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The Role of the Inductive Method as a Link Between Educational Theories and Classroom Practices

El rol del método inductivo como vínculo entre las teorías educativas y las prácticas de aula

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Abstract

This study addresses the issue of the relationship between theories and pedagogical models, focusing on their connection with educational research and classroom practice. In this context, the main objective is to analyze the role of the inductive method in the relationship between theories and pedagogical models from classroom praxis, using meta-research and reflective critique based on Grounded Theory. Thus, the definitions of theories and pedagogical models, the historical role of the inductive method in educational research, the relationship between inductive reasoning, the main theories and pedagogical models, and the practical implications of these approaches in teaching and learning are explored. The results reveal that the inductive method is essential for formulating hypotheses, theories, and models from empirical observations, providing a solid foundation for educational research. Additionally, it has significantly influenced the development of various pedagogical models, facilitating the integration of theory and practice, which is vital for effective teaching. In conclusion, the study highlights the ongoing relevance of the inductive method in educational research and its potential to improve pedagogical practices, especially with the advancement of technology, which offers new opportunities to enhance data collection and analysis.

Keywords

Inductive Method, Educational Theories, Pedagogical Models, Educational Research, Classroom Practice, Grounded Theory.

Resumen

Este estudio aborda la problemática en torno a la relación de las teorías y modelos pedagógicos, centrándose en su vínculo con la investigación educativa y la práctica en el aula. En este sentido, el objetivo principal es analizar el rol del método inductivo en la relación entre las teorías y modelos pedagógicos desde la praxis en el aula, utilizando la metainvestigación y la crítica reflexiva basada en la teoría fundamentada. De este modo, se exploran las definiciones de teorías y modelos pedagógicos, el rol histórico del método inductivo en la investigación educativa, la relación entre el razonamiento inductivo, las principales teorías y modelos pedagógicos, y las implicaciones prácticas de estos enfoques en la enseñanza y el aprendizaje. Los resultados revelan que el método inductivo es esencial para formular hipótesis, teorías y modelos a partir de observaciones empíricas, proporcionando una base sólida para la investigación educativa. Además, ha influido significativamente en el desarrollo de diversos modelos pedagógicos, facilitando la integración de teoría y práctica, lo cual es vital para una enseñanza efectiva. En conclusión, el estudio destaca la relevancia continua del método inductivo en la investigación educativa y su potencial para mejorar las prácticas pedagógicas, especialmente con el avance de la tecnología, que ofrece nuevas oportunidades para mejorar la recopilación y el análisis de datos.

Palabras clave

Método inductivo, teorías educativas, modelos pedagógicos, investigación educativa, práctica en el aula, teoría fundamentada.

Introduction

Everyone involved in the educational field has addressed, directly or indirectly, the different foundations of their practice. Although currently the central focus is on methodologies, both in classroom practices and research, there is an indissociable link between methods and theories. This forces the researcher to delve into the "epistemological panorama

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of pedagogy" (Prats, 2010, p. 5). This path is extremely complex and can become a real challenge that sometimes causes frustration and leads to abandonment because of its apparent uselessness. However, it is an important issue that must be addressed. Moreover, it is worth it, because as Baruch Spinoza (2007) says, "everything exalted is as difficult as it is rare" (p. 428) or as mentioned more contemporaneously, one cannot escape "the usefulness of the useless" (Ordine, 2013, p. 9).

At present, the importance of the intrinsic relationship between practice and educational theory is widely recognized. This relationship becomes even more crucial when the teaching practice combines the formative work with the investigative. As is often attributed to Kant (2005), practice without theory is blind, while theory without practice is sterile. Similarly, Freire (2006) noted that "separate from practice, theory becomes pure verbalism. Separate from theory, practice is but blind activism" (p. 30). In this way, both components are fundamental. In this sense, one of the problems faced is the disconnection between didactics and classroom methodologies with different theories, paradigms and pedagogical models (Álvarez Álvarez, 2015). This situation is paradoxical, since it is precisely the theoretical constructs that should illuminate educational practices and research (Dewey, 2004). Thus, the main problem of this work lies in determining Thus, the main problem of this work lies in determining the relationship between educational theories and pedagogical models with classroom praxis.

Thus, the main objective of this work is to analyze the role of the inductive method in the relationship with educational theories and pedagogical models from classroom praxis, using meta-research and reflexive criticism based on grounded theory. To do this, genealogy (Foucault, 1988) is used as a strategy to develop this article, seeking to trace the emergence of different theories and educational models in relation to the role of the inductive method. Therefore, the idea to defend is that the inductive method plays a central role as a link between theory and classroom practice. Through the inductive method and its processes it is possible to materialize the relationship between pedagogical models and classroom praxis, improving teaching practices and promoting meaningful learning in diverse educational contexts.

In this sense, this paper is configured in three sections. In the first, the concepts of theories and pedagogical models are analyzed, because it is necessary to understand the epistemological landscape that has historically supported the various classroom practices and educational research processes. In the second section, the meaning of the inductive method is

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presented from its emergence to contemporaneity in relation to educational research. Finally, the relationship between the inductive method and pedagogical models is examined, as well as its impact on classroom praxis in order to establish its central role in the relationship between theory and practice.

