontology, which is the "Mind the gap!" basic realist position. Because the aim is to isolate the particular mechanisms, which are involved, so that the objective is to investigate beyond a single level of phenomena to what causes it: it follows that the interdisciplinary researcher needs to be committed to (2) a stratified and differentiated (i.e., non-actualist) view of the world in a CR position. In general, (1) and (2) are the basic meta-theories for all interdisciplinarity. An interdisciplinary research team needs to understand these first two basic CR notions. The understandings of (1) entails that research teams can have different descriptions of the same object, which is the reason why this "Mind the gap!" is necessary. The understanding of (2) necessitates that research teams can have descriptions of mechanisms or structures, and not of surface phenomena. Thus, the importance of the idea of reality as separates from knowledge and beliefs and of reality being deep. The integration of mechanisms (via a team or otherwise) subsequently provides a partial account as an aspect of the laminated articulated reality. A unified explanation and resolution may follow as a coherent totality. In this way, the comment to (3) anti-reductionism states that there is no

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Adopted from Bhaskar (2008b, p. 242).

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single generative mechanism, but a multiplicity of them that generate all phenomena via the construction of explanations in terms of (4) laminated totalities. What follows is what we do or (4b) methodological specificity, which states that interdisciplinary activity, involves the understanding of a real life problem, such that the interdisciplinary workers need to use different descriptions to talk about it. What is important is that during interdisciplinary work, researchers investigate the problem from multiple perspectives from open systems, while respecting the particular concrete theories that they have by following both (4c) theoretical pluralism and tolerance; which, as we know, each level might consist of different theories that are particular to it. For instance, as a mathematician, the researcher might construct statistical models, which are different from those ethnographic methods used by sociologists; but this does not mean that different disciplines can attach each other's methods. In addition, tolerance refers to the idea that the interdisciplinary worker needs to be committed to a tolerant working environment, which involves respect for distance and space. For instance, if a member of a research team draws upon a particular, say Vygotskian-inspired perspective, then the other members cannot forbid or prevent such a theoretical approach so as to jeopardize the project. Lastly, in order for interdisciplinary to flourish we need to think as a society to remove the obstacles that prevent its realization or (5) dissolution of barriers. The fundamental point is to dissolve the various obstacles, including barriers to career, financial, and administrative barriers so that people can have careers as interdisciplinary workers. A reason why mono-disciplinarity may be more advantageous is because that is where the concentration of institutional power is, which needs to be corrected, and which CR can help to accomplish.

6.6   Conclusion

In this section, Blunden's (2009) proposition is taken in order to ground the conception of activity as interdisciplinarity on a strong ontology, or substance to use a Robinsonian term.

> Substances in a given philosophical system are those things which, according to that system, are the foundational or fundamental entities of reality (Robinson, 2004, cited in Blunden, 2009, p. 26).

Nonetheless, I have argued that because of its ontological, epistemological, and practical advantages over various argumentative fallacies, substance is CR. In addition, CR does not start from the premise that justifies interdisciplinary. It is not an argument for or against it, but given that the world is structured in such a way that we are now dealing with real-world problems (e.g., ecological catastrophes, pandemic outbreaks of new diseases from comestible plants and animals to human populations, collapse of economic-juridical systems, the privatization of intellectual commons for profit, etc.) that necessitate interdisciplinarity, then CR puts forward not its own justification, but P_1 and P_2 principles by which this human project can flourish guided by various conditions, including a holy trinity of interdisciplinary activity. In terms of education, I have highlighted and expanded the ontological spin taken by Price's (2010) seven-scalar laminated system to explain women's oppression in South Africa and Brown's (2008) notion of learning environment, which denotes the idea that educational contexts are ontologically irreducible and thus need to be analyzed appropriately at a number of levels without excluding the social-economic relations between families and pupils in which we see the social, cultural, and economic disparities of society, entering and thereby affecting the schools. In this manner, I have shown how to effectively ground an interdisciplinary activity on CR open systems with a particular focus, but not restricted to the field of education.

Chapter 7

Tenets of dialectical critical realism

The best school for the dialectic is emigration. The keenest dialecticians
are refugees. They are refugees because of changes and they study noth-
ing other than changes . . . If their enemies triumph, they calculate how
much the victory has cost, an they have a sharp eye for the contradic-
tions. The dialectic, may it always flourish[1].

7.1 Introduction

The development of Critical Realism (CR) continues through a second stage, Dialec-
tical Critical Realism (DCR). Bhaskar elaborates the theoretical underpinnings of
dialectical logic in *Dialectic: The pulse of freedom* (DPF) (2008b). At its heart, DPF
is the analysis of the failure of human thought to comprehend one thing: ourselves,
our agency, our transformative capacity in the world. It reveals the ways in which
human beings have effectively invented many forms to systematically eliminate their
sustainability in the world. Bhaskar writes DPF with three main objectives in mind.
The first objective is to enrich and deepen the basic concepts of CR. A second aim
is to theorize the dialectic that, although inspired by the philosophy of Hegel, is
different and original in its own right. A key issue is that the concept of dialectic
must be capable of sustaining social theory with implications for self-emancipation.
Third, DPF aims to provide a critique of both analytical and dialectical branches

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[1]Brecht cited in Bhaskar (2008b, p. 241)

of Western philosophy. These three objectives are related to each other and act to establish the underpinnings of social theory.

This chapter continues to investigate the level of 4D: learning as product-in-process. In parallel with the three objectives of DCR, the initial objective of Critical Realist Activity Theory (CRAT) is to enrich this level with the introduction of DCR (sections 2-6). The second objective is, as it has been developed up to now, to argue for a conceptualization of learning as a passage through the Bhaskarian dialectic (section 7). The third objective of CRAT necessitates putting DCR into practice by showing that it can render a superior account of the historical development of concepts that are very important to Activity Theory (AT) (e.g., the concept of contradiction) by providing an in-depth critique of the philosophical roots of Hegel and Marx from which AT initially stemmed (sections 8-10).

7.2 MELD or the Bhaskarian logic of emancipation

The link between CR and DCR is a relationship of presupposition. The second moment presupposes an understanding of the first. This presupposition means that although DCR is an original account of the dialectic based on the work of Hegel and Marx, it does not overthrow basic CR. Norrie (2010, p. 15), for example, articulates the link between these moments as a "dialecticization" of CR categories of difference, structure, internal relations, and agency. While in basic CR we see the re-vindication of ontology, in its "dialecticization" we see the re-vindication of the notion of negativity and with it the very important critique of ontological monovalence, "the generation of a purely positive to complement a purely actual notion of reality" (Bhaskar, 2008b, p. 5), a concept that has determined the course of Western philosophy.

The critical realist dialectical system consists of four levels: 1M, 2E, 3L, and 4D (or MELD) and each of these domains has a chief characteristic. The chief characterization of 1M: non-identity is provided by the concepts of difference and structure. Then, the notion of absence is a chief characteristic of 2E: negativity because it stems immediately from opening up the negative, i.e., from the re-vindication of reality as negative as well as positive. In 3L: totality, we get internal relations between entities as a main characterization of this level. The last main characterization of

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4D: agency is given in terms of transformation in praxis because it stems, as a pulse, from within agents themselves. In addition, it is important to note that the fourth level, 4D, assumes knowledge of the third level, 3L, which assumes the second 2L that, in turn, presupposes the first level, 1M. According to Bhaskar (2008b, p. 289) the dialectic is "neither good nor bad in itself, except insofar as it empowers us in our understanding of reality". How does MELD empower us to understand reality, and in particular, to understand learning? In what follows, I elaborate on each of the four levels of MELD by linking each level to its chief characteristic found in the basic CR categories, and its significance to learning theory.

7.3   1M: non-identity is characterized by difference and structure

The first level of the MELD schema is based on the idea of basic CR that states that we have a stratified and differentiated world. Structure comes in 1M with the distinction or difference in the new ontology, i.e., critical realist ontology between the domain of the real and the domain of the actual. In other words, reality follows a structure with its own differences or fissures inscribed in it. Non-identity signifies difference that can be found in notions of differentiation between some of the most important ideas of basic CR. The warning, Mind the gap!, is the phrase that I use in Chapter 5 on p. 116 to denote the areas where we have inexorable and irreducible differences in basic CR, in terms of:

- The intransitive and transitive domains of science denoting an irreducible difference between the objects of scientific investigation (e.g., generative mechanisms and real structures) and the production of knowledge of those objects (e.g., theories, concepts, models, etc.);

- The epistemic fallacy denoting the difference between epistemology and ontology; and

- The fallacy of actualism denoting the difference between three domains of reality, namely the real that includes but is greater than the actual, which includes but is greater than the empirical.

In turn, non-identity is really another way of saying difference, and the characteristic of all the themes and concepts from this initial level, 1M, is that they are non-identity relations or relations of difference, and to make sense of them we need the notion of absence, which is developed in the next level, 2E.

Where there is difference there is structure and CR provides the idea of a stratified world. The notion of non-identity is also linked to the basic CR concept of natural necessity, an exemplariness of generative mechanisms and structures at work, which assumes the stratification of reality. Following Bhaskar, Norrie (2010, p. 230) also explains natural necessity in terms of our thrownness into the "material meshwork of being" that is capable of determining the possible grounds for social justice. From basic CR, we can recall that natural necessity is found at the level of generative mechanisms that produce events, but not at the level of any regularity between them. Natural necessity means that the world must be structured in order for science to occur. Hence, we can think of non-identity as the means by which we can communicate the difference in stratified reality.

What is the consequence, then, of removing 1M from reality? Following Bhaskar (2002a), the epistemic fallacy underlies the elimination of the necessary 1M categories. As in Humeanism or positivism, what follows is an implicit ontology, a Kantianism that is incapable of sustaining labor or human praxis, let alone self-emancipation because, as Hume famously stated, there are simply no good reasons (or its variant, that all reasons are equally valid) to exit a building by the tenth-floor window, instead of the door (Bhaskar, 2002a). Two main implications result from the failure to thematize ontology: (1) destratification or the idea that there is no depth in reality leading to actualism; the opposite of 1M: non-identity yields identity, or more specifically, the "subject-object identity theory" which eternalizes knowledge as infallible and certain (Bhaskar, 2008b, p. 152), and an implicit ontology sets a ground for closure in argumentation, the source of all theoretical aporias. And (2) non-differentiation is the incapacity to sustain difference in reality. The implication is that change is impossible, giving a vision of reality as a perpetual shallowness, or what Bhaskar (ibid., p. 251) calls "demi-reality": it is a half-reality, the part of reality consisting in, or sustained by illusion, or other falsities such as absurd effects and symptoms, and various other types of reduction ad absurdum such as reification and voluntarism.

7.4   2E: negativity is characterized by absence

The second level of the Bhaskarian dialectic is negativity, which is chiefly character-ized by the notion of absence, a vital concept for change. Negativity is the vastness of absence, space, boundaries, and lack, including voids that remain when some-thing has been left out. Its enormity is indicative of the Bhaskarian asymmetrical priority of the negative over the positive. Absence does not immediately entail the accumulation of what Bhaskar calls "determinate absences":

> absence for example, from consciousness (e.g., the known, the tacit, the unconscious), and-or an entity, property or attitude (e.g., the spaces in a text) in some determinate space-time region, e.g., in virtue of distanci-ation or mediation, death or demise or simple non-existence. (Bhaskar, 2008b, p. 9).

However, in such cases we see that determinate absence gives rise, among other things[1], to contradictions (or double-binds). The dogmatic Hegelian and Marxian way of conceiving absence is to say that there are contradictions everywhere, which does not get the theorist very far. From a DCR perspective, we are aware that precisely because the rise in contradictions may lead to either their proliferation (entropy) or a process by which to restore them (negentropy), we need to go beyond dogmatic viewpoints. It is as if we are, at this point, standing in front of crossroads, so that we need to take a step further in order to theorize agency in 4D in a very precise form that does not imply a perpetual, determinist (or endist) outcome, or its justification for the purpose of some religious form of signification, or other irrealist conviction. Thus, one of the primary objectives of DCR is to revindicate the notion of negativity as absence. This re-vindication allows us to see the most basic form of the dialectic, and one in which there is an absence in theory or practice. This absence or incompleteness may lead to a contradiction, in the case where this absence has relevant meaning that matters in reality; otherwise, the incompleteness is, in some ways, irrelevant. When such incompleteness is relevant (e.g., when what is omitted is causally relevant to or for the phenomena in question), contradictions, as the signaling devices for practitioners or theorists, begin to emerge. Such contradictions may proliferate until there is a move to restore consistencies with a deeper level of

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[1]See Appendix A on p. 287 to find a list of oppositional (negative) notions other than contra-dictions that are responsible for causing challenges.

structure, or an aspect of totality that was not recognizable before.

The crucial point to keep in mind is that Bhaskarian determinate absences refer to determinate non-being as opposed to indeterminate nothingness. The meaning of the negative is related to what is absent, when something has been left out, but is not restricted to it[1]. Now I turn to illustrating the types of absences and why this notion of absence is crucial in both the social and natural worlds.

7.4.1 Absence, its chain of modalities, and Bhaskarian four-fold polysemy

We can begin with a list of classic Bhaskarian examples of various types of absences:

- The absence of food in the presence of a hungry person,

- The absence of women or slaves in the presence of politics, for example, in classical Greek times,

- The absence of rain in the presence of drought,

- The absence of education in the presence of ignorance,

- The absence of raw materials in the presence of goods or services, say an automobile.

- The absence of ethics in the presence of vice, and

- The absence of spaces between the letters or words in an intended sentence or utterance.

I use the preceding list to illustrate that Bhaskar's (2008b, p. 37) argument to revindicate negativity is as important in the natural as is in the social world, without saying that it is the same in both domains. To revindicate this notion, Bhaskar argues that (1) absence is non-being as opposed to simple nothingness; (2) non-being (absence) is real, i.e., it exists in our world; (3) the ontological status of non-being (absence) sets a zero-level by prioritizing it over its opposite, being (presence); and (4) the gap that is opened up in the prioritization of non-being over being itself

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[1]Bhaskar (2008b, p. 8) also uses negation and negativity in many other senses of the verb so as to: "negate" including deny", contradict", oppose", exclude", marginalize", denigrate", erase", split" " and so on.

denotes the asymmetrical primacy of the ontological status of negativity (absence) over positivity (presence). The consequence of opening a gap of negativity posterior to positivity brings with it the veto of an all-positive world and the possibility of change (absenting) over non-being (absence). In a "dialectization" of the negative, we see that this concept expands in terms of four modalities, as shown in 7.1, p. 226.

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Adopted from Bhaskar (2008b, p. 283).

Bhaskar (2008b, p. 283) argues for the importance of four modalities of negativity that follow the four inclusions: (1) real negation $\geq$ (2) transformative negation $\geq$ (3) radical negation $\geq$ (4) linear negation. The first modality of negativity is (1)

real determinate negation as the all-embracing concept, referring to the absence of entity, feature, product or process X; it includes all other forms of negativity, its mediations, and changes; the second is (2) transformative negation, referring to some type of change or transformation in terms of two poles, as process and product; then we have (3) radical negation referring to self-negation and involving auto-sublation, auto-transformation, and auto-realization that denotes the overcoming of the self-being or inner-contradiction (or double-bind); and lastly we have (4) linear negation, which involves a multiple of distanciations (e.g., the ontological and epistemological gap).

