


Behaviorism, Cognitivism or Humanism? The Theory of Meaningful Learning and the construction of knowledge about its frontiers and possibilities

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Charlene Rose Reis Silva¹, Clarete de Itoz² and Shirlei Nabarrete Deziderio³

ABSTRACT

This study is part of the great universe of Research in Physics Teaching, which unfolds from the higher level to Basic Education, in the search to understand the problem of school ineffectiveness. This is a difficulty in physics, but not only, so that the solution will depend on joint efforts to understand its causes. Starting from the systematic study of the theories of Learning, directly linked to one of the disciplines of the National Professional Master's Course in Physics Teaching (MNPEF), a comparison is made between the theoretical approaches that categorize the three main theories studied: behaviorism, cognitivism and humanism. The results of the analyses show that, on the one hand, there is the explicit discourse in favor of the Theory of Meaningful Learning to support the Teaching-Learning process, but on the other hand, it is the humanistic practice that enters the classroom, through inclusive appeals and methodological suggestions, and ends up transferring the focus of the school process to the students. From one of Ausubel's proposals, to progressively differentiate and then integratively reconcile any theme, we conclude with a critical reflection capable of redirecting the focus of Teaching to teachers.

Keywords: Meaningful Learning, Behaviorism, Cognitivism, Humanism, Teacher education.

¹ Master's Degree in Physics Teaching – UFNT

E-mail: charlenemaximus@gmail.com

² Dr. student in Accounting – UFNT/Unisinos

E-mail: clarete.itoz@ufnt.edu.br

ORCID: <https://orcid.org/0000-0003-4048-142X>

³ Dr. in Sciences – UFNT/UFSCar

E-mail: Shirlei.deziderio@ufnt.edu.br

ORCID: <https://orcid.org/0000-0001-6074-4093>



INTRODUCTION

The world scenario, marked by social, environmental, and technological challenges and transformations, exposes different ways of understanding and structuring education, resulting from different conceptions of the world, often created from studies or partial conclusions of what is the Theory of Meaningful Learning (SAD), by David Paul Ausubel.

This theory completes the cognitivist character of the construction of knowledge and provides the area of Educational Psychology with what can be considered the apex of human school learning, still not completely understood today.

As all human knowledge is subject to evolution, within the same line of reasoning it is perfectly possible to find criticisms and foundations about a theory, made by the authors themselves. This stems from the scientific method, which, when open, lends itself to revising previous positions in favor of new knowledge, added or suggested by experimentation and reflection on what they discuss.

Within the line of research proposed by the study, an example of this is what SKINNER (1974) discusses, who, after confronting behaviorism with the view proposed in the sequence, cognitivism, argues that one theory is part of the other, in a construction in which later results logically come from those who preceded it. And he does so, methodically, motivated by the misunderstanding he recognizes that there is about behaviorism being the philosophy of a behavioral science.

However, in the same way that he states that "we cannot measure sensations and perceptions as such, but we can measure a person's ability to discriminate stimuli; thus, the concept of sensation or perception can be reduced to the operation of discrimination" (SKINNER, 1974, p.17), we are forced to admit that the construction of knowledge, proposed by cognitivism, is directly unobservable, but can still be studied by the knowledge of learning situations that imply results that, when compared with those promoted by common sense, stand out positively from those.

It starts from the effects of behaviorism, beautifully explained to the world of Education by authors who describe, from the observations of Ivan Pavlov to Skinner, the results of the "stimulus-response", of "conditioning and reinforcement", within the view that the student's behavior can be controlled by its consequences and that, as a result of this control, school effectiveness could be achieved.

Faced with so many answers and possibilities, and the boundary between one and the other emphasis in the set of learning theories is not explicitly delimited, the main objective of this work is to raise the discussion about what actually fits in the school, in order to justify its existence/maintenance.



It is precisely at this point that the work with high school, undergraduate and graduate students in Physics Teaching, allows considerations that can contribute to the discussion about whether or not SAD can be effective as a theoretical support for school education.

They arise from the discussion and reflection on theories with teachers, educators and researchers in Teaching and Education, with MOREIRA (1999) as the main reference text, linked to the discipline Theoretical Foundations in Teaching and Learning, of the National Professional Master's Degree in Physics Teaching (MNPEF).

It starts, therefore, from the experience, the study of the book and the monitoring, by the researchers, of the preparation and application of an Educational Product created as part of the requirements of the MNPEF projects (SILVA, 2022).

It is reported that the boundary between behaviorism and cognitivism is not the only one to be resumed.

The contour between cognitivism and humanism also leaves marks on the conceptions of those who enter the universe of Learning theories in the search for answers that involve Formal Education.

THE CONTEXT OF MEANINGFUL LEARNING THEORY

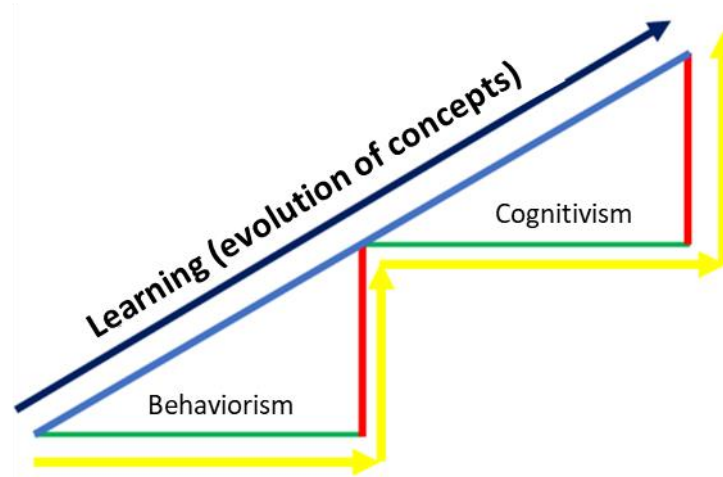
The problem discussed here involves SAD – which often appears as the theoretical resource chosen to support the choices of methods used in Basic Education – but not only it. It also includes the temporal margins that confront it with behaviorism, which precedes it, and with humanism, built at a time after SAD.