Epistemological approach to theories and pedagogical models

There are three key concepts that need to be specified because they will be the axis of this research: theories, models and methods. This section will focus on the first two to subsequently address the concept of methods. These categories allow us to raise a series of problems regarding educational research and classroom practice, directly linked to inductive thinking. For this, it is impossible not to use the genealogical approach (Foucault, 1988) that considers the conditions of possibility, both historical and conceptual, of the conformation of these great explanatory models with different approaches, foundations, places, and times of emergence.

The term "theory" etymologically comes from the Greek *theoreo*, which means to observe or look (Mora, 2009, p. 374). In a philosophical sense, it refers to the action of contemplation or speculation. Aristotle even suggested that the highest theory is "thinking of thought." In this way, theoretical life would be understood as the proper purpose of the virtuous man, which leads to a full life. It is also often understood in opposition to the practice, with a historical dispute surrounding the relationship of these terms. This dispute can be resolved in various ways: as a counterposition, balance, harmony, fusion, among others.

Theories, in many cases, lead to conceptual systems or configurations where there is coherence, cohesion and structure. These are configured in multiple ways, necessarily seeking to establish a relationship with facts or phenomena, all from both deductive and inductive reasoning. Precisely, this link with reality makes theories mutable, contingent, and evolving. Therefore, any attempt at theoretical construction is, to a greater or lesser extent, provisional (Carvajal, 2002).

In the different fields of study, including education, theories are understood as "a set of assumptions or articulated prepositions about the social reality under study and about how to know that reality" (Sirvent, 2010, p. 130). Theories are almost always reduced to the great explanatory constructs of realities that have been consolidated in the academic and

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scientific world, such as, in the educational case, the theories of Piaget, Vygotsky, Bourdieu, among others. However, it is important to consider that theories can also refer to the way of thinking that people are shaping throughout their lives and that guide their actions. In this second sense, theory is simply the ability of every human being to realize intellectual constructs of his daily life, i.e., to theorize.

The relationship between theory and research is emphasized in the possible usefulness of the first over the second (Hernández Sampieri *et al*., 2006). In this sense, as argued, the primary function of the theory is to explain, i.e., to show the "why", "how" and "when" of a certain phenomenon (Bryman, 2021). In addition, it allows to give order to knowledge, i.e., it leads to systematicity and, therefore, to organization (Flick, 2019). Another function, inherited from scientific vision, is to predict or, in other words, make inferences, more or less clear, of what will happen with the explained phenomena (Creswell & Creswell, 2018). Evidently, this predictive ability is much more complex in the field of human sciences than in the exact sciences (Silverman, 2020). In summary, the theory allows the researcher to describe, explain and predict all from a certain logical consistency that will become what is called the theoretical framework of research (Yin, 2020).

The theory has a direct connection to the cognitive processes of every human being. However, these processes are more important for researchers because of the very nature of their profession. Theorizing allows distancing from the objects of study, allows obtaining information and processing it through abstraction, comparison, and analysis resources (Schunk, 2012). All this leads directly into the field of methodology (Creswell & Creswell, 2018). However, before entering into the definition of this second major category, it is necessary to mention the implications of the theory in the field of pedagogical models.

Thus, scientific theories can be understood as the explanatory frameworks that have been established and validated throughout history to study, understand and explain certain phenomena and objects of study. Specifically, when defining the different macro-theoretical models of education, one of the first questions that arise are: ¿what is meant by the educational model? ¿What is the difference between a model, paradigm and theory? ¿What are the main models, paradigms, theories in the educational field? To answer these questions, it is essential to start from a brief retrospective view on the emergence of the various current models focusing on their epistemological criteria.

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When referring to terms such as "models" or "paradigm", it is necessary to approach the philosophical subdiscipline called epistemology, which can be defined (Mora, 2009) as the general theory of scientific knowledge. This discipline will be responsible for answering questions such as: what is a science?, what are the requirements that a discipline must meet to be considered scientific?, what implications does it have for a discipline to be considered science?

Answering the above questions exceeds the intentions of the present work. Therefore, for the purposes of this study, the approaches of Thomas Kuhn (1971) will be considered, moving away from the positivist views of science. As known (López, 2021), Kuhn shook the foundations of what was understood by science at the time, questioning the prevailing positivist view: "His book unleashed an authentic revolution, the effects of which are still noticeable today, in the modern philosophy of science" (Artigas, 1999, p. 85). One of its most relevant contributions is to point out that, globally, science also has a significant valuation burden. In the words of Gómez (2014), Kuhn shows "the explicit recognition of the presence of values not only in scientific activity, but also in its unit of analysis" (p. 69).

