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# The Question of Learning: The System-Information Interaction Model and Types of Learning<sup>2</sup>

**Abstract:** There have so far been many attempts to classify learning from the perspectives of different paradigms. In this paper several constructivist and cognitivist views are synthesized in an effort to explain how different types of existing individual systems of knowledge and information from the surroundings give rise to different types of learning. Two dimensions of information in relation to existing knowledge systems are taken into account: level of consistency with the system and the level of importance to it. When combined they result in the system-information interaction model (SII model) which describes the background of four types of learning, with the addition of a new concept of learning introduced in the paper: insignificant, expansive, transformative and maladaptive learning. The SII model is a hypothetical model based upon a system approach towards learning, different constructivist views and Festinger's Cognitive Dissonance Theory.

**Key words:** learning, constructivism, dissonance theory, system of knowledge, information.

## Background

Whenever a phrase that includes the term “learning” emerges, an old issue arises. It concerns the definition of learning and confronts one with a choice of several different traditions of determination of the concept. It should be noted that this choice often fluctuates between the need to define learning in essentialist or

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positivist manner and the aim of construing an instrumental, more contextualized definition needed for a particular piece of scholarly research (Säljö, 2009; Maksimović, 2012). In that sense, the first group of definitions tends to focus on change in one's behavior, whether that is understood in terms of classical behaviorism (externally manifested) or cognitivism (internally processed information), as the core of the determination, while others rely on different experiential approaches.

Piaget, whose approach can be characterized as a cognitive one, described mental schemes and structures as basic units that allow one to interpret reality and operate within it, to generalize and deduce from experience. They are a result of the organization of behavior and its adaptation to the surroundings (Miočinović, 2002). This approach can be characterized as early constructivism in psychology as it emphasizes how the basis of intellectual functioning is metaphorically presented as cognitive structures that emerge through the action of an individual in the world. It is also close to the general system theory (open systems, Bertalanffy, 1950; Roeders, 2003), as the structure for Piaget is a “[...] system with a series of laws that are valid for the whole system not just for its elements.” (Piaget, cited in Miočinović, 2002, p. 46).

Other constructivist views can be related to theories of system as well. For Despotović, learning is a process in which the individual's experience or personality is constructed and/or reconstructed (1997) in an attempt to create an internal model of reality or “networks of knowledge” (p.178). The network is composed of structural and functional units that hold information and assumptions on reality that are systematized in a coherent way. It is capable of integrating new information if it can make meaningful connections to elements of the network, in which case the new information is validated by the network system, and the network itself is sustained and expanded. In the event that the information is not coherent with the network it will be disregarded, unless it is persistent enough to serve as a “reality check”, forcing the network to transform or reconstruct in order to be able to incorporate new information in a consistent manner (1997). Notions of construction and reconstruction in this paradigm refer to terms of *self-sustainment* and *auto-transcendence* (qualities of the system, Roeders, 2003) that allow the system to be stabilized on the one hand, and develop on the other hand. Both polarities, self-sustainment and auto-transcendence, can have a different character in relation to learning. Processes of self-sustainment can be used to prevent learning and isolate the system from further expansion even if it is needed or desired, in an educational setting for example. On the other hand, not every auto-transcendence need prove useful or beneficial. Some of the learning related

to it might prompt the system to develop in a manner which is not adaptable or beneficial.

Also, this constructivist view brings forward the question of types of interaction of information and the network of knowledge. According to Despotović the network of knowledge can a) disregard the information, b) incorporate information and expand and c) incorporate information and disintegrate and transform (1997). One other perspective that comes from field of social psychology but has a firm cognitive grounding is the *Cognitive Dissonance Theory* proposed by Festinger. Cognitive dissonance occurs when information, attitudes, beliefs and behaviors encountered or possessed by an individual conflict whilst at the same time having similar motivational appeal. As people tend to maintain cognitive consistency (consonance), this cognitive conflict or dissonance provokes feeling of discomfort, a powerful motive that drives an individual to act in order to restore the cognitive consonance and release the emotional tension (1962a).

