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Time and cognitive development: from Vygotsky's thinking to different notions of disability in the school environment

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The perceptions about the structure of time are deeply entrenched in people's minds. As such, they do not reveal themselves directly but are mediated by how it is possible to articulate concepts that assume these perceptions. This paper assesses how the notion of time can affect cognitive development, looking at Vygotsky's works on defectology and other references, given that there is a gap regarding this articulation in specialized literature. For this purpose, it is argued that the notion of time often departs from an equivocal assumption of a linear time structure, influencing how we lead with disability issues in teaching and learning processes. The findings also show some consequences of such a departure in the conceptualization of deficiency, development, and time to the issue of the visibility of the so-called deficient, particularly concerning the school environment.

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Introduction

The objective of this paper is to assess the relationship between time and cognitive development, in the context of *disability* at the school environment, focusing on the epistemological approach offered by the Soviet psychologist Lev Vygotsky (1896–1934), particularly in his works on *defectology*¹. Our notion of space and time affect how we perceive the environment (Kant, 1998; Janiak, 2022). However, these notions are often simply *assumed* and rarely reflected upon more critically by most people. There is a general perception about their classical structures (linear time flow, and tridimensional space), but not about what they are in ontological terms, since their fundamental aspects do not allow strict definitions². In Kant's idealism, *time* was an *a priori*, whereas Vygotsky included social and cultural dimensions in the human development process. Therefore, space and time cannot be understood in themselves but can be revealed through the phenomena whose interpretation they drive if one looks carefully into these phenomena. Disability, as a concept, is grounded in the concept of development, and the latter is congenial to time. Hence, it is possible, in principle, to describe people's assumed time fabric (linear, circular, or complex patterns) by looking at how these concepts of disability and development appear in their personal approaches.

Thus, to understand the originality and importance of the notion of *time* in Vygotsky's thinking, we address the concept of *disability* as an important example of its application. Through this concept, different notions of time have different perceptions about the elements present in our culture, in particular for the concept of development in the school environment. The issue of disability is not recent; conditions such as congenital deformation, amputations, and severe diseases, for example, have been present throughout human history, influencing different social roles (Tunes & Bartholo, 2014).

Given the centrality of the concept of disability, as well as of development and time, it is important to assess different ways of conceiving their relationship. A key question is: what is disability? There is a consensual definition. For example, to some researchers disability is not a direct result of a biological disorder, but a form of constitution resulting from the impact caused by the psychophysiological formation of the person in his social environment" (Tunes & Raad, 2011, p. 34), whereas Vygotsky focused on the concept of defect (rather than disability), attributing a major social influence on how it is perceived. Although Vygotsky is a central reference in this assessment, we are not restricted to his approach and focused on the issue of disability in our analysis, including some additional references. As described in the following sections, two important elements congenial to the *psychophysiological formation and social environment* are the notions of *function and development*. However, there are different possibilities of articulation of the notion of disability—each of these possibilities constituting a particular formulation of what should be understood by the concept of disability. While attributed by a person who is supposedly processor of a so-called "normality" to another with disability, the term can be full of prejudice and motivate exclusion (Tunes & Bartholo, 2010).

In medicine, disability is often understood as something concrete, grounded in biological knowledge. In this perception, humans are supposed to have standard anatomical and physiological specificities that are presented as a *biological model*. Thus, the medical-scientific discourse tells the individuals about their normality and disability conditions, largely influencing the perception of the society more broadly. Normality is treated as completeness in the face of the model, whereas disability represents what is absent or dysfunctional. However, understanding disability only in biological terms represents a limited

comprehension of a complex issue, since it would relegate the concept to the medical observation of a certain condition

In other fields of knowledge, such as psychology, philosophy and sociology, we can broaden this understanding by associating the idea of disability with that of development—and the latter with time. The issue of cognitive development was assessed by Vygotsky's *defectology* helping us understand the possibility of inserting, in the school environment, a different perception of disability which, in the end, *dissolves this concept at the social level*.

What is *biologically* considered to be a *delay* is, for Vygotsky, a peculiar set of characteristics in the individuals, a starting point for their development. For him, however, it is not these peculiar characteristics that matter in themselves but the *processes of development* that will take place (or not) depending on the way we conceive these characteristics and the relationships that the individual in question will develop with the sociocultural environment. Thus, Vygotsky makes an association between disability and development, in which the former is temporalized. The dimension of becoming is introduced into it; thus, an idea of time fabric is required.

Therefore, for Vygotsky (2022), the question should not be focused on just what disability is or what types of it exist—in a purely classificatory attitude; its study should not be limited to knowing the level and severity because:

[...] defectology has its own particular object of study; it must overtake it. The child development processes it studies present a huge diversity of forms, an almost unlimited number of different types. Science must master this peculiarity and explain it, establish the cycles and metamorphoses of development, its proportions and changing centers, discover the laws of diversity. Practical problems were also planted: how to master the laws of this development? (Vygotsky, 1997a, p. 14).

Vygotsky's thinking, thus, implies the idea of a cyclic time, as in the citation above, connected to metamorphosis, i.e., a crisis or revolution. He also shifts the focus regarding the concept of disability, removing it from a naturalizing, classificatory (biological) and static attitude, redirecting it to the dynamic field of the becoming, in which what matters is not only the starting point, the initial peculiar state, but the point of arrival and, mainly, *the paths* that can be trodden.