His work *The Structure of Scientific Revolutions* is central to twentieth-century science and philosophy. The central concept of this work is that of "paradigm", a term that has had a significant impact. Defining the paradigm is complex due to its multiple interpretations. According to Agamben (2008), Kuhn employs it in at least two senses. First, it refers to "what the members of a certain scientific community share in common: a set of techniques, models and values to which they adhere consciously or unconsciously" and second, to "a particular element within that set" (p. 14). Examples of paradigms include Newton's *Principle* and Ptolemy's *Almagest*, which substitute explicit rules and define a specific and coherent tradition of inquiry.

Kuhn's contributions allow, according to Chalmers (1990), to understand that science does not follow a logical trajectory of order and progress, as positivist perspectives suggest. Instead, science implies abandoning theoretical structures and replacing them with new ones that are not compatible with the old ones. Thus, the answer to the question, ¿what is science?, could be that it is a discipline that manages to establish a specific paradigm within an academic scientific community. It is important to note that Kuhn's ideas are not perfect, for example, "the decisions and choices of scientists or groups of scientists are influenced by the values of these individuals or groups" (p. 145).

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As seen, the epistemological dimension of the concept "paradigm" or "model" refers "to the general conditions of production of scientific knowledge" (Sirvent, 2010, p. 141). These models, in turn, produce research logics that involve the specific production conditions of the research. Finally, these frameworks translate into methodological procedures that determine how each researcher relates theory and practice to the object of their research. However, these general frameworks debates arise around the so-called logical pairs or suppositional modes (p. 144). These mark different ideas in the multiplicity of epistemological approaches or perspectives, for example: deduction-induction, verification-generation, explanation-understanding, objectivity-subjectivity, among others.

This work focuses on the deduction-induction axis, which is explored in the following section. It is important to mention that this axis refers to the classic dispute between the processes of deductive reasoning, closely linked to an abstraction that goes from the general to the particular (decreasing abstraction), and inductive reasoning, characterized by an abstraction that goes from the particular to the general (increasing abstraction). In any case, these theoretical decisions will translate into methodological decisions that the researcher makes in his daily life and will emphasize in certain axes of the aforementioned. It is therefore necessary to address the problem of the method as it directly involves the organization and sequence of steps that seek to ensure the scientific production of knowledge.

Methods and inductive thinking in educational research processes

To approach the role of inductive method in the field of educational research, it is necessary to enter the field of metaresearch, which can be defined as "research research" (Mainardes, 2018) or also as the study of the research itself and specifically of its methods, incentives, reports, reproducibility and evaluation, among others (Loannidis, 2018). Among all these possibilities, the center of reflection will be on the relationship between method and theory in the field of educational research.

Research in the field of education is a diverse, multidisciplinary and complex space (Aguilar Gordón, 2010) that relies on disciplines such as psychology (Bandura, 1987; Brunner, 1984; Piaget, 2016; Vygotsky, 1962), sociology (Bourdieu & Passeron, 2007; Durkheim, 1973) and philosophy (Dewey, 2004; Rousseau, 2008), among others. This has led to multiple

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approaches from diverse schools, traditions and approaches. This characteristic has also made the field of education scattered and with a complex definition to limit, making it difficult to regulate it in the intellectual field (Sánchez Tortosa, 2018). In fact, research in the educational field has been nourished by different theoretical frameworks such as phenomenology, positivism, hermeneutics, structuralism, constructivism, among other currents, each with its own interpretative frameworks. In the second half of the 20th century these have been grouped into qualitative and quantitative approaches (Hernández Sampieri *et al*., 2006). And these, in turn, have led to so-called mixed approaches.

What is interesting in this paper is to explain the methodological dimension of the pedagogical models and show what is the current role of the inductive method in each of them. To this end, it is important to briefly recall what is referred to when talking about method in the field of research. Its etymology refers to the meaning of road (Mora, 2009). Therefore, it is the means to achieve a certain end, for Plato it was to seek the best way to achieve knowledge, this was a similar understanding for Aristotle. Thus, the method must be understood as a random contrast, since it has a manifest order and, therefore, a series of rules that regulate the processes and criteria for its acceptance and application.

This leads to the problem between the method and the reality to which it approaches, since, for many, the reality that is aspired to know determines the structure of the method (Mora, 2009). Thus, the method for knowing educational facts or phenomena will not be the same as the method used to know mathematical or physical reality, for example. Thus, the possibility of using inappropriate methods for certain objects of study is raised (Kuhn, 1971). In this same line, there has also been the dream of finding a kind of universal method to know all possible realities, a question that has been proven as unattainable by authors such as Feyerabend.

Regardless of the conception of the method, there is a common characteristic pointed out by Descartes (Mora, 2009), who states that any method must be accessible and applicable by anyone at any time. In other words, the method does not strictly depend on the intellectual abilities of the researcher. Likewise, it is also necessary to mention the classic distinction between method and demonstration. While the former seeks to find the true propositions, the latter seeks to find the reasons why a proposition can be considered true. Descartes mentioned that he sought to "drive reason and seek truth in the sciences", two elements that have

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permeated the contemporary views of research processes in all fields (Mora, 2009).

