DEVELOPING ATTENTION THROUGH THE VIRTUAL WORLD REDEFINES EDUCATION

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ABSTRACT: Developing Attention through the Virtual World Redefines Education.
At the beginning of early schooling, the attention span is still low, and children find it difficult to capture simultaneously in the field of attention verbal explanations and intuitive pictures, the actions they and their peers take, the actual action and its outcome. Pupils often find it difficult to voluntarily direct their attention from the superficial, immediate, situational to the essential. Focusing attention can also be influenced by fatigue caused by overloaded tasks or passive listening in lessons. Today most children regularly use gadgets and social networks for educational and entertainment purposes, and pandemic-related restrictions have increased children's reliance on technologies to connect with the outside world. The impact of technology on children is becoming harder to measure as the pace of technological innovation increases.
Keywords: *virtual communication, internet, attention volume, school engagement, attention distributivity.*

The last few years have brought an important development in technology, and the advent of the internet has helped the communication process that was impossible a few years ago. This has brought about an important change in the way we communicate, learn and has also brought about a great change in our daily lives, in the way we live, progress which has brought with it advantages and disadvantages. The media is increasingly making itself felt in our lives and children are constantly bombarded with different forms of media thanks to parents who use it to keep their children busy.

Our century is a century of communication, with the internet revolutionising the way we communicate. Life and the way we live has been changing at a rapid pace in recent times, with the internet revolutionising

the world of communications, providing a means of global information dissemination and a means for people to interact with their devices wherever they are. Whereas in the past the internet was just a means of exchanging messages, it has now become a huge place where information is stored. The popularity of email has led to a huge increase in the number of users as the primary form of online communication, so between 1986 and 1987 the number of people using the internet grew from 2000 to 30000 users, and today 60% of the world's population has access to the internet.

The Internet is used by the majority of the population, of all ages, and is used in all areas. Offering people advantages that make their lives easier, but also entertainment, it makes modern man disregard the hidden dangers, spending more and more time on the Internet, so we can see that social networks have gained more and more users, who first use networks to communicate and then as a means against boredom. It is a medium that brings together all aspects of our lives, a limitless space for connection but with great insecurity. In this infinite space, we cannot trace the origin of the information we access, which poses a great threat to us and our children. Technology is in a constant phase of modernisation.

In everyday work, the involvement of attention is always appreciated as a factor of success or success and its weakness or absence as a factor generating errors and failures. It is the first mental reality that comes to the fore, positively or negatively, whenever we have to assess the results of one specific action or another. By the imperative „be careful" we mean how to mobilise and channel, in the most appropriate way, all our powers and capacities in order to get out of a difficult situation or to achieve a goal. Subjectively, attention can be characterised as a state of tension resulting from the concentration of mental activity on an object, and behaviourally, it is targeted through selectivity, orientation and activation.

Research and theories on attention only address the implications for perception at a general level. Psychologists' interest in the issue of attention has fluctuated widely from seeing it as the "nerve of the whole psychological system" to questioning the validity of the term attention itself.

Behaviourist theories, while investigating primary human behaviour, do not address conscious processes such as thought, imagination and perceptual experience. It is clear that an acceptable theory of attention cannot be generated from behaviourism because perceptual experience is not material for a scientific debate.

Within the "Gestalt theories" the word attention is not present in any of their studies. Metzger (1954) uses "attention" in the well-known book "Psychologie"(1954) but proves unable to provide any meaningful factual or Gestalt support for the subject.

Early literature refers to theories of attention in terms of holistic perception using attentional effects. In the book "Vision and Visual Perception" (1965), authors Graham &Bartlett referred to "fluctuations of attention" in the interpretation of ambiguous figures.

Max Wertheimer and Kofflara studied the effects of increasing/decreasing the direction of attention for a given stimulus pattern. However, they failed to gather the empirical evidence established by the studies, so the hierarchy of perceptual factors was not determined.

In 1975 Kock points out that he "knows little about attention even though it is vital to the description of figures". The psychologists Egeth H. & Bevan W. (1973) „have generally recognized the existence and importance of attentional phenomena, but have failed to incorporate them into theoretical structures."

Even today, research is following the same trend, with specialists showing little interest in attention issues. The most important contributions to elucidating these issues have come from cognitive psychology and neuroscience.