On the first side of the margins, there are the authors of the transition between behaviorism and cognitivism, who rehearse one of Ausubel's statements – when he considers that Meaningful Learning about incorrect concepts can be considered epistemological obstacles – thus testing the legitimacy of the learning process from the perspective of SAD: before trusting in a new model, the authors do not abandon previous knowledge (due to the affinity and security that knowledge provides meaningful, whatever it may be).

Robert Gagné, one of these transition authors, defines Learning as a "persistent behavioral change" (MOREIRA, 1999, p. 66) but, at the same time, admits the existence of internal processes of Learning (cognitivist) that can be influenced by external events, by stimulation of the environment, etc. That is, it goes beyond the control of a behavior (observable) to arrive at the results of that control, in terms of Learning (not directly observable).

The following figure illustrates two possible paths to be followed during the construction of new knowledge.

Figure 1 – The gradual evolution of learning concepts between the behaviorist and cognitivist emphasis



(Source: the authors)

Figure 1 shows that the evolution from one emphasis to another, within the focus of Learning theories, should be seen as something gradual and uninterrupted (blue arrow – continuous), contrary to what one might think, because nature does not "make leaps", it means, in this case, that the discrete path (yellow arrows) does not lend itself to gradually modifying the path. Between one step and another of the learning process, in order to ensure the journey itself. Which is to say that we don't stop thinking about behavior abruptly, and from that very moment we become cognitivists.

Before evaluating the attempt to incorporate Meaningful Learning into the school environment, however, it is important to keep in mind the implications of this choice. The orientations of the theory make clear, as objectives, the indispensable conditions for the cognitivist construction of knowledge.

In this context, it is necessary to consider, in the first place, that the theoretical approach to Learning, based on the emphasis on cognition, is different from the behaviorist approach, and has as basic concepts the "schema", the "sign", the "mental model" and the "presence of specific subsupers" (MOREIRA, 1999), essential for the proposed construction. Authors such as Piaget and Vygotsky align themselves with cognitivist ideas and figure, among others, in the framework of cognitivist authors, alongside Ausubel.

Secondly, consider a third theoretical approach, humanism – described by Carl Roger – which discusses, within the educational panorama, the possibility of emphasizing the person, that is, each student individually, considering as basic concepts "learning to learn", "freedom to learn", "student-centered teaching" and "personal growth" (MOREIRA, 1999).

In order to enrich the foundations, it is important to consider the contributions of Joseph D. Novak and Bob Gowin, considered as authors of transition, but now between cognitivism and humanism.



Humanist aspirations, coupled with the cognitivist approach, should be observed with the due rigor proposed by the authors, who emphasize the need to value the individual, while at the same time claiming to believe in

that Ausubel's theory of cognitive learning offers a solid intellectual foundation for the creation of new situations in school teaching and learning that can lead us, in the coming decades, to better educational practices." (Novak & Gowin, 1984, p. 11)

For this reason, some points are outlined below that, in terms of the requirements for Learning, are indicated by the TAS, but that may appear mixed with educational proposals that tend more towards the Humanistic approach than that of the theory that lends them their name.

These excerpts intend to discriminate some basic conditions that justify a Teaching-Learning method being referenced by the SAD.

The discussion that follows attempts to point out a tendency to attribute to SAT an appeal that is much more plausible when attributed to Humanism. It attempts, therefore, to unveil the existence, not only of the attempt to transfer the Humanist focus to Ausubel's Cognitivist theory, but also of the implicit suggestion that the search for knowledge may be more important than the construction of knowledge itself.

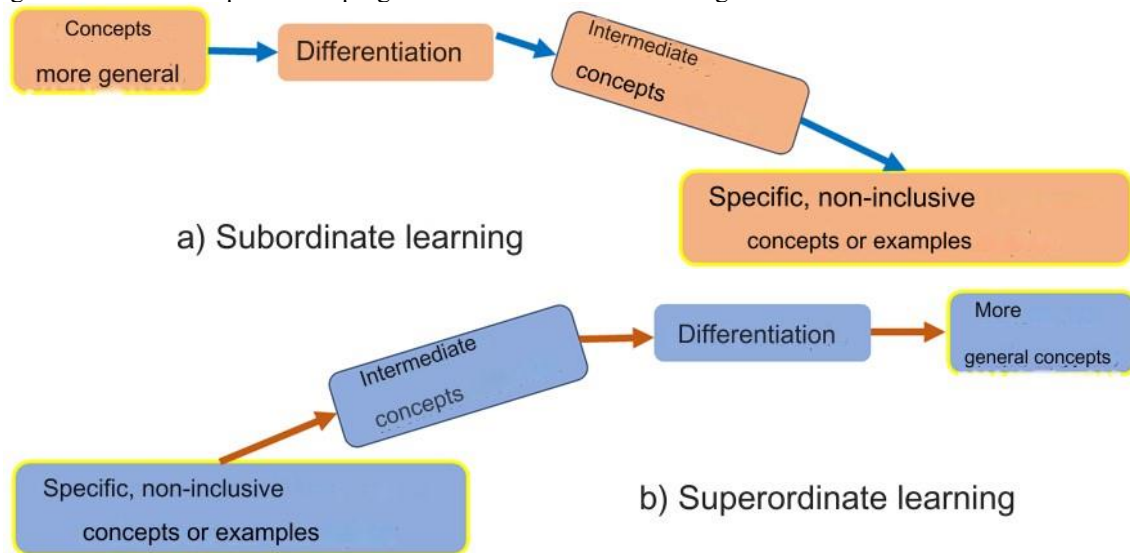
THE CONSTRUCTION OF KNOWLEDGE VIA TAS

The choice of the Meaningful Learning Theory is based on the considerations that 1. In today's world, changes occur with such speed that they leave behind, unfinished, many of the projects started. They often become obsolete due to the progress in the time required to carry out the proposal; 2. people accept, as given, a reality that escapes their comprehension and 3. "Meaningful Learning is the human mechanism, par excellence, for acquiring and storing the vast amount of ideas and information represented in any field of knowledge" (AUSUBEL, 1968, p. 58).