This change of focus allows the intervention of concepts such as *compensation and overcoming within* the relationship that disability establishes with development—concepts equally linked to temporality³. Development for Vygotsky is a process, a movement, and not something given and determined. He also states that "the difficulty of understanding the development of the late child is due to the fact that the delay has been considered as substance and not as process" (Vygotsky, 1997a, p. 133). With this displacement in the deficiency issue, temporality is linked to it. This allows the question about how an assumed fabric of time underlies a specific notion of development within the Vygotskian discourse, although Vygotsky has not addressed the concept of *time* more specifically.

In what follows, we try to clarify the relations between an assumed time fabric, the concept of development and that one of disability in the Vygotskian approach. We also discuss the consequences of this discourse for pedagogical purposes and school development, while also recognizing that there is on different types of disability, which cannot be addressed similarly. The focus here is on cognitive development and time.

Time, development, and measure

To assess the concept of *time* in the Western-European tradition, it is important to contextualize briefly the fundamental

contributions made by the Ancient Greeks, not necessarily shared by Vygotsky, but still largely present in modern society. It is worth noting that such thoughts may not represent the views of indigenous communities in the Americas, Africa, and other regions worldwide, subject to different historical influences and contexts.

We here present two distinct conceptions about the texture of time and the consequent variations in the conceptions about the notion of disability. There are, however, elements that precede the mere listing of these conceptions and their possible comparisons. These choices shape time itself as structuring or as a measure of existence.

It is possible to identify in Classical Antiquity a considerable concern with the idea of *métro*n (μέτρον), that is, with what should be used to obtain the measure of things (as opposed to *hybris* (ὕβρις), which is precisely a surpass of the *métro*n). Since development is intimately related to the notion of time, it is thus associated with the idea of *métro*n.

Thus, the question may be put in terms of what measures and what is measured, and this is the question that the ancient Greeks have already appreciated. Indeed, ancient philosophy offers two opposed and mutually incompatible answers to this question. The Sophists in general—and, in particular, Protagoras of Abdera—assume that “man is the measure of all things” (Cooper, 1997), inserting an element of subjectivity in the discourse.

For Plato *apud* Cooper (1997) and all the Classical Antiquity that followed him, such an element of subjectivity is unacceptable. According to this tradition (into which we, too, are presently immersed), it is necessary to find an absolute measure, a standard or *métro*n, to which all things are referred as subjects of measurement.

Plato builds his “world of ideas” as this element of objectivity, capable of making our knowledge objective. In *Sophist* (Cooper, 1997), he affirms “non-being” as a disconnection between the discourse articulated in the material World and the existing connections between things, perfect, eternal, and immutable, in the World of Ideas. In Plato’s *Timaeus* (Cooper, 1997), it is explicitly said that “time is the unchanging image of eternity”—which insinuates time as a parameter.

Aristotle goes further, making us approach more specifically the theme that presently matters to us. He differs from his old master’s choice of *métro*n, while maintaining Plato’s original idea of objectification. Indeed, interested in specifically qualifying change, Aristotle says, in his manuscript *Physics*, that “time is the measure of change according to Before and After” (Aristóteles (1984), 219b1).

Therefore, for Aristotle, the measure of change must be referred to as time (whose flow is perfect, eternal, and objective—and one dimensional, that is, linear). In other words: time is a parameter. Now, the concept of “development”, to which the concept of “disability” is subsumed, is a change. So, time should be the (objective) measure of development.

Plato and Aristotle are among the main founders of western philosophy. The epistemological advance of these two great philosophers over the Sophists, as they qualified them (in particular Plato), is, therefore, a watershed in the most profound and structural way of thinking in modern western societies about development, in general, and disability in particular: that they must be measured by an element of objectification, and that this element is time.

These classical views on objectification and time were crucial for the development of several areas of thought, from ethics to modern science itself. Our question, however, is not whether the search for objectification is an error in general but whether it applies to any contexts in which the construction of understanding of a phenomenon is sought.

Thus, this paper sustains that Vygotsky’s approach to development and, consequently time, is more aligned to that of the Sophists and radically departs from the usual notion that one must use time as the objective measure for development. This is at the core of Vygotsky’s assumption that “everyone develops”. This move, alone, places in opposite perspectives what one should consider the measure and the measured. On the other hand, one may continue to use linear (Aristotelian) time to measure any *individual* development; what is blocked from the outset is its use as a *universal* measure of development and, as such, as a means of comparison (for instance, when one says, prejudicially, that someone “is slow”).

Furthermore, linear time was appropriated by the Industrial Revolution and its tenet of production. Indeed, the production lines adopted by industries were directly translated into the educational environment. The point is that *production* (be it of cars or the formation of students) is a demand external to the underlying subjects, an objective parameter to measure their behavior. This idea may be appropriate for industrial processes, but inadequate for the formation of subjectivities, *which has a time of their own*.

Given that the linear time is now naturalized, some inclusive education proposals conform to this time structure and reproduce approaches that are structurally similar to those regarding the production lines. Just as an example, some schools in several countries adopt the strategy of separating the “slow” students from those that, on average, learn within the imposed pace and provide them different tests, much easier tests, such that these “slow” students can be accommodated into their production lines.