A brief retrospective view of the inductive method

Two different types of methods can be found within the methodological taxonomies: those that can be called general and those that we call specific. The former refers to processes such as synthesis, analysis, induction, and deduction, while the latter are established by virtue of the object of study and vary enormously from discipline to discipline (Mora, 2009). Special emphasis will be made on what can be called *inductive method*. To do this, it is necessary to establish what is meant by induction. This term, according to Mora (2009), was used by Plato in his famous dialogs associated with meanings such as inducing, leading to, and directing. However, his association with the field of reasoning did not occur until Aristotle, who in his famous approaches to logic understood it as the passage from the particular to the general, as opposed to syllogism, which was the passage from the general to the particular. This view similarly permeated scholastic thought in the Middle Ages.

In the Modern Age, philosophers interested mainly in the field of natural sciences embarked on reflections on inductive processes, such as Francis Bacon, who questioned these processes as being "incomplete enumerations" (Mora, 2009). Instead, Bacon worked out processes such as absence and presence tables to ensure legitimate inductions. In fact, his approaches marked important influences until the 19th century in currents such as empiricism (Locke, 1690), Aristotelian scholastic ideas (Copleston, 1993), in rationalists such as Leibniz (1989) and even Hume (1980) argued that induction is based on habit and Kant himself (2005) in inductive judgments.

After the nineteenth century, there was an explosion of paths in the approaches of induction, there stands out Gratry (1855), who considered it as an equivalent to the dialectic that allows us to move to the "other". John Stuart Mill (1894), meanwhile, developed a system of inductive logic. Peirce (1878) and Lachelier (1904) focused on the so-called problem about the basis of induction. Lalande (1922) argues that there are several types of induction, on the one hand, there is the general induction, which refers to the operation by which a certain conclusion is reached on a fact that in turn starts from another fact. This type of induction is called reconstructive and is the same that doctors use to diagnose a disease from the symptoms or also in the field of jurisprudence, with the so-called le-

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gal tests; on the other hand, the strict concept of induction refers to the processes of reasoning that start from particular cases to reach general conclusions, such as the passage of facts to the laws or from the specific to the general. This type of induction is in turn classified into two types: ordinary or amplified induction and formal or complete induction (Mora, 2009). The first refers to the experimental test worked by philosophers such as Stuart Mill (1984), i.e., to enunciate a universal judgment on a series of objects limited to the same subject and predicate; the second corresponds to Aristotelian syllogism based on complete enumerations, where a property is expressed in a single formula that has been individually affirmed for each member of a set or class.

For Nelson Goodman (1954), the problems of induction can be grouped into two major periods: the old problem of induction and the new riddle of induction. The first has been widely discussed in the 19th century and, in essence, refers to the problem of the justification of induction or, in other words, of the validity of inductive inferences. One of the possible answers is the law of universal causation, according to which induction is justified in the law of uniformity of nature, which states that, if two examples coincide in certain aspects, they will also do so in all others. Hume (1980) addresses this problem by suggesting that what is relevant is not how predictions are justified, but why they are generated in the first place. This position has been criticized for its psychological or genetic emphasis, which researchers in this field have dismissed.

At present, in what Goodman (1954) has called "the new riddle of induction", the problems around induction and inductive reasoning have led to two main lines: that of confirmation and that of probability (Mora, 2009). As for the question of probability-related induction, there are essentially two opposite currents. The one represented by Mises (1957) and Reichenbach (1949) argues that the problem of induction must be approached from the perspective of the frequency theory of probability, since inductive inferences are transformed into statistical inferences. On the contrary, for the school represented by philosophers such as Carnap (1969), Hempel (1965) or Goodman (1954), the problem of induction must be treated from probability understood as degrees of confirmation; therefore, the central notion would be precisely that of confirmation. Within these two competing schools, philosophers such as Leblanc (1983) have attempted to mediate between these two poles.

As seen, in the field of educational research, the debate on the inductive has had historical transitions that have ranged from the premises of logical reasoning to the debate around its nature in the field of science.

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In any case, they have blurred into different theoretical models that have finally been grouped into quantitative, qualitative and mixed approaches. However, the presence of the inductive not only manifests itself in the field of research, it also presents a strong influence associated with the different theories and pedagogical models that will be analyzed below.

Pedagogical theories and models from behaviorism to connectivism

Considering the epistemological basis outlined above, it is necessary to mention the taxonomy or classification criterion that will be used to list the theories and pedagogical models, while transversely showing the role of the inductive in them. First, it is worth remembering that to make a taxonomy, in general terms, it needs a classification scheme that takes into account a series of determined variables that are relevant to the object of study: "This classification attempt forces to find categories or noun groups clearly defined, and the more singular the one from the others the better, so that the classification is also integrative and coherent" (Prats, 2010, p. 7). In this way, the theoretical currents that we have chosen are: behaviorism, cognitivism, constructivism, humanism and connectivism. These have been considered for their wide presence in the contemporary vision of education, since in the 21st century they are still present in different educational policies and practices worldwide.