Based on these considerations, it is worth highlighting some points among the conceptions of Ausubel's theory to support further discussions.

When we talk about the forms of learning, we can say that subordinate learning implies progressive differentiation, that is, that starting from general concepts, we move towards other, more specific ones, as shown in figure 2(a)

Figure 2 – Relationship between progressive differentiation and integrative reconciliation in the field of SAC



(Source: the authors)

On the other hand, superordinate learning, figure 2 (b), moves in the opposite direction, that is, it starts from more specific concepts towards more general ones, implying integrative reconciliation. The importance of both progressive differentiation and integrative reconciliation, so necessary for systematizations and recognition of patterns, which consolidate the Teaching-Learning process, is admitted here.

A combination between the previous forms, anchored in the existence of several other knowledges, pre-existing in the cognitive structure of the learner, allows the attribution of meanings to a new knowledge. This is the so-called combinatorial learning.

As for the types of Learning, the starting point is the representational, that is, the one that occurs when arbitrary symbols come to represent, in meaning, certain objects or events, in a univocal relationship, that is, the symbol means only the referent it represents.

The evolution of representation, pure and simple, is the creation of concepts that depend on the perception of regularities, in events or objects, and allow the individual to move from the representation of a concrete referent to a symbolic one, which is equivalent to a representational type of higher level.

Also relevant to the process is that of the propositional type, which has as a prerequisite those of the two previous types, since it implies giving meaning to new ideas, expressed in the form of a proposition. This, in turn, is beyond the sum of the meanings of concepts and words. It is an idea that synthesizes a more elaborate proposal, regarding a more comprehensive understanding of the subject.

In the integrity of the procedure, by emphasizing that the variable that most influences the significant acquisition of new knowledge is what the student already brings within him, resulting from his training, Ausubel points to the fact that for each subject to be learned, there is a need for a minimum and previous "conceptual skeleton".



In it, different connections and arrangements between existing and new knowledge will be included, ordered and regrouped, through school work, organized and systematized by the teacher.

In this way, there is no way to neglect the particular character of the learning process, since each one has his own culture, understood here as the amount of human knowledge apprehended by an individual, that is, that which this individual is able to readily employ.

Nevertheless, Ausubel is very emphatic in stating that his theory deals exclusively with Learning by Reception and Retention of knowledge, within the scope of formal education, which differentiates it from what Roger proposes, which internalizes to the educational process an objective much closer to the level of integral human formation, permeated by individual thoughts, feelings and actions.

This is a differentiation that must be understood before proceeding. Although it may appear as an alternative, no school with a humanist emphasis has prospered to the point of becoming a model, perhaps because of the lack of empirical evidence to support this approach, or because of the personal and financial cost that it would entail, which is not available in the current scenario.

One way to look at Ausubel's emphasis on Reception Learning, however, as opposed to "inquiry," "discovery," or "process" learning, is to consider what is actually possible to accomplish within school settings.

The author attaches importance to Meaningful Learning and Retention in school education by treating as its main objective the presentation of a comprehensive theory of how human beings learn and retain large bodies of organized subjects, in the classroom and in similar learning environments. That is, to point out that the scope of SAT is limited to "Receiving Learning" and to the retention of potentially significant instructional material implies that Receiving Learning refers to the situation in which the total content of the Learning task (what is to be learned) is presented to the learner and not independently discovered by the learner (AUSUBEL, 2000, p. 18).

When looking at the school, as it really is, it is clear why it is by reception: formal education requires very special conditions, including time.

Regarding these conditions, it should be noted that basic education is now completed within twelve years, with the first nine years relating to Elementary School (EF) I and II and the last three relating to High School (ME). To understand what this entails, consider approximately two hundred school days each year. Each day, on average, there are four hours of classes. Doing the math, we arrive at a total of $(12,200 \cdot 4 = 9,600)$ nine thousand six hundred hours.

Now, compare that number to the number of hours an individual lives, say, 70 years old. To do this, simply multiply, again, the number of years by the number of days in a year and by the number of hours in each day. Thus, $(70,365,24 \cdot \cdot = 613,200)$ gives a total of six hundred and thirteen thousand two hundred hours.



The ratio between the time of study in Basic Education and the total time of life, in this case, corresponds to just over 1.5%.

Of course, it is necessary to understand that not all Brazilians live so long, in the same way that it is necessary to make it clear that only a portion of the total attends school. More precisely, EM enrolments represent less than 30% of PE enrolments, i.e. $\frac{7,87 \text{ millions (EM)}}{26,45 \text{ millions (EF)}} \cong 29,8\%$. (BRAZIL, 2023).

The calculations, therefore, serve only to illustrate a situation in which a very small fraction of time is devoted to school education.

In addition to being a short time, it should also be noted that the construction of new knowledge is not random, nor immediate or instantaneous, but depends on other knowledge, previous and difficult to manipulate.

In order to discuss this idea that the construction of knowledge does not take place in a cognitive vacuum, David Ausubel introduces the concept of subsumption.

It is not, as one might think in principle, that it refers to what is usually called a prerequisite, in the common sense attributed to prerequisites, for example, to take a certain course.