Attention can be defined as „a psychophysiological process of orientation, concentration and selective potentiation of specific modal psychic and psychobehavioral functions and activities in relation to their own object and purpose, ensuring that they reach an optimal level of adaptive efficiency".[1]

The essential process of attention is represented by the fundamental need to choose, to filter the information that can and must be admitted into the devices that elaborate responses, such as the construction of a percept, the acquisition or manifestation of a skill, „the mobilization of generalized adaptive procedures, the triggering of a „pre-wired" response already programmed in the organism".[2]

Due to the fact that attention is involved in the regulation and optimal performance of most mental processes and integrated activities, but

1 M.Golu, *Fundamentele psihologiei*. vol. I, ediția V, Bucuresti, Editura Fundatia România de Mâine, 2007, p. 621.

2 M. Reuchelin, *Psihologie generală*, Bucuresti, Editura Științifică, 1999, p.482.

also by virtue of its heterogeneous structure, attention has been approached and theoretically explained on the basis of different models: neurophysiological, neurochemical and psychological (motivational, cognitive). (M. Golu, 2007).

Neurophysiological models consider that the orientation of psychoneural activity, the selective nature of reflection, is the result of the formation of an area of optimal excitability in the brain's cortex. This is why objects and phenomena in the centre of attention are reflected with particular precision and accuracy.

In the realization of attention, the main formation involved is the reticular system, which acts from the brainstem and diencephalon, having functions of activation, filtering and facilitation of cortical psychophysiological processes underlying some mechanisms of mental processes. The reticulate formation prepares the cortex and sensory pathways to respond appropriately to a stimulus. The relationships between the reticulate formation and the cortex were modelled by Sokolov (1963) to explain the orienting reflex. The orienting reflex is a conglomerate of neurophysiological and behavioural changes that occurs when the organism is confronted with a novel and motivationally significant stimulus.[3] This mobilization has somato-motor components (pupillary reflex or in the case of perception of auditory stimuli the turning of the head towards the sound source), vegetative components (changes in pulse, respiratory, cardiac reactions: vaso-dilatation in the head and vaso-constriction in the extremities), sensory components (there is an increase in the sensitivity of the analyzers), electro-encephalographic components, biochemical components, both at cellular and cortical level. At the cortical level we are talking about excitation and inhibition, irradiation, concentration, mutual induction, biochemical activity of the cell. In fact, the whole body participates in the realization of attention.

The problem of attention, at the algorithmic and computational level, concerns the criteria on the basis of which selective information processing is performed, where and how information segregation is performed. Depending on the answer to this, three types of integration models have been outlined:.

3 M.Miclea, *Psihologie Cognitivă Modele teoretico-experimentale*, Iași, Editura Polirom, 2003.

The early filtering model proposed by Broandbendt (1958), considers that information occurs as segregation at the sensory level. Stimuli received at the analyzer level extract the information, the information is stored in a sensory or short-term memory, the information passes through the long-term memory. Filters would be those mechanisms that block some information and favour others. According to this model, information selection is based on physical characteristics at the primary level, but experiments have shown that there is unconscious semantic processing of information.

The late filtering model according to which stimulus processing at the sensory level (primary processing) is performed automatically, stimuli initiate feature detectors, which mostly operate automatically without attention, their recognition is done by matching detected features with patterns in long-term memory, temporarily some of these patterns are activated, the activated part forming the short-term memory, this temporary activation is maintained by relevance mechanisms, which establish information, which is revealed under the motivational aspect, selectivity intervenes, therefore after the initiation of semantic processing. All messages are processed indiscriminately up to the level of semantic processing, at which point those with task-relevant values are processed and the others are ignored.

This model cannot explain why we have difficulties in presenting two different messages with the same intensity, which should not occur if the filtering is done at the semantic level. Therefore, as distractors multiply, the reaction time remains constant when identification is done after processing a single feature, but when identification involves processing two features together, the reaction time increases linearly. The first processing is automatic and the processing of a conjunction of features is a non-automatic attentional process.

The attenuating filter model is a hybrid model with the basic idea that the filter does not operate in an all-or-nothing manner, but attenuates the received signals by making successive selections. Stimuli to which the subject is not attentive are processed more or less, depending on the degree of demand on the cognitive system; if they do not pose a problem, the other messages may also benefit from laborious processing. If the stimulus demands a large part of the cognitive resources, the processing of the others is much reduced.

