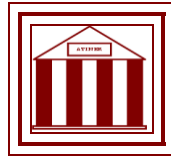


**Athens Institute for Education and Research
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**The Impact of Cybernetics
on Contemporary Education**

**Tiago Quiroga
Professor
University of Brasília
Brazil**

**Cláudia Sanz
Professor
University of Brasília
Brazil**

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Athens Institute for Education and Research
8 Valaoritou Street, Kolonaki, 10671 Athens, Greece
Tel: + 30 210 3634210 Fax: + 30 210 3634209 Email: info@atiner.gr URL:
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The Impact of Cybernetics on Contemporary Education

Tiago Quiroga

Professor

University of Brasília

Brazil

Cláudia Sanz

Professor

University of Brasília

Brazil

Abstract

The internet was one of the most important phenomenon's that impacted the twenty-first century, generating significant consequences for education. The society of knowledge has shifted from learning from an ideal of value to learning from an ideal of efficiency. The problem that this brings is that education is no longer viewed as an emancipation process, but is now based on how mathematical theory defines information and portrays the question of meaning. Education researchers tend to not question the fundamentals of cybernetic science. The objective of this article is to discuss Wilhelm Dilthey's concept of lived experience and apply it to education as an alternative to Warren Weaver, Claude Shannon, and Norbert Wiener's mathematical theory point of view.

Keywords: Brazil, contemporary education, cybernetics, mathematical theory

Introduction

The advent of the internet is considered one of the greatest hallmarks of our current existence. A number of theorists assert that it is not an exaggeration to say that the internet is one of the most unique discoveries of our time and that it marks the beginning of the 21st century. According to these theorists, we live in a historic period that is different from the previous due to the supposedly infinite possibilities of communication. In other words, this phase in history is decisively marked by the social structures that are built around and through communicational networks and supports. There is no doubt that the internet has forged a completely new way of circulating information, goods, people, and products at speeds never seen before. It is this circulation that establishes the internet as a new social value founded on storage capacity, permanent availability, and the ability to manage vast amounts of information.

Due to its broad scope, there are naturally copious amounts of research projects being conducted that revolve around this subject. This makes the challenge of understanding the internet as a historical event that individualizes our existence, result in a wide ripple effect. For the purposes of this article, we will focus on the cultural point of view where discussions place the internet at the core of the important changes occurring in our cultural order, specifically those related to education. As a starting point, we will address the new pedagogical ideal that has emerged from the so-called *knowledge society*. The expression was largely coined in the beginning of the 21st century and points to a new order in the economics of knowledge that is being implemented on a global scale and branded as *information*. Although it is originally understood in the mathematical theory as a unit of measure, which eventually produced the computer and cybernetics, the idea of information today is no longer restricted to a scientific environment. To the contrary, the reach of the internet made it the new, universally valid order of magnitude, which leads us to view it as a cultural phenomenon. Thus, although the word *information* originally designated a theoretical category of mathematics used to address the relationships between humans and machines (Weiner, 1968), the expansion of cybernetics, which became the new ideal of control, integration, and operation for the various social fields, shifted it from being a specific problem for mathematical theories of communication to being an important cultural phenomenon for our times. Seen as a new paradigm, the idea of *information* can be viewed as the foundation of cybernetics, or the "science" that places communication and control in the same category (Weiner, 1968). Weiner (1971) states:

The needs and complexities of modern life have made such a process of information more demanding than ever, and our press, our museums, our scientific laboratories, our universities, our libraries, and our manuals are required to satisfy the needs of such a process, because if they do not, they will not achieve their goal. To live effectively is to live with adequate information. Thus, communication

and control belong to the essence of man's inner life, as they belong to his life in society (as cited in Miège, 2000, p. 31).

Therefore, under the auspices of information, a culture of effectiveness takes root in the various social fields transforming technological euphoria into a new horizon of social connection, which predominantly must meet the requirements of private capital and techno-science profitability. This causes a significant set of political beliefs to be transferred to the ideals of effectiveness in communicational technologies. As representatives of the encounter between precise levels of truth, these technologies bring into being the objectivity sought by the great theoretical formulations of the late 18th century, especially by the framework for modern natural sciences, and can thus recover the "intrinsic demand for the veracity of language" (Vattimo, 1992, p. 26). Herein the issue lies.