Having taken the discipline of Physics I, and only then Physics II, does not mean that all the concepts worked on in the first discipline are available in the cognitive structure.

The idea of subsumer is different. It refers to the existence of specific, and not simply literal, knowledge that, when available in the learner's cognitive structure, when information is added, is remodeled with it.

Together, they are transformed into a new knowledge: more elaborate, relevant and that will be available for future constructions that, by affinity, is claimed in the dynamics of the creation and decoding of other concepts or objects.

Thus, in addition to the specificity of a subsumer, since each theme requires one or a group of particular subsumers, it is necessary to understand that a new information anchored in a subsumer does not result in a simple sum, since the result of this addition is unpredictable, modifying both in the construction of something new.

It is in this sense that it is important to think of the cognitive structure as something plastic, remodelable in increasingly complex forms, mainly by processes typical of schooling, and which, according to its own complexity, will be able to create and decode worlds with high degrees of complexity.

That said, it is already possible to discuss, close to the domains of SAD, a concept, brought by VAN MERRIËNBOER & SWELLER, known as "working memory", or as the "place" where Learning takes place (VAN MERRIËNBOER & SWELLER, 2010).

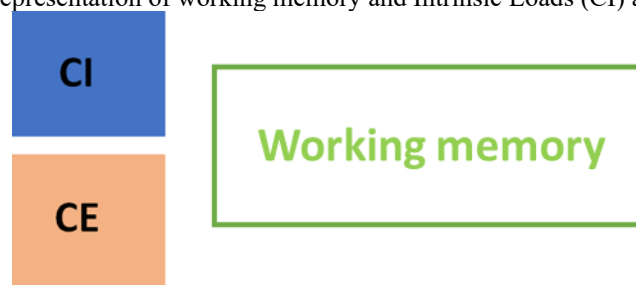
At first glance, one could think of working memory as something internal to the cognitive structure, in which the processes that result in new knowledge are constructed, by means of generative resources (data processing).

Considering that Learning is something particular, and distinct for each student, the representation of working memory, as shown in figure 3, is equally different, in dimensions and complexity, for each one. In other words, it is individual and unique, but it must evolve as the school process becomes more effective (in the sense of really delivering what it proposes).

From a certain perspective, this is exactly the role of formal education: to remodel simple cognitive structures in others, with a greater capacity to organize, retain and reconcile knowledge, scientifically accepted, in order to evolve the capacity for understanding that each individual has of the external, social and complex environment, through internal evolution, and, therefore, inherent to each being that makes up this society.

Beyond the individual peculiarities, however, it is possible to visualize schemas that, in general, help in the understanding of what would be the limits to knowing, represented by working memory. For the sake of simplification, let's consider the following figure as a model.

Figure 3 - Schematic representation of working memory and Intrinsic Loads (CI) and Extrinsic Loads (EC)



(Source: the authors)

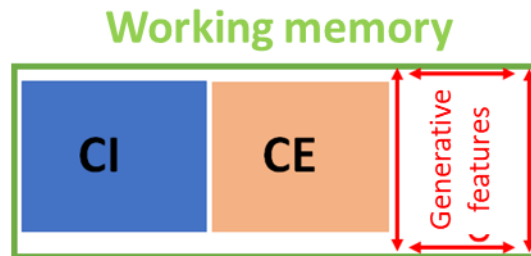
Consider, then, two types of cognitive loads, through which school contents are presented to students during classes by Meaningful Reception: the Intrinsic Load (IC) – which corresponds to verbal or written explanations, and corresponding examples – and the Extrinsic Load (EC), composed of graphs, tables, diagrams and figures that facilitate the understanding of those who must grasp the contents taught.

Then, by taking on the responsibility of training others, teachers incur the respective responsibility of distinguishing between the working memories of different levels of specialists, and from their privileged perspective, in terms of knowledge, reshaping them in the sense of provoking their learning dynamics, for each subject addressed.

In a class based on SAD, in which the Teaching-Learning process is the focus of the teaching work, the ideal is to fill the students' working memory, only partially, dosing between certain

amounts of Intrinsic and Extrinsic Loads, and leaving space for data processing. This representation is shown in Figure 4.

Figure 4 - Optimally populated working memory with space for generative features

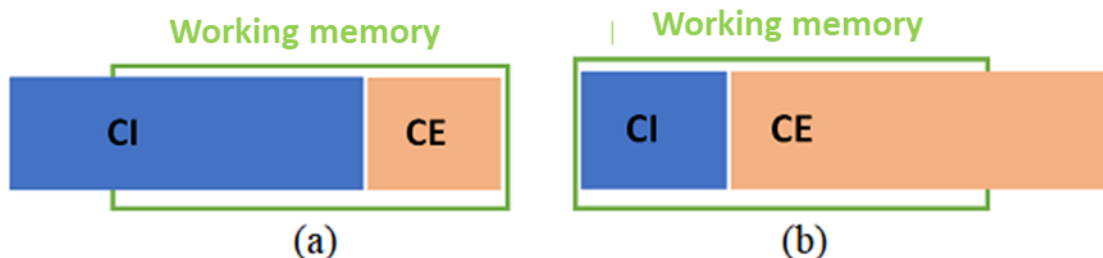


(Source: the authors)

Note that data processing, in order to happen, requires "space", or Generative Resources, as the author calls it, in the working memory. The problem is that, when exceeding the capacity of the working memory, both through excess Intrinsic Load and Extrinsic Load, the processing of information will not take place.

Figure 5 exemplifies the forms of cognitive overload, in which there is no room for Generative Resources, which are essential for the construction of knowledge.

Figure 5 - Cognitive overload (a) due to excess intrinsic load and, (b) due to excess extrinsic load



(Source: the authors)

In order to avoid overload, the authors of the transition between cognitivism and humanism set out to understand how to map students' cognitive structures.