The neoconexionist model is based on the idea of cognitive resource allocation, because the cognitive system has a limited amount of representa-

tions or processing and therefore it must develop a certain policy for managing cognitive resources.

Neurocognitive research has indicated that operations supporting visual orientation appear to be located in abstract neural areas (Posner, 1988; Posner & Petersen, 1990) compressing a network of cortical (deactivation), midbrain (mutation) and thalamic (activation) structures. These structures cooperate to direct attention to a particular location in space. The orienting network also has close anatomical connections and interactions with the anterior attentional network (Rothbart, Posner & Boylan, 1989), especially between the posterior parietal cortex - associated with attentional deactivation and areas of the frontal cortex (Goldman, Rakic, 1988). This anatomical organization led Posner (1988) to suggest that attentional deactivation is due to advanced control mechanisms.

Henderson (1996) suggested that attention can serve to establish visual links with motor links: a process of action selection. Rothbart (1989) argued that one of the purposes of development is to bring more peripheral mechanisms, such as motor responses, under the control of more central mechanisms, such as attention. In 1991 Posner & Rothbart said that the anterior attentional system develops later than the posterior system being associated with effortful voluntary processes.

Neurochemical models based on discoveries in recent decades about the role of mediators and neurotransmitters in the functioning of the central nervous system, link attention to reactions and transformations taking place in the brain. Thus, according to M. Zuckerman (1983), „sensation seeking" or „sensation avoidance" are conditioned by the level of brain activation, which is in turn determined by the level of catecholamines (dopamine, serotonin, norepinephrine).

Psychological models highlight the psychological side of attention. Thus, the motives and goals of the subject's activity are closely related to psychic activism, linking attention to the conscious nature of the activity.

According to psychoanalytic unconscious theory and behaviorist reinforcement theory, attention is the projection of motivational processes in the selection and identification of meaningful, useful, relevant situations (objects, phenomena) (Berlyne, 1968, 1970; Maslow, 1970; Zörgö, 1980; Nuttin, 1983).

We can say that there is a direct proportional relationship between the level of motivational activation and the level and orientation of atten-

tion, if we consider that the absence of motivation leads to lethargy, even depression, and, implicitly, to the blocking of attention towards external events and action. In a learning activity, motivational factors (curiosity, interest in knowledge) are the main drivers of voluntary mental activity.

Cognitive models consider attention to be central in selecting, processing and using information from the surrounding reality. There is no incompatibility between the explanatory models presented, but a complementary relationship, with each model revealing certain aspects of attention.

The classification of attention is very broad and can be done according to many criteria. The most common classification is by the nature of the setting. Thus we distinguish between involuntary and voluntary attention.

Involuntary attention is triggered by internal and external stimuli and consists of orientation, unintentional concentration, triggered spontaneously and without voluntary effort. Involuntary attention can be attracted by the external environment, as a result of the particular organisation of the perceptual field in which an object appears detached from the whole. This form of attention is also found in animals.

There are several qualities of stimuli that can provoke, capture involuntary attention: stimulus intensity, contrast, novelty, sudden onset or disappearance, complexity, stimulus property of adapting to interest, etc. It is generally short-lived, lasting as long as the action of the provoking stimulus lasts, about 10-15 minutes if the stimulus remains constant, and varies according to the individual and the objective characteristics of the stimulus. Involuntary attention is passive, self-initiated, effortless, provoked by external, usually novel, strong excitants, based on the orienting reflex.

Studying the mechanisms of activation, D.E.Berlyne (1966) demonstrated that the faster onset of involuntary attention and increased alertness are influenced differently by the formal characteristics of the stimuli. Thus, heterogeneity - a perceptual field made up of different elements - , asymmetry, contrast, irregularity, movement, intensity trigger it the fastest.

Its main function is to explore-investigate the new and unpredictable and to prepare voluntary attention.