As Festinger (1962b) stated:

A person can change his opinion; he can change his behavior, thereby changing the information he has about it; he can even distort his perception and his information about the world around him. Changes in items of information that produce or restore consistency are referred to as dissonance-reducing changes. Cognitive dissonance is a motivating state of affairs. Just as hunger impels a person to eat, so does dissonance impel a person to change his opinions or his behavior. (p.3)

My intention in this paper is to apply Festinger's theory to Despotović's and Piaget's cognitive-constructivist views – not to see how different information interacts mutually, but rather to see how new information interacts with a previous system of knowledge. More precisely, how the system of knowledge behaves if the information is consistent or inconsistent with it, bearing in mind the qualities of the system (self-maintenance and auto-transcendence). But in order to achieve full typology of this interaction, another dimension of information, besides consistency/inconsistency, will be added – subjectively attributed importance of information. The typology of described possible interactions will be then used to classify the outputs of the interaction – learning.

In this paper the notions of network of knowledge, a system and its structures will be used as synonyms. The terms self-sustainment and auto-transcendence will be used to describe how an actual individual system i.e., network of knowledge, is stabilized or consolidated, or quite differently transformed and/

or expanded. Similarly to Piaget's concepts of accommodation and assimilation these two processes tend towards reaching the equilibrium needed for the person to function successfully in their surroundings. This division is hypothetically the core of the mechanism that would explain how every learning possibility can be interpreted by an individual's system or network of knowledge as an opportunity for learning, a strength, a weakness (in which case resistance to learning occurs), or a challenge/threat, depending on the motivation of the individual and his/her capacity to conform/disconform.

### System-Information Interaction Model

Before going more into details about the model one would have to first operationalize how the system of knowledge tends to react when confronted with the information. For that purpose a hypothetical model of system-information interaction with regard to learning is constructed. The model implies learning tendencies in which the system of knowledge, in terms of its attributes of self-sustainment and auto-transcendence, interacts with two dimensions of new information: *consistency* with the system and subjectively attributed *importance* of the information determined by an individual (Figure 1). Both consistency and importance can have a positive or negative valence, that is, can be low or high. Depicting the qualities of the system, which in interaction with information can vary in terms of consistency and importance, would appear to result in the opportunity for different kinds of learning to be typologically classified. The model represents a synthesis of Piaget's constructivism, Despotović's views on the constriction of the knowledge process (1997), aspects of the systemic approach (Roeders, 2003) and views on transformative learning and Festinger's theory of cognitive dissonance (1962a; 1962b). In this paper the terms "consistency" and "inconsistency", i.e. high vs. low consistency, refer to Festinger's notions of consonance and dissonance, which he himself regarded as synonyms (1962, p. 2-3). Of course, the model is a proposal and still needs to be validated through research, but it might prove to be useful, not just for the future theoretical conceptualization of learning, but also for practical application, i.e., learning interventions.