This is not a quick task, nor is it easily achievable by "non-specialists" or by teachers who are not yet proficient in the didactic-methodological articulation that is imposed in the classroom. Not to mention the solid initial training that teaching requires, which is not always available to beginners in the career.

From these considerations, we then go to Novak and Gowin's explanations on how to improve Ausubel's proposal.



THE LIMITS OF SAC AND THE USE OF COMPLEMENTARY APPROACHES

From now on, it is already possible to observe, more closely, what are the consequences of having a strong humanist appeal within formal education. This is due, as we will see below, to the apparently predominant discourse related to Discovery Learning, as an alternative to Reception Learning, having entered the classroom.

Looking more closely at the considerations of Novak and Gowin, it is clear that the defense of processes to map and help in the understanding of the concepts covered in the classes, does not try to abolish the contents. These are strategies that aim to facilitate students' understanding of the concepts studied.

It is not, therefore, a matter of weakening the central purpose of education, to provide conditions for people, valued and confident in the educational process, to be able to take charge of the very construction of the meaning of their experiences, but of mapping what is available for the construction of new knowledge. To this end, the authors describe three main ideas: 1. the concept map; 2. the diagram in "See", and 3. the clinical interview.

Items 1 and 2 refer to students, as they "improve learning by combining theory with practice, what is unknown with what is familiar" and item 3 "allows teachers and parents to evaluate such integration" (NOVAK & GOWIN, 1984, p. 11).

In order to help each one reflect on their experiences, in order to construct new meanings, without ignoring the importance of feelings, they emphasize, like Ausubel, that learning is the responsibility of the student, and that, "once relieved of this responsibility, the teacher can concentrate on the teaching process" (NOVAK & GOWIN, 1984, p. 14).

When they talk about learning about Learning, they emphasize that the help of "Seeing" is:

that when students are confused about the new concepts they are trying to learn, the problem is usually at the vertex of "See". Students must be helped to recognize (1) what events or objects they are observing, (2) what concepts they already know that relate to these events or objects, and (3) what records are worth making (Novak & Gowin, 1984, p.22).

The authors also consider that "the best theory of learning that focuses on concepts and propositional learning as the basis on which individuals construct their own idiosyncratic meanings is the one proposed by David Ausubel" (NOVAK & GOWIN, 1984, p.23).

In the choice between the strategies pointed out, from the memoristic to the highly meaningful, they highlight those that have been "designed to support approaches of instruction that aim to increase Meaningful Learning" (NOVAK & GOWIN, 1984, p 23).

They also explain that "the construction of concept maps has been successfully used by students of the first level of Basic Education and the construction of diagrams in "See" by students of the more advanced levels" (NOVAK & GOWIN, 1984, p 24).



This is also a point to be highlighted from the authors' ideas, because it is important the level of understanding of the students to choose one among the available methods, as well as a deep knowledge of those who will use these strategies in a non-superficial way. After all, promoting learning depends a lot on teaching methodologies and the time available, which most of the time must be fully articulated among the various school demands.

We agree with Novak and Gowin when they differentiate between Learning and development, in short, it is not enough to grow in order to evolve, at least not in terms of the evolution of knowledge, which must be built by each individual who consciously chooses to learn.

Hence, it can be understood and verified that: "an education that intervenes in the lives of children creates a world that they could never envision without this education. True education changes the meaning of human experience" (Novak & Gowin, 1984, p. 27).

When considering the various aspects of what was discussed, we must rescue the objective of this discussion, which is to focus on what can be done in a school system to increase its effectiveness.

In fact, when considering the results on the proficiency of Brazilian students, the fact that there has been a low school performance in the country for decades stands out.

Different discourses, due to the diversity of possible interpretations, and the lack of in-depth studies that attempt to justify them, may have contributed to this fact. Among them, the following stand out: the trails of continued progression (BERTAGNA, 2009) implemented in Basic Education; Teaching by Competencies and Skills, which show the loosening of the systems in relation to the content taught (SACRISTÁN, 2011), the active methodologies, which defend the focus on the student (BERGMANN & SAMS, 2016), for example, among others, and some discourses that openly suggest the reduction of the amount of content covered in the classroom.

On their own, each of these would have no destructive effect on educational outcomes. The problem that emerges is that of suggestion, on different fronts, which end up introducing to the systems, various narratives, cut out of their contexts, or even studied in a superficial way, which collaborate for the result in question.

In the discussion on competency-based education, for example, Sacristán (2011) says that language is not innocent and questions the reasons for its incorporation into the Educational System, as a way of controlling efficiency in a context in which persistent school failure stands out.

Most of the time, the blame for failure is shared between teachers and students, either because of the fragility of the curricula or because of the lack of appreciation of students who, supposedly, mock the opportunity to learn, due to carelessness or lack of interest (SACRISTÁN, 2011, p.19).

It is noteworthy, however, that the administrative bodies of education are also not held accountable for the results, perhaps due to the small volume of related research (OKSANA, 2012).



This could highlight a project that is intended to be invisible, but that over the years ends up leaving its fingerprint, unequivocally, in the school failure produced by contingencies and refusals of educational investments. This leads to the quality of teacher training (MIORANDO, 2017), which interferes with their autonomy to accept, or not, the suggestions, not always justified, that accompany endless demands for educational reform.

But it can mean the opposite, since, in not having identified the deviation between methods and objectives, the administration itself may have made a mistake, forging the teaching work without distinguishing the transformation it promoted.

And this wouldn't be a criticism, after all everyone makes mistakes. A school system that denies error would be denying itself, because it is on them that new successes are built, after all, corrections can be the awakening to transformations and, as BECKER (1994) states: "the educational process that transforms nothing is denying itself" (Becker, 1994, p. 88).

However, in the comparison between learning theories, connected by tenuous temporal boundaries, the difficulties in mapping peculiar and individual structures during the process of construction of new knowledge are clear.