Voluntary attention is characterised by the presence of the intention to pay attention and the voluntary effort to maintain it. So this form of attention depends largely on the individual and his or her motivations. Being consciously self-regulated, voluntary attention is superior both in its verbal

mechanisms of production and in its implications for human activity. Voluntary self-regulation is achieved through intentional orientation towards the object of attention, goal-selectivity and increased mental effort. Voluntary attention is essential for carrying out activity, but due to increased energy consumption, fatigue intervention can be maintained for a relatively short period of time.

Voluntary attention is not fixed at one point, but follows the flow of the activity, the sequence of steps and responds to objective demands. Both the mobilisation and concentration of voluntary attention and the commutativity and distributivity of voluntary attention can be maintained with the help of speech which increases the signalling value of certain stimuli. There are differences from subject to subject in the level of concentration on the detail, insignificant elements of a situation (object, phenomenon), and the essential ones.

Voluntary attention requires effort, will and motivation to complete and achieve the goal (we have to learn a lesson, a poem, etc.). Theodule Ribot ("Attention and its pathology"[4], said that voluntary attention "is an apparatus of perfection and a product of civilization". It is superior to the involuntary one in its capacity of elaboration and conceptually theoretical interpretation. It has 3 links: the afferent link (input), the intermediate link (processing, interpretation) and the efferent link (elaboration, selection and emission of the corresponding answers or results). Attention must be equally distributed across the 3 links to solve a task effectively. Intellective attention (intermediate link) characterizes introverts, whereas extroverts are characterized by sensorimotor attention (Eysenck, 1968). Intellective attention is more complex, requiring greater effort and motivation to sustain, compared to perceptual and motor attention.

The two forms of attention, involuntary and voluntary, are connected, and there are degrees of transition from one to the other. For example, learning starts with voluntary attention, then comes interest, the pleasure of learning[5], and attention gradually becomes involuntary.

Habitual or post-voluntary attention is a higher form of attention, be-

4 Theodule Ribot, *Atentia si patologia ei*, Bucuresti, Editura Iri, 2000, p.71.

5 Ioan-Gheorghe Rotaru, "Valences of Education", în *Proceedings of the 24th International RAIS Conference on Social Sciences and Humanities*, August 15-16, 2021, Princeton, NJ, United States of America, pp. 190-196.

ing a specialized attention based on habits and is formed through education, because attention can be educated. This form of attention involves concentrating on an activity that does not appeal to us, but by virtue of practice and experience we begin to like it and come to enjoy doing it, without the need for voluntary effort.

In conclusion, the three forms of attention: involuntary, voluntary and postvoluntary are interdependent, forming„a cyclical dynamic unit"[6]

The French psychologist Theodule Ribot distinguishes between two types of attention, quite distinct from each other, but which broadly correspond to the two forms of attention mentioned above, namely involuntary and voluntary attention. These are: spontaneous (natural) attention and voluntary (artificial) attention. The first form, neglected by most psychologists, is the natural, primitive, genuine form of attention. The second is a result of education, of training.

Th. Ribot argues that spontaneous attention is the only attention that exists as long as education does not come into play. Attention is a gift of nature, unequally distributed from one individual to another. Strong or weak, it is caused by affective states. Man pays attention spontaneously only to things that interest him, that touch him, that make him feel pleasant, unpleasant or mixed. The nature of spontaneous attention in a person reveals his character or at least his fundamental tendencies. It shows us whether we are dealing with a frivolous, banal, narrow-minded, open, deep spirit. Ribot gives the example of a concierge who spontaneously pays attention to gossip; the painter is attracted by a beautiful sunrise; the geologist is attracted by rocks in which the ordinary man sees only stones.

Voluntary or artificial attention according to Th. Ribot is a product of necessity, which appeared with the progress of civilization, art, education, training. It finds its conditions of existence in spontaneous attention. Voluntary attention was born under the pressure of necessity and with the progress of intelligence. It is an apparatus of perfection and a product of civilization. Stressing that voluntary attention is the result of education, Ribot proposes three directions as a means of training: the first, in which the educator, teacher and parent, relies on feelings (fear or tenderness and sympathy, curiosity, interest and attraction to reward); the second refers to

6 M.Golu, *Fundamentele psihologiei*. vol. I, ediția V, Bucuresti, Editura Fundatia România de Mâine, 2007, p. 631.

ambition, practical interest and duty, and the third refers to the fact that attention is developed and maintained through skills and imposed exercise. In the early school age period the capacity to expand or build the attentional field increases, the speed of switching attention and the ability to detach attention from the distractor increases.