The objective of this article is to discuss how this culture of effectiveness, based on information, affects educational processes. The working hypothesis is that this *knowledge society* leads us away from the modern ideal of freedom built upon the principle of *autonomy*, or *the ability to think for yourself* – a concept that refers to knowledge as a condition for emancipation (Kant, 1985), and leads us to the direction of a contemporary scenario where educational processes that subscribe to the idea of *information* (Weaver, 1978) become increasingly anchored to the supposed virtues of effectiveness. Consequently, the idea of freedom has been atrophied by many education projects and has been reduced to a constant logic of overcoming/optimizing time and space. We are seeing a shift from *value-based ideals* to *efficiency-based ideals* (Carneiro Leão, 2002) where education becomes disconnected from practical materialities such as beliefs, biography, and individual lived experiences. In other words, we are slowly moving in the direction of understanding education as the (fast) management of huge amounts of data, and forgetting that education was historically guided by the idea of *self-reflection as the sovereignty of spirit* (Sodré, 2002).

Our initial methodology is to discuss Wilhelm Dilthey's concept of *lived experience* and compare it to the mathematical theories that are foundational to contemporary education as espoused by Warren Weaver, Claude Shannon, and Norbert Weiner. The main goal of our methodology is to show the importance of maintaining education as a process of autonomy that needs subjects and lived time, thing which necessarily includes a historical perspective. This proposal would seem contradictory to the mathematical theory of education, which does not consider time of existence as part of knowledge. We intend to analyze this perspective that produces a progressive increase of education concepts that do not require emancipation. From the perspective of human sciences where choice is central to concepts of freedom, this seems very dangerous.

The Issue of Meaning in the Mathematical Theory of Communication

In order to understand the scenario, it is necessary to expose the fundamentals of the effectiveness regime in terms which are not intrinsic to it, i.e. its functionality. Here we are speaking specifically about the problem of *meaning* or *signification* in the cybernetic regime and/or in mathematical theory of information. One of the founding fathers of the mathematical theory of communication (information), Warren Weaver (1978), states that there are "... two messages, one which is loaded with meaning and the other which is pure nonsense" (p. 28) both have the same value or are considered equivalent in terms of information. In this case, the meaning is not overly important because both represent the same unit (standard quantity) of information. In addressing the question, "How do humans communicate with each other?"¹ Weaver and Shannon (1948/9) did not exactly ignore the semantic and persuasive aspects of the issue, yet they did affirm that this question could only be answered by verticalizing the technical interpretation. "One might be inclined to think that the technical problems involve only the engineering details of good design of a communication system, while semantic and effectiveness problems contain most, if not all of the philosophical content of the general problem of communication. To see that this is not the case, we must examine ...important recent work in the mathematical theory of communication" (Weaver, 1978, p. 26).

Influenced by authors such as the Russian, Andrei Markov (1856-1922), the American, Ralph Hartley (1888-1970), the Briton, Alan Turing (1912-1954), and even the Hungarian mathematician, John Neuman (1903-1957), Weaver and Shannon (1948/9) thought of the communicative process to be based on the premise of applied mathematics. In this case, for example, grammar (alphabet and language) would not be described exactly by its set of meanings and how they could be interpreted in specific contexts, but instead it would be based on rules and procedures that point toward the necessary guidelines for conducting well-defined, non-ambiguous assignments. From here the concept of the algorithm arises, the ancestor of the binary digit (bit), as the matrix for the claims of reaching precise measures of information related to transmitting symbols.

Hence, according to Abraham Moles (1986), the mathematical theory that understands communication as the emission of quantified symbols can be considered one of the founders of the so-called *canonical schema* that belongs to the scientific field of social communication. Impelled by the need to "reduce the diversity of real situations to a basic schema unit the ... transmitter-channel-receptor", the theoretical model initiated the possibility of "analyzing the

¹Warren Weaver and Claude Elwood Shannon are co-authors of the book that first systematized the theory expressed in Shannon's article - *A Mathematical Theory of Communication* (The Bell System Technical Journal 27, pp. 379-423, 623-656, July, October, 1948) and Weaver's article *The Mathematics of Communication* (Scientific American 181, pp. 11-15, 1949).

