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Izabela ZIĘBACZ

<https://orcid.org/0000-0002-4275-0550>

Jan Długosz University in Czestochowa, Poland

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Education on the verge of changes. The process of education in terms of the cybernetic theory of character

Abstract

Contemporary change processes in the sphere of education are multi-context and determined by various factors. Undoubtedly, the factor organizing the discussion on the new model of education is the uncertainty related to the shape of the future. This uncertainty is caused by the direction of changes in the area of functioning and development of societies and the emergence of the knowledge-driven economy. These changes, in turn, are the result of the impact of mega trends, including the development of new information and communication technologies (ICT), globalization of various spheres of life, progressive phenomena of socio-economic polarization, cultural changes, acceleration of migration processes, etc. These changes set the framework for processes of education and upbringing generate numerous challenges in educational activity related to fundamental issues: how to teach? by what methods? What kind of results to expect? (Wasylyuk et al., 2020). Educational institutions play an important role in this process, including universities, “where self-steering prevails over learning, externally guided” (Laurisz, 2022). M. Mazur’s (CTC) (1976) cybernetic character theory, pioneering on a global scale, is a proposition of a response to these educational challenges. This work is an attempt to use the CTC to identify the parameters of character of the studied students in the field of social work. The proposed solution may support didactic processes by optimally matching the efforts and capabilities of students to the needs of the education process.

Keywords: cybernetics, education, knowledge management.

Introduction

Pedagogy is a field in which permeate the achievements of other scientific disciplines. “You can talk about a surprising relationship of thoughts, among others in physics and education” (Piasecka, 2015), and cybernetics (Wilsz, 2008), which is dictated by the fact that traditional methods used in teaching do not keep up with the progress and information development of society. However, as specialists from various fields confirm – the disciplines of science used so far in pedagogy are not able to precisely define human characteristics, the knowledge of which is the basis for taking actions aimed at increasing the effectiveness and efficiency of the didactic process (Wilsz, 2012).

Pedagogy, as a science of upbringing, wants to guide an individual in such a way that he can optimally implement his goals and intentions, and consequently achieve social goals. The question arises: how to support the achievement of these goals, if we are not able to define them precisely? It follows that we are currently dealing with a situation where we want to achieve certain positive goals based on the wrong assumptions. It is assumed that the student is some “plastic matter” that can be freely shaped, modeled (without knowing his basic goals and aspirations) (Stoffova, 2017). Such an approach leads to treating the individual as the subject of the education process, and not the subject of this process. Therefore, in view of the fact that the main subject of pedagogy’s interests are the mechanisms leading to behaviors, as well as the behaviors themselves (Petty, 2010), this means that all theoretical considerations that fall within this issue should include the psyche, understood strictly as all processes in information area of the autonomous system (which is human). The term “psyche” is a specific terminological convention, with the difference, however, from other psychological, sociological, or pedagogical definitions (definitions of personality) that the term draws attention to a specific area of physical phenomena that must be analyzed in order to obtain cognitive results. Referring to the increasing number of attempts to learn and explain the mechanisms of human behavior, it can be argued that in order to predict human behavior, we must first understand the basic processes that determine this behavior (Grover, 2016). Therefore, there is a need to undertake this analysis in the framework of cybernetics, thanks to which it will be possible to look at the education process differently and propose other methods of its implementation.

Psychology and cybernetics in the context of educational challenges

In pedagogy, we deal with complex phenomena and processes taking place in the human psyche (Hall et al., 2020). Mental processes and phenomena, in-

cluding impressions, perceptions, ideas, talents, strivings, thinking, feelings, interests, will and character qualities, are so intertwined with our own selves that they have become almost obvious to us (Strelau, 2006). In reality, however, we do not know much about mental operations, intellectual processes, or reactions to external influences and phenomena (Linton, 2019; Strelau, 2006). The pedagogical process of human development and education, or the process of psychophysical shaping of personality, are very complex processes. In addition, these internal mental processes intertwine with other processes that take place in the human body and at the same time are related to our environment and its social structure (Linton, 2019). Therefore, in the course of pedagogical influences on an individual, it is necessary to take into account their personality, attitude, as well as the complicated process of receiving and processing information.