Not only because of the unobservable character of these structures, but also because of the dynamics of cognitive modeling and remodeling that takes place continuously, modifying itself to the extent that it modifies existing subsumers, in connection with information added to them. In addition, this is another action that adds to the extensive list of teaching tasks.

To explain just one item of the confusion of existing biases, perhaps we can differentiate about one word, in particular, that was borrowed from the perspective of Education, without understanding its real meaning: the word focus.

In physics, focus is a point from which a beam of light diverges, or to which it converges. This means that if all the rays of a light beam are deflected to a single point, all the others are blurred, that is, no light will reach the neighboring points.

By comparison, in the school, a teacher who turned all his attention to a single student would abandon the others without any assistance, since it is a question of the impossibility of multiple foci for the same beam of light, or, by comparison, many students for a single teacher.

Note that here it is not a matter of differentiating between the capacity of a teacher, more or less prepared, but of the real impossibility of focusing on one, without blurring from the other students.

The result of so many conceptual conflicts was the impossibility of structuring the school to carry out the SAD, based on Teaching by Reception and Significant Retention, defended by Ausubel, who is the focus of the teaching activity.



It is the complexity of the Teaching-Learning processes that requires a deep study of the "urgent" structuring of formal education.

We will try to further improve our view of what is understood as the process of knowledge construction. To this end, we will introduce to this reflection a distinction between things that are natural in the world and those that are exclusive to human constructions.

For example, "dogs, stars, and human beings are natural objects" (Novak & Gowin, 1984, p. 20), just like water and oil. Telephones, buildings, and airplanes are human constructs, and so is scientific knowledge.

Consider that an individual can make or lose a lot of money overnight, becoming rich or poor, almost immediately. It is the acquisition or loss of something external to himself: money. So it can be immediate.

This does not happen with someone's culture, because from the cognitivist perspective, knowledge cannot be acquired spontaneously, neither for individuals who behave in an exemplary way – behaviorist approach – nor for those who are welcomed in all their social, financial or emotional needs – humanistic approach.

The construction of elaborated knowledge, such as scientific/scholarly, is the result of a cognitive process that internally alters the way of thinking, acting and behaving, through the understanding of the world, in order to apprehend its complexity through internal tools of understanding.

The decoding of the complex occurs when, by self-modeling, in an increasingly complex way, through the construction and reconstruction of the knowledge it incorporates, the cognitive structure begins to perceive, through assimilation, the complexity of the environment, through the capacity it grants itself to extend itself over the limits of its own understanding, through the recurrent process of Learning.

Therefore, to conclude this point, it could be said that a simple structure is enough to recognize what is simple in an object, but a complex cognitive structure is required for those who want to understand the complexity of this same object. In other words, the world is what it is, but it is appreciated individually as a cut-out that the individual himself, according to his cognitive tools of observation, is capable of covering.

But, finally, what is the importance of constructing complex knowledge, via very well sequenced, chained and systematized fragments, whose only democratic path is Formal Education?



THE COMPLEX COGNITIVE STRUCTURE NECESSARY FOR THE DECODING OF THE WORLD

The discussion proposed above is supported by the literature, on different fronts, on the need to recognize the complex, but not only by the appearance of what is given. Also because of the definitive perspective of the dynamics with which reality is altered, in the face of scientific/technological advances (SIQUEIRA, 2005).

According to MORIN (2007) "the tradition of thought that forms the ideals of elementary schools orders that the complex be reduced to the simple, that what is connected be separated, that what is multiple be unified, that everything that brings disorders or contradictions to our understanding be eliminated" (MORIN, 2007, p. 18)

And this is a perfectly understandable criticism, which from the educational point of view, understands that the path to be followed is exactly the opposite: to transform the simple cognitive structures received for formal education into complex ones, so that when they become complex they can decode the world as it is, that is, strictly complex.

Further on, the author warns that "... the divided spirits become blind to interrelations and causality in circuit; they commonly consider living and social phenomena from a linear causality and a mechanistic/deterministic conception that applies only to artificial machines." (MORIN, 2007, p.19).

And this is exactly where the perception comes in that in order to teach, one must impose limits, or borders, of what will be worked on, and at what time, because we learn in blocks and not all at once.

It is as if the teacher, by observing the students in the school process, could distance himself from them enough to, from the top of his place of observation, infer the best path to follow.

This projection to the whole of the school universe guarantees, each school day, a different choice directed to the observed demands, and this, in fact, is a work that cannot be processed by teaching machines, since they could not decode the daily and uninterrupted procedures of teaching.

In the same way that this teaching practice is necessary, in the sense of separating complex knowledge into teaching units, the integrative reconciliation of the parts, as a whole, is essential.

And this is a statement that touches on the affirmations of the TAS, which defends and points to progressive differentiation, without absolutely discarding the need for integrative reconciliation, which does not exist in common sense for large bodies of elaborated knowledge, but which must dispense with Formal Education, without which the connections that make us understand the whole are lost. originally built in its parts.

And this is another function, proper to the teacher, because only the one who conceives the whole will be able to separate it into blocks, without losing the perspective of what it is up to him,



later, to reconcile with the students, in order to recreate the complex by means of components put back in connection.

In the same way that the fractionation of the real does not serve Education, as Morin states, the realization of Humanism, as an alternative basis for SAD, does not serve the systematizations necessary for the construction of complex knowledge.

Therefore, it is necessary to reflect on the possibilities of the humanistic emphasis, of learning to learn, for example, that it may or may not be introduced as a global objective in Educational Systems.