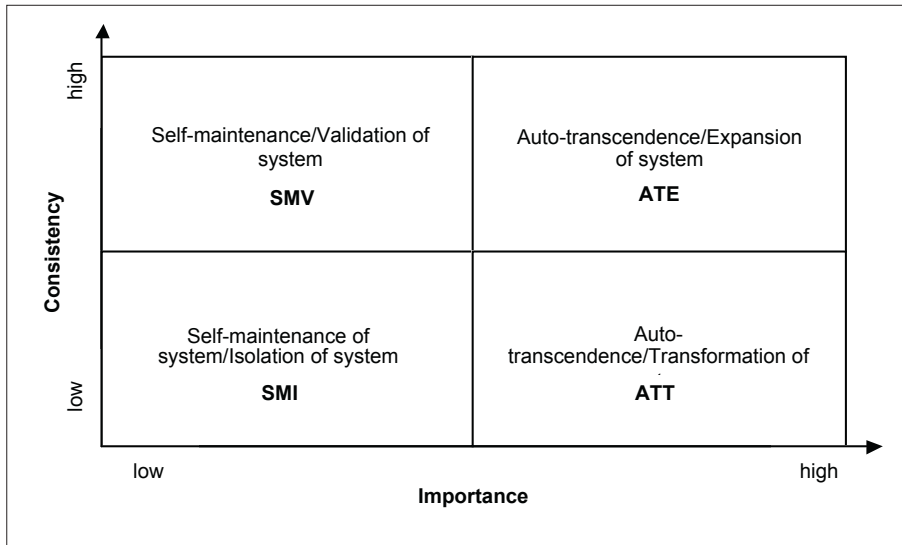


Figure 1: The System-Information Interaction Model (SII Model)

## Explanation of the Model and its Reflection on Learning

### *Auto-transcendence/Transformation of the System (ATT)*

#### *– Low Consistency and High Importance*

When a system and its structures are confronted with the type of information perceived by the system as important but inconsistent, it is forced to transform itself in order to be able to integrate new information. Information might be considered important for various reasons: it may originate from a significant source, it may arise from a peak experience (Maslow, 1971) or it may be encountered very frequently. For example, a person with anorexia nervosa often accompanied by body dysmorphic disorder (Grant, Kim, Eckert, 2002), undergoing fruitful psychotherapy, transforms the ways in which he or she sees his or her own body. Or, a person with low assertive communication skills after a great deal of constructive feedback on the matter from various individuals, changes his or her core principles and beliefs regarding communication and his or her role in communication with others. In Piagetian terms, the structures responsible for social communication are no longer able to assimilate new contents without undergoing a transformation process, so they are forced to accommodate

significantly in order to assimilate. In this process, transformative learning occurs, i.e. accommodation significantly prevails over assimilation. One of Piaget's best-known pieces of exemplary research on egocentrism in children in the pre-operational stage, usually referred to as "The Three Mountain Task" shows that they are incapable of taking into consideration the perspectives of others even when it comes to visuospatial reasoning. The research showed that the children were not able to perceive how an object looks from a perspective other than their current one, even if they were previously given the opportunity to observe the object from different perspectives (Miočinović, 2002). In order for the child to assimilate new information (the other perspective), its system of knowledge or responsible structures would have to accommodate (transform) over a period of time and abandon the egocentric position.

In this example, the transformation process happens when accommodation significantly prevails over assimilation in the process of adaptation. More generally speaking, individuals go through a process of transformative learning when important information from reality cannot be integrated into the current system without transformation of the system itself. This type of learning is also called *accommodative* or *transcendent* learning (Illeris, 2009, p.13).

But, the process can be more complex. For example, a person with low assertiveness in communication might show resistance to becoming more assertive, that is, to changing his or her core beliefs about communication, as it would require a change in the way he or she sees himself/herself e.g. "women should be polite and pleasant in communication", "a man should respect his colleagues and boss". Even if frequent feedback from significant others can prove to be subjectively important, thinking about changing core beliefs can create too much anxiety. In this case, one of the possible scenarios is that a person may choose not to change his or her existing structures but rather to resolve an issue (dissonance) in a quite different manner. In these types of case the model benefits from Cognitive Dissonance Theory (Festinger, 1962a, 1962b). Since a system structure related to social, professional or gender identity is in dissonance or inconsistency with important information from the social surroundings, the person reaches a state of conflict which is, according to dissonance theory, hard to maintain, and the created conflict will require one of the dissonant elements to be changed. In the event that system structures (beliefs and attitudes related to the aforementioned identities) are changed, a person will undergo a transformative learning process as described previously. But in the case of the example, the person might use different strategies to change the information. He or she might reduce the importance of the information, in which case the model type of functioning moves from auto-transcendence/transformation of the system (AT<sup>T</sup>) to self-maintenance of

