THE IMPORTANCE OF COGNITIVE SELECTIVENESS IN THE AGE OF INFORMATION FLOOD

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Abstract

Civilization changes resulting from technological development are the causes of modifications of life conditions. The effects of technological development are perceived as ambivalent as well as positive, and negative. Psychologists are interested mainly in the latter ones, especially in the phenomenon of overproduction of information, sometimes called information overflow or information flood. This social phenomenon requires from contemporary people the ability of selecting data, their intentional choice, in line with the specificity of the realized cognitive tasks. The competences required to perform this task properly are called metacognition. They involve knowledge of cognitive functioning, i. e. higher-level skills including planning, monitoring, control and regulation of the cognitive activity. The development of metacognition seems to be a major challenge for contemporary education.
Key words*: information flood, metacognition, selectiveness.*

Introduction: analyses background

In the era of information flood, the selectivity of mind might be investigated taking into account many different theoretical frames developed in psychology and theories of media. Two of them seem especially suitable and well adapted, namely McLuhan's laws of media (McLuhan & McLuhan, 1992) and metacognitive functioning framework (Sternberg, 1998).

The so-called laws of media depicts the main differentiated effects of the presence of new technologies, as they disclose in everyday life. These are as follows: the enhancement effect, the retrieval effect, the obsolescence effect and the reversal effect. The two former effects represent positive outcomes. Enhancement means a higher effectiveness of functioning due to technological facilities (in relation to the well-known metaphor formulated by McLuhan (McLuhan & McLuhan, 1992) that media are the extension of our senses). The retrieval effect constitutes a metaphorical expression of the obvious tendency of the rebirth of the image code (the era of words is followed by the era of image). The two said laws characterize negative consequences of the presence of electronic media. By using the notion of obsolescence McLuhan stresses the weakening of an important kind of activity consisting in a deep, slow reflection conducted on perceived data. The quantity of information, the speed of its transmission, as well as the fast pace of life, makes such an elaborate reflection difficult. The reversal effect is the reversal of the amplification effect. In some sense media turn against man, and a very good illustration of this is offered by the phenomenon of information overproduction. Computer connected to the Internet supplies an easy access to information, the information takes the form of flood, calling for a rigorous selection. Otherwise, orientation, decision, emotional and so on problems will appear.

The magnitude of data confronted with human cognitive possibilities is a major psychological

challenge. It calls for the already mentioned selectivity requiring many complex skills: the assessment of accuracy (truthfulness), usefulness, up datedness of information; the ability to keep distance from parts of information; the ability to reduce the information intake; the ability to integrate new data with prior knowledge. The most adequate context for empirical studies and theoretical analyses of the issue is supplied by the notion of metacognition, meaning higher order cognitive skills, the ability to think about thinking, to reflect upon own cognitive functioning and all the skills that must be implemented. This framework has been extensively investigated in the last decades, including the role of mature metacognitive knowledge and skills in effective cognitive functioning (for example: Boekaerts, 1999; Efklides, 2006; Koriat, 2000).

Both theoretical backgrounds, theories of media and psychological, are complementary to each other, giving the opportunity to analyze the relations between the information overflow resulting from technological advances and human mind work.

The phenomenon of information overproduction

You *can* have too much of a good thing. As this proverb holds, abundance of certain goods might be the cause of many problems. We are facing such a situation in the contemporary world and it is due to the development of modern technologies. Information technology is present in every area of life, and, apart facilitating and improving the quality of life, creates many organizational, educational and psychological problems. The source of many of them is the Internet: an inexhaustible and incessantly increasing store of a whole array of information.

The number of users of this medium in the world, despite geographical variation, is growing constantly and includes ever wider groups of children, adolescents and adults (DiMaggio et al., 2001). The results of Polish research reveal that approximately 1/3 of Poles have access to a personal computer and 17% of Poles have access to the Internet in their own households (Czapiński & Panek, 2003). It is worth adding, as a comparison, that the internetisation of the society in USA is much higher. As many as 71% Americans go on-line, and 59% of households reported that they had access to the Internet at home. Statistically, Polish internaut is an inhabitant of a big city with secondary education and earning a good salary (the most profusely represented professional group are freelancers, the second in number are hired workers), living in a family. Children tend to be the innovators and the driving force in the family urging their parents to buy new equipment and they are the ones promoting technology and encouraging adults to accept it. It is often the case that children are more competent than parents and teachers in using the electronic devices. Referring to the differentiation proposed by M. Mead (2000) we can state that many contemporary societies represent prefigurative culture, in which adults draw from the resources of younger generations. Educationists describe the problem we face today as a pedagogical inversion.