Therefore, it is important to try to evaluate the achievements of psychology in the field of personality research. Starting with the concretization of the term itself, on the one hand, we deal with a multitude of “contradictory ideas” (Hall et al., 2020), on the other hand, there are opinions that it is not purposeful to synthesize theories, the empirical usefulness of which remains largely unproven (there is a large chaos in terms of definitions used as tools for personality research (Hall et al., 2020). Even the exact meaning of the term “personality” itself has not yet been established, as the process of clarifying the concept as it is applied has not yet been completed (Linton, 2019). In particular, the main problem with defining personality is the delineation of its boundaries. By personality, R. Linton proposes to understand “an organized aggregate of mental processes and states specific to an individual” excluding from its area all other elements that can be found in other, more developed definitions. It should be noted, however, that the pursuit of “adding and developing definitions” seems to be a vicious circle, the more so as the author himself formulates such a statement as “the formulation: processes, mental states is unclear, but it seems reasonable to leave it as such which is” (Linton, 2019). Which means that “definitional creativity” is in progress and may never actually end. This short analysis does not imply any attempt at an attack on psychology. Almost any theory, when developed systematically and linked to large-scale empirical research, is more likely to develop than a juxtaposition of existing theories, many of which are imprecise and insufficiently related to empirical data (Zaniewski, 2003).

However, the above-articulated doubts and reservations, troubling more and more researchers, have become the source of the increasingly expressed postulate of finding a concept free from “naturalism and dualism of inherited (biological) and social (environmental) factors” (Wilsz, 2008). Such a concept is characterized by methodological and theoretical consistency, consistent with the assumptions of epistemological rationalism, allowing for a deep analysis of

organic human structures, can be found in Marian Mazur's cybernetic theory of character (CTC) (Wilsz, 2012). In particular, it is about the use of the cybernetic theory of independent systems and the cybernetic theory of human characters by M. Mazur, which have gained worldwide recognition (Pawlak, 2020). This theory is a concept of a human being and it seems to have an advantage over the existing concepts (behavioral, psychological). In teaching, it is about the controlled shaping and development of specific mental processes and personality traits of a student, which can be treated as a cybernetic treatment (Stoffova, 2017). Cybernetic analysis contributes to a better understanding of the nature of the complex learning process (Ziebacz, 2022). Many phenomena, which so far could only be treated descriptively, can be explained by cybernetics with the use of methods and conceptual apparatus proper to science. A derivative of the use of cybernetic analysis is the rationalization of the teaching process and the possibility of formulating practical rules of teaching (these rules are considered and interpreted, as it were, from a higher point of view).

Educational processes in cybernetic analysis

In general, pedagogical research tries to reach knowledge in both inductive and deductive ways, but the multiplicity of acting and influencing factors cannot be recognized only statistically, but also dynamically, and at the same time in a mutual condition. Moreover, while in the natural sciences the factors at work can be eliminated relatively easily, in pedagogy it is extremely difficult (Biriukow, Geller, 1983). For here not only is the situation constantly changing, but even the same causes can have different effects (Karney, 1998). As a result, no two teaching situations are alike, even when external conditions such as teaching material, method, and aids are the same. And here cybernetics comes to the rescue of pedagogy, because it can analyze complex systems using mathematical methods and detect various intervention factors. The point is therefore to use cybernetic methods to study complex and multilaterally conditioned didactic phenomena and processes, making them available for further analysis (Ziebacz, 2022). Cybernetics allows, above all, to formulate quantitative statements where we have only had qualitative results so far (Gomolka, 2019). As a result, a better solution for the use of learning time and more effective teaching methods can be found. The methods of cybernetic research complement the existing research methods of psychology and pedagogy. However, they do not claim to replace these traditional methods (Biriukov, Geller, 1983). It is important that cybernetics today contributes to the fact that it explains some issues in the field of teaching better, while doing so from the point of view of a unified theory (Staffova, 2017). Information theory and communication theory