the system/isolation of the system (SMI). This can also be done through a series of defense mechanisms such as rationalizing, denial, withdrawal etc. It should be noted that Piaget's theory states that what is assimilated is not necessarily an objective feature of the content (object) or information, but rather its perceived quality. In the previous example, the person might change the perceived quality of the information in order to change its importance, which will allow the system to change to an SMI type of reaction. So in terms of the model, in the case in which transformative auto-transcendence of the system is not possible at the current moment, however adaptive or beneficial it may be, the system can override the inconsistency by a mechanism of cognitive dissonance resolution and/or a defense mechanism, and therefore self-maintain through isolation. It seems to be close to what Illers (2013) calls regressive transformation. Regressive transformative learning usually happens in situations when the learner does not have the strength or qualifications to go through with something new and then must resign and accept things as they are and find a more secure position. However, the concept is somewhat problematic: "Regressive learning itself could be criticized for its normative character, but progressive transformation could be subjected to the same criticism." (Popović, Maksimović i Bulajić, 2013, p.7)

As an alternative to reducing the importance of information and moving to self-maintenance of the system/isolation of the system, the person from the example might still choose to transform. But not to transform in the meaning described previously, to accommodate his or her structures, to integrate new information in order to adapt to his or her social surrounding, but transform in a rather specific and *maladaptive* manner. To resolve the tension created by the new, significant and inconsistent information, an individual may choose to create or add new structures to existing ones in order to achieve *false consistency* or a sort of false consonance. For example, he or she may choose to create cognitive-emotional attitudes and beliefs which are obsessive and manifested through compulsive behaviors. Every time a person is faced with a piece of information or a strong demand to behave more assertively, as given in the example, he-she can engage the new structure and start cognitively and behaviorally manifesting his or her neurotic defenses – consistency (false) is achieved and the emotional conflict or tension is temporarily resolved. As these beliefs and behaviors are constructed through practice and are *per se* a relatively constant change in personality, by the very definition of learning they represent a learning outcome. *Therefore, whenever a new piece of information interacts with individual system structures in a way which transforms them to become less adaptive to reality, maladaptive learning takes place* (Figure 2). Maladaptive learning is added to the model as a parallel one to transformative learning.

*Auto-transcendence/Expansion of the System (ATE) - High Consistency and High Importance*

In this type of system and information interaction information is both highly important and highly consistent with the system. As it is highly consistent, the system will not have to go through the process of transformation in order to integrate it, it will just have to expand. For example, when a child is taught the mathematical operation of multiplication, usually the operation is presented and explained through the operation of addition, which has already been mastered. The information might be regarded as important by the system as it is new, but it builds upon the existing knowledge of addition. Therefore, in order to integrate the new information, the system need not transform but rather expand. In other words, assimilation prevails over accommodation in the adaptation process. As a result, learning is expansive rather than transformative (Figure 2). In adulthood, for example, this type of interaction and learning might occur when a scholar is presented with a new type or class of evidence that require him or her to expand his or her premises and paradigms, but not to transform them in the manner of the “Copernican revolution”. The system will meet little resistance when integrating the information. Illeris states that this type of learning is the most common one, calling it *assimilative* or *learning by addition* (2009) and defining it as a situation in which the “[...] new element is linked as an addition to a scheme or pattern that is already established.” (p.13). In the model described here, this type of system-information learning outcome will be called *expansion learning*.

*Self-maintenance of the System/Validation of the System (SMV) - High Consistency and Low Importance*

Sometime it happens that one is dealing with new information that is highly consistent with the system but is regarded as unimportant. This might be because the information is vaguely familiar or falls into a class of information that is already well known. So, what would be the nature of this type of interaction from the SII model perspective? The information will be integrated, but as it is not a new type of evidence for existing structures, neither a significant expansion, nor a transformation of the system will occur. The information will be assimilated at a low level of information processing (maybe not even stored in long-term memory) without reflecting the system in any significant way. The system will simply be validated as correct. For this reason it is believed that as no significant accommodation takes place (assimilation prevails over accommodation very significantly), no significant learning occurs. This type of system-information interaction is therefore named *insignificant learning*. For example, a person might find out that a certain



book or a journal article he or she already possesses in printed form is also available online in electronic form.