The issue of medicalization and the multiplication of syndromes in the successive Diagnostic and Statistical Manuals of Mental Disorders (DSMs) that touch on the school environment may also be considered at least partially, to some extent, *the result* of the adoption of this external temporality and its demands. For example, the use of medicine to improve attention and the new definition of burnout syndrome (Endress, 2021; Kafer, 2013) may not be necessarily a medical issue per se, but a complex issue related to our perception of time and disability⁴. The adoption of an external and objective temporality may be the deep *cause* of what is later called disability, moreover when this temporality is assumed in connection to teaching strategies that are impervious to distinctions of race (Leva, Hannon & Vereen 2021) and gender (Taylor, 2015), which show differences in developmental paths, as is shown in the following sections. This paper does not aim to address complex disability conditions and the several existing disorders, but to offer a theoretical framework for approaching these issues more critically in the school environment.

Disability as a relationship with a model

From the semantic point of view, it is clear that the concept of *disability*, in any context of articulation in which it is considered, is set against the background of a model by which it is intended to affirm a pattern or normality. However, individuals are not equal and, hence, there is an intrinsic variability associated with them, similar to variations observed in nature more broadly (Canguilhem, 2011).

Thus, the “dis” of disability means nothing more than an absence or decrease that is objectively observed or subjectively assumed in the relationship between the object that one wishes to qualify as disabled and its model—the latter not always explicit, not always obvious, not uncommonly stealthy and, sometimes, elusive.

Even when the model is explicitly enunciated, it is always idealized. In areas such as Biology or Medicine or Psychiatry, the model can be proposed following two different strategies: (i) the

characteristics that permeate roughly most of the specimens (statistical model, descriptive in character); and/or (ii) the selected characteristics that must be *desired* for such specimens (axiological model, of a nomological nature). Each field of study will use its bodies of knowledge and methods to justify one choice and another. Regarding cognitive development, the school environment often prefers the statistical model by basing cognitive *disability* upon test outcomes, although Vygotsky also addressed some statistical standards for development. The risk is that the use of such statistical models may disregard the complexity and specificities of each individual, treating those out of an average parameter as a disturbance in probabilistic series (Moysés, 2001). Thus, such statistical models should not be seen as a sentence. It is important to emphasize that there is no clear cleavage between (i) and (ii), since, for example, the strategy (i), of descriptive character, can often engender (ii), of normative character—and, often, it does so. In either case, even in its most basic semantic root, the notion of *disability* is only put as a *relationship*—a relationship between a subject and an idealized model.

From this first consideration, there are several questions that are important to consider. When we talk about disability: what models are being considered? Are such models objective, or are they subjectively constructed? What factors intervene in the constitutive *relationship* of disability? Are these models stable throughout history? Or, from the variations of the models, could we draw changes in the relationship and, therefore, in the very conception of what *disability* is? In addition, do ideological aspects permeate these models? How do we justify the selection of a particular model?

In order to answer to this list of questions, admittedly incomplete but seminal, we believe it is possible to situate the concept of disability and its relationship with the assumption of a time fabric or time structure in the school environment. To do so, we must pass through different levels of description of the relationships that subsume the concept of disability, namely: objective anatomical deficiency; objective functional disability; and subjective functional disability. Each of these descriptions has contributions and limitations to assess the relationship between time and cognitive development in the context of disability.

Objective anatomical deficiency

As far as human beings are concerned, there is a first context in which we can articulate the notion of disability, one in which it can be considered objectively given, to the extent that it is related to a *natural biological model*. This approach considers the *anatomical biological model* for human beings as the base of comparison. Under this perspective, the model is eminently statistical and descriptive—it is simply a question of recognizing that certain anatomical characteristics permeate most human beings. The concept of *deficiency* then allows those specimens that do not have all the listed anatomical characteristics to remain as standard individuals but to do so by assigning a fault or decrease⁵, often leading to prejudice and discrimination. In other words, it is about the difference between “primitivism” and “deficiency”, or “defect”, as discussed by Vygotsky (1997b).

The deficiency is objectively seen as the mere lack of one of these anatomical elements or their abnormal constitution. Thus, all problems related to disability arise and are solved trivially as problems of an absence or quantitative/qualitative limitation, including impacts on school learning.

Nonetheless, it seems evident that such a conceptualization is too poor and often highly discriminatory to serve as the basis for a more profound concept of disability because:

[...] only with the idea of qualitative peculiarity (not exhausted by the quantitative variations of some elements) of the phenomena and processes that *study defectology*, it acquires for the first time a firm methodological basis, since no theory is possible if it departs exclusively from negative premises, as well as it is not possible to exercise any educational practice built on the basis of merely negative principles and definitions (Vygotsky, 1997a, p. 13).

A complete analysis of the issue of disability should look at the various aspects that involve the development of the subject considered to be disabled. According to Vygotsky (1997a), these perspectives should be focused on the anatomical, physiological, and, mainly, cultural levels, which leads us to a second context of articulation of the concept of disability.

Objective functional disability

Thus, we move to a second level of articulation of the notion of disability that we could link to the notion of *objective function*. This level differs considerably from the first in several ways. In addition to purely anatomical materiality, there is also the possibility of articulating patterns for the *functioning* (functional models) of the various elements of human anatomy, causing such patterns to be configured as a biological (in a different sense from the previous one) functional model, such as limited visual capacity, movement, or cognitive process, which are also related to cultural issues. In short, function explains structure and the socioenvironmental context explains function.