Following these modalities of absence, we can elaborate on real negation as the driving force for transformation. First, we need to differentiate between two stages, i.e., the transformation of the product (or absence of process) and transformation of the process (or absence of product). In these cases, what is absent from the entity (product or process) is the means by which that entity comes into being. This logic results from the application of the asymmetrical priority of absenting (change of product) over absence (as process), which refers to transformation in the product itself. Bhaskar (2008b, p. 39) denotes such a stage with the term "process-in-product". In a reversal, the logic that results from the application of the primacy of absenting (change of process) over absence (as product) refers to the absence from the product of that by which the product is itself completed; in other words, this stage denotes an ongoing process of transformation by which the process is itself what brings the product into being or becoming. Bhaskar (ibid., p. 39) denotes such a stage with the term "product-in-process". The result of these stages functions as a pluralistic chain of co-existence of different modalities of absence that Bhaskar (op. cit., p. 39) terms as the "fourfold polysemy" in order to denote this logic of negativity in terms of MELD (1M: absence as product, 2E: absence as process, 3L: absence as process-in-product, and 4D: absence as product-in-process).

In this thesis, I show how Bhaskarian fourfold polysemy functions as a pluralistic in terms of the conception of learning at each of its stages, from 1M to 4D, without resorting to reductionist accounts of learning.

(1M) Learning as product Theoretically, 1M denotes a simple absence of process. This level leaves out the process by which the product comes into being. CRAT thematizes 1M with the outcomes (or products) that result from the application of the three previous theories—collaborative learning, cooperative

learning, and supplemental instruction—to small-group schemes in higher education, as given in section 2.3, p. 24. To conceptualize 1M, I have argued that this level is evident in the way learning products acknowledge the need to account for learning processes, the following level in the journey through this dialectic.

(2E) Learning as process Theoretically, at 2E we have a process of change (absenting) without product. The process may or may not be caused by contradictions. This idea of absenting as change without product refers to the sense in which learning is a yearning for change because as long as we live there is always something new to be learned. CRAT conceptualizes this level, section 2.4 on p. 27, as an apprehension of incompleteness via the Bhaskarian notion of the absence.

(3L) Learning as process-in-product Theoretically, 3L is the level of totality in which the process that is sometimes incomplete, contains gaps, fissures, and so on, is part of the product. CRAT exemplifies this level with the AT notion of an expansive transformation (which is equivalent to the Hegelian Aufhebung, a totality that is closed in thought and thus needs supplementation with (i) the next level in practice, which is 4D, and (ii) the Bhaskarian notions of open systems) as I show in section 3.6, p. 59.

(4D) Learning as product-in-process Theoretically, this is the level of transformative praxis. CRAT elaborates this level in section 7.6.1, p. 244, by means of putting CR to practice in resolving the dualisms of AT, and in this chapter, by means of providing a critique of both the analytic and dialectical Western philosophical bedrocks that sustain the historical development of AT.

The purpose of the logic denoted as the fourfold polysemy is connected with one of the key objectives of DCR, which is to revindicate the notion of negativity with what Bhaskar (2008b, p. 20) terms the critique of "ontological monovalence", the doctrine that reality is purely positive. According to Bhaskar (2002a, p. 60), the positivization of the world can be traced back to "the Parmenidian distinction of being and non-being", an anamorphic perspective that results from the imbibition of the negative (absence as non-being) by the positive (being). Greimas and Rastier's (1968, p. 83) model of "the elementary structure of meaning", as illustrated with Figure 7.2, p. 230), can be used to provide an example of positivization in the world

because their model contrasts two semiotic axes: the positive S axis (representing any type of semiotic system or the reality of meaning) as opposed to the negative $\bar{S}$ axis (absence of meaning), where S subordinates its contradictory $\bar{S}$. A purely positive account of reality is a subject that Plato retakes and re-formulates without the negative $\bar{S}$, but only in terms of their difference. Whereas Plato replaces absence with difference, Aristotle denies it. This contradiction between S (a positive account of reality) and the omitted or re-formulated $\bar{S}$ (a negative account of reality), to place it in Greimasian terms, requires a compromise to overcome it, as in the invocation of the past as the element to substitute for $\bar{S}$. What I am referring to is what Bhaskar (2008b, p. 138) terms the "self-referential paradox": the idea that generates a "stalemate" between the justification of belief, either in terms of religious convention or social convention, as a resolution to problems such as that of induction. Thus, the positivization of reality begins with its anamorphic perspective, followed by the reformulation of the negative for difference, and replacement of the 2E level, and is what Bhaskar (2008b, p. 138) calls the "Plato-Aristotelian fault-line... [denotes] the fissions caused by ontological monovalence" of the Western-philosophical trajectory that thereby reinforces the status quo.

What is the consequence of removing 2E from reality? Following DCR, we see two main implications of ontological monovalence that underlie the elimination of the necessary 2M categories: (1) theory-practice types of inconsistencies, which are "the absence of coherent philosophy within a lot of contemporary thought" (Bhaskar, 2002a, p. 60), including theoretical dichotomies—mind vs. body, facts vs. values, reasons vs. causes, and so on—the problem of induction, and other types of unsustainable epistemologies; and (2) the fallacy to thematize absence results in such splits, and such splits necessitate some type of "resolution", usually in the form of compromises that function as defense mechanisms allowing a false theory to continue—e.g., the TINA formation: the acronym for "there is no alternative" (Bhaskar, 2008b, p. 113). Without absence we have a reality without difference; without difference human beings would not able to tell apart anything, not even their own needs from the needs of others. Thus, the move to eliminate absence is actually eliminating the very natural necessity, to put in Bhaskarian terms, that sustains us in the world. Now, after outlining the Bhaskarian re-vindication of absence, we can see it in terms of causation.

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Adopted from Greimas and Rastier (1968, p. 96).

7.4.2 Absenting: causing is transforming, is re-determining

Absenting is, in simple terms, the eradication of an absence. When we speak about absenting the absence, we are talking about getting rid of the absence. A process of absenting is a process of transformation. It involves the possibility of the eradication of an absence. To recall, AT posits the possibility of transformation, with the term expansive learning, which has an implicit ontology and thus it remains unable to deal with its own dualisms, while it completely lacks theoretical possibilities for self-emancipation. Now, we can further see how in DCR the notion of transformation as the process of absenting is homologous to causality, which is directly linked to emancipatory implications.

Synchronically, we can think that the world is full of objects, products, practices, entities, processes, etc., that are lacking in it. Such absences have causal effects at any one point in time, or, to put it in DCR terms, I am referring to spatio-temporal causality, which is the idea that causality is not mechanical; it does not mean regularities that are determined, but that are dynamic. In Bhaskar's (2008b, p. 281-281) great dictum:

> To cause is to change is to absent is to transform and re-determine. Causation is absenting...So we have the result that negativity is the hub not only of existence but also of causality. Quite simply, to cause is to absent.

In order to convey the dynamism of causation, I refer to Hartwig's (2007b) tabular representation (see Table 7.1, p. 231, below) in which causality is applied to the MELD schema. This dynamism denotes a concatenation of causality that leads to a chain of bringing about transformation, what is, in DCR terms, denoted as a "chain of causation" of phenomena.

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Adapted from Hartwig (2007b, p. 59).

This dialectical matrix needs to be differentiated from a perspective of regularity—deterministic causality (i.e., the idea that can be explained metaphorically by a billiard-ball situation, in which the cause of some phenomena X sets a chain reac-

tion of events Y1, Y2, ... Yn that holds regularity under some closed descriptive conditions). After we apply the MELD schema to the notion of causality, we see that it sets in motion a chain of events where the cause of some phenomena X is a transformation of an effect, which leaves traces of such a phenomenon. Such traces follow a chain of phenomena and may happen in any one of the four modes of absences. This chain corresponds to the four modes of universality, and what I call "traces" refer to the four types of Aristotelian causes, and to the four types of Bhaskarian tendencies. From a DCR viewpoint this relates to 1M: non-identity, in which we have a product that is a synchronic or snapshot view of the world. This initial level is a structure that is generally very useful in terms of a basic assessment of what is in or out in our account of reality; we need structure to identify the terms of the next level of process. The 1M-level captures the Aristotelian material-formal cause; it is basically a static view of the world. We can think that product is something that history has thrown up at us, so that it is already out-there in the world. 2E: negativity requires that we set the product in motion and it is captured by the Aristotelian efficient-final cause: the perception of the product as made up of the process. At the level of 3L: totality, we do not encounter a single process; rather, as in the Aristotelian formal-material cause, we encounter a multiplicity of processes coming together in a product, which is denoted as process-in-product. In 4D: transformative praxis, we have the transformation of process-in-product into something new, as in the Aristotelian final-efficient cause, denoted by product-in-process. Other philosophical traditions typically explained transformation or change as a redistribution of unchanging elements or instances such as atoms, forms, and facts. In fact, if we analyze what we ordinarily mean by change, then it involves the coming into being of something new, and-or the passing out of being of something that was there. This notion of change implies that it involves something more than just a redistribution of unchanging elements, for instance, as in Parmenidesian blockism, in which reality is eternal and nothing significant has ever happened. In contrast, DCR links causes and transformation as the removal of absences as the means by which to conceptualize transformation in the social and natural worlds. From a DCR viewpoint, we are concerned with conceptualizing transformation of what is lacking in social and natural realms: in more specific terms, I am referring to the "process of absenting absence" (Bhaskar, 2008b, p. 176), which is what the dialectic is.

7.4.3 From absence to absenting and back

The basic form of the Bhaskarian dialectic is that relevant absence occurs when something has been left out. At this point we need to distinguish between a relevant and a non-relevant absence. A relevant absence has pernicious effects in the way it registers as incompleteness, which then goes on to generate contradictions. In contrast, a non-relevant absence does not register any incompleteness and thus contradictions may go unnoticed. After an absence is set in motion, i.e., after it is registered as pernicious incompleteness, what follows is that it generates contradictions that, in consequence, give rise to a process of transformation. This process of transformation is not automatic. In turn, transformative praxis takes time and effort in order to discover what has been left out.

The classic Bhaskarian example about the history of science illustrates the process of delay prior to transformation. To the physicists of the end of the nineteenth century, it was clear that there was something wrong in the structure of their conceptualization of reality using Newtonian models; the challenge was to discover what was left out from the theory. After a long delay that took time and effort, theories like quantum mechanics and Einstein's theory of relativity provided new insights into problems of physics. The point of this example is to illustrate that transformative praxis is not automatic, but it may actually take a long time and much effort to achieve. After such a discovery of what is absent is made, then there is a move to incorporate it into to the theory (or into the natural world, as nature incorporates it). In this manner, we see how the basic form of the dialectic is a move towards rectification or remedying of the incompleteness. After discovering what has been left out and after this has been included as part of a theory, we have a more inclusive totality, free from contradictions, which refers to the idea of transformation directed at remedying the absence. Another name for this dialectical process is negentropy, or the move to increasing order, as opposed to entropy, which is the move to increasing disorder or chaos.

7.4.4 Relevant absence is pernicious incompleteness

Bhaskar (2008b) argues that we cannot have being without absence, but we need to differentiate between relevant and non-relevant absence. First, consider the case of a hungry individual who wants to remove feelings of hunger. The absence of food is

the negative condition of food that drives the individual towards an absenting or the move to remove that condition. In this case, the absence is registering as pernicious incompleteness, which may lead to a contradiction of eating or dying. We can show that this idea is so important that the world is overflowing with examples of absence. Let us recall, for instance, that various self-immolations started protest movements after a man in Tunisia set himself on fire (and later died in consequence) because police prevented him from selling his produce without a permit. Furthermore, let us consider malnutrition, scurvy, and homelessness as three examples of absence, which are still prevalent even in the so-called advanced countries such as the USA. This type of absence can result in people having much lower life expectancies, which may lead to premature deaths. Here we have a clear absence of nutrition, vitamin C, and an absence of proper housing. In all these cases, the accumulation of absences is registering as incompleteness, which could have pernicious effects. The important point to denote from these examples is that for an absence to be a relevant absence; that is, to register as pernicious incompleteness, it moves the system to generate inconsistencies that have detrimental effects, such as in the first example, which necessitates resolution in a complete, more comprehensive totality.

As we have seen from the examples, inconsistencies can be resolved, but not always, which is not to say, in the Hegelian sense, that inconsistencies can always be resolved. Bhaskar (2008b, p. 84) argues that "in an open world neither inconsistency nor incompleteness are [completely eliminable]; and the possibility of both is transcendentally necessary conditions for science". To paraphrase, Bhaskar is saying that in some form or another, we are always going to have some inconsistencies (or incompleteness) left, i.e., we can never get rid of them entirely because of the nature of the world. Let us consider a theoretician that is able to point out where a theory seems not to be able to be fixed by identifying that such a theory is incomplete. In such a case, there might be an inconsistency followed by a difficult challenge to resolve it. The good theorist either ignores or resolves the challenge in order to create a more consistent theory. As an example we can take this thesis, where I was able to point out that inconsistencies with AT are derived from ignoring Hume's theory, which caused various dualisms. In this particular case, inconsistencies can be resolved via CR.

To further elucidate this point, I want to refer to Bhaskar's *Plato etc.* (1994) where he gives a list of the most relevant types of dialectic that are concerned with

including what has been left out from the understanding of transformation.

Adopted from Bhaskar (1994, p. 184).

In short, if we have an absence, then something that may be necessary is lacking in a thing, or a situation is incomplete, and the basic form of the dialectic involves a move towards completing it. The inclusion of absence yields a more comprehensive totality, the negentropic solution, but there is also the case when there is proliferation of absences, the entropic solution. This level of 2E: negativity is implicit in the level that follows.

7.5   3L: totality is characterized by internal relations

> [The] only plausible concept of a totality is that of a partial totality rife with external as well as internal, and (not the same thing) accidental as well as necessary connections, replete with gaps, discontinuities, voids as well as pockets of thoroughgoing (sub-)totality. (Bhaskar, 2008b, pp. 270–271).

The third level of the Bhaskarian dialectic is 3L: totality, which is grounded on the idea of understanding the world as a whole that includes its splits (partial totalities) and its boundaries (sub-totalities). The chief characterization of totality is the notion of internal relations. From basic CR we can recall that there is an internal relation between two elements, say A and B, if one element, A, is a necessary condition for the other element, B. In more precise terms:

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> A relation between the structures or mechanisms $M_1 R M_2$ is internal if an only if ... M_1 would not act in the way it characteristically does unless M_2 was so related to it; it is symmetrically internal if this condition applies reciprocally in the case of $M_2 R M_1$. (Bhaskar, 2009, p. 108).

Traditionally, the assumption about nature was that there were no internal relations, so that if we change a natural object (e.g., the direction of a river), then it did not have an effect on the other (e.g., the natural eco-system that depended on the river). From a DCR perspective, this traditional assumption breaks down in the social world because in social reality we have that interactions affect elements that are internally related. For instance, when there is a mutual exchange of utterances between two people, we have that there is an interaction of sentences that depend on, but also follow form the initial interlocutor involved in the mutual conversation.

Totality may be described as a constellation that maps a "system of internal relations" (Hartwig, 2007j, p. 470), which is mainly developed in the third level of the MELD schema. At his level, totality is a system to be connected through, and engaged in various types of intra-activity, but it also has a spanning structure to the other three remaining levels. The question that follows is: what is the mode by which the Bhaskarian totality spans across the other levels? The answer is provided via the mode of holistic causality, which occurs when complex parts of a whole are united, as explained below.

7.5.1 Holistic causality as the mode of operation of totality

Bhaskar (2008b) develops the notion of holistic causality as the mode by which 3L: totality operates. At this point, we need to recall that causality assumes the four modes of absence (see Figure 7.1, p. 226) in other words, causality does not imply mechanical "billiard-ball" determination, but has a dynamism that occurs as a chain of four types:

(1) Transfactual causality in 1M or the idea that causation is efficacious at the level of generative mechanisms.