different possible types of communication in order to establish a classification of the acts of communication" (Moles as cited in Miège, 2000, p. 25). This period between wars in the USA was predominantly marked by a broad diffusion of interpretive models of exact sciences that served as a foundation for the communication theories where "information gains the status of a calculable symbol" (Mattelart & Mattelart, 2001, p. 57). Here, three authors are worth noting: Claude Shannon (1916-2001), Warren Weaver (1894-1978), and Norbert Wiener (1894-1964). They are considered icons of the project that intended to build "a general communication system ...in which it would be possible to quantify the cost of a message, of communication between the two poles of the system amidst random interruptions called *noise*, which was undesirable because [it impeded] *isomorphism*, or the full correspondence between poles" (Mattelart & Mattelart, 2001, p. 58). Thus, the new ideal for a "precise measure of information associated to transmitting symbols" (Mattelart & Mattelart, 2001, p. 58) would culminate with the invention of the computer, the fundamental sign of our times.

The impact caused by the shift from ideals to effectiveness was significant and has driven us from living under the so-called systemic rationality founded on *causality*, to working under the requirements of *probability*. The origins of the new model are based on *entropy* (Weaver & Shannon, 1948/9), which makes it radically innovative. It works with "the statistical nature of information" (Weaver, 1978, p. 28) that, instead of determining a first cause, demands "total uncertainty minus noise uncertainty" (Weaver, 1978, p. 31). When Weaver (1978) defines *information* as a "measure of one's freedom of choice in selecting a message" (p. 31), it has at its origin (transmitter, for example) a *desirable uncertainty* in that it increases the level of freedom of choice. He adds, "Thus, greater freedom of choice, greater uncertainty, and greater information go hand in hand" (p. 31). This development that eventually gave us today's computers could no longer be ignored in the order of political events. In the late 19th and early 20th century, the shift from the industrial model to cybernetics entered a new scenario of *administrative positivism* (Mattelart & Mattelart, 2001). In this context, cybernetics emerged as a derivative of the command theory in engineering, thus a science of command and government (control) of things (humans and machines) where the study of messages and the ease of communication enables the organization of society and places communication technologies in an even more central role (Wiener, 1968, p. 16).

The course of historical development will be intensified, broken down, and above all explicated under the auspices of the shift from the mathematical theory of communication to cybernetics, which radicalizes not only the discursive format of functionality, but also the positivism of natural sciences today. We speak of cybernetics as the new positivism of our contemporaneity from whence comes the ideal of *transparency*, which has the idea of *information* at its epicenter - the new order of universal greatness. Unlike those that take pride in praising the diversity that we have enjoyed in the wake of internet, we understand that while it updates and expands the mathematical

theory of communication, it does not exactly renew the unity of human beings (because it is no longer about nature) as Auguste Comte had posited. Rather it renews the idea of *information* as the new and supposedly only principle of universality of our times. With the addition of the particularity of speed (intensification of time flow), what we see today is the re-foundation of the positivism of the late 19th century that sought to equalize mankind and nature under the auspices of *metron*.

The difference of the paradigm, which took human sciences further than any ontology other than the physiology of freedom, is that it is now conducted by the expansion rituals of *probability*, in other words, "information is a measure of one's freedom of choice in selecting a message" (Weaver, 1978, p. 31). It can be said that this new foundation for the economic system (society of risk) -emerging cybernetic positivism- reduces the *symbolic nature of social life* (Blumer, 1969) to merely become *information* of the statistical nature of the message. Hence, what is new is that, besides becoming the proper legislation (order of magnitude) for the various social fields (a new *ethos* of organization), the idea of *information* carries with it the peculiarity that its specific sense cannot, under any circumstances, be attached to the idea of meaning (Weaver, 1978). Not being able to be mixed with any genus, *information* here presumes the complete absence of meaning and contains only the idea of being circumscribed to a sense of a standard-measured unit that wants to be henceforth universal. It is important to remember Weaver and Shannon, the fathers of the mathematical theory of communication (information), who assert that is it "surprising but true that accordingly to this point of view, two messages, one heavy with meaning and the other completely meaningless, can be equivalent in terms of information" (Weaver, 1978, p. 28). Naturally, such positivism is neither simple nor clear and it breaks with an extensive legacy of thought built upon the *causal* deductive logic of Descartes. The *probability*, founded on the precept of *entropy* (Weaver, 1978, p. 31), becomes paradoxically contemporary, in that the current paradigm of certainty (effectiveness) is based on the ideal of *total uncertainty* (entropy founded on the statistical nature of information).