Thus, a difficulty is implied in the articulation of this concept. Such an attempt seems doomed to fail, because all humans are different at some level.

Moreover, the environmental conditions can influence the individual abilities, such as the possibility of differentiating colors or, mainly, shades of a color. For example, a person born and raised in a tropical region when moved to a region covered by ice sheets such as the arctic, may have difficulties to perceive the different shades of white as Inuit and Yupik people do. This makes this individual very little *adapted* to its new natural environment, not being able to discern, for example, the traps hidden in white shade variations, such as the white of the frozen surface of a river, that may indicate that the ice there does not support the weight of an adult human being.

At this point, when we leave the plan of a purely anatomical conceptualization of deficiency, it is possible to realize that even still trying to keep ourselves close to possible scientific objectivity of a natural character, we are inexorably engulfed by another element related to *the relationship* between the organism and its natural or environmental *context*. Such a context or natural environment now serves as a backdrop for what itself refers to *functioning properly*; in this case, it is related to the adaptation to a given natural *environment*.

Assuming this interpretation, it is still possible to find an objective dimension of the concept of functional (functioning) disability, one that establishes this concept as a relationship between one's corporeity and its given natural environment. Thus, this concept is objectified from aspects related to the biological traits, referring more appropriately to the functioning of human anatomical elements in the relationship they establish with their capacity for survival, perpetuation of the species and evolution. The objective existence of the natural environment, *considered given and fixed*, allows the objectification of functional disability. Nonetheless, it should be noted that now, as it is a relationship, by moving one of the poles of this relationship (the natural environment), one can move from a situation of disability to a position of ability. The concept of disability becomes, therefore, context-dependent⁶.

It is thus clear that, already at this level, the notion of disability becomes fluid since the mere change in the natural conditions surrounding the organism can make it less able to survive, taking organisms previously considered very well adapted to the environment (enabled) into organisms poorly adapted to the environment (disabled). On the other hand, the organism *can*, in principle, *develop* mechanisms that allow it better adapt to the natural environment, becoming more adapted to it (enabled).

Therefore, we may say that the concept of *anatomical deficiency* addressed in the last section is objective, particularly for potential medical issues involved, but it may not be an appropriate approach to discuss learning and cognitive development. The idea of functional disability, even in a natural sense, opens a set of possibilities for deepening the concept of disability, particularly when compared to the concept of development.

This functional context of articulation may seem artificial at first and even distant from the context of the school environment. However, a quick consideration of support rooms or feature rooms, for example, indicates precisely the opposite.

The student who is considered functionally “deficient” (in the sense of having a significant cognitive variation) is often sent to another school or to another space in the school itself with special resources, even when the student is kept, most of the time, in the usual spaces with other students. In this case, what is deduced is that the school and its usual spaces are being conceived as fixed or given, in a similar (but equivocal) character to the natural environment, capable, therefore, of establishing a relationship of disability in the functional sense; and the student is sent to another setting, or to a particular environment to which they are supposedly more adapted. Thus, it follows from objectification that functional disability is always assumed to be a trait *of the being*, which is the general perception in these environments precisely because one of the poles of the relationship keeps being considered fixed.

As such, since the individual is considered the *locus* of disability, as the special rooms seem to say, would these spaces not be more properly environments of exclusion? A study by Maconi, Green & Bingham (2019) carried out a student assessment in a large university in the United States, showing that it is fundamental to eliminate the forces of exclusion and stigmatization among students and, at the same time, offer social spaces to those with disabilities to help empower them to build their own agenda. It is worth noting that this question may not be applicable to those with severe cognitive disorders based on clinical evidence, who may require continuous special assistance and substantially adapted environments, including safety protocols, nursing, and medical support readily available. In such cases, special environments may be required.

Subjective functional disability

Thus, if we wish to go beyond the notion of merely objective anatomical disability or the notion of objective functional disability, transcending towards a concept more appropriate to the articulation of human differentiations, then we should consider the social dimension as a fundamental element in the construction of the model that underlies the constitutive relationship of disability. It is in this context that Vygotsky’s approach becomes especially relevant. An analysis, therefore, by which the concept of disability will finally be articulated, in which “any physical insufficiency, be it blindness or deafness, not only modifies the relationship of the child with the world, but which, above all, it manifests itself in relationships with people” (Vygotsky, 1997a, p. 116, our translation).

The term “*construction*” is crucial here since, at the social level, it cannot be accepted that the characteristics of the model *are already given beforehand*, as occurs with human corporeity (definitional

restrictions) or with the natural environment (adapted operating restrictions). Vygotsky suggested that there are different approaches to disability, from an organic impairment (primary disability) to cultural perceptions (secondary and tertiary disability) (Rodina, 2007). Therefore, by focusing on the primary disability alone, one may ignore the developmental processes.

In the social realm, of which the school environment is a subsystem, the characteristics that make up the model are constitutive of the very social *organization that selects them*, so that one has, here, a bidirectional relationship: society chooses the characteristics that it will value due to the maintenance of its own broader organization—in a circular way that is at the root of self-realizing prophecies.

This implies that the model cannot be merely descriptive because it lacks the objectivity of the other levels of articulation, which allows for the fixation of the model in the relationship with a given concreteness. It needs to be axiological.