(2) Rhythmic causality in 2E or the idea that causation is not only local but exercised in a spatio-temporalization by causal powers of structures.

(3) Intra-active causality in 3L or the idea of causality as a system or structure of internal relations (or totalities).

(4) Intentional causality in 4D or the idea that people are laminated structures so that, as stratified individuals, they are capable of giving reasons for causes.

After we see the four types of causality, then our conception of determination is shaped. In particular, Bhaskar (2008b, p. 127) argues that holistic causality happens when we have α and β or "complex coheres", where α and β are such that:

Table 7.3: Holistic causality

	The mode of operation of totalities in action
(α)	The totality, i.e., the form of structure of the combination, causally determines the elements; and
(β)	The form of structure of the elements causally co-determine each other, and so causally (α) determine or (β) co-determine the whole.

Adopted from Bhaskar (2008b, p. 127).

The (β) case tells us that totality is seen as emergent. In other words, totality has emergent powers and also includes its elements, which are seen to have relative autonomy. In this sense, totality takes milder types of determination. Moreover, holistic causality is "a structured, asymmetrically weighted, differentiated nexus" (ibid., p. 271). We can think of holistic causality as an emergence of a unit, a cell, or a whole with its particular forms of determinations, mediations, structures, negations, exclusions, and concreteness from which it can react against itself. Holistic causality is exercised in the four moments of DCR and gives a fourfold perspective on causality: "as (1M): transfactual efficacy, (2E): spatio-temporal process, (3L): holistic causality, and (4D): intentional agency" (Norrie, 2010, p. 95).

In basic CR, for instance, there are various instances where we see that totality is exercised. In Bhaskar's PN (1979), totality at work appears as the drive to connect philosophy and science, and scientific knowledge and everyday practice, in theory and praxis. In RTS, totality at work appears as a reality that is structured into three levels (empirical as the all-containing domain of reality, which is differentiated but contains the actual, which is differentiated but contains the domain of the real) where

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causal relations form a series of connections between those different three levels. At the level of the empirical, the exercise of causation adds "transfactual efficacy" of those generative mechanisms that exist and act in the intransitive dimension (ID), independently of our notions. In addition, when reasons are acted on (i.e., when reasons are said to be efficacious), then they are a subset of causes. In other words, reasons form unities, referred to as "constellational unities" (Bhaskar, 2008, p. 273), as I show below.

7.5.2 Constellationality and mediation

Two closely related themes in 3L: totality are the key ideas of constellationality and mediation to resolve oppositions or dualism. On the one hand, the idea of mediation denotes an intermediary (or a possible healing of splits, dichotomies, etc.) between two entities; more precisely, DCR argues that mediation occurs "if A achieves C, secures or eventuates in C (either in whole or in part) via or by means of B, then B may be said to mediate their relation" (Bhaskar, 2008b, p. 114). On the other hand, the idea of constellationality is first coined from an Adornian adaptation from W. Benjamin in order to analogically concretive how "ideas are related to objects as constellations to stars" (Hartwig, 2007, p. 78). However, the Bhaskarian constellationality is different in scope since it takes different forms, which is closely related not only to the idea of connection (mediation) but also disconnection.

The characteristic of constellationality is a key part of 3L: totality. There are two important notions to keep in mind when speaking about constellationality, (1) mediation, i.e., the means or medium of connection; and (2) what Norrie (2001, p. 54) calls "differentia", i.e., as disconnection, or another way to say the difference between distinct, but overlapping levels of reality. For instance, constellationality is used to articulate traditional problems of opposition in terms of relations of containment. Such relations of containment mean that one term is contained as a subset of the other and that both terms make up a constellational unit. To explain constellationality, Bhaskar (2008b) begins with various relations that may be seen as problematic in terms of mediation (a closed-subjective mediation and an open-objective mediation); for instance, let us consider the following five duos:

(1) subject and object,

(2) ontology and epistemology,

(3) reasons and causes,

(4) language and reality,

(5) internality and externality.

From a naïve realist view, we have that the relation, say between (3) language and reality, is bounded with our subjectivity. In other words, we can only articulate such mediation as a bounded condition of our knowledge or ability to articulate it in language. In this manner, it is closed by our subjective mediation. In contrast to the closed-subjective mediation stance, in DCR we have a "transcendental detachment" (Bhaskar, 2008, p. 271). From this vantage point, we see that the duo, (3) language and reality, are in a constellational unity, in which the being or reference is independent of our use of language and other types of referential means we use to denote its existence, so that to argue for differential detachment is to argue for the ontological stratification and differentiation of reality.

Another example of constellational unity is the mediated relation between (1) subject and object, where we step out from a hemisphere of closed subjectivity to a hemisphere of open objectivity. Such open objectivity means that it is possible for us to have a conception of truth, with both scientific and philosophic grounds, at an ontological level. This notion of open objectivity is exemplified if we recall *mind the gap!* The intransitive and transitive divide (ontology-epistemology) dimensions of language from a viewpoint of a geo-historical emergent conception of knowledge. In a closed-subjective hemisphere it is impossible to have a conception of truth, since everything is contingent without any social or natural scientific grounds. Now, differentia highlights the distinction that unities, as opposed to identities, are denoted by both analytical and dialectical reasons, which implies that they do not cancel each other out. In short, constellationality provides us with the means to interdependently bind the oppositional relation of containment or dichotomies, from which an open-objective mediation as opposed to a closed one occurs, without canceling out their respective difference. This idea of openness and the metaphor of stars as partial universes in a constellation take us into the only conceivable totality in terms of other important concepts, sub-totalities and partial totalities, as I discuss below.

7.5.3 The openness of partial and sub-totalities

We can start by differentiating between an open totality and a closed one. For Bhaskar (2008b), the future and totality are necessarily open. In contrast, Hegel's totality is "constellationally closed" (ibid., p. 271). The reason why Hegel's totality is closed is that he joins both the concepts of identify in the first moment and difference in the second movement around a master idea, which leads him to an absolute "true totality" (ibid., p. 270) so it does not include its discontinuities. This master idea cannot sustain the four 1M to 4D moments of DCR since it lacks the last moment of a 4D: transformative praxis. Contrary to a closed-Hegelian totality, Bhaskar (2008b) argues that there is no master idea of an absolute totalization, but that of a partial totality and also "totalities within totalities" (Bhaskar, 2008b, p. 55), or sub-totalities. Norrie (2010, p. 90), following the Bhaskarian 3L, also stresses that we have an open totality since it assumes that there are partial totalities, a term to "denote the splitting, fracturing and broken nature of the whole under condition of material diffraction", and sub-totalities, a term in which we do not perceive everything as internally related, but only some phenomena. The reason we need to conceive the world as containing its own breaks, fissures, and splits (or its partial totalities), in which we find totalities within other totalities (or its sub-totalities), is to be able to see the world as a place where the future is not determined but rather is an open domain. In opposition to a closed notion of totality, this level has a fourth moment in DCR as a step into the open space for the future as defined by 4D: transformative praxis. In this sense, the crucial implication of the Bhaskarian totality is the idea of ontological openness. In other words, reality as a totality is a differentiated structure that includes its own subsets as "discontinuities, hiatuses, spaces, binds, barriers, boundaries and blocks between totalities" (Bhaskar, 2008b, p. 126). Therefore, the Bhaskarian totality is linked to the idea that ontological reality is open; it includes being "paced" with its own fissures and mediation.

What is the consequence, then, of the de-totalization of reality? Following Bhaskar (1994), we see that there are two implications of the failure to thematize the openness of 3L. Hegel's attitudes of (1) the Unhappy Conscious of X (split within the element X itself) and (2) the Beautiful Soul (alienation) provide the best examples of such consequences. We can imagine that this is the level where we encounter the effects of the other two levels. For example, the acceptance of constrains, authority, ills, fate, and acts or God, is what Bhaskar (2008b, p. 28) calls

the "uncomprehensive necessity", and is homologous to the failure to conceptualize natural necessity at the 1M level of ontology. An implicit ontology yields the Beautiful-Soul effect of alienation. A second consequence of de-totalization is (2) the elimination of absence that creates theory-practices splitting inconsistencies. This positivization of reality yields the Unhappy-Conscious effect of theory split within our practice. According to Bhaskar (2004, p. 189), Hegel wants to overcome these two attitudes, i.e., alienation without a theory-practice split with this "immanent teleology", but fails to do so because by doing so, Hegel closes this 3L level of totality with his endism. I have only provided two attitudes or effects of de-totalization; however, Bhaskar (1994) provides us with other effects such as Descartes' stoicism: a reification of knowledge as absolute certainly, and various types of fetishisms.

7.6   4D: agency or transformative praxis

The chief characterization of 4D: agency is transformative praxis, which is essential in the social world, but also it is essential in the process of producing a negentropic outcome. To put it simply, DCR reclaims agency form the slumbers of disempowerment and sometimes-fictional role under which irrealist philosophy locates it. At a philosophical level, we see that the dualism between realism and irrealism grounds the dichotomy between agency and embodiment. While irrealism is the doctrine that denies the existence and action of real entities in the world, realism asserts it, and CR posits its inexorable nature independently of our knowledge. From an irrealist viewpoint, reasons that are acted upon are embodied in some grand idea (e.g., a potential good, salvation, or change for others, informed choice, necessity to eradicate some ill), so that the agent acts on behalf of reasons that are "out-there" in the world of "grand" ideas or non-real entities. In particular, we see that at the moment of action, the agent is not subjectively or objectively responsible for it, as her reason is disembodied from its irrealist cause. Two classic examples from naïve Marxism and religion can be provided here. First, when Marxists sustain the explanatory theory of identifying a true interest in the working class, so that the idea of the proletarians as the social class of emancipation provides the idea for a revolutionary movement, it is not too divorced from the sanctification that attaches the predicate "in God's name" after every intended action. This disembodiment is the cause of many fallacies in philosophical thought: anthropism, monovalence, actual-

ism, moral irrealism, deagentification, existentialism, etc. In this manner, irrealist philosophy is unable to sustain the basic CR notion that reasons (which are acted on) are causes. In contrast, DCR sees reasons in terms of a totality that emerge from its causes and form the causal powers of mind (as conceived by Synchronic Emergence Powers Materialism [SEPM]), that depend on the negative presence of the past, and are contingent on the future. On the grounds of self-authority alone, DCR constellational encloses moral and ethical stances. In other words, we find that at first instance, knowledge and being are related in a dualistic way; but form a DCR vantage point, we come to see that knowledge as itself part of being. In this manner, we can see way the concept of being constellationality contains knowledge as part of itself, so that when an agent acts under a self-authority doctrine, then if this personal-authority position is not serious it implies that she is not ethical. We may recall from 3L that Norrie (2010), for instance, illustrates ethics by arguing that the relationship between ethics and history that can be seen in terms of an open totality by the way in which ethics is partly constellationally contained within our history.

Now, we can think of 4D: transformative praxis, as the transformation of transformative praxis, which is the point of introducing Bhaskar's (2008) dialectic of freedom:

> the desire to be desired and this involves the desire to be recognized, again through the logic of dialectical universalizing insofar as this involves the capacity to enjoy rights and liberties, [it] entails the real enjoyment of equal and universally reciprocally recognized rights and liberties, including the right to de-alienation and the enjoyment of health, education, access to resources and liberties.

Now, 4D: transformative praxis entails that emancipation must be grounded on self-authority; hence it needs to be self-emancipation such that we cannot emancipate a group of workers under the flag of a revolutionary working class. People themselves are self-revolutions, i.e., each individual has to create the condition as an emancipatory agent.

Although Hegel serves as an inspiration for the Bhaskarian dialectic, it is through the critique of Hegel and Marx that DCR is different and original in its own right. Norrie (2010) rightly points out that whereas DCR is composed of the already mentioned four levels, the Hegelian dialectic consists of only three levels: (1) the

first level of identity, i.e., the tautologically true thing or concept, a thing X is such a thing itself because it is called that X; (2) the second level of negativity, i.e., the process by which the conflicting states cancel out in an interpretative understanding or *Aufheburg*; and (3) the triad level of closed totality, i.e., the structure where truth is seen to lie in the whole in the all-encompassing constellation through reason.

I want to further elaborate on the distinction that shows how the Bhaskarian dialectic (DCR) is differentiated in all three levels from the Hegelian dialectic. In DCR, 1M means non-identity, whereas for Hegel, the first level is identity. Although Hegel and Bhaskar (2008b) both have the concept of negativity, what Hegel is lacking is real determinate absence. Hegel conceptualizes negativity as nothingness, which automatically cancels out. This cancellation of the negative is what made Marx (and others) believe that Hegel was an apologist, since Hegel aimed to produce an immediately good outcome in philosophy. In contrast, Marx conceptualized the negative space, as containing contradictions, that has not been resolved by Hegel's philosophy. In DCR, the third level is an open totality, whereas the Hegelian totality is closed. The last level in DCR is 4D, a level that denotes the importance of transformative praxis to change the world, which in Hegel's dialectic is simply absent. This level is needed in order to avoid the Hegelian closeness, which is the realization of the theory-practice unit in theory, as a return to open totality in order to "achieve the unit of theory and practice in practice" (Bhaskar, 2008b, p. 5). In this manner, we have seen a "dialecticization" of basic critical CR that is provided by the Bhaskarian dialectic in the MELD schema. Simultaneously, this Bhaskarian dialectic provides us with new philosophical grounds by which to re-read or re-interpret the philosophical roots in which the activity-theoretical approach is rooted.

7.6.1 4D: learning as product-in-process

At 4D: learning as product-in-process, CRAT investigates learning as transformative praxis including emancipatory praxis: whenever we perceive a real change in the world, for example, we can make a parallel of this event at this 4D-level of the dialectic of emancipation. In particular, we can relate it to the individual level of a student's understanding, which inevitably requires engagement as practice, which is already an intrinsic spark of freedom. To further elucidate this idea, let us recall that various protest movements in Tunisia were sparked with self-immolations,

for instance, by a man who set himself on fire (and later died in consequence) because police prevented him from selling his produce without a permit. In the same manner, learning always involves an action of some form to another as there is no learning without action, a point already articulated in the second generation of AT with the dictum: "There is no such thing as activity without a motive" (Leont'ev, 1981, p. 408). Another way to state this idea is to say that we have not learned until we have changed in some particular way, which is when knowledge is part of ourselves, what Bhaskar (2002b, p. 115) terms as an "in-building" of knowledge, e.g., when knowledge "becomes part of our inner most being" (p. 115). Then our inner being changes by applying knowledge, i.e., the employment of knowledge to make or create objects that we are trying to learn from is, what Bhaskar terms, the stage of "making" (or creating) because it involves our agency or "transformative praxis [poesis] or production, i.e., objectification... (creative work) [at, in and on the physical world]" (ibid., p. 112). In other words, dialectical sublation is expanding and explaining the form of what happens in a transformation. It is expanding the content of what happens between the social structure and agency, in Transformational Model of Social Activity (TMSA), which is precisely the explicated version of what Engeström had identified as the point of commonality between third-generation AT and Bhaskarian CR.

At this point, we are able to articulate the main problem with AT in terms of its conception of learning. As AT has an implicit ontology that is crucial for this investigation, it cannot explicitly locate learning as a self-emancipation pulse that is an intrinsic part of the individual; rather it posits learning as a potentiality of actions of a group of people that can be "collectively generated as a solution to the double bind potentially embedded in the everyday actions" (Engeström, 1987, p. 174, emphasis added). Once again, the key problem is that learning is displaced to a type of superstructure position, i.e., learning is not fully articulated as a self-emancipating pulse that is enfolded in the individual, but we only see it as an effect, a symptom, of a manifestation of an invisible structure that generates it. Thus, there is a need for a superior theory of reality; against deagentification, CR re-vindicates ontology and with it, agency, as self-emancipatory potentiality, thereby assimilating AT into the dialectic, the logic of emancipation.