in particular provide valuable incentives. These theories have the potential to detect and remove many barriers to the learning process. Regulation and control theories also play an important role in teaching (Grover, 2016). It is important for the educator to anticipate the difficulties inherent in the teaching material and in the learning process and to take measures to overcome them (according to the nature of these difficulties), primarily through the selection of appropriate teaching methods. This is the control process. In teaching, the teacher must be able to adapt to any situation, changing a rationally established pre-set work plan, which means the so-called adjustment. The aim is therefore such teaching that will contribute to the improvement of students' results, to extend the scope of independence of this work, to individualize it (Christ, 2013), the derivative of which should be the reduction of the time needed for learning. The teacher, in turn, should therefore be able to pay more attention to teaching content as well as teaching and learning methods. The introduction of the cybernetic character theory, in connection with the elements of knowledge about the teaching methodology, may give the opportunity to increase the efficiency and effectiveness of educational processes. Knowledge of the rules governing human behavior based on the study of human character (Cybernetic theory of the character of Mazur), provides the basis for predicting educational behavior of human based on the study of human control parameters. On the other hand, adjusting human control parameters to the curriculum should translate into an increase in the effectiveness of education by bringing the didactic process closer to the self-education model (ideal model).

It is worth mentioning here selected benefits of the application of M. Mazur's cybernetic character theory (CTC) in relation to didactic processes. This theory, describing the essence of intraorganic control processes, shows the autonomous source of every human being (Staffova, 2017). Moreover, the essence of the CTC conceptual solutions proves that the choices made by people (characterologically determined) are not accidental, but result from the general, organizing principles of steering mechanisms (Mazur, 1983). In addition, it explains the principles of the information and energy transformation, providing strict evidence (Wilsz, 2012). It is very important that the CTC was developed solely on the basis of general laws, using appropriate terminological conventions, and not the description of empiricism, which, being extremely diverse, does not make it possible to precisely describe it (Mazur, 1999).

Without going into the theoretical foundations of this theory, there are, among others, energy parameters: *dynamism*, *tolerance* and *compliance*. The most important of these energy parameters is *dynamism*, which determines the level of the so-called available power. The available power is understood as the energy that a person can have at his own will, and in fact according to the will

of his organism, because some of the actions taken are carried out subconsciously. This parameter, like others, changes over the years as the body ages. Each person, in the initial stage of life, has an excess of available power, and in the end its shortage. This fact causes that in different periods of life human aspirations change (Mazur, 1999). For example, the basic aspiration of a man with excess power (exodynamics) will be to dissipate it, and of people with a deficiency (endodynamics) to collect it, while the middle dynamism (statics) will seek to maintain the state of possession. Knowing the dynamism of character allows you to clear up many misunderstandings and doubts. For example, teachers complain about “difficult” students, not realizing that they are dealing with individuals who are at the stage of exodynamism, but praise obedient students and claim the credit of inculcating in them in accordance with the rules (wrongly, because they are dealing with individuals with accelerated character, which are at the stage of statism). Other parameters of character are *tolerance*, which determines the range of situations attractive to a person, and *susceptibility*, which determines the range of situations that a person accepts under duress (Mazur, 1999). To sum up – the character of a person is unchangeable, and in a situation of a conflict of character with the situation, it is precisely the situation that needs to be changed.

Research methodology

The research procedure presented in the article was carried out in August–October 2021 on a group of 10 extramural students, majoring in social work. The research sample was varied in terms of age, ranging from 20 to 45 years. The study was conducted using an anonymous questionnaire, developed on the basis of detailed statements about the relationship of individual characters to various situations and phenomena (Mazur, 1999), which are manifestations of character dynamism as perceived by M. Mazur (Table 1).

Knowledge of the detailed manifestations of character dynamism allows us to properly relate to representatives of each character. On the basis of the study, a matrix of detailed manifestations of character dynamism was determined for a group of 10 students (Table 2).