Therefore, we must consider the social/cultural realm as the element that selects or values important functions, as well as their appropriate or inadequate achievements, as constitutive of the model before which, finally, the concept of disability, the one that is relevant to us humans, will be articulated. Hence, “the basic fact of the cultural development of disabled children is the *inadequacy, the incongruity* between their psychological structure and the structure of cultural forms” (Vygotsky, 1997a, p. 32—our translation and italics).

We have argued previously how the flow of time, imposing changes in the natural environment, inserts a character of inconclusiveness in the biological adequacy of individuals, being able to transform them from efficient to deficient and vice versa.

This same flow of time imposes, through social changes—that is, on differences in worldviews and the place of the human being in it—a historicity of the complementary conceptions of sufficiency and deficiency. This is the concept of disability that interests us. Thus, it is important to emphasize that, for this work:

- disability is constituted in the relationship between a human being and their social context or environment, in particular, that of the school;
- this social context is not objectively given but constructed; therefore,
- the very notion of disability, at this level, is not given either, but built in the constitution of the (social) environment itself, its assumed underlying time fabric and its values, needs, demands, goals and objectives.

Thus, from a synchronous point of view, disability constitutes a relationship between a state of a human being with a historically constructed social context. As there is diachrony (becoming) in *both terms* of the relationship that constitutes a disability, any attempt to establish the concept without attributing historicity⁷ to it will lead to deviance from the concept itself. Therefore, any mention of the notion of disability without its historical determinants being considered (even if not explicitly specified) is equivocal.

It should be noted, however, that these comments refer to the social reception of the notion of disability. This does not preclude one to *consider* individuals’ peculiarities (anatomical or not) to help them develop. The present approach sustains that these peculiarities (one may still say objective disabilities) do not imply social disability. Vygotsky considered that some disabilities, such as deafness, were an “organic defect”, i.e., something objectively given, whereas “primitivism” was given by the social environmental context.

Thus, we have so far only focused on the concept of disability itself. It is now necessary to reintroduce the idea of development,

which will allow us to understand some of the self-referential processes by which societies build their models and the place of time in such a construction.

Relations with the concept of development

The social dimension of the concept of disability also establishes new time relationships when compared to the biological dimension (anatomical or functional) if we make it go through the concept of development. From the perspective of the anatomical dimension alone, time is often neglected. The notion of development is not articulated on this level of definition of disability (or is expressed only in the physiological plane, as in individuals who can revert a certain anatomical restriction). Vygotsky also addressed the differences between congenital anatomical defects and hereditary.

In the biological sense, the functional dimension allows the introduction of the concept of development from the notion of adaptation (a process). In this context, development can be objectively measured. For example, the use of glasses by a visually impaired person can change the relation of deficiency.

The social dimension, however, because it cannot count on the fixed character of either side of the defining relationship of disability, establishes, within the very notion of development, an element of subjectivity that will be addressed according to *axiological principles* imposed by the society itself.

Vygotsky's central assumption is that *any individual develops*, while also pointing out that the socioenvironmental context influences such development, which may cause a behavioral primitivism in the individuals, and which is different to an organic "defect" (Sarmiento, 2006). In other words, the issue is the subjective question, socially constructed, of the *social perception* of this development. According to his words: "As the objectives are being exposed in a pre-development way (due to the need to adapt to a sociocultural environment destined to a typical human type), neither does understanding flow freely, except for a certain social channel" (Vygotsky, 1997a, p. 19, our translation).

The *process of the naturalization* of disability, in this social context, is usually a choice making strategy, largely arbitrary, to pass as something given—as in the contexts of anatomical and functional articulation, already presented.

Thus, despite the fact (at least to Vygotsky) that every individual develops, such development may pass unnoticed due to the simple fact that the same defining criteria used to define the disability relationship will also be those imposed for its recognition (or not), indicating that the individual does not develop in the *direction set by the normative model*.

Therefore, the claims that "everyone develops" and "certain individuals do not develop" are only apparently inconsistent. "Apparently" because they are stated at different levels of articulation. These statements cast bare the fact that "developing" is not being considered in the same way in each of the statements. Its apparent inconsistency explains precisely the fact that, from the social point of view, "development" is what is socially recognized as such, and there are criteria for *its recognition*; so that those who do not meet the imposed standards will be classified as individuals who do not develop or who have difficulties to develop, despite their abilities and functionalities having changed over time (that is, despite they having objectively developed). It is in this realm that the *invisibility* of those who develop outside the criteria of social recognition is articulated. In this case, it is possible to affirm that everyone develops but that, socially, not everyone is perceived as developing.

Thus, the problem of *recognition of development* is identified with that of the very definition of what is disability. As shown in the next section, the assumption of an underlying time fabric has much to do with this recognition.

The fabric of time and the social recognition of development

Variations in the conceptions about the fabric of time can directly impact the *recognition* of the student's development. Assuming distinct temporal fabrics, as we shall see in the following, the very concept of development can change.

Development is usually considered from the point of view of a serial time. We assume an abstract straight line to which we add a clock, and development is regarded as the acquisition of certain stages that label this line (as ticks of a clock). The time fabric of a serial time is imperative here, for it allows for the objectivity of the measurement of development. Furthermore, serialization of time is closely related to productivity in Western history. It is entrenched in industries, agriculture and, of course, the school environment. Being it so, it imposes a measurement from the outside, in the sense that the subject being considered is the one to be measured. At the same time, the serialized process gives the objective framework of this measurement: the time interval in which a student's development is measured in a coordinated manner with the productivity requirements *imposed to it from the outside*.