7.7 The structure of the Bhaskarian Hegel-Marxian critique

I now turn to show how DCR can provide a superior account of the historical development of concepts that are very important for the activity-theoretical approach by giving an in-depth critique of Hegel and Marx, from which the philosophical roots of AT come. In particular, CR offers a critique of Hegel and a critique of elements in Marx. The following Table 7.4, p. 246 aims to illustrate the distinction between an Engeströmian and Bhaskarian interpretation of these two classics and the notions of contradiction and learning.

Table 7.4: Engeströmian versus Bhaskarian interpretations

Interpretation	Engeström	Bhaskar
Hegel	The first philosopher to inquire into the nature of knowledge under a societal influence.	The U-D-R logic and the critique of (1) realized idealism, (2) spiritual monism, and (3) immanent teleology (or endism) and therefore they can be related back to ontological monovalence, the idea of reality without the negative (or absence)

Table 7.4 – *Continued from previous page*

Interpretation	Engeström	Bhaskar
Marx	(1) The Hegelian notion of self-creation as labor that is a revolutionary practice, i.e., "[the] coincidence of the changing of circumstances and of human activity can be conceived and rationally understood only as *revolutionising practice.*" (Marx, 1888/1972c, p. 144) It is used in order to overcome the dualism between idealism and mechanical materialism (2) Dialectical concept of commodity as a "contradictory unit of use-value and exchange-value" (Engeström & Miettinen 1999, p. 5)	The critique of (1) principle of identity, (2) logical mysticism, and (3) subject-predicate inversions. Now, each of these instances (1)–(3) can be related back to fallacies in the Western-philosophical traditions: (1) the principle of identity relates to the epistemic fallacy, (2) logical mysticism relates to actualism (or what Bhaskar calls the Plato-Aristotle fault-line), and (3) subject-predicate inversions also stem from the principle of identity, but looking at Hegel's U-D-R logic, (3) refers to endism, the idea that we have arrived at the end of history. The critique of subject-predicate inversion and immanent teleology
Contradiction	(1) Ubiquitous sources that drive transformation. (2) Four types of contradictions.	(1) Hegelian and Marxian contradictions, (2) Dialectical and logical contradictions
Conceptualization of learning	Epistemology: a theory of methods of intervention (but not restricted to them). Learning as the possibility of expansive transformation	Ontology: in DCR there is a deepening of the theory of reality already developed in basic CR. A dialectical conception of learning as dialectical sublation

Adopted from Bhaskar (2008b, p. 127).

AT takes its starting point in the philosophy of Kant, and specially Hegel and Marx, without providing a critique of the problematic elements of these two classics of dialectical philosophy. A simple look at reality demonstrates that there were problems in practice that Hegel did not manage to carry out in his program, and the purges of Stalinism can be taken as evidence that there was incompleteness and other problematic elements in Marxist theory as well. Thus, we cannot take these classics as points of departure in the articulation of theory without being critical about them in the first place. This is the point of entrance of the Bhaskarian Hegel-Marxian critique. According to Bhaskar (2008b, p. 92), Marx believed that there was, in the dialectic of Hegel, a "rational kernel", which suffered mystifications under the Hegelian system; however, Bhaskar stresses that Marx did not get around to articulating what this rational kernel was, and this is *inter alia* what DCR claims to be able to do.

In order to provide an adequate account of the philosophical roots of AT, using the Bhaskarian dialectic, it is crucial in terms of three stages. First, it is important to understand the dialectic of Hegel, and what is incorrect with the Hegelian dialectic by using the more appropriate concepts developed by DCR by means of the Bhaskarian critique on Hegel (in section 7.7.1, p. 248). Then it is also important to show what is incorrect or otherwise inadequate with Marx by means of the Bhaskarian critique of Marx (section 7.7.5, p. 261).

7.7.1 Bhaskar on Hegelian dialectics

The activity-theoretical community does not explicitly elaborate on a critique of Hegelian dialectics; rather, Engeström and Miettinen (1999) assert that Hegel is the first philosopher to inquire into the nature of knowledge under a societal influence, as a topic that links Hegel and the Vygotskian thesis.

> Hegel was the first philosopher to draw attention to the role of material, productive activity and the instruments of labor in the development of knowledge. He clearly enunciated the theory that individual conscious-ness is formed under the influence of knowledge accumulated by society and objectified in the world of things created by humanity. (Engeström, 1987, The triangles of human activity, para. 4).

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In contrast, DCR provides the first schema of the Hegelian logic along with its critique. In the Bhaskarian interpretation, there are two senses of the dialectic in Hegel. As identified by Bhaskar (1994, p. 15), the first inflection is the idea of dialectic as "the logical process of reason" and the second inflection is the method or motor of this logical process that is the dialectic. The first inflection is itself constituted by two main strands: (A) the Eleatic strand, which is the dialectic as reason; and (B) the Ionian strand, which is the dialectic of process.

(A) The Eleatic strand Bhaskar (2008b) traces back the dialectic as reason (Eleatic idea) to its Greek origins. This idea derives from the Greek word, dialectikê, which is roughly translated as the art of discussion or conversation by means of "reasoning by splitting into two" (Bhaskar, 2008b, p. 15). According to Bhaskar (2008b, p. 50), this Eleatic idea of the dialectic as reason results in Hegel in what Bhaskar terms as "realized idealism", or the Hegelian identity between thinking and totality.

(B) The Ionian strand The dialectic as process (the Ionian idea) typically takes a double ascending-descending movement: (1) the ascending dialectic refers to the existence of higher forms of reality. According to Bhaskar (2008b, p. 46), the ascending dialectic takes the form of "spiritual constellational monism" in Hegel. And (2) the descending dialectic refers to the manifestation of those higher forms in terms of phenomena in reality, which as Bhaskar says, results in "immanent teleology". The combination of the ascending-descending unit forms the Hegelian dialectic:

> a logical process or dialectic which actualizes itself by alienating or becoming something other than itself, and which restores its self-unity by recognizing this alienation as nothing other than its true expression and manifestation. (Bhaskar, 2004, p. 116).

In order to better understand the above account of the Hegelian dialectic, Bhaskar (2008b) identifies characteristics as auto-generated, auto-differentiating, and also auto-actualizing.

Auto-generating The Hegelian dialectic as a process is capable of restoring or actualizing itself from alienating states (e.g., problem, conflict, contradiction, deadlock, split, etc.) by a unification of opposites.

Auto-differentiating The Hegelian dialectic involves the recognition of the alien-
ation, the absence (e.g., contradiction) state, as its own free state of manifes-
tation and expression—e.g., resolution, transcendence, enlightenment, critique
of beliefs.

Auto-actualizing The Hegelian dialectic as the particular state(s) that is already
inscribed into the unity or whole that makes the dialectic completed in itself
as a system.

Once again, the Hegelian dialectic combines reason (Eleatic idea) and process
(Ionian idea) as part of the first of two main inflections, which we will be returning
to. In addition, I want to highlight these three key terms: realized idealism, spiritual
constellational monism, and immanent teleology, because they represent recurrent
terms by which I organize the rest of this section. For now, I want to concentrate on
the second inflection, the motor of this logical process of reason that is the dialectic.

Bhaskar (2004) illustrates the Hegelian dialectic as the second movement in the
U-D-R schema (see Figure 7.3, p. 251).

ρ-transform In the first instance, we need to move to the point where we observe
contradiction, as denoted by ρ in the diagram. In other words, it requires
work in practice to get to the level of analytical thought or understanding.
This move is what Bhaskar calls pre-philosophical or pre-reflexive thought
(PRT) to understanding, using Hegel's term.

U (understanding) It is our basic analytic thought that conforms to the principle
of non-contradiction in which meanings remain stable and truth-values do not
change. However, we do not notice the contradictions in our understanding.

For instance, if our understanding about a particular domain of reality excludes
something, then we get contradictions. The dialectic brings out the contradictions
that signal the fact that our universe of discourse needs to be expanded, so that we
have to introduce what has been ignored.

In the field of education, the dialectic is particularly important because if we
are concerned with the idea of inclusive education we need to consider those sectors
that have been excluded. This example is meant to illustrate one of the ways in
which we use the insights of the dialectic without acknowledging it in educational
practice today.

To return to the U-D-R schema:

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Adapted from Bhaskar (1994, p. 119).

σ-transform It refers to the move needed to recognize contradictions, inadequacies, or anomalies in our understanding of concepts and-or practices. Metaphorically, we can imagine that a "quantum leap" is needed in order to bring out such inconsistencies.

D (dialectic) As defined earlier, is the second level in which we have the experience of a real determinate negation: the experience of absence as the experience of some product that is being left out that drives the need to remove it (Bhaskar, 2008b).

τ-transform It refers to a second move needed to rectify the already identified inconsistencies. A second "quantum leap" that we need to take in order to resolve such contradictions.

R (reason) What Hegel calls reason is what, in DCR terms, is meant for the building of a more comprehensive totality, which aims to incorporate what is left out. After we incorporate what has been omitted, then we can restore consistency to the system. In addition, Bhaskar (2008b) talks of a further possible move that depends on wisdom, what he terms as a post-philosophical wisdom (PPW). This move depends on our values, such as the idea of a social project, etc.

Before seeing Bhaskar's (2004) critique of the Hegelian dialectic, it is important to understand what it means to think dialectically. Marx had already identified the essence of the Hegelian dialectic, with the motor of scientific progress (Bhaskar, 2008b). The problem with Hegel, according to Marx, is that he covers it in a mystical shell.

> The mystification which dialectic suffers in Hegel's hands, by no means prevents him from being the first to present its general form of working in a comprehensive and conscious manner. With him it is standing on its head. It must be turned right side up again, if you would discover the rational kernel within the mystical shell. (Marx, 1887/1992, p. 15).

To paraphrase, Marx is saying that Hegel identified the rational kernel in scientific progress, but after doing so, Hegel proceeds to cloud it within this mysterious shell.

I want to refer to examples in order to understand the proper essence of the dialectic. Let us consider any scientific theory about the world. Typically, natural

or social theories tend to leave something out of their conceptualization of reality. Nevertheless, many of these theories are successful for long periods of time because they manage to capture essential features in the domains of social or natural phenomena. However, we see that in our history of science there are false attempts as well as development. This logic of development can be explained in dialectical terms.

Thus, we see that at any time in the history of science there is a moment of normal science, in Kuhnian terms. In short, normal science is a process by which a novice scientist is tested to see if she is able to obtain the right results. Anyone working in a scientific lab can be seen as a contemporary example of what this process is about. The problem arises when anomalies, which are always present, start to accumulate, thus becoming contradictions. It is a fact that these contradictions accumulate; we can even call contradictions that accumulate other contradictions a powerful contradiction. Some of these powerful contradictions indicate that something has gone wrong in this system, or totality, to use DCR terms.

What this example means dialectically is that when contradictions are accumulating something crucial has been left out. In short, the theory is radically incomplete so that what is being left out generates contradictions. Such absence can produce contradictions, which then act as a signaling device for us to expand the universe of theory or practice so as to restore consistency. Thus, we see that contradiction is a signaling device that tells us that something enormous has been left out, so that what we need to do is to discover the feature of reality that has previously been omitted. In short, the absence is generating contradictions, then contradictions need to be resolved; that is, there is a move to find out what has been left out, so that there are various processes involved

Exemplary cases of the resolution of contradictions in a more inclusive totality are found in the great moments of scientific discovery. In the case of Newton, the theory of gravity explained more features of reality that previous theories had excluded—e.g., a pre-Newtonian way of understanding the fall of an object might have theorized that there is something inherent in the object that was causing it to fall, rather than the understanding that there is something which is exerting a force that pulls the object to the ground. Something similar can be said about Einstein's discovery of the relativity of space and time, and many other great scientific discoveries.

DCR provides us with the idea of dialectic as a powerful means by which to discover "the rational kernel in the mystical shell" (Marx, 1887/1992, p. 15). I refer to Bhaskar's (2008b) reading to show how Marx wanted to explain the meaning of the rational kernel, but this idea was not elucidated during Marx's time. In short, Marx left the idea of the rational kernel as a mystery. The demystification of the Marxian rational kernel is what DCR claims to do, in part. After a scientific discovery is able to restore consistency then we can rebuild a more comprehensive, and again, a more inclusive totality.

The purpose of these examples is, of course, to illustrate the basic form of the dialectic. In short, there is an incompleteness that denotes the presence of an absence, or in CR terms, a real determinate negation that becomes generative. This absence or incompleteness is what causes contradictions, which are proliferating in the system. In order to remedy such (pernicious) incompleteness we need to rectify it; that is, we need to include what has been excluded. The dialectic process is a very simple process. It is a movement that goes from absence to the generation of contradictions; it is followed by the way contradictions necessitate new discovery and a more comprehensive theory, or to put it in DCR terms, a more comprehensive totality, which allows us to restore consistency.

We see the dialectical process at work in the case of natural science by the way scientific discovery aims to restore what has been left out into the theory and then more theoretical work is done to make a new whole consistent. Bhaskar (2008b) argues that an analogous process can be found in the social world. For instance, the struggle for women's right to vote in the decades before World War I can illustrate how there was an absence (e.g., namely the exclusion of women from voting) in the electoral system of major Western countries. The result of the fulfillment of absence resulted in a more inclusive electoral process. We can continue in history to identify more absences, from slavery to colonialism, to the more recent uprisings in Egypt and Libya against dictatorships.

Again, we can see that both in the social and the natural world, there is this same move. The move starts with the realization that there is a problem because the system is incomplete. In other words, absence is generating the incompleteness in the system that we call totality. Such absence may be social, natural, or cognitive. This identification necessitates the rectification of the absence. We are talking about the re-incorporation of what was absence, so that the remedying of the absence is by

the construction of a more comprehensive inclusive totality, which is what dialectic is!

Now, aside from making the logic of Hegelian dialectics accessible to us in terms of the logic as the kernel of emancipation, DCR goes a step further. The next step is to see that the Hegelian system, in terms of the three Bhaskarian terms of realized idealism, spiritual monism, and immanent teleology, also has its limits. Following this interpretation, we can see that Hegel aims to accomplish three main goals throughout his life.

Realized idealism This notion is the idea of the dialectic as reason or the Eleatic strand. In broad terms, realized idealism refers to the limits of human thought, and for Hegel the understanding of reality includes its speculative parts. Hegel aims to see reality in terms of what he calls Absolute Spirit. This idea of the Absolute Spirit is the way to reconcile two conflicting views—e.g., reason and thought, what Bhaskar terms the notion of "constellation identity" (Bhaskar, 2008b, p. 19).

Spiritual monism Contrary to the idea that human beings are always divided (e.g., the division between cognition and will), Hegel aims for an ascending dialectic in a unified division: a "unity-in-diversity, identity-in-difference, harmony-in-conflict," etc., (ibid., p. 117). Spiritual monism is the idea of the dialectic as process or the Ionic strand.

Immanent teleology According to Bhaskar (2008b), Schiller's Letter on the Ascetic Education of Mankind influenced Hegel to want to resolve the conflicting view between a major spiritual world (e.g., in thought) and how this spiritual world descends to exist as part of a minor material word (e.g., of the being). Hegel aspires to avoid the fates of what he calls Beautiful Soul and Unhappy Consciousness. In short, Beautiful Soul and Unhappy Consciousness are archetypal figures in the Hegelian dialectic that function to explain social "attitudes" or ideological concepts. Their purpose is to substantively explain the (implicit) logic in which the individual moves toward a state of reflection in self-consciousness.