Depending on the location of the object in focus, attention can be external and internal. We speak of external attention when the object of attention is external to the subject (when we are looking at objects, phenomena in the environment or the movement of our action) and of internal attention when the object of attention is in the plane of consciousness, of psychic life, by focusing on our inner life, on our own images, thoughts, feelings. It is engaged in the act of introspection.

Inner attention is closely related to the notion of inner seeing, which in fact means a series of related images that move our attention to the plane of consciousness, a series of memories. And it is the long-chain reflex that awakens these memories.

Distraction is the opposite of concentration, being the result of the action of different stimuli, which cause the person's interests in another direction, for example: the appearance and onset of fatigue, the decrease of interest and the appearance of boredom, etc.

The problem of attention has been the subject of research in experimental psychology laboratories because it is a relatively easy psychological process to measure. Important scientific studies and research have been carried out to identify the factors involved in the decrease in alertness of concentration and to discover the means of maintaining the highest possible level of concentrated attention. The results have shown that, especially in the case of monotonous tasks, attention decreases rapidly, and fatigue sets in after 20 minutes.

Affective states have been found to play an important role in establishing attention and that attention is an adaptive act that can be developed through the learning process. Interest is also the tendency to pay attention to objects, people or situations to which we are attracted and in which we find satisfaction. It also stimulates the desire to continue an experience that has begun, while aversion leads to abandonment and rejection.

Experimental psychological research examines, in addition to the stability of attention, the phenomena of distraction, distribution and switching of attention. In order to understand the ability to maintain atten-

tion under disturbing conditions (noise, light sources, monotony, fatigue, emotional states, etc.), we need to know that any act of attention consists in the form of a dominant by concentrating excitation in a particular focus and inhibiting other subdominant centers.

Thus, if during a one-sided, monotonous activity, the mobilising processes are extinguished, a collateral stimulant can uninhibit them, periodically intensifying the focus of attention. This is why psychologists recommend that in certain situations work should not be done in absolute silence: a melodious muted music (complementary stimulant) does not hinder work, but encourages it. But strong complementary stimuli are inhibitory and disruptive in maintaining attention, they reduce the energy of the dominant activity and cause a new orienting reaction, a new dominant (loud, shrill music accompanied by an emotionally engaging text is distracting).

The degree of distraction depends on motivation, interest in the activity and its novelty and variety. Focused attention can also be maintained when the work is automated, when skills are well established or when we are accustomed, adapted to working in the presence of disturbing job-specific arousals.

Another psychophysiological state is alertness, which has the effect of preparing for a perceptual, motor and/or intellectual activity, as well as carrying out such activities in relation to a task that requires the proper functioning of attentional qualities.

F.J. Mackworth defines alertness as an activating state of attention to detect and respond appropriately to specific, sometimes hardly perceptible, changes in the environment at random intervals. Individual differences in alertness are thought to be due to the strength of the nervous system. The tasks of alertness and attention are very close and can hardly be dissociated. Depending on the specialised activities, states of alertness are structured into: checking, watching, inspecting and watching.

Alertness involves general exploration of the environment, waiting and searching for something as yet undefined. It does not have a specific orientation, it does not stop on something, but explores everything.

Studies by Pamela J. Sutton and David H. Rose concluded that at any age explicit instructions led to increased attention to the pattern, and the use of an effective attentional strategy was associated with drawings that reflected visual reality. These studies provide evidence that intellectual

and visual realism are not two different stages in development, but may reflect children's use of different attentional strategies.

In contrast, many studies have shown that children under 8 years of age are faster to develop visual images than canonical drawings. These data have led researchers to question whether intellectual and visual realism are distinct developmental stages (Arrowsmith et al., 1994; Bremner & More, 1984 ; Cox, 1986 ; Thomas & Silk, 1990).

Studies by Batrrett et. al., 1985; Davis, 1983 ; Davis & Bentley, 1984; Levis et. al., 1993 have suggested that signaled contrast and instructional effects improve drawing performance in younger children because they help the child clearly understand what the experimenter is asking them to do. As children gain control over attentional resources, the types of events they can observe increase. As their knowledge grows, emphasis on different perceptual cues leads to more events and also to change (Ruff & Rothbart, 1996).