The Eternal Return of Behaviorism

Behaviorism (Ortiz, 2013) maintained a hegemony during the first half of the 20th century. In simple terms, its conception of learning is based on the stimulus-response partnership. The studies began with animals: the dog in Pavlov's case (1927) and the dove in Skinner's case (1938). These experiments led to the hypothesis that a certain response to a certain stimulus can be conditioned. The key to making this partnership work is in repetition, adding different types of reinforcement. For Gallardo and Camacho (2008), behaviorism—or more precisely the theories of conditioning—does not present a single aspect. On the contrary, there are at least two variants: the classical conditioning represented by Pavlov (1927) and the operant conditioning, whose most famous exponent is Skinner (1938). Special mention is given to Thorndike (1913), who can be considered the first psychologist of education who developed a theory of conditioning applied to learning.

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In the 20th century, in the field of psychology, the two most "important currents of thought were structuralism and functionalism" (Schunk, 2012, p. 71). In a context in which the discipline sought its consolidation by moving towards more scientific and experimental approaches, the contributions of behaviorism emerge, which became "the main psychological discipline" (p. 72). Watson (1924) founded modern behaviorism, following a model in psychology that resembled that of the physical sciences, working with observable and measurable phenomena. This approach focused on behavior, moving away from the introspective views of structuralism and overly general views of functionalism.

Pavlov (1932), for his part, represents the theory of classical conditioning, which focuses on "the presentation of an unconditioned stimulus, which provokes an unconditioned response" (Schunk, 2012, p. 79). Pavlov argued that any stimulus could be conditioned to produce any response, although later research showed that it is not always feasible to generalize the conditioning process. Subsequently, Skinner's celebrated theory of operant conditioning (1938) went from experimenting only with animals to testing with humans. The principles of his theory are based on functional analysis of behavior and highlight the implications for prediction and control of behavior. Behavioral theory became complex, including a number of basic processes such as positive reinforcement, negative reinforcement, and punishment.

The role of the inductive method in behavioral theories is centered on the processes of observing specific behaviors of subjects and formulating generalizations from them. These are relevant elements to understand how different stimuli and responses can generate changes in the behaviors of these individuals. The limitation lies in equating the human being with a machine, assuming that their behaviors can be modified and predicted by the application of specific stimuli and responses. Although behavioral approaches are not very popular in the theoretical field and there are few defenses due to the existence of more current and complex theories, many of their premises are still alive in practice. Therefore, "the disappearance of a behavioral theory did not mean the disappearance of behaviorism" (Peña, 2010, p. 130). In this sense, it is important to mention that "the contributions of neobehaviorism, like other learning psychologies, can provide necessary ideas for innovation and the construction of teaching and virtual learning" (Gros, 2007, p. 247).

In a specific classroom example, if the teacher wishes to promote reading habits in their students using behavioral principles and the inductive method, they can start by establishing a reward system. Every

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time a student completes a book and shares a brief review with the class, they receive a gold star on a collective mural. Without initially explaining the purpose of the mural or the stars, the teacher watches as some students begin to participate in order to obtain the visible reward. As more students see their peers receive stars and awards, they are motivated to imitate them. The teacher positively reinforces these behaviors through praise and small additional rewards, such as extra time in playful activities. Through the observation of these specific experiences and the associated positive consequences, students induce that reading and participation provide them with benefits, both individual and collective. Without needing to explain in an abstract way the importance of reading, students internalize this habit thanks to operant conditioning—a key principle of behaviorism—and the inductive process of generalizing from concrete examples and behaviors, as will be explained later also by the concept of "modeling" of Bandura (1987) and the direct reinforcements in the classroom environment.

Behavioral theories, as already mentioned, had hegemony during the middle of the 20th century. However, since the beginning of the 1950s and 1960s, these theories have been questioned, gradually reducing their validity and giving way to cognitive cutting theories. For these theories, on the other hand, "mental activities such as attention, expectations, thought and remembrance as crucial to learning processes" are important (Morris & Maisto, 2005, p. 173).

The Diffuse Boundaries Between Cognitivism and Constructivism

Regarding the onset of cognitive currents, there are a number of problems to frame them precisely, as there are multiple nuances, however, we can say that: "we did not need to exhibit our learning for this to occur. Tolman called learning latent to learning that is not apparent because it is not yet demonstrated" (Morris & Maisto, 2005, p. 173). One of the phenomena that highlights the importance of cognitive processes is the so-called *insights*, which refer to the integration of the elements of a situation. Thus, Albert Bandura (1987) raises one of the first criticisms of behaviorism through his studies that showed how "people could learn new actions by simply observing others perform them" (Schunk, 2012, p. 118). Bandura is framed in social cognitivist theories, which posit that human learning occurs within a social environment. From the epistemological point of view, this aspect is responsible for distinguishing between new learning and the performance of previously learned behaviors.

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Thus, Bandura proposes learning by observation or vicarious (Morris & Maisto, 2005), which states that learning through modeling occurs when observers acquire new patterns of behavior, even before they have been directly exposed to such modeled behaviors. This repeats behaviors that we have observed, although this does not mean that we more often imitate those that are rewarded. One of the most influential are the theories of information processing (Schunk, 2012), which focus on how people pay attention to environmental events, encode information, associate it, store it in memory and recover it, among other processes. Within this nomination coexist several theories where there is not necessarily a predominance of one over another, however, special mention requires the theory of the Gestalt.