In an approach taken from the assumption of a serial time fabric, development is thus "objectively" measured by the individual's arrival at the "end of the line", given its departure point and the time it took to do it. One can, for instance, change the assumed "normal" time interval for the characterization of "normal" development and, thus, include or exclude human beings from the category of the abnormal by simply a *fiat*, an arbitrary decision—this is what we mean by an external perception of the role of time on the definition of development.

In the school context, the cognitive psychology of development clearly demonstrates what we are arguing. Cognitive development has been classically conceived as a movement through a single sequence of stages, linearly ordered one after the other. It is characterized as an adaptation behavior that increases as the child walks a *behavioral ladder* from stage to stage. In this perspective, individual variations in a student's development can be considered as a function of the difference in the *rate of progression* in the ascent of this ladder and in the stage at which the development of a person was in the beginning. When students assumed to begin from the same development point do not take a higher position on that ladder; they must be at a lower developmental stage. There is no other way to go (Kohlberg, 1969).

As previously discussed, the linear character of this development perspective lends itself perfectly well to its temporalization (and, therefore, objectification) since the above-mentioned *line of development* is put side by side with a temporal axis, which provides a supposedly objective measure of the child development that can now be compared, and which is assumed given. It is assumed here, implicitly, and paraphrasing Aristotle (1984, Book IV, p. 10–13), that time is the measure of *development* according to before and after.

It could be argued that child development researchers have successively found this alignment of stages in the most distinct situations of application, in the most diverse cultures, implying that these are effectively objective. It occurs, however, that it is also necessary to *consider* the method that such researchers use to peer into development. The fact is that the research methods commonly used to study cognitive development are biased against the detection of diversity. Having been designed to detect one, and only one, hypothetical development path, they have proven insensitive to other possibilities. Thus, it is not in theory that we build such invisibility, but in an even more remote place—the methodology that gives it rational support.

The fact is that there are statistical methods available that offer ways to detect developmental diversity both among individuals and between groups of different cultures (Flavell, 1972). Unfortunately, to our knowledge, such methods are not always used consistently. However, diversity is ubiquitous in cognitive development, with

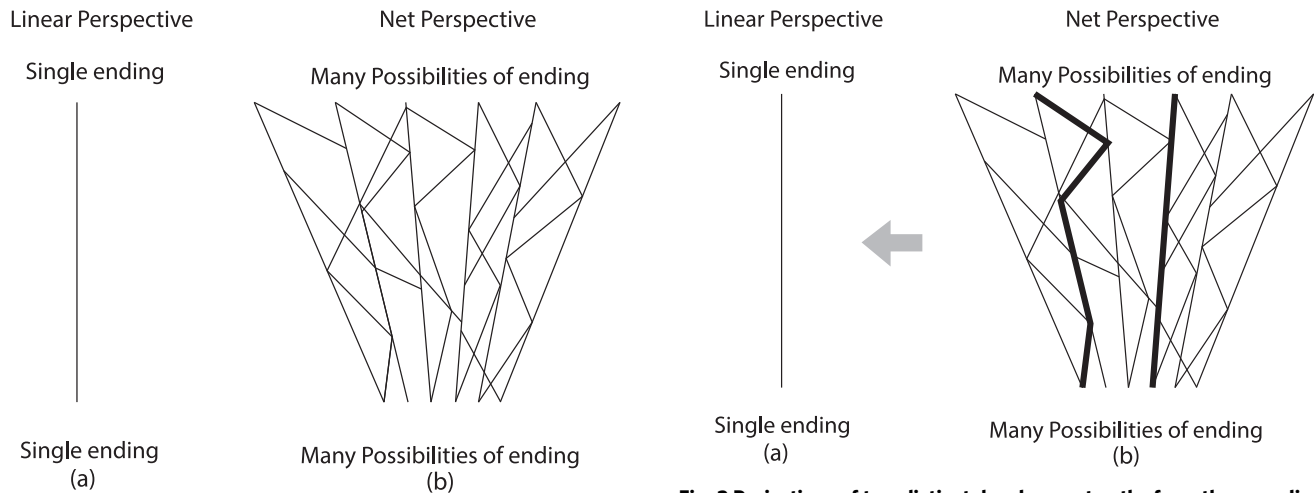


Fig. 1 Comparison between the linear perspective (left side) and the network perspective (right side) on development. Source: (left side (a)) the authors; (right side (b)) Fischer, Knight & Van Parys (1993, p. 35).

children developing along different paths, with significant experimental evidence for this (Fischer & Knight, 1990; McCall, Eichorn & Hogarty, 1977). Such evidence points to the fact that each person does not develop along a single linear sequence of development stages but on multiple paths that end up forming a behavioral network (Fischer, Knight & Van Parys, 1993).

Individuals build paths that intersect as they progressively develop more complex skills, resulting in numerous development pathways and the important phenomenon of coordination, according to which diverse developments can support other developments. When such individuals do not eventually show great strides in one path, they may develop into another (Bidell & Fischer, 1992).

In this perspective, what is obtained by looking in detail at the developments of several individuals, is an intricate mesh of smaller, more limited and different developments for each individual, which support subsequent actions, forming a path of development that *reveals* the particular temporality of that individual—an *internal* notion of temporality.