*Self-Maintenance Isolation of the System (SMI) - Low Consistency and Low Importance*

When a new piece of information is not consistent with the system but is regarded as being of low importance, there is a tendency for the system to reject the information. The information is not assimilated, therefore the system does not need to accommodate, and as a result no learning takes place. For example, if a person with very good communication skills, who is often praised by others for being a good communicator, received the opposite feedback on the same issue from a non-significant other it will most likely tend to disregard the information and chose to maintain the system without the wish to deconstruct it. In other words, if the information received is not consistent with the system, and is at the same time unimportant, it will most likely be rejected as an irrelevant or non-valid input from the surrounding.

This does not by any means mean that the information is not valid per se. Let us imagine, for example, a situation in which a scientist at the beginning of the 16th century claims to the average person in the street that the Earth is revolving around the Sun and not the other way around. The person will most likely dismiss the information, not being able to integrate it into his/her own system, at the same time also regarding it as unimportant, as it would not have a significant impact on his or her everyday life, and since the common perspective of the time was that geocentricity was a correct and valid understanding. This prevailing inter-subjective concurrence on the matter at that time would allow for the person to believe that the idea of heliocentricity was information that was not important. As the information is highly inconsistent with the system of an average person, the only way in which information would be integrated is one that would require a transformation of the system. The transformation would demand that the information be important - for example, to come from a person of great authority, to come from a majority of people (tendency towards inter-subjective concurrence) or to come in the form of strong evidence that would accompany the information.