If the problem of sterile cognition is considered within this paradox, the idea of *transparency (techno-logy)* emerges from the "ruins of the rationalist ideology of linear and continuous progress" (Mattelart & Mattelart, 2001, p. 185) not as something new, but to refine and modernize the control paradigm by substituting records of the experience of truth with effectiveness and, in the end, proposes an even more efficient framework. When "the truth is no longer in line with the order of the cosmos or with God, if there is no horizon capable of guaranteeing the eternal framework of immutable order, if the order of the world is no longer in your being but rather, depends on technical doings, effectiveness becomes explicitly the only criteria for truth" (Gallimberti, 2006, p. 13). Unlike the precision we seek, we can ask ourselves if we are in the middle of an organizational, schizophrenic model that is situated between the premises of *entropy* and *effectiveness*, cloaked in the paradox of absolutes (extremes). On one side, we have unrestricted uncertainty, and on the other, we

have full effectiveness - "maximum fairness possible in obtaining a channel of communication that operates in the presence of noise" (Weaver, 1978, p. 32).

Lived Experience and Meaning in Wilhem Dilthey

The German philosopher and pedagogue, Wilhem Dilthey, takes a different approach to the proposition built around the idea of meaning in *The Mathematical Theory of Communication* (1948/9) and *Cybernetics and Society* (1968). While in the latter case the fundamental elements of the effectiveness regime propose a theoretical model (of information) that requires the complete absence of meaning (resulting in the internet having significant impact on cultural and educational order), Dilthey advocates a robust defense of the idea of meaning as the condition for understanding the educational process. Certainly Dilthey shared the same interests as Weaver, Shannon, and Weiner in addressing a project of freedom where knowledge could contribute to guiding practical conduct. The path he chose, however, was neither technical (transposition of space and time) nor metaphysical, nor one of natural science. Dilthey defined his work as an attempt to "complete the School of History assignment that enabled the emancipation of historical consciousness by offering ... an independent philosophical foundation to the sciences of spirit and, therefore, allowed these sciences to [form] a whole that is independent of the sciences of nature" (Dilthey as cited in Amaral & de Camargo, 2010, p. 15). His primary goal was to contribute philosophically to forming *Geisteswissenschaft*, otherwise known as *sciences of spirit* (Dilthey as cited in Makkreel & Rodi, 1989). To do this he rejected any metaphysical universality. He believed that all science was necessarily empirical and that it was the indelible mark of modern science that brought theoretical knowledge to the forefront. According to Dilthey, knowledge provides the foundation for the sciences of the spirit. This beginning neither with metaphysics nor with the universal presuppositions of *unity* and *certainly* required by natural sciences, but with *experience*. His project, therefore, can be defined as the empirical foundation of the sciences of the spirit.

The effort to ground these sciences theoretically can be understood as developing *a critique of historical reason*, or in other words, "it is within the power of man to know himself as well as the society and history that was created by him" (Dilthey, 1922, p. 116). Although he refers to Kant, a *condition of possibility for all knowledge* (1998), Dilthey is more interested in "the concrete man, the specific being that not only thinks, but also feels and wants, ... in other words, in life, not merely its representation" (Dilthey as cited in Amaral & de Camargo, 2010, p. 17). While his philosophical procedures refer heavily to Kant, who used critical procedures to introduce the subject of knowledge, Dilthey questioned the *conditions of the possibilities of historical knowledge*. The difference is magnified in his criticism of the enormous attention given to the paradigm of *representation* in the modern philosophy of consciousness. According to him, "no real blood flows in the veins of the

knowing subject constructed by Locke, Hume, and Kant, but rather the diluted extract of reason as a mere activity of thought" (Dilthey as cited in Amaral & de Camargo, 2010, p. 17). In order to give a principle of originality and independence to the sciences of the spirit, Dilthey stated that as opposed to the concept of *representation*, it was necessary to think about *lived experience* as an epistemological division. In this case it would be an alternative to merging life and representation. To *understand life for what it is* (Ortega y Gasset, as cited in Amaral & de Camargo, 2010) was not only Dilthey's primary desire; it was also the task assigned to the independent framework of the sciences of the spirit.