Therefore, development should define time, not the other way around. This is the key to understanding Vygotsky's perspective on development. In such a relationship, time can no longer be a measure of development, let alone be objective.

In Fig. 1, we present schematically two different conceptions of development side by side. The methods commonly used to analyze cognitive development usually *project* a complex and rich structure (the network on the right) into a linear structure, over which it is possible to supersede an objective temporality. Thus, those who walk a “longer” path (but, at the same time, possibly richer), when projected onto the serial structure, present a longer time between the start and end points of the line, allowing one to conclude for an eventual “slowness” in the process, as shown in Fig. 2.

On the other hand, the network structure is impervious to this process of objectification (and naturalization) since each path presents its own temporality and is virtually incommensurable with other possible paths, mainly because each path accesses different development elements.

It is this conception of a “fractal” structure of the temporal fabric, now defined from the developmental paths, that prevents the use of a serial time, common to all approaches that search for objectification (and naturalization) based on some comparison criteria. The passage here is much more profound: it is about *preventing* time from serving as an (objective) measure of development—of course, one can still measure each of the

Fig. 2 Projections of two distinct development paths from the same linear perspective. Source: (left side (a)) the authors; (right side (b)) the authors referenced in Fischer, Knight & Van Parys (1993, p. 35).

changes of individuals temporally; what one can no longer do is compare each one with some other, without a context.

Moreover, ample experimental evidence (Fischer, Knight & Van Parys, 1993) confirms that even in “the beginning”, individuals cannot be situated at a “point” of a development path—another necessary assumption of the serial perspective. On the contrary, they spread over a more or less broad “range” of stages of development (cf. Fig. 1, right side). Thus, neither the starting stage nor the arrival stage can be identified with a single possibility or *point*; thus, no straight line can be traced linking such points. Which path a specific individual will follow will depend on numerous intervening factors, such as their culture, family environment, issues of affection, gender, and so many others (Fischer, Knight & Van Parys, 1993).

Thus, it does not cause strangeness that the hegemonic methodology has been, so far, linear since it adjusts to the rationale of the current social organization that often underpin a devotion to the objectification. Therefore, the shadowing or oblivion of other possibilities for the concept of development stems from the insistence on considering such a development as having a point of arrival, a starting point, an endpoint, and a temporality that objectively measures the passage from the former to the latter.

This is the point at which Vygotsky enters with all its strength. His psychology, based on different requirements, produced a methodological approach and a theoretical basis for understanding the unique paths of development that children in general, including those with special needs, walk through, which suggest pedagogical approaches designed to account for these paths. In this context:

With the increasing recognition of the central roles fulfilled by social and cultural factors in learning and development, sociocultural theories have received increasing attention. The broad scope of studies investigating the formation and development of human society and culture is reflected in the multiple interpretations and applications of these sociocultural theories. These varied interpretations are also reflected in the different perceptions of the works of Lev S. Vygotsky, widely recognized as the founder of Sociocultural Theory, whose research on the relations between learning and development address issues related to education in general and education for exceptional children in particular in the 21st century (Mahn, 1999, p. 341).

In his works, Vygotsky considers the natural, individual, and social forces that lead to consciousness. Forces often acting in

contradictory directions, from whose joint action consciousness emerges as a synthesis. Consistently with the central character of this assumption, he addresses development using the dialectical method. Therefore, the preconception of a temporal fabric can be articulated to generate an invisibility of many development paths and, therefore, socially characterize disability—and how it can be overcome.

The subject of disability. In anatomical disability and biological functional disability, the model can be considered objective (the anatomical model that objectively defines a lack, the natural environment that objectively defines, albeit synchronously, an adaptive inefficiency). Of course, there is still a choice (made by the criteria of Biology) of the model but considering biology and its standards these deficiencies can be defined, identified, and objectively measured. In this case, the model is not in question, and the notion of disability may be referred objectively to the person, even if it is still a matter of a relationship,

The defect in creating a stable biological human type deviation from man by causing the loss of some functions, the insufficiency or deterioration of organs, the more or less substantial restructuring of all development on new bases, according to the new type, logically disturbs the ordinary course of the process of rooting of the child in culture, since the culture is shaped to an average person, typical, is adapted to its atypical constitution and development conditioned by the defect, it cannot be fixed directly or indirectly in the culture, as happens with the average child (Vygotsky, 1997a, p. 27, our translation).

However, in the socially constructed disability, the model is not given and, once put forward, it needs to be justified. This makes an important displacement of the referent of the term “deficient”. In this case, unlike anatomical and functional biological deficiency, the term “deficient” does not qualify the individual but is, or should be, more properly, a *classification of the relationship*.

In this perspective, one should not think of a disabled subject who is already given in the face of a social environment (such as the school one), but rather in a subject with singularities (no longer deficiencies in the social sense) with which the social environment (e.g., the school) is not able to cope, with a disability *in the relationship*.

In this case, dysfunction is considered *symmetrical*: such individuals are considered dysfunctional in such a social environment, with their given time and space (school), but also this environment proved dysfunctional to some of the individuals, to the extent that it was not able to organize itself to welcome them. In this perspective, there is no primacy on either side of the relationship—there is no possible objectification. The assumption of the symmetrical character of the association also implies different forms of intervention when the said relationship presents an inadequacy.