Research using the cost-benefit paradigm to examine the development of orientation has consistently shown that at least by age 6 children are able to orient their attention in response to peripheral visual cues (Akhtar & Enns, 1989 ; Brodeur & Boden, 2000 ; Brodeur & Enns , 1997; Enns & Brodeur 1989 ; Pearson & Lane, 1990) and that throughout life this ability changes very little. This type of orientation is called exogenous orientation and has been characterized as involuntary and automatic. This means that, all things being equal, when stimuli appear in an empty field or change colour, size or brightness, attention automatically orients to that stimulus regardless of its location.

Akhtar and Enns (1989) examined exogenous orientation in 5, 7, 9 year old children and adults and found that all groups showed significant costs and benefits and that the magnitude of each measure decreased with age. The decrease in costs was interpreted as consistent with the bright spot metaphor of attention. Children were slower than adults in turning off the bright spot on an invalid cue in order to pay attention to the uncued task. As a reason for the decreasing magnitude of benefit with age, the authors considered the predictive value of cues, i.e., attentional resources allocated to the cue are thought to be variable depending on the validity of the cue among other things (Shaw, 1978). It was also noted that with age, people make better use of the predictive value of the stimulus, to their advantage over children, who allocated more resources to the location cue than adults,

who knew better and henceforth showed greater benefits.

Gadgets are a reality of today's world, they are the most convenient way to receive information effortlessly. Today's children spend a lot of time in front of screens, with new technology as a social component.„Originally intended to be a wireless device, easy to carry and connect anywhere independently, and designed like its fixed ancestor for verbal communication, the mobile phone has been enriched with various functions, becoming also a camera, a camcorder, a sound recorder, an audio and video file reader..."[7]

Of all gadgets, the increased interactivity, sharing of information, knowledge and ideas has made the smartphone one of the most popular gadgets.

The digital world has a strong impact on children, we want all children to be able to access the resources they need to gain knowledge and skills for an optimal future, but without becoming virtual individuals living their lives only in the digital space. For this to become possible, these children need to be provided with education[8] and information that will enable them to develop in a healthy way.

Conclusions

Children learn about the importance of interacting with people in social situations, using technology only when they are unable to use a physical connection with others, so they can use technology to create „virtual connections.

Early access to technology creates the digital skills children need for their future success in school and as adults. Throughout historical evolution, a mutually determining and influencing relationship has existed and operated between society and education. Contemporary society, characterised by an accelerated pace of change and by the deepening interdependencies between its components, with the most profound consequences for human development, naturally calls for the foreshadowing of measures and the adoption of educational solutions in line with the essence and meaning of its development. We live in a hypercomplex environment, populated

7 Jean-Claude Larchet, *Captivi în internet*, București, Editura Sophia, 2018, p. 22.

8 Ioan-Gheorghe Rotaru, "Current Values of Education and Culture", în *Proceedings of the 24th International RAIS Conference on Social Sciences and Humanities,* August 15-16, 2021, Princeton, NJ, United States of America, pp. 87-92.

by a wide variety of objects and forms, invaded by a multitude of stimuli, an environment that evolves unpredictably, generating critical situations. If we do not have the ability to make quick adaptive decisions, we may lose the chance of an appropriate response forever. The psycho-physiological mechanisms involved in selecting those stimuli that have significant motivational or adaptive value are called attention.

From a psycho-pedagogical point of view, attention represents an optimal relationship between the subject of instruction and the educational environment, consisting in the orientation and concentration of cognitive mental activity on an object or phenomenon. There can be no effective learning activity without focusing the learner's consciousness and thus capturing his attention. From the point of view of the organisation and conduct of the teaching process, the development of the ability to pay attention, or more correctly, of attentional skills is based both on respect for certain conditions and laws of the human psyche and on the choice of appropriate teaching strategies.

In organizing the teaching approach, the teacher will take into account both the external conditions related to the novelty of objects, phenomena, situations, intensity of stimuli, movement, change, variation of teaching material, but also the internal factors related to students' interests and motivation for learning. It is important to make the most of this ‚openness' of the schoolchild's personality to the need to learn, to know, in order to cultivate their attachment to school and learning, their love and interest in knowledge.

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