Dilthey understood *lived experience* as the explanation of what defines *experience* as empirical and not empiricism. The difference is referred to in the beginning of *Phenomenality* (The Breslau Draft, 1880-1890) where Dilthey establishes the modern philosophy of consciousness as his starting point. According to him, "all objects of consciousness, including people I interact with, exist to me as facts of my consciousness: facts of consciousness constitute the only material upon which objects are built" (Dilthey, 1982, p. 58). This affirmation is important because it emphasizes the so-called *facts of consciousness*, which is a kind of interpretative key that is decisive in understanding not only the difference between the empirical and empiricism, but the very work of Dilthey. According to him, if all science is empirical and views experience as a kind of fundamental axiom, then the *facts of consciousness* are original nexuses through which we can observe the non-distinction between historical phenomena and the world of life.

This affirmation appears quite dangerous in the fact that it views the notion of the external world as it views that which occurs in our consciousness, meaning it is a subjective phenomenon. If that were the case, then Dilthey would be hostage to the same system of representation (of consciousness) that predominates in the theory of modern knowledge, and which he harshly criticized. However, what he proposes is that the *facts of consciousness* occur in *the totality of our psychic life*, like the experience where what is "real is that which acts [in our] psychic totality" (Dilthey as cited in Amaral & de Camargo, 2010, p. 17). In this sense, there could be no possible retreat from a consciousness that, for example, might have within it an a priori and constant system of representation to metaphysically conduct life and/or awareness itself. There would be no distinction between representation and life. It is just one thing: life is representation, which is life. In other words, to Dilthey *the real conditions of consciousness* can only be understood through a living historical process. Consequently, the *facts of consciousness* occur in the *totality of the psychic life*. Dilthey's proposals that are centered around the idea of the *totality of the human nature* or the *psychic totality*, are expounded in two of his important works: *Ideas for a Descriptive and Analytical Psychology*, or *Ideas* (1894) [1976], and *Contributions to the Study of Individuality* or *Treaty of 1895* (1895-1896).

In the first volume Dilthey describes the psychic structural nexus that connects us to each other, puts us in the order of culture, and emerges in

institutions through historical phenomenon. He states that this connectedness is *originally and continually given, as life itself*, thus expecting this descriptive and analytical psychology to focus on the ongoing *regularity of the nexus of a developing psychic life* as it moves toward a unique and practical historical conformity. The second volume is a continuation of the first one, thus making it important to understand conformity in the context of diversity. In summary, what the author does is to present the idea that *psychic totality* or the *totality of human nature* necessarily implies constituting the dialectic association between a structural arrangement that is common to us, i.e. the psychic nexus (life), and the particularities that this structure acquires in the process of individualized human practices. This dialectic movement is what defines the course of human history. Thus, Dilthey affirms, "What man is, only his history can tell him" (Dilthey, 1931, p. 226). This is the goal of the science of the spirit, to think of historical reason as necessarily for the understanding of all of human individuation based on the nexus of psychic life and on what it has in common. Furthermore, "to raise a man's unique and concrete lived experience to a level of historical awareness" (Dilthey as cited in Amaral & de Camargo, 2010, p. 23).

The permanent tension between individual and general, between generic and unique constitutes, therefore, not only the basis of Dilthey's psychology, but also the very goal of the *sciences of the spirit*. It is about observing how a variety of practical singularities express the *common nature of all psychic life, and vice-versa*. According to him, "(...) the very nature of the sciences of the spirit consists in connecting the general and the individuation; they seek the original relationships that condition the individuations, the gradations, the similarities, and the types of historical human life" (Dilthey, 1924, p. 258). It is worth noting, however, that Dilthey is not interested in universal ontological precepts, but rather in the life of history. This concern leads him to name anthropology, in addition to psychology, as a foundation for the sciences of the spirit: "anthropology and psychology constitute the foundation of all knowledge of historical life, as well as of all the rules for directing and perfecting society" (Dilthey, 1922, p. 32). The present supposition points to the centrality of not only the principle of *lived experience* but also of its repercussions upon the notion of meaning.