On the basis of the matrix of detailed manifestations of character dynamism, *dynamism* was determined (Table 4), and then other energy parameters, such as: *susceptibility* and *tolerance* of the character of the researched resource of employees (Table 7).

Table 1
Detailed manifestations of character dynamism (selected examples)

No.	Manifestations of character dynamism Categories	Exodyna- mism (A)	Exostatism (AA)	Statism (B)	Endodsta- tism (C)	Endodyna- mism (CC)
		1	attitude to the rules	capriciousness – ambivalence	individualism	principle
2	receiving information	gullibility	agility	literal	Suspicion	Distrust
3	deciding (anticipating)	carelessness (impulsiveness)	recklessness (improvisation)	straightforwardness (schedule)	providence (plan)	cunning (program)
...	...					
35						

Source: Mazur, 1999, op. cit.

Table 2
Summary table of the results of the character dynamism research in numerical form

Student No.	Cybernetic character classes				
	A Exodynamism	AA Exostatism	B Statism	C Endostatism	CC Endodynamism
1	12	0	14	0	9
2	6	5	11	7	6
3	2	5	17	9	1
4	7	7	13	7	1
5	10	1	14	6	4
6	10	11	9	5	0
7	7	11	5	7	5
8	8	10	13	4	0
9	4	10	11	7	3
10	12	4	14	4	1

Source: Author own's elaborations.

Table 3

Matrix of detailed manifestations of character dynamism (simplified form)

Student No.	A/AA	B	C/CC
1	17	6	12
2	11	11	13
3	7	17	10
4	14	13	8
5	11	14	10
6	21	9	5
7	18	5	12
8	18	13	4
10	16	14	5
11	7	22	6

Source: Author own's elaborations.

Table 4

Character dynamism

Student No.	Dynamism factor [n=C/A]	n	Dynamism [D] [D=Log n]	D	Cybernetic character class
1	1	n=1	0	D=0	static
2	1,222222	n>1	0,08715	D>0	exodynamics
3	1,166667	n>1	0,066947	D>0	exodynamics
4	0,4	n<1	-0,39794	D<0	endodynamicist
5	0,545455	n<1	-0,26324	D<0	endodynamicist
6	0,266667	n<1	0	D=0	static
7	0,615385	n<1	-0,21085	D<0	endodynamik
8	0,230769	n<1	0	D=0	static
9	0,777778	n<1	-0,10914	D<0	endodynamicist
10	1	n=1	0	D=0	static

Source: Author own's elaborations.

The ranges of numerical values for individual character classes are presented in Table 5.

Table 5
The numerical ranges for character classes

C<A	n<1	D<0	endodynamism
C=A	n=1	D=0	statism
C>A	n>1	D>0	exodynamism

Source: Author's own elaboration.

The study used an innovative approach using the information entropy of C.F. Shannon to study the source of information which is a man in order to determine the abovementioned energy parameters of the character. The entropy method was used to determine the values of five classes of character dynamism, according to the formula:

$$H = - \sum_{i=1}^n p_i \log(p_i)$$

where:

$p_i = \frac{p_i}{\Sigma}$ – the probability of the intensities of the detailed manifestations of the dynamism of the character of the researched resource.

Table 6
Entropy estimates for character dynamism

Student No.		Entropy (H)		ΣH_c
1	0,15939	0,157984	0,15939	0,476763
2	0,151669	0,157704	0,157984	0,467357
3	0,1313	0,126749	0,139794	0,397843
4	0,155448	0,133109	0,107658	0,396215
5	0,157984	0,148523	0,1313	0,437807
6	0,157704	0,155405	0,107658	0,420767
7	0,159761	0,159176	0,146509	0,465446
8	0,159761	0,144028	0,091453	0,395241
9	0,151669	0,144028	0,139794	0,435491
10	0,146509	0,144028	0,146509	0,437046

Source: Author's own elaboration.