Cognitive activities of Internet users' are very diverse. Taking the type of actions as the dividing criteria, authors point to the following: expressing, protecting, gathering information, as well as interfering (Megens & Martin, 2004). Very often the only the goal of the Internet activity users is gathering information and our further discussion will be based on this very type of activity. The Internet activity involves multiple forms of exploration, the most dominant of which are browsing Web pages, searching in databases and downloading files.

The ease of creating and publishing Web pages as well as the very speed of information transfer over vast distances, enables an easy access to information being a decisive factor of the attractiveness of the Internet. Its content – judged on the basis of the size of the data as well as its organization and reliability – remains disproportionate to the cognitive capacities of human mind. The main barriers are linked with the properties of human attention and short-term memory. The situation briefly characterized above is defined in a multitude of ways depending on whether the size of the information produced or the mental limitations are highlighted. The most common description categories are: flood of information, overload of data, cognitive stress and info-stress. In everyday language the word 'flood' dominates, emphasizing the almost cataclysmic dimensions of the problem. But it can also be useful in psycho-didactical analyses undertaken herein.

The information flood phenomenon, seen from a psychological perspective, is complex and multifaceted. One of the important problem is expressed in the question about motivation for the search of

information in the superabundant repository that the Internet is. Psychologists associate human actions with various needs amongst which the cognitive, security and affiliation needs are emphasized. Fulfilling the first need, based on an 'orienting reflex', takes part in deciding on the course, dynamics and level of an individual's mental development. The spontaneous search for novelty is engraved into man's psychical structure and the interest based motivation makes this cognitive need incessantly insatiate.

However, obtaining information is characterized not only by a defined content characteristic, but also by a certain stimulation value. Novelty-seeking may sometimes stem, above all, from the desire to seek out stimulus (sentience, sensation). The last of them is also referred to as an individual psychological need and described as an individual need for stimulation (Farley, 1985). The 'stimulation optimum' under conditions of which we function best has a different value for every person. That is why the effects of the information flood are also felt with different intensity.

Selectiveness and selection

The effectiveness of functioning in the world, particularly under conditions of a surplus of information, is determined by the ability of making choices. Accurate and apt decisions often determine life's successes although not all are undertaken consciously and are well thought out.

Psychological tradition identifies two levels of human behavior regulation: drives and emotional level, on the one hand, and rational and volitional, on the other. Basic needs are initiated as the first regulators and various emotions accompany their satiation or deprivation. As the higher cognitive functions develop (particularly that of logical thinking), choices are dictated all the more frequently by rational reasons, and drives and emotions are subject to higher levels of control. The selective role of mind reveals itself thus as one of the pillars of rational actions. How very distant from this are the many Internet users who too often are not reflective enough in their contact with electronic media!

Selectiveness is understood in psychology as the capacity to differentiate defined subsets of information (Hankała, 2000). It concerns information received from the external world in the course of mental activity (imagining, thinking), as well as that stored in memory. Selectiveness, therefore, goes beyond the phase of the intake of external information as it also refers to later stages of analysis. In relation to that issue, two approaches are present in psychological literature. The first, a narrow one, is focused on the processes of perception and is connected, above all, with the functioning of attention. Such a selectiveness concerns the exploration of the external world but is also sometimes directed at the content of the mind, making up the unique 'inner eye'. The main parameters of attention are: span, vigilance, divisibility, the ability to search (Nęcka, 1994). Selectiveness, however, treated in the broad sense of the word, transgresses beyond perception and encompasses the remaining psychological processes such as memory, thinking, deciding, acting and judging.

Some researchers emphasize the particular role of memory, highlighting its high status in the selectiveness processes of mind. This approach is based on contemporary views seeing memory as closely related to other cognitive processes. All of them are seen as occurring simultaneously and are studied jointly. Memory, however, is conceived as having the leading role in the usage of individual and social experiences (Kępiński, 1974). As such, it remains irreplaceable in processes of understanding, initiating, as well as action planning. It is also essential in thinking, providing raw materials in the form of information and creating space for the operations being carried out (working memory).

The term 'to select' is usually associated with rejection, distancing oneself. Selection, however, does not exhaust the extremely capacious category of selectiveness. This is because the 'differentiation' emphasized in the definition occurs in many different ways. We can say that it is connected with the specificity of processing i.e., the characteristic way of analyzing information. If we were to refer to the familiar and still acknowledged concept of Craik and Lockhart's levels of information processing (Anderson, 1995), then the 'shallowest' one of them depends on taking into account solely the superficial (perceptive) traits of the material. In such a view something may be 'distinctive, obvious to the eye, centrally positioned, colorful, appealing' etc. A deeper processing is expressed in finding and retrieving sense, interpreting meanings. This form of cognitive involvement requires to devoted time to it and ample reflection. And finally, the deepest level of analysis assumes the form of referring the received information to the 'self', i.e., connecting it with broadly understood personal experience.