The inductive method plays a relevant role in cognitivism, as these theories are developed from observation and detailed analysis of mental processes. Specific situations are observed, patterns are identified, and generalizations are formulated about how people process information. The theory of the Gestalt (Schunk, 2012), for example, is based on the observation of how people perceive and organize the elements in their environment, concluding that perception is an integral process in which the whole has a greater value than the simple addition of its components.

In fact, the word Gestalt, which gives its name to this theory, literally means "form", "figure" or "configuration" and collects the essence of their psychological approaches that maintain that objects or events are perceived as an organized whole. The meaning arises from the general configuration and not from the individual parts. In simple words, a tree, for example, is not the set of roots, trunk, leaves and branches, but the configuration with meaning of all these elements. The human being is not limited to the capture of the parts, but to the whole. The brain creates totalities with meaning.

Perhaps it could be argued that cognitivism is a transit from behaviorism to constructivism, hence its difficulties in defining it and specifying it by its multiple nuances. In any case, this path leads to one of the most influential theorists of education during the 20th century, Jean Piaget. The approaches of this thinker have had an unquantifiable impact on education, both in theory and in pedagogical practice, not in vain "the name of Piaget is one of the most frequently mentioned in pedagogical publications" (Fairstein & Carretero, 2007, p. 178).

Jean Piaget (2016) is usually part of what has now been called a constructivist perspective or conception. However, the most accurate way to refer to its conceptual framework would be as "genetic psychology"

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(Fairstein & Carretero, 2007, p. 179). Today, constructivism is difficult to define, as it is not limited to a single psychological theory, but is a convergence of multiple theories. In this context, it is possible to distinguish three types of constructivism: epistemological, psychological and educational. Regarding Piaget's theory, the main focus of his theoretical corpus was not initially oriented from a psychological perspective, his main interest was epistemological in nature (Fairstein & Carretero, 2007). In other words, Piaget did not focus on child development itself, but rather its issues were more philosophical, specifically related to the theory of knowledge, where psychological research acted as a simple means. It was from these interests that he began to explore how knowledge and intelligence develop in people from birth to adulthood.

Genetic psychology (Piaget, 2016) considers cognitive development as an increase in the human being's abilities to predict, explain and understand the world around them. Therefore, behavior is considered to be the result of mental representations. Thus, "the subject of genetic psychology is an active constructor of meanings" and "Piaget theory conceives learning as a process of adapting the mental structures of the subject to his environment" (Fairstein & Carretero, 2007, p. 182). This adaptation occurs through two processes: assimilation and accommodation. Surely the contribution that has transcended the most throughout history are the famous stages of cognitive development of Piaget. These stages or evolutionary stages (Gallardo & Camacho, 2008) are continuous and should not be progressively transited, i.e., it is not possible to omit one in the development of the child.

The final theory Piaget worked on until his death was that of balancing (Fairstein & Carretero, 2007). In this theory, Piaget refers to the mechanisms that allow the individual to move from one scheme to another at a higher level. With this contribution, he completed his explanation of adaptation theory. In this way, the process of equilibrium is formed by the logic of equilibrium-conflict-new equilibrium. Piagetian theories, as already mentioned above, have exerted a radical influence on later educational theories and practices. The applications of genetic psychology (Fairstein & Carretero, 2007) can be grouped into pedagogical proposals and psychopedagogical research. The first refer to the application of Piagetian theory in the creation of educational programs, teaching methods, teaching strategies and other related aspects. The second, on the other hand, consists of studies in which Piagetian conceptions serve as the basis for conducting research on certain aspects of the teaching and learning

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processes and are not necessarily shaped as proposals for direct application in education.

From cognitivism to constructivism

The inductive method is also fundamental in constructivism. Educators and psychologists look at children's cognitive development and interactions in various situations and then extract general principles about how knowledge is constructed. For example, Piaget used detailed observation of his own children and other children to formulate his theories about the stages of cognitive development. This inductive approach allows researchers and educators to develop pedagogical strategies based on how students actually learn and understand the world around them.

Along with Piaget (2016), the great theorist associated with current constructivism is Lev Vygotsky (1962), who shows the importance of "social interactions that allow to organize the activity of the apprentice" (Vila, 2007, p. 207). His theory emphasizes the importance of the social environment for learning and development. Despite Vygotsky's short life, he made a great intellectual projection (Vila, 2007), organized on two fronts: developing a scientific psychology and creating a set of techniques oriented to various aspects of human life. His psychological work had a strong impact on the educational field.