Table 7
Character tolerance and susceptibility in terms of cybernetic

Student No.	The width of character [L=log5]	Tolerance [T]	[T/L*100%]	Susceptibility M=1-H/L]	[M=1-H/L] %	[T/M]
1	1,544068	0,476763	0,308771	0,691229	69%	0,690
2	1,544068	0,467357	0,302679	0,697321	70%	0,670
3	1,544068	0,397843	0,257659	0,742341	74%	0,536
4	1,544068	0,396215	0,256605	0,743395	74%	0,533
5	1,544068	0,437807	0,283541	0,716459	72%	0,611
6	1,544068	0,420767	0,272506	0,727494	73%	0,578
7	1,544068	0,465446	0,301441	0,698559	70%	0,666
8	1,544068	0,395241	0,255974	0,744026	74%	0,531
9	1,544068	0,435491	0,282041	0,717959	72%	0,607
10	1,544068	0,437046	0,283049	0,716951	72%	0,610

Source: Author's own elaboration.

The distribution of entropy for individual character classes is presented graphically in Figure 1.

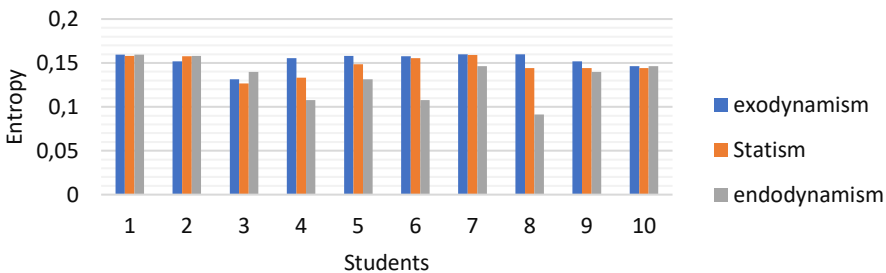


Figure 1
 Share of character classes for the researched resource

Source: Author's own elaboration.

Another parameter of character studied was tolerance (T). Tolerance is the difference between the boundary dynamisms of the dynamic range of character. Tolerance is a measure of the variation in the dynamism of character and is defined as the total entropy of the manifestations of character dynamism. Compli-

ance (M) is the difference between the impassable dynamism and the closest limiting dynamism to the dynamic range of character. The vulnerability is the redundancy, calculated according to the formula:

$$H_{\max} = H = - \sum_{i=1}^n \frac{1}{N} \log\left(\frac{1}{N}\right) = \log(N)$$

Compliance (redundancy) $M = 1 - \sum H_C / H_{\max}$

where:

N – the size of the collection

The width of character (L) is the sum of the tolerance and susceptibility. The width of character is defined as the maximum value of entropy of the examined detailed manifestations of character dynamism.

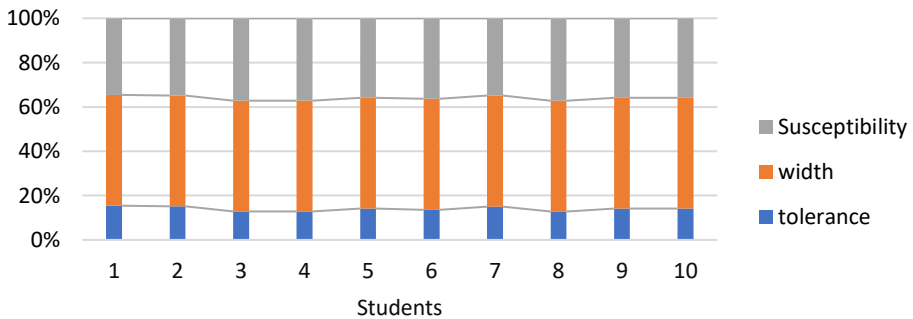


Figure 2

Width, tolerance, susceptibility of character

Source: Author's own elaboration.

Thanks to human tolerance, he can distinguish situations in accordance with his character from all possible situations. In contrast, the range of character dynamism is determined by character dynamism and character tolerance. The lack of understanding of the breadth of character and its components is, as a rule, a source of harmful and at least unnecessary friction in interpersonal relations, based on the dependence of one person on another. Students in the research group (10 people) have the characteristics described in the Figure 2. (cyberthnic character traits), that the instructor should take into account and choose the methods of information transfer in order to obtain the best results of his didactic work. The above considerations can find practical application in organizing all human activities, also in pedagogy.