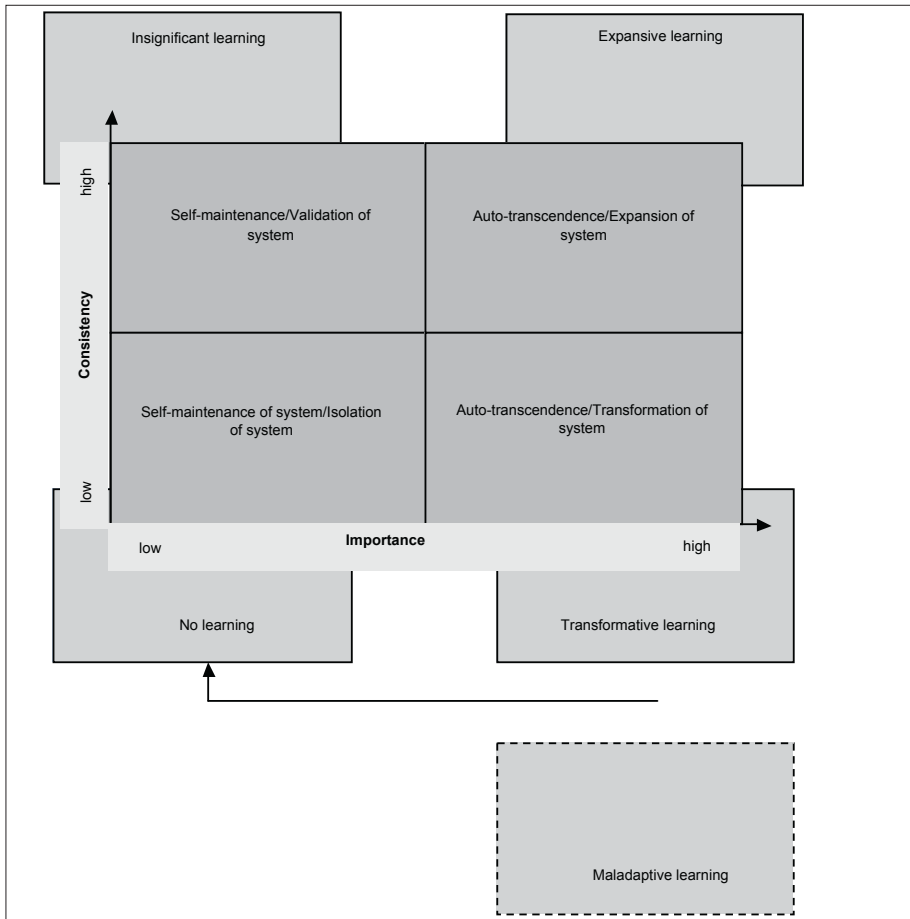


Figure 2: The System-Information Interaction Model (SII Model) and Learning

### Resistance and Readiness/Participation in Learning from the SII Model Perspective

As the SII model is a general model of the system-information interaction in relation to learning, it can be equally applied to all contexts of education and learning, regardless of whether it is a formal, non-formal or informal setting. Several possibilities can be distinguished in regard to the SII model and learning readiness and resistance (Figure 3). The model might prove to be valid in regard to the

issue of readiness and resistance as the Cognitive Dissonance Theory is a meeting point of cognitive and motivational aspects of tendencies in behavior. Cognitive dissonance is basically a motivating state as the tension it creates drives towards behavior and change in one way or the other (Festinger, 1962b).

Expansive learning can likely be treated as an *opportunity* for learning, as information is compatible with the system and subjectively perceived as important at the same time. For example, a scholar with skills in quantitative data analysis can find out about new procedures or new software to help in dealing with the statistical procedures he or she frequently use.

*Strength/Comfort zone* refers to insignificant learning (SMI), as information encountered is regarded as highly consistent but unimportant. When it comes to a situation in which information appears to be inconsistent and unimportant, the individual is likely to reject possibilities to learn, either because the information is not relevant *per se*, or the person's system fails to recognize its importance. The second case can be understood to be a *weakness* or low possibility for the person to learn or develop. It should be noted that this is a point where resistance (in terms of the model, that is, resistance referring to system-information interaction) to learning can be encountered.

Resistance to learning seems to arise in two of the types presented in the model: SMI and ATT. However, in the described SMI type of interaction, weakness/resistance to learning can be transformed into challenge if the importance of the information is shifted from low to high importance. Transformative auto-transcendence of the system can also be related to resistance to learning. It has two possible outcomes when learning is the focus. It can lead to transformative learning, in which case it represents a challenge in terms of learning possibilities. However, it can also lead to maladaptive learning or no learning at all. In this scenario a person will not accept a challenge to change their perspectives on meanings, core beliefs, patterns and attitudes, but would rather choose to avoid information which is highly important to him/her by lowering the importance of the information (as described by Festinger's theory) and moving to an SMI type of functioning or to creating patterns of behavior that have the character of defense mechanisms - a sort of maladaptive learning. In the second case a learning opportunity that new information might present to the system can be perceived as a *threat*.