First, Unhappy Consciousness refers to the logic of skepticism, in which an individual knows about the inconsistency between theory and practice, but resolves

to take refuge, for instance, in an attitude of submissiveness under the presence of some master. Second, Beautiful Soul refers to the logic of alienation, in which the individual tries to overcome the divide between the self and world by withdrawing from the very society it aims to understand in reflexivity. Hegel begins his philosophical journey wanting to overcome the Beautiful Soul (alienation), but never accomplishes the move beyond the Unhappy Consciousness because, although he is aware of the theory-practice contradictions, he resolves to take refuge in a contradictory-free endist view of reality. This resolution is a compromise and Marx criticized Hegel for it. Hegel's endism can be understood in DCR terms with what Bhaskar calls the TINA syndrome, after the Thatcherian catchphrase "there is no alternative", so that to say that Hegel's contradictory-free history is a symptomatic way to mediate his theory-practice inconsistency is similar to saying that:

> some conceptual or social form is at once both false and necessary... ([it] is a distinguishing feature of dialectical argument), incoherent yet indispensable, (for Hegel, logically) contradictory but dialectically essential is just to say what is a Tina compromise. (Bhaskar, 2008b, p. 113).

To apply a modified Thatcherian catchphrase to rephrase the above, we can say that in Hegel "there is no unresolved contradiction", meaning that all contradictions can be resolved in thought. The idea of TINA is strongest in the way it shows a closure. After we see that Hegel wants to accomplish key objectives, to avoid the destiny of the Beautiful Soul with his philosophical system, denoted by Bhaskar's (2004) U-D-R scheme (see Figure 7.3, p. 251), we can start to discern Bhaskar's (2004) critique of Hegel.

The Bhaskarian critique of the Hegelian philosophical system unfolds from an initial form of immanent critique to an antimonial critique, and to a final omissive critique. In addition, Bhaskar uses three criteria: rationality and seriousness, totality, and clarity, which apply to all forms of critique. In particular, the criteria of rationality and seriousness are mainly related to the immanent critique, which is related to realize idealism, but they also apply more generally as well. The criterion of totality mainly applies to spiritual monism, which is concerned with the omissive critique. The third form of critique is antimonial critique that is mainly targeted to the immanent teleology, which raises questions of clarity. I want to highlight that the omissive critique applies to all these forms of critique and that there are also antinomies in all of them. Moreover, what it is important for us is to understand

that all forms of critique (e.g., immanent, antimonial, and omissive types) and all three criteria (e.g., rationality and seriousness, totality, and clarity) apply to all the key terms (e.g., realized idealism, spiritual monism, and immanent teleology). Therefore, Bhaskar (2004) organizes the Hegelian critique around these notions, as shown in Table 7.5, p. 262.

7.7.2 Critique of realized idealism

The first main problem with the Hegelian dialectical system is realized idealism because it commits the epistemic fallacy: it does not have a concept of ontology apart from epistemology. The criterion of seriousness, the possibility of theory and practice unification, is also employed to produce an immanent critique. According to Bhaskar (2008b), Hegel commits the epistemic fallacy when he reduces the gap of being and knowledge of being to just thought. In other words, Hegel resolves the inconsistency of theory-practice in theory. This means that Hegel does not have a 4D: the moment of transformative praxis. Hegel has the idea of process, but he does not have the idea of process driven by human beings in society, and that is the reason why Bhaskar (2008b, p. 96) calls it this "speculative illusion". In turn, Hegel is not really serious when he aims to resolve contradictions, as he commits the fallacy of speculative illusion that relates to the product of actualism (also referred to as a centrist or expressivist perspective). In contrast, DCR resolves the theory-practice gap in practice (or better said, in 4D: transformative praxis).

7.7.3 Critique of spiritual monism

The second chief error with Hegel's dialectic is spiritual monism, which seeks both the explanations of phenomena that happen in the world and the rectification of contradictions in philosophical thought; that is, in the thought of philosophers such as Hegel. From a DCR view, contradictions need be to resolved in material reality. In particular, spiritual monism lacks the CR idea of stratification in material reality. Thus, we see that the chief error with spiritual monism is really actualism, which reduces it all to a superficial level of the actual by not accounting for depth in reality. Moreover, spiritual monism does not really understand what CR calls SEPM: the idea that, as far as we know, mind is an emergent power of matter (Bhaskar, 1979), and Hegel does not account for this. Thus, spiritual monism is a form of ontological

idealism (also referred to as the triumphalist perspective).

The concept of totality serves here to emphasize the CR commitment to ontology and it is used to produce an antimonial critique. According to Bhaskar (2004, p 124), Hegel fails to produce an "absolute absolute". This double absolute that splits reality into what we can know (or account for) and what we have not discovered yet is Hegel's absolute. In short, what I am referring to here is the lack of the concept of ontology and stratification of reality, or in CR terms, a lack of transfactuality. Moreover, Bhaskar (2008b) shows how Hegel collapses both the intransitive and transitive realms of reality, which determines the possibility of science. Thus, Hegel lacks intransitivity. Bhaskar (2004) also shows that, for Hegel, causal laws are teleological, because the Hegelian dialectic lacks the notion of natural necessity, as he aims to see freedom in fate, at a single actual level of reality that defines the order of his existing life.

## 7.7.4 Critique of immanent teleology

The third key mistake in the Hegelian dialectical system is with immanent teleology. The source of error here is that immanent teleology does not allow for 4D: transformative praxis. The source of the problem in immanent teleology is ontological monovalence: the absence of the concept of absence or real determinate negation itself; such as, the absence of transformation, change, geo-history, and the possibility of a better world. It does not allow us to sustain the TMSA: the idea of a society in which we do not create social structures but we reproduce and more or less transform them (Bhaskar, 1979), which is always a possibility. Also, immanent teleology does not allow for resolutions, which can be discussed under the idea of clarity. This criterion raises questions about the dimension of space and time and it is used in the critique of Hegel to produce an antimonial critique. Bhaskar (2004) highlights that Hegel produces a totality that is closed in the dimensions of space and time.

Allow me to sum up the three errors of the Hegelian system. First, realized idealism commits the epistemic fallacy: it collapses both the transitive and the intransitive dimensions; it fails to sustain CR ontology. The second error is spiritual monism, which involves what Bhaskar (2008b) calls the speculative illusion; it commits the fallacy of actualism: the destratification of material reality and also the failure to sustain SEPM by dislocating mind from matter. Third, immanent

teleology commits the fallacy of ontological monovalence and does not allow us to sustain TMSA by denying transformation, which results in an endist perspective, also denoted with an early Fukuyamaian view of the end of history as we know it.

To illustrate, what Hegel is doing is assuming that contradictions are going to be resolved in a progressive and preservative manner. This progressive manner that preserves existing phenomena is only one model of change. We can differentiate at least two models of change: the dialectical model is negentropy (increase into order) and the model of entropy (decline into confusion, chaos, or disorder). For instance, in the theory of thermodynamics, entropy occurs in physical systems generally, but as we see in biological evolution, entropy does not always occur. In fact, as animals and plants evolve through time, we get the opposite process that corresponds to an increase in order or negentropy. In social science we have dialectical changes (or negentropic changes) throughout human history (e.g., as we have already mentioned in the women's suffrage struggle, colonial independence, etc.). In the social world, there are also examples of entropic change, the process by which contradictions proliferate and whole civilizations collapse (e.g., possible examples are the Mayan civilization, the Dark Ages in Europe, etc.), and even our contemporary civilization is open to the possibility of entropic changes. These two models are not, of course, the only models by which to conceptualize change. For instance, we can have a revolutionary, abrupt change (e.g., consider the recent social uprisings), an evolutionary slowly evolving change (e.g., the biological unfolding of humans or other living organisms through history), an endogenous change from within (e.g., the rate at which an infection spreads in an individual host), an exogenous change generated from external conditions (e.g., the case of language mutations when a local dialect is exposed to external linguistic influences from migrating communities), intentional change as individual consciousness or the awareness of a collaborative group (e.g., if I know smoking causes cancer, then I intentionally decide to quit smoking), or unintended change as a unforeseen result (e.g., in obtaining a doctoral degree, I did not foresee the consequences of reproducing the institutional system of higher education). In fact, we can build a typology of different conceptions of change. Most importantly, there is also transformative change, which does not preserve previously existing phenomena, but radically negates them. On this note, Hegel assumes that all phenomena will be retained. The counter point to Hegel's assumption is scientific revolution, in which the existing beliefs are falsified.

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In this manner, once we do not make all change conform to the Hegelian schema where dialectical totality (dt) is seen as a dialectical process (dp), which is itself seen as dialectical reason (dr), then we have a variety of different models of change. For instance, I have already discussed the models of negentropy and entropy. In particular, I resort to Bhaskar's (1994) genealogy of the notion of dialectic as shown in Figure 7.4, p. 260, as an exemplary model of change that encompasses the main ideas that I have already discussed.

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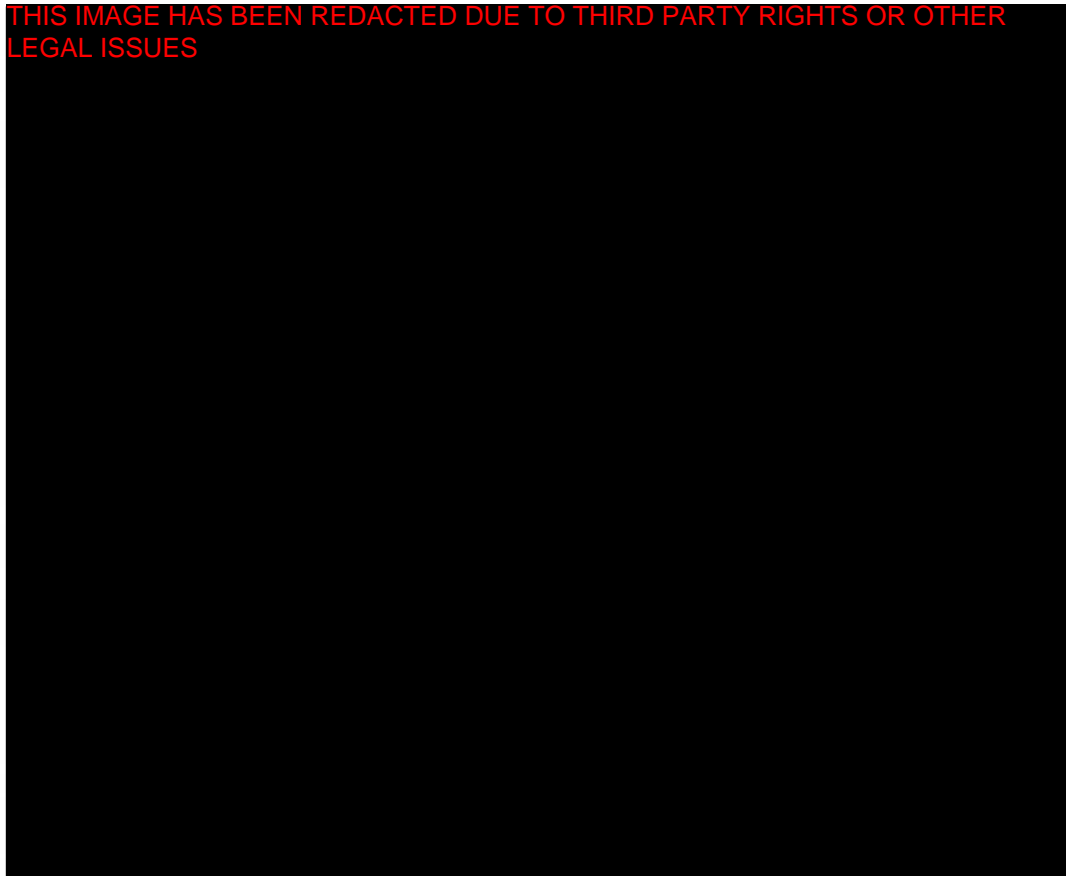
Adapted from Bhaskar (1994, p. 136).

Therefore, we have seen that the Hegelian schema (dt=dp=dr) is incomplete because the notion of determinate negativity, which is the motor of the system, is absent from it. Hegel's dialectic is shown to be a subset of a larger CR dialectical system: $dr^0 \geq dr^+ \geq dr' \geq dr'' \geq dr'''$ (Bhaskar, 2008, p. 28), where I paraphrase each of the terms as follows:

$\mathbf{dr^0}$ Processes are not deterministic, but occur in geo-history.

dr$^+$ It involves the resolution of contradiction (theory and practice inconsistency).

dr$'$ It involves the rational outcomes or resolution of some contradiction. This level conforms to the Hegelian "determinate negation".

dr$''$ It involves the possibility of a recondition between theory and practice.

dr$'''$ It opens up the constellation to the possibility of freedom. This possibility encourages, in practice, the possibility of an emancipatory society.

Metaphorically, we can think of the Hegelian system as a complete constellation because concepts are related to the elements that make up a system as complete. For Bhaskar (2008b), this dialectical system is "constellationally closed" (p. 24). This closed system does not mean that Hegel saw the end of the world in the future of a process of geo-history, but that, as we have seen, Hegel loses transfactuality and intransitivity, he commits the epistemic fallacy, and lacks 4D as transformative praxis.

I can now turn to Marx, who isolates the main ideas of Hegel in what he called the rational kernel in the Hegelian dialectic, the process whereby incompleteness generates contradictions. And these contradictions are resolved by incorporation of what is left out into a more comprehensive inclusive totality, as I explain in what follows. From a DCR perspective, we see that although Marx stated in the introduction to *Capital* to have uncovered the rational kernel from its mystical cover, he never actually develops it. In particular, the Bhaskarian DCR claims to articulate what Marxian meant by the rational kernel in Hegelian dialectics, the logic of emancipation. Now, I continue with the Bhaskarian critique of some elements in Marx.

7.7.5 Bhaskar on the Marxian critique of Hegelian dialectics and Marxian dialectics

Although AT takes much of its terminology from Marx's *Grundrisse* (1984/1973) and argues that Marx is the "first philosopher to explicate pointedly the theoretical and methodological core of the concept of activity" (Engeström & Miettinen, 1999, p. 3), it does not provide a formal critique. However, the Engeströmian interpretation of Marxian dialectics reveals, although not fully articulated, two types of dilemmas. First, AT agrees with the epistemological materialist reading of the

Hegelian notion of self-creation as labor in Marxian terms of emancipatory practice. Ironically, the activity-theoretical interpretation of the Hegelian—Marxian reading of self-creation also reveals its main problem because being (ontology) is fused with its methods (epistemology), or as they put it: human "nature is not found within the human individual but in the movement between the inside and outside, in the worlds, of artefacts and artefact creation" (ibid., p. 5). Second, AT is aware of the deterministic, and often endist readings of the Marxian notion of labor under capitalism, and argues that the creative potential of labor remains an undeveloped theme, as follows.

> Marx developed the idea of alienated labor [or the] idea of total submission of concrete work to abstract work and production of surplus value of the creation and uses of technologies, makes much of his analysis of the effects of labor on humans a somewhat abstract and exaggerated history of ever-increasing misery and exploitation. That is also way the creative and dynamic potential of work process and technologies remains under developed in his work. (op. cit., p. 5).

On topics (1) epistemological materialist and (2) endism, DCR argues that although Marx did not conceive the dialectic with what Bhaskar (1994) organizes as a formal critique, the intuition was there in the essence of his method, which was a basically realist one. Now from this realist intuition, I want to focus on what Marx identified as being erroneous with Hegel by following a Bhaskarian interpretation. There are three main criticisms that Marx made about Hegel, according to Bhaskar. These criticisms fall under the theme of the Bhaskarian formal critique: (1) the principle of identity, (2) logical mysticism, and (3) inversions (Bhaskar, 1994, pp. 125–126) and are organized in the Table 7.5, p. 262.