For Vygotsky, the genetic method cannot be limited to orthogenesis; on the contrary, understanding human behavior requires an understanding of three different domains: species evolution, cultural evolution, and ontogenetic development. His early studies were focused on *knowing the origin and development of consciousness.* Thus, in his work *Thought and Language* (Vygotsky, 1962), he explains the process of internalizing language as the main means of human consciousness. And this process has a social origin by emerging only in relation to others. In the pedagogical field, the approaches of Vygotsky (1962) imply that human development and teaching-learning processes are interdependent. These ideas lead to the concept of the "zone of near development" (Vila, 2007, p. 223), which refers to the existing relationships between the psychological social functioning and the individual functioning of the mind, i.e., the relationship with others and with yourself. These elements show the existence of a real evolutionary level understood as that which a person is able to do by himself, and a potential evolutionary level which is defined as that which a person can do with the help of another. The area of near development is therefore the distance between the second and the first.

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Vygotsky's ideas today are being taken up and worked on enthusiastically. At present, educational innovation seems to have focused more on Vygotsky, not in vain the contributions of Bruner, Cole and Wertsch have received a strong influence from his figure. Among them, the most famous is undoubtedly Jerome Bruner, with his learning by discovery (Schunk, 2012, p. 266), which implies the ability to train by discovering problems from the students with a minimum of guidance from teachers. Here, the idea of "active student" (Ortiz, 2013, p. 13) that needs the creation of didactic experiences that contribute to these experiences begins to be clearly visible.

Bruner, along with David Ausubel, are part of the later constructivism and although they are present in several pedagogical currents, their influence is not pure (Ortiz, 2013). Thus, for example, the Ausubel's approaches are known as "significant learning theory" (Gallardo & Camacho, 2008, p. 44), which affirm that the student's learning depends on the previous cognitive structure and its relationship with the information acquired. In other words, "meaningful" learning can be called when new information is in contact with concepts previously acquired by the student.

The inductive method is evident in Ausubel's constructivism, since it is based on observing how students integrate new information with their previous knowledge and then generalize about the best pedagogical practices to facilitate this process. This approach allows educators to develop strategies that are tailored to the individual needs of students, promoting deep learning. For example, in a high school history class, the teacher may seek to get students to understand the causes of the French Revolution, but instead of explaining the causes in a master lesson, he divides students into groups and provides each with a variety of resources (excerpts from historical documents, letters, period illustrations, economic statistics, and personal testimonies) that students analyze, discuss with each other, and observe, under the teacher's guidance. They identify patterns such as social inequality, the financial crisis, and enlightened ideas. Through this process, they induce the main causes that led to the outbreak of the Revolution. This approach allows students to actively build their knowledge, applying the inductive method by drawing general conclusions from specific data, and exemplifies constructivism by encouraging meaningful learning based on exploration and collaboration.

On constructivism, until the 21st century, it could be spoken in detail, however, being "very broad and varied" (Ortiz, 2013, p. 30) we cannot analyze all its manifestations and lines in detail. It can be said vaguely that it rescues the cognitive aspects that are based on learning, these are mediators of behavior, also producing behavioral changes. Likewise, cons-

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tructivists postulate the need for methods of natural experimentation (Ortiz, 2013). This current houses a huge number of theoretical constructs in which sometimes humanist theory is usually included, which for some "is largely constructivist" (Schunk, 2012). However, given its specificity, it will be analyzed in a particular way.

Humanist theories and their quest to integrate cognition, emotion and choice

Humanist theories (Schunk, 2012) emphasize cognitive and emotional processes, focusing on people's abilities to make decisions and aspire to control their own lives. Among the assumptions made by these theories is the holistic view of reality, bringing together categories such as "behavior," "thought," and "feeling." For this perspective, human decisions, creativity and self-realization are fundamental aspects of study that must be valued and incorporated. In this sense, one cannot start from animal studies to extrapolate them to human beings, who are much more complex entities.

One of the most relevant contributions of these theories would surely be that made by Maslow, for whom the actions of people are guided by their goals or objectives. In this sense, human actions represent an effort to satisfy needs, which in turn are structured in a hierarchy (physiological, security, belonging, esteem and self-realization). This hierarchy has implications for teaching-learning processes (Schunk, 2012). For example, it is useful for teachers to be able to understand students in a comprehensive way, creating environments that facilitate learning. As known, it is not entirely feasible for students to devote all their effort to study if they have not met the first needs of their pyramid (physiological or safety), i.e., students who have not fed properly, who find themselves in a difficult socioeconomic position, etc.

Likewise Carl Rogers' thought centered on "realization" posited that life is constituted as a process of continuous personal growth. This natural tendency is the basis of motivation, from which absolutely all others of lesser significance are derived. Thus, personal growth is understood as achieving autonomy and, therefore, greater degrees of freedom from external forces (Schunk, 2012). Applied to the educational field, this means that the human being has in itself a power for learning nourished by desire. In other words, students know that learning is relevant because they are convinced that this will help them grow, improve. Therefore, the role of the teacher is that of a facilitator of learning and its duty is to create environments for students to achieve their goals.

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In general, humanistic theories focus on motivation for achievement (Schunk, 2012, p. 360), with numerous applications in teaching-learning processes. There are many avenues for motivation, for example, transmitting optimistic expectations to students and structuring activities in a gradual way that prevents them from being discouraged by the complexity of the challenge posed. The great contributions of these currents show us their holistic approach, which must consider both the cognitive and affective components, and within the latter the motivational ones. Therefore, for students to achieve academic success and optimal learning outcomes requires both willingness and skill (Gallardo & Camacho, 2008).