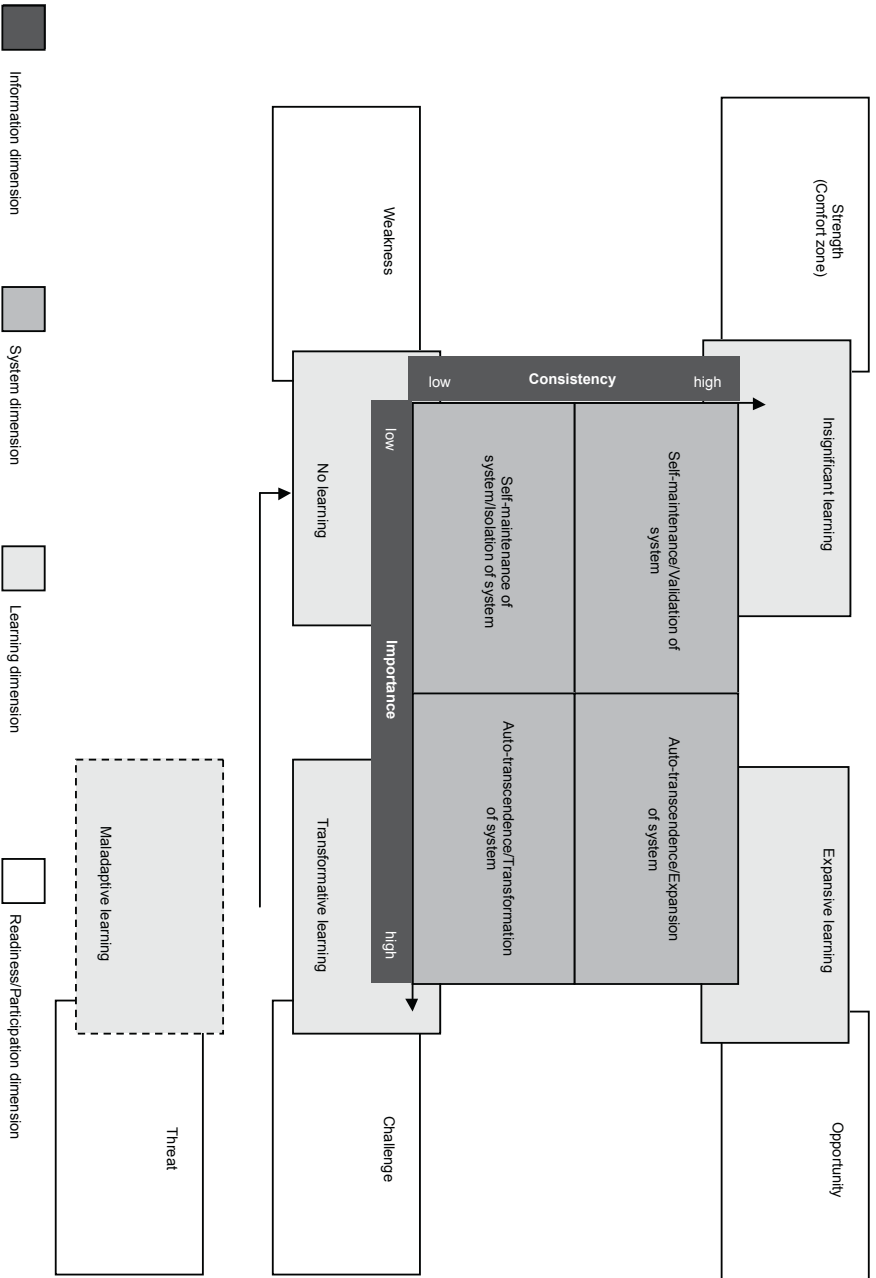


Figure 3: The System-Information Interaction Model (SII Model) and Learning Readiness/Participation

## Final remarks

The model presented is an idea yet to be expanded on and validated. It is a typological description of how the system of knowledge and its related structures relate to new information, where information is primarily understood in terms of learning content. It leads to or predicts a typology of learning, where four sorts of learning are distinguished (excluding the no learning situation): insignificant learning, expansion learning, transformative learning and maladaptive learning.

It is important to note that one important type of learning stands behind this typology as it cannot be related to a person's existing knowledge and experience. It is a type of *cumulative* or *mechanical* learning (Illeris, 2009) which occurs when completely new structures or units of knowledge are created. It can be described as an isolated structure, so new that it cannot yet become a part of structures or networks already possessed. As Illeris states, it mostly occurs in the early years of life, and later, in adulthood, it is encountered when a person deals with something that lacks a context of meaning or personal significance, such as a PIN code, for example. It is also present in the situation of the conditioning type of learning (2009). A slightly different view on the matter is proposed by Hornblum & Overtone (according to Despotović, 1997) who suggested that whenever adults are faced with completely new or unfamiliar situations they tend to apply this type of learning. Furthermore, they regress to a lower level of cognitive functioning (mechanical learning), until they manage to comprehend the main meaning of situation or the problem. Subsequent to this phase they shift relatively quickly back to a higher level of cognitive functioning. This view, known as the *regressional hypothesis*, suggests that adults tend to relate newly created structures with previous ones in order to create a unifying context of meaning or, in other words, to, circumscribe the system.