The selective function of the mind is an important but not sufficiently described phenomenon. It

has two pillars and encompasses the selected information as well as the selection strategy. The problem remains how and what to select but the method of selection itself is often connected with the kind of information. Selection, which is the essence of selectiveness, is a complex human competence requiring knowledge and skill. Just as the majority of skills, it is acquired gradually, according to a fixed order. The essence of developmental changes is expressed in a transfer from a lack of differentiation of information, through selectiveness carried out under guidance (externally controlled), to self-regulated selectiveness (Ledzińska, 1996). The last of these, being both voluntary and conscious, has a subjective character and is one of the indicators of man's cognitive maturity. It cannot be achieved without using some contents of the mind, apart the value systems, also the systems of knowledge stored in long-term memory and the applied cognitive strategies (analysis, synthesis, comparison, generalization, abstraction). Thanks to them we stop reaching out for certain sources such as addresses, databases, pages, catalogues, books; we do not develop certain motives and do not want to socialize. The involvement of every of the above mentioned mental links in the selection process tends to be different and is determined both by psychological characteristics, and situational factors. The human mind – even perceived in the aspect of selectiveness – cannot, nevertheless, be treated mechanically. Its functioning is never the result of an aggregation of the various perceptive, memory, thought functions or the like. Mind as a whole is capable to do what no other psychological mechanism is capable of. So it happens that we select accurately although we are not always capable to precisely verbalize the reasons for our decision.

Selectiveness and higher-order cognitive skills

Investigation of selectiveness calls for a broader psychological perspective. The most suitable is given by the metacognitive knowledge and skills framework. The term metacognition is used to denote cognition of cognition (Flavell, 1979). Metacognition is a model of cognition, which acts at a meta-level and is related to the object/world through the monitoring and control functions (Nelson, 1996). Metacogniton has many facets: metacognitive knowledge (MK), metacognitive skills (MS) and metacognitive feelings (MF). Metacognitive knowledge is declarative knowledge about cognition, which we derive from long-term memory. Metacognitive skills is procedural knowledge. This is a part of the so called executive processes. Metacognitive feelings are products of processes such as those concerning task characteristics and the procedures to be applied (Koriat, 2000).

Contemporary educational and cognitive psychologists agree that such cognitive tools are the essence of self-regulated learning (SRL), which in turn is indispensable as the basis for life-long learning (Boekaerts, 1997, 1999; Sternberg, 1998; Vermunt, 1996). Metacognitive knowledge and skills might be located in even larger frames of human abilities. As described by the "Group from Michigan", one can distinguish three main types of learning strategies: cognitive, metacognitive and resource managing (Pintrich & De Groot, 1990; Pintrich, Smith, Garcia & McKeachie, 1993). Cognitive strategies are all behaviors directed toward the content of learning and their role is to "transfer" knowledge from the external world to one's mind. They mean acting on the material in one of the three main ways: rehearsal, elaboration or organization. Selectiveness skills might be seen as cognitive strategies belonging to the elaboration or organization type. Organizing information is a frequent form of selectiveness. Operation-wise, it depends on creating hierarchies along with placing the most important information at the top of the thought ladder. This ordering takes place according to various criteria linked to cognitive development. The direction of ontogenetic changes depends on a gradual shift towards the use of logical criteria like, for instance, belonging of information to a certain semantic category. This means gradual elimination of pre-logical principles of organization, to which belong, among others, co-occurring in time and space, physical likeness and so on.

Age, level of education, stage of schooling and type of school attended are important determinants of metacognition. Secondary school students differentiate less cognitive and metacognitive strategies, as well as less mental models of learning, than the average university students. University students with very low achievement resemble secondary school students in this respect (Vermunt & Verloop, 1999). Indeed, data show that university students from the second year demonstrate a higher diversification in strategies than first year students (Vermetten, Vermunt & Lodewijks, 1999). Interesting results were obtained in an investigation with secondary school students from different types of school (Slaats,