It is not, however, a matter of discarding learning to learn as part of educational practice, but only of rejecting it as a generalization of the educational proposal that, otherwise, always reduces

the complex character of the world in disunited fragments, ... unidimensionalizes the multidimensional... and most of the time it ends up being blind, because it destroys all possibilities of understanding and reflection, eliminating at the root the possibilities of a critical judgment, and also the opportunities of a corrective judgment or a long-term vision" (MORIN, 2007, p. 19).

Students, left to their own devices, are unable to divide, understand and reconstruct concepts without the help of the one whose function is to guide them in this construction. And learning to learn does not fit into the time of Formal Education, as a method.

The same can be said of Learning by Discovery, which would require a time that supposedly fits the humanist conception, but is very far from the current conditions of Formal Education Systems.

The defense of the cognitivist choice, which falls on the teacher's autonomy to impose boundaries on school contents, in the sense of delimiting classes into corresponding and individual units, does not, in any way, adhere to the defense of authoritarianism in the classroom.

In the same way that it cannot admit, in a world where the construction of scientific knowledge takes place at a much faster speed than in the past, the defense that school content should decrease, in relation to the amount it represented in the past.


On the contrary, the defense is to create more favorable conditions for human understanding to be extended, via Educational Systems, so that it can understand the knowledge necessary to maintain the development of the current world, permeated by new technologies and their applications, increasingly diverse and also more complex.

To improve the visualization of the insertion of the humanistic approach in the cognitivist approach, table 1 illustrates, unequivocally, that although Ausubel's theory excels in the Teaching of Meaningful Reception, whose basic concepts are: schemes, signs, mental models, subsumers and constructivism, school practices end up being guided, almost exclusively, by learning how to learn,



freedom to learn, student-centered teaching, and personal growth. The red arrow indicates this displacement.

Table 1 – Grafting of the basic concepts of humanist theory to replace those of cognitivist theory

Approach	Behaviorist	Cognitivist		Humanist
Theoretical	Ivan Pavlov, John B. Watson, Edwin Guthrie, Edward L. Thorndike, B. F. Skinner	Piaget, Jerome Bruner, Lev Vygotsky, Johnson-Laird, Ausubel, George Kelly		Carl Roger
Basics	Stimulus, Response, Conditioning, Reinforcement, Behavioral Goal	Schema, Sign, Mental Model, Subsumption, Constructivism		Learning to Learn, Freedom to Learn, Student-Centered Teaching, Personal Growth
Key Idea	Behavior is controlled by its consequences	Knowledge is built		Thoughts, feelings, and actions are integrated

(Source: adapted from SILVA, 2022)

Hence, it is possible to list two misconceptions that can help to understand the failure of the appeal for the Theory of Meaningful Learning in schools:

1. the systematic adhesion of different discourses on the teaching process, without the prior and necessary progressive differentiation between them, between what each one of them represents and in what proportion they should enter the classroom and;
2. The lack of integrative reconciliation of the educational whole on the part of the agents of the school universe, with a view to ensuring the path of development. That is, how to recompose the teaching practice, with a focus on the teaching process, the student practice, with a focus on responsibility for their own learning, and the administrative practice, with a focus on the organization and investment for the Public Education systems, in which most students are inserted.

The problem discussed in the work is not new, and has already been approached from different angles. One of MOREIRA's (2018) statements is that

There was a superficial and polysemic appropriation of the concept of meaningful learning. All learning became meaningful, all teaching methodologies began to aim at meaningful learning. A trivialization of the concept. There was, however, no appropriation of the theory or philosophy underlying it (MOREIRA, 2018, p.24)

The author also states that what happens in schools, the result of rote learning, even if called by any other name, is something that is quickly forgotten and cannot subsidize new knowledge. According to him, this type of knowledge "continues to predominate in schools, accepted without question by teachers, parents and students, fostered by university entrance exams and exalted by preparatory courses. A huge waste of time" (MOREIRA, 2018, p.24).



Hence the defense that in order to avoid further waste of time, it is necessary to reposition the school activity in favor of the work of logical reasoning and appropriation and construction of basic knowledge, without which the remodeling of simple cognitive structures into complex ones will not take place.

If, on the one hand, "the defetishization of school knowledge is the first form that assumes awareness of the phenomenon of school failure as a failure of the school institution" (PAULILO, 2017, p. 1262), on the other hand, it is necessary to take as many more steps, as necessary, in order to bring to the discussion themes that, on different fronts, make us aware of educational problems as a whole.

CONCLUSION

From the description of the conditions included in the SAD, from the observations that a partial mixture between the approaches of the theories is natural, and from the discriminations made about the three that were addressed in the study, it is possible to synthesize some considerations about the school teaching-learning process.

The word school resumes the objective of answering the question of what really fits in the systems of Formal Education, as a theory to support their activities, and that at the same time allow them to fulfill the purpose that is theirs: to be efficient in taking the process to maximum effectiveness, reestablishing the learning of millions of individuals who trust that they will have their lives changed in a unique way, through the knowledge that only Formal Education is capable of delivering.

As we have seen, there is a real appeal to develop teaching in such a way that individual improvement is converted into social improvement. Hence the support requested from the school to the society that maintains it, in search of mutual development. But how to do this, in order to abandon the persistent failure, accumulated over decades, within systems that deliver less, each year?

Well, if the goal is to keep up with world development, at the speed that it imposes on everyone, the answer must come from improving our understanding of how to carry out the Teaching-Learning process, stripped of humanistic conceptions that enter it, without even openly denouncing what it came to.

As TAS itself suggests, let us turn our observations and reflections to the theories, in a profound way, and make the necessary differentiations for understanding.

First, let's get back to the basics of each theory.

1. Behaviorism: stimulus, response, conditioning, reinforcement, behavioral goal.
2. Cognitivism: schema, sign, mental model, subsumer, constructivism.



3. Humanism: learning to learn, freedom to learn, student-centered teaching, and personal growth.

Now, it is up to the integrative reconciliations, necessary for a complete view of the problem. Of course, the difficulty in recognizing the obstacles, before changing the course of Education, is not small.