Table 7.5: The Marxian critique of Hegel as schematized by Bhaskar

Hegelian principle	(1) realized idealism	(2) spiritual monism	(3) preservative sublation (immanent teleology)
Formal critique	(1) principle of identity	(2) logical mysticism	(3) subject-predicate inversions

Form of materialism	(1) epistemological	(2) ontological	(3) practical
Philosophical critique	(1) centrism- expressivism	(2) triumphalism	(3) endism
DCR organization	(1) critique of epistemic fallacy	(2) critique of speculative illusion	(3) critique of ontological monovalence
Substantive critique	(1) lack of autonomy of nature	(2) cognitivism	(3) lack of geo-historicity

Adapted from Bhaskar (1994, p. 126).

To reiterate, Marx did not articulate the explanation of the forms of materialism with the specific Bhaskarian terminology: (1) epistemological, (2) ontological, and (3) practical ones. Rather, these types are developed by Bhaskar (1994) as a heuristic attempt to bring out the rationale in Marx (as what Marx would have articulated if he had had the time to develop his philosophy during his lifetime). We can begin with the first type of materialism by recalling basic CR. In this sense, (1) epistemological materialism is basically transcendental realism. Hence, "the main point here is the existential intransitivity and transfactual efficacy (relative or absolute) of the objects of scientific thought" (Bhaskar, 2009, p. 130). In other words, it asserts that there is a world out-there that is differentiated and structured. It follows that (2) ontological materialism is about mind and thought being grounded on the material being. At this level we have the three criteria for emergence (see Table 5.4, p. 131) of unilateral dependence, i.e., the social is unilateral (dependent on the biological, and thus the physical), taxonomical irreducibility, i.e., it is consistent with Synchronic Emergence Powers Materialism or SEMP, and causal irreducibility of the social sciences to include the natural sciences, which asserts that although mind is grounded on material being, it can be reduced to it, so that we see that "mental states are real, i.e., irreducible causally efficacious" (Bhaskar, 2009, p. 152). In addition, (3) practical materialism is the TMSA.

For instance, we can consider Marx's own refection on history:

> Men make their own history, but they do not make it just as they please; they do not make it under circumstances chosen by themselves, but under circumstances directly found, given and transmitted from the past. The

tradition of all the dead generations weighs like a nightmare on the brain of the living. (Marx, 1852/1972b, p. 595).

What Marx is referring to is, in fact, the unintentional, unilateral conditions that people do not create in the present, but which are always given by the past. Marx's visual metaphor presents the idea that the past conditions have a prior weight on present circumstances and which in basic CR is denoted with the TMSA that highlights the social conditions that pre-existed the individual. Thus, this unilateral condition of materialism is what Bhaskar calls "the meta-sociological basis of Marx's materialism" (p. 153), which takes the form of a type of materialism, which does not appear in the above Table 7.5, p. 262, but one which is important to illustrate. I am referring to the substantive research program of (4) geo-historical materialism, which is the four-planar social being (Figure 4.4, p. 107). This materialism is centered on the key notion of the causal primacy of the mode of labor (re)production of human beings in both natural (physical) states, and in the development as human-species beings. After illustrating the four types of materialism, I continue following the Bhaskarian interpretation of the concepts that make up Marx's formal critique of Hegel in the (1) principle of identity, (2) logical mysticism, and (3) triple inversions (Bhaskar, 1994, p. 125).

(1) **Critique of the principle of identity** The first is, in Bhaskar's (2008b) terms, the principle of identity: this notion is a code for the epistemic fallacy that we have already seen in RTS. In this manner, once we make this connection, it becomes very easy for us to understand it. To recall, the epistemic fallacy means that knowledge and being are the same, which is wrong.

(2) **Critique of logical mysticism** The second error that Marx identifies in Hegel is what Bhaskar (2008b) denotes as logical mysticism. Bhaskar explains this Marxian critique on Hegel with the notion of speculative-positivist illusion, which is the idea that thought and philosophy operate free of social and material determinations, as if these notions exist in a thought realm in itself. However, let us resort to Bhaskar's PN (1979); in particular, we can resort to the concept of SEPM, which allows us to understand that thought is the product of mind, and also the understanding of mind as an emergent power of matter that is grounded on material conditions in a broad sense (e.g., social and biological determination) that act as constraints on our thought. Throughout human

history, people have had different thoughts and a field of the social sciences is dedicated to studying how these are related to different material conditions, such as forms of economic production, political systems, and methods of reproduction. Moreover, the second Hegelian error (speculative-positivist illusion) is connected to actualism. From Bhaskar's (2008) RTS, we can recall that actualism is the reductionist view of reality to a single level in the destratification that occurs in traditional philosophy.

(3) Critique of subject-predicate inversions According to Marx, the third key error of Hegel is what Bhaskar (2008b) refers to as subject-predicate inversions, which is the code for ontological monovalence. To reiterate, this ontological monovalence is the continued restoration of positivity that involves living without absence, incompleteness, or contradictions. Ontological monovalence tries to immediately resolve the contradiction by, sort of say, slighting them to the side. A source of ontological monovalence is in not understanding Bhaskar's (1979) TMSA, in which human beings always take the conditions of society, to reproduce or transform society itself.

We see that there are three great errors that Marx pointed out about Hegel, using the terms provided by Bhaskar (2008b): the epistemic fallacy, actualism, and ontological monovalence. As noted by Norrie (2010), Bhaskar (2008b) endorses Marx's critique of Hegel, but does not stop there.

In addition, I want to focus on what Bhaskar identifies as being erroneous with Marx by following the interpretation set out in Table 7.4, p. 246. Bhaskar goes on to make some criticisms on Marx for not carrying through his insights sufficiently, as we see in the three ideas: centrism, triumphalism, and also endism. The main idea, according to Bhaskar, is that in Marx there was an underdevelopment of scientific realism, and there was also an underdevelopment of the critique of empiricism as Marx was concentrating on rationalism and idealism. In short, the various types of underdevelopments in the Marxian thesis left the project unfinished as he was concentrating on the transitive dimension, i.e., the process of science, from which Marx viewed science as labor.

7.8 Bhaskar on contradiction

Although the concept of contradiction may be employed as a metaphor to describe some constraint, dissonance, deadlock, or impasse in the physical world, it has a very specific definition with respect to goal-oriented human actions. Whereas in AT we find four types of contradictions, as summarized with Figure 4.2, p. 88, in DCR the notion of contradiction in broader terms denotes, more generally, a constraint or a bind, in a situation that may typically involve opposing parties. The satisfaction of this constraint may occur at the expense of involved parties.

More specifically, Bhaskar (2008b) isolates the role that the concept of contradiction plays in the Hegelian dialectic. To do this, he contrasts both Hegel and Marx in order to differentiate the boundaries and to show the intercepting places between both logical and dialectical contradiction. We are reminded that there are various dialectics, and not all need to depend on contradiction and they may or may not adhere to logical norms. To begin, I show the differentiation between internal and external contradiction.

7.8.1 Internal and external contradictions

AT and DCR agree on the notion of internal (or built-in) contradictions; however, DCR introduces a more rigorous account of them. The concept of contradiction, in general terms, deals with a well-known dilemma in everyday life. Consider the case when we are in front of a crossroads where we need to take one of two roads ahead. The paradox that I want to illustrate is that it is not possible for us to follow two paths simultaneously. In other words, we are confronted with a situation in which we experience an auto-constraint because it is not possible to have it both ways, and in this sense we have a situation of a double-bind, a contradiction in general terms. We can also illustrate such a situation with the catchphrase of Catch-22, after the novel of the same name, to show the dynamics of such paradoxical logic.

According to Bhaskar (2008b, p. 56) an internal contradiction is "a double-bind or self-constraint (which may be multiplied to form a knot)" . In general terms where S: system, structure, or agent, internal contradiction occurs when S is "blocked" from functioning according to R: a rule, system, or principle, because it might be functioning according to some other rule or principle, say R'. To solve this blockage, the system S might take an action, T', that is meant to undermine or override the

original T. The generation of this opposite allows S by means of T' to override or undermine T, or R' overrides R.

> In this case a system, agent, or structure, A is *blocked* from performing with a rule of principle, R, because it is performing with another R'; or a course of action T, generates a countervailing, inhibiting, undermining, overriding, or otherwise opposed course of action T'. R' and T' are radically negating R and T respectively. (Bhaskar, 2008b, p. 56).

In AT we have encountered an equivalent concept of inner-contradiction formulated after the Marxian notion of commodity as the contradictory element in capitalism. Thus, AT makes a homology between the capitalist mode of production and the activity system, and the Marxian commodity and the relations between the components (e.g., subject, object, rules, division of labor, etc.) of the system. However, AT does not develop the notion of internal contradictions beyond this level of homology.

In DCR, the concept of internal contradiction is also differentiated from external contradiction. First, Bhaskar (2008b) points out that external contradictions may be generated by structures that are "internally related". In CR terminology, two structures are internally related (e.g., aRb, a is internally related to b) if there exists a necessary condition for one of the structures (e.g., a) to exist, whether the relation between such structures is symmetrical or not (e.g., the relationship between slave and master).

External contradictions are introduced as follows:

> External contradictions—constraints—would appear to be pervasive— indeed, exemplified by the laws and constraints of nature (such as the speed of light), to be established by the mere fact of determinate spatio-temporal being. (Bhaskar, 2008b, p. 57).

AT has a conception of external contradictions; however, these are not articulated in terms of the Bhaskarian master-slave relation; rather they occur when elements outside of the system—for instance, a new object, instruments, rules, or other subjects— enter into the existing working (activity) system to perturb its "normal" working dynamics. At this point this new element can be re-integrated into the system or rejected. The problem with the activity-theoretical idea of external contradictions is that it is not reflexive, i.e., it assumes that the original activity system has a "normal" way of functioning (which is internally contradictory by definition). Thus,

since the activity system is contradictory in the first place, as evidenced by internal contradictions, it needs to transcend these contradictions; otherwise it is unsustainable.

It is important to note, as Bhaskar (2008b) suggests, that the term contradiction does not imply that every S (structure or agent) is ultimately constrained or that constraints are eternal or needed, but since S is constrained, then the possibility to change can emerge. Then the question arises as to how to change or how to remove constraints, so that the possibility for change arises from contradictions. If change is to be possible in S, then there is a degree of tendency or complicity, which may or may not be related to the identity of S that allows this change to occur. If S lacks this tendency, then we can say it is not prone to change. This understanding between change as having a tendency that allows it to be possible serves to introduce other types of contradictions: the existential, formal logical, and dialectical ones.

Existential It refers to the "finitude" of some S. This condition may be seen as the thing that decays and perishes in the spatio-temporal dimension. Some examples of existential contradictions are the oppositions between mind and body, the problems between power and need, the dichotomy of master and slave, etc.

Formal logical contradiction It is a type of self-constraint, double-bind, or internal contradiction. It is characterized by axiological indeterminacy: "A and ~A" (Bhaskar, 2008b, p. 57). Here, A is a minimal grapheme unit and ~A the negation of A (not A). We can see examples of such axiological indeterminacy in the way S: agents act as free to choose their praxis, intentions, beliefs, etc., but under the normative aspects of social life, these are constraints. In social reality, these types of contradictions depend on both semantics and context. For example, we may assume that "A and ~A" are logically contradictory.

Dialectical and logical contradictions It is another type of self-constraint, double-bind, or internal contradiction. What differentiates dialectical contradictions from logical ones is that there is a connection between their elements (aspects or entities) that form a totality. This connection between such elements is such that elements are "distinct but inseparable" (Bhaskar, 2008b, p. 59), in time or by circumstance. Such connections may have various features:

dialectical connections, including contradictions, may hold between

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> absences and absenting as well as positive instances and processes, and the causal connections and existential dependencies may be transfactual or actual. (ibid., p. 58).

To illustrate contradictions, we think of the double-bind between human beings and the continuous burning of fossil fuels together in the totality of the environment in which we live. The essence of contradictions is that we cannot follow two paths; that is, human beings cannot continue burning fossil fuels and expect to survive as if in an unchanged planet that does not involve human reality, actions, and their impact on their surroundings.

From a DCR perspective, the concept of dialectical contradiction is grounded on reality, in human praxis, not just in human thought. There are material structures and situations, which could be described as contradictory, meaning that in those situations there is double-bind, i.e., two entities or situations cannot go on together. In dialectical contradictions we cannot have a situation in which there are two types of phenomena that occur together that also have a connectedness (dialectically connected). The connectedness means that for these entities to flourish they need the absence of certain environmental conditions.

Now, DCR argues for the vital concept of contradictions for social science to apply it to real things in the world. If we have absences and constraints, then there is no a priori objection to explain the world in contradictory terms. From DCR, we can recall that the critique of ontological monovalence argues that we have absence and negativity in the world ontologically.

Now, logical contradictions and dialectical contradictions are the same if both share the same grounding error (even if we can or cannot identify the grounding error). These two types of contradictions have different boundaries. When we isolate such a boundary, then we are able to describe logical contradictions in terms of dialectical contradictions (which is what, according to Bhaskar's (2008b) interpretation, Hegel aims at, and sometimes achieves).

In this manner, the definition of a dialectical contradiction, according to Bhaskar (2008b, p. 59), is:

> more or less antagonistic, in the sense of expressing or representing or even constituting the opposed interests of (or between agents or collectives; and if antagonistic, they may be partial or latent or rhythmically dislocated, and manifested to a greater or lesser extent in conflict, which

in turn can be covert or overt, transfactual or actual, as well as conducted in a variety of different modes.

The following schema helps us to make out the subtle differentiations that separate dialectical contradictions from pure conflicts. For example, whereas Marx uses the notions of contradiction, antagonism, and conflict interchangeably, in CR terms these concepts may be equal, but more appropriately they are seen sequentially contained in one another, as shown below.

Table 7.6: Sequential containment of dialectical contradictions

Dialectical contradictions $\geq$ antagonisms $\geq$ conflicts $\geq$ overt struggles

Adopted from Bhaskar (2008b, p. 59).

In fact, Bhaskar (2008b) warns us that it is a mistake to consider conflicts as "more" empirical forms of contradictions. While some contradictions appear as a visible conflicting struggle, others do not necessarily surface in practice.

The CR notions of $power_1$ and $power_2$ help to further illustrate the character of dialectical contradictions. CR differentiates between power, which has the capacity for the transformation ($power_1$) of such antagonistic relations, and power that is expressed as dominant or controlling over relations ($power_2$). This differentiation between the sense of $power_1$ (as transformative capacity), which is at a different level than $power_2$ (as in the Foucaultian term used to characterize a relation of oppression), allows us to further understand the antagonistic character of dialectical contradictions, but also to see their interconnected dependence. As an example, Bhaskar (2008b, p. 60) employs Hegelian terminology in what he calls master-slave (-type) relations. In this type of relation one of the terms is always subordinated to the dominant other, but this could also be reversed. Another classical example, this time employing Marxian terminology, is the contradiction between the subordinated proletarian and the dominant capitalist. These examples can help us distinguish the Marxian contradiction from the Hegelian one, as shown below.

7.8.2 Hegelian and Marxian contradictions

The differentiation between logical and dialectical contradiction serves to differentiate between the Hegelian and Marxian dialectics. On the one hand, the Hegelian dialectic is driven by the move of the elements from A and ~A, from a positive identification of contraries to a negative identification, in order to restore identification of the initial elements. For example, Hegel aims to assert, in general terms, the following formula.