For example, in a cultural and artistic education class, if the teacher seeks to promote the personal development and self-realization of students by applying fundamentals of humanist theories, he can propose to his students to create a work of art that represents their emotions and personal experiences without providing specific instructions or role models. Thus, when students work on the development of their projects, they freely explore their feelings and thoughts, reflecting on them in their creations. This can be complemented by the presentation of the works to their classmates explaining their expressions and meanings. This activity allows to induce general concepts about the diversity of human experiences, the value of respect, empathy and self-expression. This example is not intended to suggest that, when applying motivational methods, a structure is dispensed with; on the contrary, the structure is fundamental in learning scenarios to motivate the student and allow him to relate freely and consciously to educational activities (Reeve & Cheon, 2021).

Connectivism in the Digital Age

Connectivism takes for its foundation elements of complexity theory. According to Pérez Gómez (2012):

> It assumes the current version of constructivism when taking into account the unlimited digital context of human exchanges. It emphasizes that the learning scenarios are available to all, offering unsuspected learning opportunities, and represent the endless telematic networks of accumulation, exchange and permanent creation of information and knowledge (p. 15).

In connectivism, context plays an essential role, as teaching-learning processes focus on developing connections within knowledge networks, which determines the "what" and "how" of learning. It is not only

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about memorizing data or concepts, but also about knowing how to locate, build and maintain these connections to recreate and apply knowledge dynamically through networks (Pérez Gómez, 2012). This does not imply an environmental reductionism, since the key is precisely in the relationship between contents and contexts; it is more about assimilation processes than acquisition, recreated jointly in the networks in which the individual participates (Pérez Gómez, 2012).

In the 21st century, new technologies and digitalization have greatly improved the collection and analysis of educational data. Moreover, tools like artificial intelligence have been able to identify patterns and trends that could go unnoticed with traditional methods of data analysis. All this contributes to facilitate the understanding of educational processes and the corresponding development of pedagogical strategies based on proven information (Pérez Gómez, 2012).

In the field of educational practice, the inductive method can be applied within the frameworks of connectivism by generating learning processes where technologies and information networks are used for developing various competences (Pérez Gómez, 2012). For example, in a citizenship education class, the teacher may propose students to explore the impact of social media on communication. To do this, students must connect with various online platforms, such as blogs, podcasts, forums, or virtual communities. Students, individually or in groups, can participate in online discussions, follow experts on the subject and share information through their own social networks. As they collect data and experiences from these interactions, they must infer patterns about how social media influences the way people communicate, inform, and relate. Using the inductive method, students draw general conclusions from their specific observations. Among their findings, social media can be inferred to facilitate the rapid dissemination of information, but it can also spread disinformation.

This process reflects the practical application of connectivism, where learning occurs through connections in a network and knowledge that is distributed among various sources and accessed through participation in digital communities. Students build their own knowledge by navigating and managing information in a technological environment, applying the inductive method to generate deep understandings from real online experiences (Pérez Gómez, 2012).

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Conclusions

This paper argues the importance of the inductive method in the relationship between theories and pedagogical models from classroom praxis, using meta-research and reflexive criticism from grounded theory. Throughout the analysis, it has been evidenced how inductive thinking allows researchers to formulate hypotheses and develop theories from empirical observations, providing a solid basis for understanding and improving teaching and learning processes. In turn, these theories are enriched from classroom practice.

The inductive method has been key in the evolution of various pedagogical theories, from behaviorism to connectivism. In the context of behaviorism, the observation of specific behaviors has allowed to identify general principles on the stimulus-response relationship, establishing a mechanical understanding of learning. In the realm of cognitivism and constructivism, the observation and detailed analysis of mental processes have led to a deeper understanding of how students process information and build knowledge. Connectivism, for its part, has taken advantage of inductive observations about digital interactions and networked learning, adapting these ideas to the age of information and technology.

One of the conclusions of this work is the reaffirmation of the need to integrate theory and practice in the educational field. The inductive method acts as an essential bridge between the two, allowing empirical observations to not only inform theoretical development but also guide pedagogical practices. This integration is relevant to ensure that educational practices are effective and based on sound principles and empirical evidence.

Despite its benefits, the inductive method also presents challenges, especially in terms of the validity and reliability of generalizations derived from specific observations. However, digitalization and advanced technologies offer new opportunities to improve the collection and analysis of educational data, enhancing the use of inductive reasoning. Researchers and educators are called upon to explore new ways of applying this method to address the complexities of contemporary education.

In summary, the study highlights the continued relevance of the inductive method as an element that allows to link classroom praxis and pedagogical theoretical models. Thus, it is possible to improve teaching-learning processes, adapting to the changing needs of students and taking advantage of the opportunities offered by technologies in new contexts. The inductive methodology, therefore, remains essential to continue innovating and improving pedagogical practices in the 21st century.

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