Lodewijks & van der Sanden, 1999). Four learning styles were identified: passive, reproductive, constructive and flexible. Each of the identified learning styles dominated in a different type of school. In commercial school the reproductive style was the most common, in technical school the constructive one, in medical school the flexible one, and in agricultural school the passive one. This investigation did not answer the question as to whether differences in the learning style were present prior to the entrance in the secondary school and were the cause of the choice of the given type of school, or whether learning in a given school promoted the development of one of the learning styles. Probably there is a kind of transaction: the individual's learning style influences the choice of the type of school, and experiences in a given educational context enhance the original dispositions. An analogy is the fact that the development of general views on the essence of learning and the development of learning strategies have a transactional character. More mature views of learning provoke the usage of more elaborated strategies, and the development of strategic knowledge and efficiency in strategic behavior contribute in turn to the modification or strengthening of a given conception of learning (Czerniawska, 1999; Dembo, 1994).

Discussion

The information flood makes the accuracy of our source and information choices a skill of highest priority. Books, courses and training dedicated to information management are enjoying immense popularity. An attempt to consider the discussed competences comprehensively allows to distinguish several groups of Internet users. One of them is formed by adults and the matures in the cognitive sense. All persons having the need for selecting and who are capable of choosing are comprise in this group. From a psychological perspective they can be defined as well adjusted and their behavior expressed in contact with electronic media may be described as adaptive.

Individuals displaying two models of non-adaptive behavior form a much greater group. They are, on the one hand, adamantly opposed to IT, seeing in it mainly a source of threat and thus reject modern technology. On the other hand, we encounter uncritical individuals with a limited ability of selecting, surfing the net by way of free associations. A lack of limits in using the Internet may disrupt the overall psychological functioning of a person in all areas: cognitive, emotional and social.

The term 'informational metabolism' by way of comparison to the energetic metabolism was proposed by A. Kępiński (1974), an eminent Polish psychiatrist and humanist many years ago. The exchange of information, similarly to energy, is one of the prerequisites of life. It also determines quality of it. In a metabolic cycle we are dealing with a phase of taking in food (source of energy) as well as assimilating it. This trait of living organisms has its analogy in information processing. After the stage of taking in information, time is necessary for its psychological assimilation – understanding and integrating it with an individual's prior knowledge. An uncontrolled intake of different information is similar to a bad diet, always having negative consequences.

It is not enough to be able to use a cognitive strategy. An as important aspect of cognition is covered by the notion of metacognitive strategies: planning, monitoring, controlling, regulating, assessing, giving feed-back… Selectiveness, a more complex strategy as compared with rehearsal, is in urgent need of that higher-order cognition. And when thinking about the information flood, the need for mature metacognition is even more pronounced. Lets analyze a typical situation of a person starting his/her everyday contact with the Internet. This person needs at the first instance to plan what the contact should be, how long it should last, what is he/she looking for. Forming such a plan, formulating own aims, enables the control, monitoring and regulation of the whole process. If I do not know what I am looking for, I will not be able to decide whether I have reached my goal. Also in every act of selection metacognitive awareness is strongly recommended: one must reject what is not needed at the moment and leave the appropriate data, not forgetting about important ones. It is also important to be able to assess if the goal has been reached, and if so, stop the activity (Vermunt & Vermetten, 2004).

Conclusions

Nobody is born with a sophisticated metacognitive knowledge and skills. It is the role of the educational system to develop such knowledge and skills in pupils.

Many psychologists point to the fact that what is especially important is the congruence between the individual's learning style and learning behavior, and the congruence between particular elements comprising a given style and the degree of control the individual is able to exert over his/her own learning (Beishuizen, Stuoutjesdijk & Van Putten, 1994; Entwistle, Tait & McCune, 2000). On the other hand, a "surface" learner appears to profit more from an acceptance of external control (Beishuizen, Stoutjesdijk & Van Putten, 1994). In this context, the concept of "frictions" between learning and teaching strategies is relevant. Frictions are meant as the lack of adjustment between strategies employed by the learner and the strategies required by the task. Frictions may play a positive role when they lead to the development of the strategic activity; and a negative, destructive one when they force learning to occur on a level lower than that potentially available to the individual (Oosterheert & Vermunt, 2001; Vermunt & Verloop, 1999).

Thus, developing metacognition is a major challenge for contemporary education. The skill of selecting can and ought to be taught, especially in formal educational settings. But it seems that the principal problem today remains the selection (choice) of teachers capable of shaping media skills in pupils. Knowledge of the specificity of the media approached in terms of the principles of the human psychological functioning is fundamental for such teachers. It is the role of psychologists and educationist to supply teachers with knowledge about media and psychological limits of human processing in order to give them the necessary tools to booster appropriate Internet usage in their pupils and students.

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