Table 7.7: Hegel's formula

A is A
A is (i.e., passes over into) not A (or ~) A
A is B (the determinate result of the transition)
A is after all A

Adopted from Bhaskarm (1994, p. 120).

We see that the Hegelian dialectic involves a continuous movement (e.g., from understanding to speculative reason, (see 7.3, p. 251). In this movement the elements are not dialectical oppositions, but they are contradictory. At the moment of passage, contradictory elements are permitted to exist, but only in a different space and time. This implies that both elements can never be simultaneously dialectical and contradictory. In this Hegelian transition (which effectively moves the coordinates so that elements remain connected) elements are no longer contradictory opposites but dialectical (see Table 7.8, p. 272 below), points 3. and 4.: logical contradiction — transition — dialectical connection — reconciliatory theoretical result).

On the other hand, Bhaskar (2008b) sees the Marxian dialectic as a dynamic and multi-dimensional logic. The Marxian dialectic can be simultaneously contradictory and dialectical. It allows for the ontological split between various opposites such as present and past, appearance and essence, present and absent, etc. Whereas Hegel describes the contradictions of his era by reconciliatory and non-contradictory means, Marx takes those contradictions as the means to explain the world with the meaning of capitalism:

the period of capitalism, when social wealth becomes to an ever-increasing

degree the property of those who are in a position to appropriate continually and ever afresh the unpaid labor of others. (Marx, 1887/1992, p. 408).

To sum up, the distinction between Hegelian dialectics (HD) and Marxian dialectics (MD), Bhaskar (2008b) gives the following Table 7.8, p. 272.

Table 7.8: Hegelian and Marxian contradiction

1. HD: Logical contradiction → dialectical connection → transfigurative re-description [→ analytical reinstatement]
2. MD: Dialectical connection → dialectical contradiction → transformist praxis → practical resolution
It needs to be noted that both MD and HD differ in their order of sequence.
3. HD: Logical contradiction — transition — dialectical connection — reconciliatory theoretical result.
4. MD: Dialectical connection — dialectical contradiction — dialectical praxis — transformative negation — resolutionary practical result.

Adopted from Bhaskar (2008b, pp. 64–65).

According to Bhaskar (2008b), for Hegel, the resolution of a contradiction is always in theory and for Marx it is always in practice. This distinction is not to say that Marx went out to practically intervene in the resolution of conditions, but it was in his theoretical work that Marx highlighted that contradictions need to be resolved in practice. To explain, the resolution of contradictions requires a practical approach, i.e., the resolution needs to be based on practice (e.g., theory is substantively founded on practical actions of writing theory about the real world) and it starts by a transformative negation of the existing ills, contradictions, and absences. From a DCR viewpoint, all practice is "quasi-propositional", meaning that it depends on conceptions and expressions of beliefs, but they do not exhaust it. The important thing to notice here is the relation between theory and practice, which Bhaskar (2008b, p. 66) approaches with what he terms as "the duality of theory and practice". There are various consequences of such duality, which are tied to the already mentioned inner contradictions, the inconsistency between theory and practice.

The reading that Bhaskar (2008b) makes of Marx's explanation of the contradiction and the mode of production of a society is Marx's version of what Bhaskar calls immanent critique, which consists of the identification of contradictions that are immanent to the mode of production as the main source that generates them in capitalism. For instance, a contradiction exists in the twofold characterization of labor, as it is compared to a commodity—e.g., a good or service. Engeströmian AT agrees with such an interpretation, as follows:

> Marx's analysis of capitalism includes invaluable analytical instruments, above all the concept of commodity as a contradictory unity of use value and exchange values. This dialectical concept is crucial for any serious analysis of the contradictory motives of human activity and human psyche in capitalist society. (Engeström & Miettinen, 1999, p. 5)

This contradiction surfaces when we make the distinction between the usefulness of a thing of utility without (monetary) value (e.g., use-value) and the value it obtains when we exchange or sell it (e.g., exchange-value). As denoted by Marx, in terms of "human labour, it follows as a matter of course, that value can only manifest itself in the social relation of commodity to commodity" (Marx, 1887/1992, p. 32). CRAT is also an example of immanent critique because it effectively identifies that AT fails to adequately engage with a critique of empiricism. For example, Marx did an immanent critique of the political economy, which involves the identification of the contradictions, mechanisms, and causal tendencies of capitalist society in his *Capital* (1987/1992). What is important to note is that Marx's relational conception of society, which depends on the idea of the mode of production, already presupposes a hermeneutic stance that opens up that possibility for the union of practice and of theory in practice. Moreover, Marx did not just do an immanent critique, but of course, he also did an explanatory critique, although he did not use those CR terms. In his critique of the political economy, Marx not only explained the destructiveness of social and natural phenomena under capitalism, but he also explained why capitalism brought about many changes all over the world. A critique that is tied to not only identifying contradictions, but also to their source, is what in DCR is termed an explanatory critique, the key to explain the elements that cause contradictions in the first place.

7.9 Conclusion

This chapter introduces DCR, assimilates AT via the Bhaskarian re-vindication of agency, and provides a better account of the historical development of AT through the Bhaskarian Hegel-Marx critique. Thus, we see how DCR provides important terms by which to understand and (re) interpret the extensive work of both Hegel and Marx, while at the same time it provides an original critique in its own right.

What is unique about CR in its basic and dialectical forms, and what AT lacks, is a critique of Humean legacy, which follows in two parts. First, the important aspect to stress is that of the critique of empirical realism, i.e., epistemic fallacy, the implicit ontology of an undifferentiated, unstructured, unchanging world: Hume's theory of causal laws. This implicit ontology prohibited any discussion or explicit ontology but did not get rid of the implicit ontology itself, which AT inherits from Kant through Hume. The second is a distinct and most important critique of the Humean non-transitional path from facts to values. AT accepts the Humean prohibition on transition from facts to values. It is here that activity theorists consciously accept it, although they about it by aiming to overcome the fact-value dichotomy. The theory of the explanatory critique, which started by focusing on facts and values (by finding and explaining the fallacies that departed from Hume), is not the point of departure of AT. In this manner, although AT contains Hegelian and Marxian epistemologically grounded approaches, it remains ontologically implicitly grounded on a division between facts and values, promoted by Hume. In this manner, I have identified, not only isolated, that fact that the root of AT dualisms grounded on an absence of a critique of Humean theory.

The following chapter is a reflection and conclusion of CRAT. This chapter concludes with the understanding of the concept of contradiction, which very important for AT. DCR allow us to articulate it for a number of reasons (which are causes).

- First, it has characteristics of being auto-overriding, performative, and self-deconstructive phenomena.

- Second, it is set against the background of what Bhaskar calls "hermeneutic—hegemonic struggles" (Bhaskar, 2008b, p. 66) over power$_2$ (oppressive) relations. In other words, the agent (or community of agents) may reject (or accept) in their practice, what is then affirmed (or denied) in conceptualizations. For example, in the narrative struggle between "good" and "evil", the

"good side" wants transformative capacity, which is $power_1$ to abolish $power_2$ relations.

- Third, the inconsistencies of theory-practice are accumulative. This accumulation is viewed in a series of phases, in which each phase is brought out by the "blind spot" that preceded other phases. In the case of Hegel, the sequence of pathological blind spots (dc=dr=dt) is constituted by what Bhaskar (2008b, p. 66) terms "the Achilles' Heel critique" of the Hegelian dialectic.

- Fourth, the breaking of the theory-practice unity (what in CR terms is referred to as the axiological necessity: "epistemologically mediated natural necessity that assets itself in practice" [Bhaskar, 2009, p. 843]) generates a "vector" that is the one-dimensional reductionist perspective of ontology (being) to epistemology (knowledge) that in CR terms is known as the epistemic fallacy.

Chapter 8

Reflection and conclusion

Now, HERE, you see, it takes all the running YOU can do, to keep in the same place[1].

8.1 Introduction

Reflexivity entails theory-practice consistency. From a Critical Realist (CR) perspective, a reflective act denotes the "capacity of a philosopher (or of a philosophy) to sustain his or her own content and conditions of production" (Bhaskar, 2002a, p. 54). The development of a Critical Realist Activity Theory (CRAT) necessitates to question reality and the conditions under which transformation is possible, and including the interrogation of one's own conditions of sustainability as part of a "meta-reflexively totalizing situation[2]" (Bhaskar, 2008b, p. 125). The failure to engage with such reflexive act is the failure to conceptualize being that generates splits, and then absurd compromises to sustain a false theory in practice. CRAT is self-reflexive from the moment it actively seeks to identify and resolve dichotomies via a sublation of Activity Theory (AT) by means of the philosophy of CR, and in this manner, it is able to sustain its own practice via ontological realism. The

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[1]Said the Red Queen in Carroll's *Through the looking-glass* (1871, p. 39).

[2]Bhaskar (2008b, p. 125) develops the concept of "meta-reflexively totalizing situation" as a three-part argument: (1) the agent, as a stratified being, is engaged in his or her practice and understands that this engagement depends on questioning reality, i.e., in the need ask ontological questions, to keep re-vindicating the what-does-it-mean struggle, (2) the agent minds the gap; in other words, in the agent's production there is a detachment from the realm of the social (linguistic) transitive and the intransitive realm, (3) agents "can escape the fate of being prisoners of the past", via creation that mobilizes the past and exploits all the resources at their availability.

Bhaskarian notion of reflexivity takes CRAT from an explicit theorization of being via basic CR neatly to avoid ontological monovalence via dialectical CR with its explicit re-vindication of absence. As a consequence of conceptualizing a realist ontology and the understanding of the critical realist categories of reality, CRAT is serious and thus capable of sustaining its own grounds in the Bhaskarian dialectic and argue for it with the passage through from 1M to 4D, as follows: 1M: learning as product (non-identity), 2E: learning as process (negativity), 3L: learning as process-in-product (open totality) and 4D: learning as product-in-process (transformative praxis). Thus, it is fitting for CRAT to end at this precise level, i.e., 5A in the CR philosophy because it is the level of reflexivity.

This chapter recapitulates the overall account of learning as a passage through the Bhaskarian dialectic and it adds a level of reflexivity in terms of what I call 5A: learning as an emancipatory intentionality. This addition means that CRAT thematizes the 5A: learning as emancipatory intentionality via Bhaskar's *Educating the Educators-Or, Empowering Teachers* (2002b, p. 140). Then CRAT employs Bhaskar's five creative cycles of learning as a self-reflexive passage through the dialectic itself with the particular intention to highlight what each level means for education. To include, CRAT identifies what has been left out from this initial engagement with the philosophy of Meta-Reality in terms of two other possible levels for learning. Last, the conclusion provides the summarizing argument of this thesis.

8.2 Reflection 5A: learning as emancipatory intentionality

CRAT, as it has been developed up to now, makes use of the fact that dialectical CR uncovers the Hegelian rational kernel, the idea that the passage through the dialectic is a "**general theory of all learning processes**" (Bhaskar, 2002a, p. 56). The key to its conceptualization is transcendence of absence that generates incompleteness. Thus, the ultimate goal of learning is to transcend such incompleteness, i.e., to reincorporate the element that is left implicit into the totality of learning to move to a greater, more complete totality. This absent element is real and part of the totalization of reality. In this manner, one is then compelled to situate the researcher herself or himself as part of an absent element, which is what self-reflexivity means.

Metaphorically, we can think that the absent element of CRAT is the Bhaskarian 5A-stratum of reflexivity that just like a spark that is capable of initiating a fire. This level is an intrinsic part of the learner, i.e., the researcher herself or himself as learner has an intrinsic capacity to initiate such fire that is the dialectical process of learning.

To illustrate dialectical learning, it is necessary to proceed through the Bhaskarian logic of emancipation from 4D > 3L> 2E and 1M, which requires a reflexive level in order to satisfy what Bhaskar (2002c, p. 100) calls "the five creative cycles of learning", as tabularized with Table 8.1, p. 278.

Table 8.1: CRAT argument: learning as a passage through the dialectic

	Causal-axiological chain	
	5-fold polysemy	Creative learning cycles
1M: **Non-identity**	product	calling
2E: **Negativity**	process	creation (or becoming)
3L: **Open totality**	process-in-product	binding (formation, or elaboration)
4D: Transformative agency	product-in-process	making (or what is transformed)
5A: **Reflexivity**	inwardness	fulfillment of intentionality
	The understanding of our world	
1M	as being	
2E	as a process, of creation of emergence, becoming and transformation, of negating (absenting) and- or presenting;	
3L	as totalizing or shaping or binding into a whole (holistically); and	

Table 8.1 — *Continued from previous page*

4D	as incorporating human agency or making—an agency which is capable of coming to self-consciousness and finding it is capable of coming to self-consciousness and finding itself;
5A	as reflected or fulfilled in the objective physical world of work, and its products, constituted in the space of four-planar social being.

Adopted from Bhaskar (2002c, p. 108).

Before going into the cycle as a self-reflexive passage through the five levels, it is necessary to stress two important points. The first point is that learning, as Bhaskar (2002b) argues, like emancipation cannot be imposed on any individual. The key idea is that education (or emancipation) is not some phenomena that can be forced on people because at the heart of it, we have that individuals, pupils themselves need to learn. In this precise sense, education is about those "Oh, I see it!" moments. It is a spark or calling, to use Bhaskarian terms, from which something completely new and different can emerge in our creation, which requires that, for example, unless the pupil does see it, there is no education. What this "Oh, I see it!" or eureka moment suggests is that education involves a process, which Bhaskar (2002c, p. 99) calls "unfolding" or the bringing out of something that is already "enfolded", i.e., as a possibility of something that is implicit.

Although for Plato, the unfolding aspect of learning is unworldly, for Bhaskar (2002c), it is different. To illustrate such differentiation Bhaskar makes references to Chomsky, who sees that we cannot learn to speak unless (unlike stones) we have the capacity to learn to speak, e.g., our language capacity is an innate potentiality, and Rousseau who states that we are born free, but we encounter many chains. From a CR viewpoint, this enfolded property denotes our potentials as something that we must have ourselves, before any learning can occur. In that sense, Bhaskar refers to 1M-stratum of being as the platonic doctrine of anamnesis which is remembering; it means that all education happens because we bring about its realization, something that is implicit, tacitly there, or enfolded, even if this metaphorical spark is not actualized but remains as a potential. The actualization of learning means that there is a universal assumption of the potential with the individual to bring about change. In terms of learning, it is better to think in terms of bringing out a potential

or actualizing a potential. In this manner, this first cycle of the dialectic is realization that emancipation is not an outside injunction, but self-injunction.

Second, we have a 2E-stratum of becoming, where we can ask how do we learn best? It is better to go in a state of emptiness, not thinking about anything because otherwise what happens is that pre-conceptions get in the way. This level of becoming is an in-between space of our present, a place where a moment of "eureka" or discovery can also occur.

Third, there is a 3L-stratum of a process of in-building knowledge, what Bhaskar (2002c, p.101) calls "formation" (or "binding"), in which knowledge becomes part of the learning by exploring all the potentials of what the learning means. In other words, this stage requires awareness in practice of the knowledge boundaries, its application to new contexts, and so on. For example, we can imagine that this level is similar to learning how to ride a bicycle for the first time. Then there comes a magical point, when learning becomes a Bhaskarian basic act, in the case that we do not have to think about it, we just do it, we no longer need to consciously test the boundaries of our knowledge. This Bhaskarian notion of a basic act is equivalent to the Leont'evian notion of operations (or automatic acts, e.g., tying our shoes, that we can do without thinking about making a plan of how to do these acts, as they are spontaneously done). The hallmark of this phase of learning is that we can transition to do things in the world, we can use our knowledge, we can make things.