When this type of learning is added to the typology offered in the paper it seems that the picture of the learning process from a cognitive and constructivist point of view becomes more complete. However, if learning is to be further understood it must be synthesized with other views on learning that go beyond individualistic and cognitivist approaches.

## References

- DESPOTOVIĆ, M. (1997). *Znanje i kritičko mišljenje u odrasloj dobi*, Beograd: Institut za pedagogiju i andragogiju Filozofskog fakulteta u Beogradu.
- FESTINGER, L. (1962a). *Theory of Cognitive Dissonance*. Stanford: Stanford University Press.

- FESTINGER, L. (1962b). Cognitive dissonance (offprint), *Scientific American*, 3–10.  
Retrieved from: <http://spiritof76.us/wordpress/wp-content/uploads/2012/12/COGNITIVE-DISSONANCE-with-TEXT.pdf> (october, 2013)
- GRANT, J. E., KIM, S. W. & ECKERT, E. D. (2002). Body dysmorphic disorder in patients with anorexia nervosa: prevalence, clinical features, and delusionality of body image. *International Journal of Eating Disorders*, 32(3), 291–300.
- ILLERIS, K. (2009). A comprehensive understanding of human learning. In K. Illeris (Ed.), *Contemporary Theories of Learning* (pp. 7–21). London and New York: Routledge.
- ILLERIS, K. (2013). *Transformative Learning and Identity*. London: Routledge.
- MAKSIMOVIĆ, M. (2012). Teorije učenja i odnosi moći u obrazovanju odraslih. *Andragoške studije*, 1, 37–62.
- MASLOW, A. H. (1971). Peak experiences in education and art. *Theory into Practice*, 10(3), 149–153.
- MIOČINOVIĆ, LJ. (2002). *Pijažeoova teorija intelektualnog razvoja*. Beograd: Institut za pedagoška istraživanja.
- POPOVIĆ, K., MAKSIMOVIĆ, M. & BULAJIĆ, A. (2013). Gender Printed in a Social Mask – an Exploration of Resistance in Adult Education. Paper presented at the ES-REA Conference „Private(s) world(s) - Gender and Informal Learning of Adults”, 10–12 October, 2013, University of Coimbra, Portugal.
- ROEDERS, P. (2003). *Interaktivna nastava: dinamika efikasnog učenja i nastave*. Beograd: Institut za pedagogiju i andragogiju.
- SÄLJÖ, R. (2009). Learning, Theories of Learning, and Units of Analysis in Research. *Educational Psychologist*, 44(3), 202–208.

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## Tipovi učenja – model interakcije sistema i informacija<sup>4</sup>

**Apstrakt:** U naukama koje se bave učenjem i obrazovanjem, u prošlosti je, kao i danas, bilo više pokušaja da se klasifikuje učenje iz ugla različitih perspektiva i paradigmi. Ovaj rad predstavlja pokušaj da se nekoliko različitih kognitivističkih i konstruktivističkih refleksija o učenju sintetizuje u naporu da se objasni kako različiti tipovi interakcije nekog postojećeg individualnog sistema znanja i informacije iz sredine kreiraju i vode do različitih tipova učenja. Pri tome su u razmatranje uzete dve dimenzije informacije koje proističu iz njene interakcije sa sistemom znanja: nivo konzistentnosti informacije sa sistemom i nivo značaja koji informacija ima za sistem. Kombinovanje datih dimenzija informacije u svom odnosu prema postojećem sistemu znanja rezultiralo je kreiranjem modela interakcije sistema i informacije (SII model), koji opisuje poreklo razvoja četiri tipa učenja (kao rezultat modela nastala je i nova tipologija učenja): beznačajno, ekspanzivno, transformativno i maladaptivno učenje. Hipotetički model, predložen u radu, zasniva se na sistemskom pristupu učenju, različitim konstruktivističkim pristupima razmatranju učenja i Festindžerovoj teoriji kognitivne disonance.

**Ključne reči:** učenje, konstruktivizam, teorija kognitivne disonance, sistem znanja, informacija.

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