In order to escape *phenomenalism* (experience and knowledge as mere representation), Dilthey advanced his proposition of the vital relationships between common psychic structure and individuations. This constant tension, which comes from the facts of consciousness, can be called *the experience of resistance* (Dilthey, 1922). The philosopher believed human beings are essentially a set of *impulses* that use the anthropological perspective that life is the result of interaction between representation, willingness, and feeling. Dilthey affirms that humans are always seeking to fulfill their desires or impulses. Hence, they move and act upon different things because they are always submitted to stimuli. However, the reality of the outside world resists the *movements of their bodies and the impulses of their will*. The facts of consciousness though are between impulse and resistance. In other words, it is

precisely at this point that it is possible for us to form an idea of our exterior reality because we feel something is pressuring and inhibiting the movement of our bodies. When we notice this resistance we become aware of our own life. This is to say that "the facts of consciousness also, above all, the experiences of pain, pleasure, happiness, fear, satisfaction, etc., which are the most elementary experiences of resistance exerted by an exterior world on the movement of my body" (Rodi F., as cited in Makkreel & Scanlon, 1987, p. 10). This means that, not only do the facts of consciousness spring from the experience of resistance, but also that resistance is not possible without lived experiences. In other words, lived experience is the nexus that connects the parts to the whole. Moreover, this connection is entirely based on the relationships of meaning between generic and particular, equality and difference. According to Dilthey, "the nexus of lived experiences, in its concrete reality, lies in the category of meaning, and meaning does not lie anywhere outside lived experience, but is rather found inside it, at its nexus" (Dilthey as cited in Amaral & de Camargo, 2010, p. 29). Connectedness is therefore about the centrality of lived experiences, as well as the relationships of meaning in historical thought. Both point to hermeneutical resources as a basis for the sciences of the spirit.

Conclusions

It is thought provoking to bring together the mathematical theory of communication and Dilthey's works as a way to understand the transformations we are facing in education in the context of our society of information. We are uneasy with this new ideal of control introduced by cybernetics and founded on the information rooted in the principle of meaninglessness that expands a type of social order where the rules are about control in and of itself. We no longer speak of a deeper type of representation where the meaningful must objectify lived experiences, whether or not we are capable of understanding the reciprocity between them. For example, a law is always an interpretation (representation) and its virtue is dependent on its capacity of understanding the world of habits and customs, the world of life, culture, and justice. In contrast, in the paradigm of information, justice increasingly requires efficiency, notwithstanding the complexity of external references. Efficiency here means precision in the speed of managing data on a global scale in order to reach practical goals. Our hypothesis is that the model of representation historically found in mathematical logic has been radicalized by the new ideal of knowledge which is based on information and is deprived of body, time, and meaning in a way that transposes time and space in order to meet the metaphysical demands of globalization. This presents cybernetics as the vector of universal progress. By using quantification codes and by transmitting symbols based on the principle of analogy and of meaninglessness, cybernetics is able to expand the mathematical ideal to the contemporary project of *transparency*, which not only positions the internet as

one of the greatest happenings of our times, but especially establishes *technology* itself as the new synonym of human emancipation.

In this context it is possible to conclude that the concept of education is significantly changing due to the increasing disparity between knowledge and freedom, where freedom as technology reduces the transposition of time and space. The current paradigm of information as a new cultural experience supposes that knowledge is without subjects or motivation. This phenomenon occurs because *temporality* has been disassociated from *existence*. As a result, time is found in things, objects, and machines, or in other words, in information. Today, existence is external to subjects. This causes an immense reflux in education, given that historically it was grounded on a modern ideal of knowledge intended to produce emancipation (freedom) using historical reason, thus creating a new dimension of knowledge that springs from the belief that human beings alone, in the order of time, are capable of determining their own future. Consequently, if the fundamental category of history, existence becomes diluted, we lose the perspective of freedom that belongs to the world of life, to the flow of time, and to human protagonism. Hence the important retrieval of Dilthey's work, especially his proposals that revolve around lived experiences and meaning as ways to access life in the course of history.

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