But once it is recognized that although school systems speak of Meaningful Learning (item 2, above), Project-based Teaching, Discovery Teaching, student-focused methodologies, and the view that personal growth will take place through formal education, actually represents the entire set of claims of humanistic theory (item 3).

We must ask ourselves, then, why has no Teaching System openly based on humanism been fully developed, why it is not the model to be implemented in schools and, finally, why, in addition to the discourse for Learning, the methods used in schools have so little of what the TAS suggests?

The focus of Ausubel's theory is limited to Reception Learning and the retention of potentially significant instructional material. This implies that the total content of the Learning task should be presented to the learner and not independently discovered by them.

Very well, this restores the focus of the school process to the teachers, which in fact should never have been undone, but only the study of theories can re-establish this understanding to thousands of teachers. They have been surprised, over time, by many discourses with tendencies that are revealed in the light of integrative reconciliation and that only with a lot of study are we able to do.

Everyone, professors, researchers and students, seems to have been led to a collective acceptance, which should be corrected, in the future, also in a collective way.

But how? Taking back, for the teachers, the teaching process. Dosing between Extrinsic and Intrinsic Loads, respecting the degree of development of the students, forging the uninterrupted and sequential realization of the Learning process – legitimately attributed to the students. Modeling simple cognitive structures into others of a higher level and demanding better conditions for teacher training, on an ongoing basis, among other things.

Once the legitimate Teaching-Learning process is re-established, the equality of teaching conditions between public and private systems will also be re-established.

Two final important observations can be drawn from the analyses:

1. Teaching practice, mixed over the years with student practice, may now represent another epistemological obstacle to changing directions.

After all, learning meaningfully that should make use of experiments, projects and discoveries to "attract" the student to Learning, instead of the incentive of education being the



construction of knowledge itself, can require both effort for teachers and students, in the resumption of basic contents that have been transformed into training gaps, for both of them.

2. Filling these gaps is indispensable for the recovery of the integral intellectual development of teachers and students.

Because, in SAT, it is imperative to have subsumers, or minimum "conceptual skeletons", for the resumption of the construction of elaborated knowledge. If they are not present, it is up to the schooling process to return them.

Finally, it is important to indicate the need to continue research to understand whether the changes were induced by the school administration, so that, if this is the case, it is possible to review positions derived from incomplete views of the theories that subsidized the observed transformation.



REFERENCES

1. Ausubel, D. P. (1968). *The Acquisition and Retention of Knowledge: A Cognitive View*. Springer Netherlands. Edição do Kindle, p. 213. ISBN 978-94-015-9454-7 (ebook)
2. Ausubel, D. P. (2003). *Aquisição e retenção de conhecimentos*. Lisboa: Plátano Edições Técnicas. Tradução do original *The Acquisition and Retention of Knowledge* (2000).
3. Becker, F. (1994). O que é Construtivismo? Série Ideias, n. 20. São Paulo: FDE. Recuperado de http://www.crmariocovas.sp.gov.br/pdf/ideias_20_p087-093_c.pdf
4. Bergmann, J., & Sams, A. (2016). *Sala de aula invertida: Uma Metodologia Ativa de Aprendizagem*. 1. ed. São Paulo: LTC, p. 116.
5. Bertagna, R. H. (2009). Ciclos, Progressão Continuada e Aprovação Automática: contribuições para a discussão. *Educação: Teoria e Prática*, 18(31), p. 73.
6. Brasil. Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (Inep). (2023). *Censo Escolar da Educação Básica 2022*. Brasília.
7. Miorando, T. M., da Silva Debus, I., & Fortes de Oliveira, V. M. (2017). Políticas públicas para a formação docente: saberes e práticas da docência. *Caderno Pedagógico*, 14(3). DOI: 10.22410/issn.1983-0882.v14i3a2017.1701.
8. Moreira, M. A. (1999). *Teorias de Aprendizagem*. 1. ed. São Paulo: EPU, p. 200.
9. Moreira, M. A. (2012). O que é afinal aprendizagem significativa? *Qurrriculum, la laguna, Espanha*, n.11, p. 1-27. Disponível em: <<https://goo.gl/6qsysz>>.
10. Morin, E. (2007). *Educação e complexidade: os sete saberes e outros ensaios*. 4. ed. São Paulo: Cortez, p. 104.
11. Novak, J. D., & Gowin, D. B. (1984). *Aprender a aprender*. Plátano edições Técnicas. Lisboa: 1ª ed., p. 212.
12. Oksana, P. (2012). Evaluation of educational administration: A decade review of research (2001–2010). *Studies in Educational Evaluation*, 38(3–4), 73-83.
13. Paulilo, A. L. (2017). A compreensão histórica do fracasso escolar no Brasil. *Cadernos de Pesquisa*, 47, 1252-1267. <https://doi.org/10.1590/198053144445>.
14. Silva, C. R. R. (2022). *Pensando em difração de ondas: um projeto para o Ensino de Física na Educação Básica*. Dissertação (Mestrado Nacional em Ensino de Física - MNPEF) - Universidade Federal do Norte do Tocantins, Araguaína.
15. Sacristán, J. G., et al. (2011). *Educar por Competências: O que há de novo?*. 1. ed. Porto Alegre: Artmed, p. 1-264.
16. Siqueira, J. (2005). Bioética, meio ambiente e vida humana. *Revista Brasileira de Bioética*, 1(3), 248-256.
17. Skinner, B. F. (1974). *Sobre o Behaviorismo*. 1. ed. São Paulo: Pensamento-Cultrix, p. 215.



18. Van Merriënboer, J. J. G., & Sweller, J. (2010). Cognitive load theory in health professional education: design principles and strategies. *Medical Education*, 44, 85–93.