Fourth, we have a 4D-stratum of creation. This phase is what Bhaskar (2002c, p. 103) calls making because we are able to produce things in the world; In other words, when we can make things successfully, then we can see our intentionality fulfilled (as 5A). The fulfillment of intentionality is a capacity of what Bhaskar call our ground state.

In Bhaskar's *The Zen of Creativity and the Critique of the Discursive Intellect* (2002c, p. 140) argues that the logic of learning actually goes through five phases or stages, which mirrors of all human action in "the cycles of creativity" with 5A: capacity to fulfill intentionality as absent element in CRAT up to now. Following Bhaskar, we incorporate this level of reflexivity, when we can see our intentionality reflected and objectified in the world in the unity of our theory and practice— our intentionality and result. In a transcendental self-reflexive act that aims to reincorporate the absent element 5A into CRAT in order to move to a greater totality, I now illustrate the passage through the Bhaskarian five creative cycles of

learning.

Following Bhaskar (2002c), 1M denotes a basic urge or the state of calling. At this point we want something to happen. For example, we can imagine the universe before the Big Bang in which everything is ready to happen. Imagine the learner with a mind in a "blank state", but alert there is nothing prior to language or there is no society-preceding agency.

Then, 2E: the stage of creativity[1] or creation occurs as a result of which to all the circumstances of learning all the conditions that, for example, Brown (2009) talks about in his learning environment, as a result you have the "Oh, I see it!"-moment or the moment when the learner finally has grasped whatever she is trying to learn. This is the stage of creativity itself, which applies not just to the learner, but also to the scientific discovery because when we are trying to solve a problem in any kind of discipline, we suddenly (or gradually) experience that there is a moment in which we see "it", the thing that is the breakthrough, in retrospect, brought into light. This moment of eureka is a moment of lucidity that does not come form the boundaries of the past, nor the future, but forms the in-between space of our present

> Nothing new ever comes form thought (or from the past or future), it always comes from un-thought (now), from the space between, behind or beyond thought (in the present). It always comes from a suspension of thinking, or a moment of supramental consciousness erupted into a space in the discursive process of thought. (Bhaskar, 2002c, p. 105)

The problem is that we tend to live our lives, in what Bhaskar terms axiological contradiction, either worrying about a future that we do not know or nostalgic (or under bitter memories) about a past that left us; when in fact, as Bhaskar suggests, it is wiser to live and also to act from the unplanned, uncertainly level of our ground state, and to be open to possibilities and adjustments of change. The 2E level is something extraordinary because such moments of lucidity is a breakthrough that tends to be a very simple flash, and what follows in 3L is that this simple flash needs to set in. What might be difficult to do is to retain such finding, to retain it or "hang on to it", as it were, and to develop it. This instant moment of lucidity needs to be practiced; it needs to become a Bhaskarian basic act. In particular, thought plays an important role here because we have to continuously remember

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[1]The reader is referred to Bhaskar's quote in section 1.1, p. 5.

and produce knowledge that we already have, and thus we are investigating how this new knowledge fits together with pre-existing knowledge.

For example, in section 3.7, p. 62 of this thesis, I show that at this level, some of the ideas of AT would be very relevant here, for example the AT notion of zone of proximal development (ZPD), which is drafted from the thesis of Vygotsky (1978). In terms of education, Engeström (1996, p. 168) argues that what differentiates his expansive learning via ZPD from learning theories is that:

> The expansive learning approach exploits the actual existing conflicts and dissatisfactions among teachers, students, parents and others involved in or affected by school, inviting them to join in a concrete transformation of the current practice... It is built on facing the current contradictions and draws strength from their joint analysis.

To paraphrase the above quote, the AT focuses on ZPD as a dimension or space in which collectives, e.g., relations between individuals, can explore and dwell in to resolve their conflicts, contradictions, and so on, and from a CR perspective we are now able to go a further level to re-vindicate agency in as self-emancipatory learning, and thus sublating the original ZPD thesis via CR.

2E is followed by 3L, the stage of formation or binding. At this 3L-level, we test the boundaries and consciously apply our knowledge to different contexts. At the same time, we are engage in a process of making as a result of this application of what is learned. Sometimes in this process of production we may find our intentionality reflected in the outcome. Although we may see a part of our intentionality expressed in the product, the general characteristic of 3L is that knowledge is not yet part of our being. In other words, we have to consciously try, apply, and test what we know in order to master it. In contrast, the 4D level of making characterizes itself when knowledge is part of our being, i.e., in the process of production there is an unconscious generation of knowledge as spontaneous creation, and in 5A, we have mastered this knowledge that reflects our intentionality. For example, although CR philosophy is not yet a basic act for me, it is still allows me to bind it, to gradually appropriate it (at 3L), to make this argument and have my reflection reflected on it to create this argument (at 4D) and have my intentionality reflected on it (at 5A). Another example of the 3L level is in the case that a student needs to revise for an exam because she or he has not reached a point of immediate access to knowledge, which is a Bhaskarian paradoxical feature of exams. Let us suppose that a teacher

suggests to a student that she should not revise, and to be fresh for an examination, but such student always revises because she needs to practice. Here the teacher might be assuming that the student is at a stage where she does not need to revise (at 4D), which possesses knowledge that can be spontaneously generated under time constraints. What this example is trying to illustrate is that creation, recreation, and discovery are essential to learning, which are united in 4D: making, as our need for the objectification and transformative praxis of our knowledge. From a CR viewpoint, learning should be something very exciting, process of discovery. It is at this point working at the frontiers of discovery. It requires cycles and processes that can be proposed to be very similar to what a student is going through.

In a first reflexive move, CRAT accounts for 5A: the stage of fulfillment of intentionality. This is the level of unification of theory and practice, which is reflective in the learner's intentionality. Thus, it is my intentionality to end CRAT by summarizing some of the most import concepts already covered in this thesis eight key principles of the Bhaskarian philosophy of Meta-Reality, as shown following Table 8.2, p. 283.

Table 8.2: Eight principles of meta-reality for learning

The principle concerning:
(1) **absence** because it is essential to change, particularly elaborated in section 7.4, p. 224
(2) the ontological necessity (and apriority) of **absence to presence**, and of **negative to positive** being, in section 7.4, p. 224 and Appendix B, p. 289
(3) the **dialectic**, in Chapter 7, p. 220
the centrality of **transcendence** of dualisms, in Chapter 5.1, p. 116
(4) the **deepening of ontology** to include being processually, in section 5.2, p. 119, section 6.3, p. 191 and section 7.3, p. 222
(5) the irreducibility of **emergence** with Table 5.4, p. 131
(6) **creativity** in all being, section 1.1, p. 5 and this section
(7) the **critique** of discursive intellect and the subject predicate form, section 6.1, p. 217

Table 8.2 – *Continued from previous page*

The principle concerning:
(8) ontological **bivalence and polyvalence**. (This principle is already implicit with principles (1) and (2), however, Bhaskar (2002c) explicitly puts this level in order to stress that it underpins the previous ones because from principle 1. we know that learning always involves change of perspective, and to understand change we need to have 2. absence as real. Therefore, we must critical of a totally positive account of the world, i.e., ontological monovalence, and we need to have ontological bivalence from the start).

Adopted from Bhaskar (2002c, pp. 124-131).

In a second reflexive move, CRAT acknowledges an element that has been left out from this conceptualization of learning. This element is denoted with two other levels of the Bhaskarian philosophy of Meta-Reality (PMR), i.e., 6R: (re-) enchantment and 7Z/A: non-duality. For this conception of learning 6R is important because it thematizes the notions of value and meaning into an otherwise Kantian-inspired conceptualized reality where these crucial ideas are imposed on it, rather than being part of reality itself. The last level 7Z/A is important for the resolution of conflicts because it thematizes being as involving the priority of identity over difference, unity over split, which is what non-duality means. Thus, the absent element is in fact a new re-starting point to continue with the emancipatory dialectical logic of learning or CRAT as the passage through understanding being, as shown below.

Table 8.3: Transcendental dialectical critical realist

Understanding being as:
(1M) such
(2E) process
(3L) a whole or a totality
(4D) transformative praxis
(5A) reflexivity and inwardness
(6R) re-enchanted, valuable and meaningful in itself
(7Z/A) incorporating the priority of identity over difference, unity over split, and as non-duality

Adopted from Bhaskar (2010, p. 123–124).

Bhaskar (2002c) argues that the key concepts of 7Z/A can be shown to be at work in every day life. Whereas an orthodox theorization of non-duality assumes that it is possible to obtain it in a very rare state, e.g., a religious nirvana state in order to achieve unity. In fact, the Bhaskarian argument is that this state of unity is achievable in everyday life. For instance, we are in a state of unity when sustaining daily communication, which is what "transcendental identification", is, in terms of the philosophy of Meta-Reality. When unity is at work in order when we perform daily basic acts in what Bhaskar (2002c, p. 5) calls our "transcendental agency" and when we engage in solidarity with the other such as in the case of playing a game or in an orchestra, then we are putting to work or "transcendental holism or teamwork" (ibid., p. 6). These states, together with our "transcendental self" (op., cit. 6), i.e., our very self that reports the fracture and split or contradiction when there is no unity, form the Bhaskarian argument by which the Philosophy and Meta-Reality can become significant for, for example, the resolution of conflicts since it is grounded in our very ordinarily experience.

In a third reflexive move, CRAT acknowledges that self-conscious entails two levels of responsibility. Objectively, as conscious beings we are responsible for the intended consequences of our actions, and subjectively we are also responsible for the un-intended consequences of our actions too. In *The Little Prince*, Antoine de Saint-Exupéry (1943/1995) exemplifies this idea with the following excerpt:

> "Now here is my secret. It is very simple. It is only with one's heart that one can see clearly. [1] *What is essential is invisible to the eye.*"... "It is the time you lavished on your rose which makes your rose so important."... "Men have forgotten this basic truth", said the fox. [2]*"But you must not forget it. For what you have tamed, you become responsible forever.* You are responsible for your rose." (p. 82, emphasis added)

In the above quote, [1] the priority of the negative over the positive and [2] this double objective-subjective responsibility are crucial because it "enables us to be more creative than we would otherwise been" (Bhaskar, 2002c, p. 111). Creativity, in this sense, is not the end but the beginning. It is a vital introduction the understanding of reality and of our own intellect and its limitations.

8.3   Final conclusion

My thesis, a Critical Realist Activity Theory, is that **learning is a passage through the dialectic**, the logic of emancipation and for self-emancipation. It employs the Bhaskarian dialectic to show how various contemporary learning theories—collaborative learning, cooperative learning, supplemental instruction, and AT—function in a pluralist sense to account for the four main critical realist categories of reality—1M: learning as product (non-identity), 2E: learning as process (negativity), 3L: learning as process-in-product (totality), 4D: learning as product-in-process (transformative agency), and 5A: learning as emancipatory intentionality (reflexivity), as a complete passage through the five Bhaskarian cycles of creativity. The Bhaskarian dialectic allows us to be Hegelian without the Hegelian closure in thought. In particular, CRAT engages with a proto-explanatory critique of AT by showing the theoretical dichotomies that are evident within this research community, thereby laying the ground for an omissive critique. Then, CRAT identifies that AT fails to adequately engage with a critique of empiricism, i.e., a lack of a critique the philosophy of Hume. In order to properly articulate an omissive critique, i.e., to show how this absence generates the theoretical dichotomies within AT, CRAT makes use of a superior theory, and in this manner, it engages with some of the elements for an explanatory critique via dialectical CR. A result of this investigation is, in part, the explanation, up to a certain degree, of why the activity-theoretical approach is dichotomous in the first place, leads this theory of learning, in accordance with the philosophy of CR, to sustain agency and with it self-emancipation as an implicit element of what I consider is Marx's phrase for the phrase of what remains an open problem of investigation—i.e., "From each according to his abilities, to each according to his needs![1]"

8.3.1   Summary of the original argument of CRAT

In this thesis , (α) I am using CR as it has been developed in its most cogent form in order to illuminate and resolve the contradictions within AT and thus to explain them, which is what an explanatory critique is. In particular, (β) I am using DCR to provide a new conceptualization of learning as a passage through the dialectic.

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[1]In Marx's *Critique of the Gotha Program* (1891/1972a, p. 531).

Appendix A

The following list of oppositions in philosophy is taken from Bhaskar's *Plato etc* (1994, pp. 184-186).

co-inclusion any of the three modes we have discussed [i.e., dialectics of co-inclusion: (a) as dialectical contradiction in the modes of ontological stratification, absence, intra-activity and agentive agency; (b) as social conflicts in the modes of power$_2$ struggles, constituted by or grounded in dialectical contradictions; and (c) as dialectical transitions over distanciated space-time.

dilemma either-or (or reject of bivalence or excluded middle of both).

antimony both (or rejection of non-contradiction).The presence of the past and outside, especially in the form of existential constitution by geo-historical processes of formation. Existential constitution, permeation or connection of one internally related element by another.

inversion reversal of hierarchy.

chiasmus juxtaposition of the terms of a polarity.

aporiai interminably insoluble indeterminacy.

ambivalence tendency to both of two or more incompatible positions.

anomaly incompatibility with an established pattern.

ambiguity vague indeterminacy of positions.

denegation denial in theory, affirmation in practice.

unseriousness the inversion of de-negation.

split-off e.g., in the form of projection or retrojection.

duplicity equivocation between incompatible positions.

paradox incompatibility between established (e.g., epistemological cannons and perceived reality.

complicity acceptance of or dependence upon an incompatible position.

domination in any of a number of modes including suppression, exclusion, and fragmentation.

plasticity susceptibility to a multiplicity of incompatible positions.

alienation estrangement from self.

theory-practice inconsistency e.g., immanent critique.

theory-practice incompleteness e.g., lack of dialectical universalizability.

Appendix B

The following list of oppositions in philosophy is taken from Hartwig's *Dictionary of critical realism* (2007, pp. 376-377). The primary term is in bold-faced type.

absenting (change) over absence (non-being)

absence over presence (negativity over positivity)

constraints on human action over enablements and the realization of possibility: there are many more things we cannot or could not do than we can. This is the axiological asymmetry, offsetable to some extent by emancipatory praxis (made possible by the asymmetry of emancipation)

dialectics over analytics within the dialectic of dialectical and analytical reason

totality over its aspects, relations over relata (or the shaping of the part by the whole) (the ecological asymmetry)

our transcendentally real selves over master-slave-type structures of oppression, and **action flowing from our essential selves** over exploitative and oppressive action (the asymmetry of emancipation or of axiology and emancipation)

entropy over negentropy

the epistemic over the ontic within the expressive-referential duality of truth, and **the ontological and alethic moment** over the other moments in the truth tetrapoly

explanation over prediction in science (entailed by the unfolding openness of the world)

internal over external relations within the dialectics of internal and external relation

non-identity (alterity) over identity within the dialectics of internal and external relations

objectivity over subject-object within subjectivity, or ontology over epistemology

the past over the present (the temporal asymmetry)

the political over the ethical in the EA of the transitive dimension TD (explanatory primacy), and **the ethical** over the political in the IA of the TD (normative primacy), constituting a fluid constellational unity within the political

practice over discourse and theory in the constitution of subjectivity

reason (belief) over desire (want, intention) in human action—belief does not have to wait on anything else to issue in action, want must wait on belief (the psychological asymmetry)

science over philosophy

social structure over human agency (the social asymmetry)

master over slave in power$_2$-stricken society (the relative structural asymmetry of dialectical contradictions, connected with directionality)

structures over events, hence the possible (dispositionality) over the actual.

the asymmetry of time and space in regard to causality-causal powers must be possessed and exercise in time but do not necessarily have position in space

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