Finally, shifting the perception of disability to mean an inadequate relationship between individuals and their respective contexts, without considering the primacy of one side (which can no longer be considered as “given”) is a way of getting rid of the very concept of disability of the being, causing it to collapse into the concept of the inadequacy of the social relation.

The fabric of time in Vygotsky. Ordinary schools usually adopt the perspective that development takes place in stages that follow each other linearly (the serial fabric of time) and that, for this reason, it is not only possible to know, objectively, the development states of the students, but also to compare them and hierarchize them in an equally objective way. Such schools assume, *ipso facto*, that time is an appropriate measure for development.⁸

This approach, adhering to the Platonic-Aristotelian paradigm prevalent in modern society, allows the school to suspend the symmetrical character of its relationship with the students and assume the position of a fixed reference, a given one of normal development to be ideally sought. Thus, the perception of disability remains objective functional, and the school is beyond all criticism when a student “does not develop”—the fault is transferred to the student. With this, the school builds large spaces of invisibility within it, unable to visualize entire categories of development that take place under its nose, but not related to its model of development—unable also to intervene and improve such developments that, after all, it does not see.

It creates, therefore, a form of *self-fulfilling* prophecy by which the school, by not seeing the student’s development, does not invest in this development that, making such development lose strength. In the end, one may conclude equivocally that such individuals do not develop according to the conventional expectations because they are not capable of it. Epistemologically, the self-fulfilling prophecy ends up functioning as a criterion and, a posteriori, *for a verification of the adequacy* of school choices, reinforcing its rigid positioning as a fixed reference in the relationship with students.

In turn, Vygotsky’s approach to development suggests another direction, indicating that the temporal fabric that lives up to development in all its wealth cannot be linear in nature. Within this approach, the straight line that supports the perspective of the serial fabric of time is only the result of a desire for *objectification*. In contrast, a complex time fabric can at least induce greater visibility of the development process.

Final considerations

Vygotsky’s approach is deeply connected to the dialectical method, brought about, in a prominent position, the notion of time (even if not explicitly stated). This prominent position would not suffice to explain the outcomes of his works, though, if it were not combined with his sociocultural perspective. The latter introduced the social context as the most important intervening variable in the issue of development. Moreover, his works related to disabilities, such as in *Defectology*, articulate all these elements critically, providing valuable insights for the reflections here presented.

Notwithstanding, Vygotsky’s originality can be measured by another standard, which is the timeliness of his works, even after almost a century of their being brought to light. The necessity of personalizing teaching and learning is an obvious conclusion drawn from his work, although, such a theoretical framework should be put alongside other elements characteristic of our times, such as digital technologies and artificial intelligence.

Therefore, we conclude that the perception of time, deficiency and development is a fundamental issue to build appropriate pedagogical methods to different cognitive patterns towards an inclusive education, which considers the students in their totalities and differences, including their varied bodies, physiologies, social and historical contexts.

Data availability

Data sharing is not applicable to this research as no data were generated or analyzed.

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Notes

- 1 The term “defect” is used by Vygotsky as a source of manifestation of abilities, rather than a weakness (Smagorinsky, 2012). Defect is usually related to an organic issue, which may not be necessarily a disability for cognitive purposes. Nonetheless, the term defect may sound discriminatory when taken out of context. It also worth noting that he used the language of his time. In contrast, the concept of “deficiency” is often associated with individuals who have “special needs”, requiring assistance for their “disabilities”, encompassing several medical and mental issues, such as autism, dyslexia, blindness, deafness, and physical disabilities, among other examples.
- 2 Indeed, time has long been “defined” in so many conflicting ways in the philosophical tradition, from Aristotle to Saint Augustine, from Heidegger to Sartre to mention a few examples.
- 3 If we refer to the *zeitgeist* in which Vygotsky establishes the notion of development and the concept of disability, we must attempt to the fact that his methodology involves the adoption of a dialectical perspective, which is only articulated in the context of becoming.
- 4 We make this statement with due care, aware that there are issues that do not refer only to one aspect of time and its complexity. Some people, for example, have physiological problems related to the production of neurotransmitters that are fundamental to the cognitive process, serious neural training problems, illnesses or accidents, among other critical aspects of learning.
- 5 Even at this most basic level, it is possible to adopt an axiological perspective, as occurred with the *scientific* attempts to provide the *real measure of man*, with the consequent elimination of all who did not have the so-called measures of the category of the truly human, or at least human to the highest degree, as with the eugenicist approaches, critically discussed by Gould (1999).
- 6 It can also change in the case of the anatomical disability, if the anatomical model is changed, but in quite different ways from the functional disability.
- 7 The diachrony of the human element of the relationship would include the notion of “development” that we will deal with later.
- 8 Vygotsky addressed the issue of development not only in his studies about *defectology* but also in his *pedological writings*. As already mentioned, he has not addressed the issue of *time* more directly, and that would require discussing Hegel, too, which is not the objective here.

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Author contributions

All authors contributed in multiple roles: conceptualization, methodology, validation, formal analysis, investigation, data curation, resources, writing—original draft, writing—review and editing, visualization, supervision, project administration. The first author had the supervision oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team; project administration—management and coordination responsibility for the research activity planning and execution; and funding acquisition of the financial support for the project leading to this publication.

Competing interests

The authors declare no competing interests.

Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

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This article does not contain any studies with human participants performed by any of the authors.

Additional information

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