Discussion

Further development of the cybernetic character theory will certainly open up possibilities for rationalizing the teaching process. By incorporating the cybernetic point of view into pedagogy, didactics, methodology and teaching practice, we open up new areas of research. Teachers should be able to participate in research, undertake research, verify theory, accumulate experience, disseminate it, and create a new teaching theory so that it, in turn, helps to redesign practice. Unfortunately, changes, both in the environment and in the person themselves, are not always developmental. If the teacher has knowledge about the control mechanisms and knows the values of the students' steering properties, then they will be able to choose the type of influence that they will direct to students to activate their developmental processes. Unfortunately, the same interaction, effective for one student, will not be as effective, or not effective at all, for other students. This is because no two students are the same, having identical values of steering properties, and whose role in human development processes is decisive (Wilsz, 2012). Such knowledge makes it possible to distinguish between situations: falling within human tolerance, which are consistent with his character (these are situations to which a person strives, for example, studying his favorite discipline); any emphasis will be unnecessary here, as man makes an effort of himself (even greater than that commanded), according to his character. Another type of situation are those that are within the breadth of character, but are beyond the scope of tolerance (they are inconsistent with the character of the individual and are acceptable only due to vulnerability); in such situations, action is dependent on the pressure exerted according to the resistance exerted. We can also deal with situations that do not fit into the breadth of a person's character (they are contrary to his character); man cannot be compelled to act provoking opposition, and all pressure is ineffective (Kossecki, 2001). To sum up, internal transformations are a consequence of, inter alia, development processes, the aging process, the impact of the environment and the impact of an individual on the environment. However, their knowledge is necessary to optimize the adjustment of students' efforts and abilities to the requirements of the education process, set by the study program and the environment in which they function, and to achieve the intended didactic goals.

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Edukacja na styku zmian. Proces kształcenia w ujęciu cybernetycznej teorii charakteru

Streszczenie

Współczesne procesy zmian w sferze edukacji są wielokontekstowe i determinowane różnorodnymi czynnikami. Niewątpliwie czynnikiem organizującym dyskusję wokół nowego modelu edukacji jest niepewność związana z kształtem przyszłości. Ta niepewność powodowana jest kierunkiem zmian w obszarze funkcjonowania i rozwoju społeczeństw oraz wyłaniania się gospodarki napędzanej wiedzą. Zmiany te są z kolei wynikiem oddziaływania megatrendów, w tym m.in. rozwoju nowych technologii informacyjno-komunikacyjnych (ICT), globalizacji różnych sfer życia, postępujących zjawisk polaryzacji społeczno-ekonomicznej, zmian kulturowych, akceleracji procesów migracyjnych itp. Zmiany te, wyznaczając ramy dla procesów edukacji i wychowania, generują liczne wyzwania w działalności edukacyjnej mające odniesienia do kwestii fundamentalnych: czego uczyć? jakimi metodami? jakich wyników oczekiwać? (Wasyłuk i in., 2020). Istotną rolę w tym procesie odgrywają instytucje edukacyjne, m.in. uczelnie wyższe, gdzie samosterowność przeważa nad kierowanym z zewnątrz procesem uczenia się (Laurisz i in., 2022). Propozycją odpowiedzi na wspomniane wyzwania edukacyjne jest pionierska w skali światowej cybernetyczna teoria charakteru M. Mazura (CTC) (1976). Niniejsza praca jest próbą zastosowania CTC do identyfikacji parametrów charakteru badanych studentów na kierunku praca socjalna. Proponowane rozwiązanie może wspierać procesy dydaktyczne poprzez optymalne dopasowanie wysiłków i możliwości studentów do potrzeb procesu kształcenia.

Słowa kluczowe: cybernetyka charakteru, edukacja, zarządzanie wiedzą.