TEACHERS' OPINIONS ON THE CONCEPT OF REPRESENTATION AND PREDICTORS FAVOURABLE TO THE CREATION OF REPRESENTATIONS IN PUPILS

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ABSTRACT

International research in the field of education focuses on the approach and use of mental knowledge-related mechanisms. In the educational research in Romania, we see the absence of studies focused on revision, analysis, and summary of the literature on the concept of representation and a shortage of studies tackling issues concerning creation of quality representations in primary school pupils. The aim of the study is to analyse teachers' opinions on nine different themes of interest in the lexical field of representation, explored throughout three standard interviews. The interviewees are teaching staff, a professor and two pre-university teachers. The data collected are presented in tables and analysed by manual codification. The results are significant in relation to the theoretical substantiation. The main conclusion of the study is: representations constitute a premise for the optimal functioning of the intellect. Some predictors favourable to creation of quality representations in pupils are the use of previous cognitive experiences, the accessibility and monitoring of learning as well as the quality of educational aids. By using suitable didactic resources, which reproduce the reality in a simplified manner or bring about elaborated abstractions, the teacher facilitates learning.

Keywords: didactic, primary education, data processing, interview, learning

INTRODUCTION

Intuitive information is the first stage of knowledge. The human brain has mechanisms through which realities which are no longer present may be recalled; in other words, the human brain is capable of representation. The possibility to have such representations allows people involved in cognitive or practical activities to mentally reproduce the form of what they know concerning events, feelings, ideas, or objects, although the latter do not have an actual impact on them (APA, Vandenbos, 2015). Images from the past,

stages of creating an object, may be seen spontaneously, with the “mind’s eye”, because the engramation mechanisms are activated by internal/external stimuli or in the context of the learning process (Golu, 2004).

From a cognitive perspective, the essence of learning consists in people’s ability to generate mental representations of the reality around them (Atkinson et al., 2002). The effects of learning depend on the extent to which the trainables understand what they learn, namely by integration of the new knowledge into their own mental activities. The more varied the relations between the newly-acquired knowledge and the previous knowledge, the more efficient the acquisition.

Although experience shows us that teachers are concerned with sharing knowledge, they are not, however, equally concerned with creating mental images favourable to acquisition of knowledge. The need for structural-cognitive training is imperatively highlighted in didactics; going from intention to achievement is however difficult.

Therefore, the aim of the study was to investigate teachers’ opinions on creation of representations. The study has important implications in the process of theoretical substantiation, as the predefined problems were clarified through a dual perspective: psychological and didactic.

THEORETICAL BACKGROUND

In the psychology literature, representation was defined in line with the scientific paradigm applicable to a specific period, sometimes in a contradictory manner, going from seeing the representation as a mere recall from the memory to absolutizing it in the mental life (Popescu-Neveanu, Zlate & Crețu, 1998; Zlate, 1999). The concept is outlined as a sensory cognitive process signalling the concrete features of objects and phenomena in the form of a unitary advanced general image (Sterian & Nicoară, 2017), and an image reflecting an external reality in an internal environment (Clapin, Staines & Slezak, 2004; Miclea, 1999).

The emergence of the representation follows perceptive information (Miclea, 1999; Zlate et al., 2005), of which the generative sources are: reality (Tarnovschi & Racu, 2017), long-term memory, and imagination (Golu, 2004; Zlate et al., 2005). The notion of representation is used to express distinct mental relations: as a process, being an updated internal informational model, which may be absent from the sensory field, and as a product, by mentally producing and using images of some absent objects (Golu, 2007; Zlate et al., 2005). Both as a process and as a product, the representation implies complex interactions at mental level (Popescu-Neveanu, Zlate & Crețu, 1998).

In addition to the active relation between the object and its representation, the verbal mechanisms are also involved when elaborating the image of such a representation (Golu, 2007; Paivio, 1990). The words structure the elements of the representation, fasten them in the conscience

and, therefore, enable the representation to bear a meaning (Gans, 1981; Tarnovschi & Racu, 2017).

Transforming the image through the word is a complex issue and it usually consists in enriching the image by relating it to other images:

“When saying ‘desert’, we immediately build the image of the wilderness of some horizons, hot sands, unbreathable air, and torrid sun. Nevertheless, when pronouncing the word ‘oasis’, the image of the desert gains considerable ground and turns from a deserted area to a fertile one, where there is water, shade, and date trees” (Neculau et al., 2005, p. 33).

Some of the most important characteristics of the representations are figurativeness, promptness, and panoramization (Tarnovschi & Racu, 2017; Zlate et al., 2005). Other characteristics acquire scientific meaning both in outlining the conceptual framework of the representations and in getting to know one’s personality: intensity (expresses the force of the image), stability (defines the length of the representations in one’s conscience), the degree of completeness (the general volume of information of the representation), the degree of relevance (the meaning of the information reflected by the image), the degree of generality (selection of the repeatable characteristics), and the type of the designative connection (the semantic correspondence between the image and the external reality). All these features support the assertion according to which representation is the superior stage in organizing the mind (Golu, 2004; Sterian & Nicoară, 2017).

In life and in people’s activities, representations fulfil two roles: the role of knowledge, by providing the essential features of previously perceived objects or phenomena (Golu, 2004), and the role of adjustment, by anticipated mental preparation of actions, coordination, and correction of the trajectories of such actions (Tarnovschi & Racu, 2017). Representations allow understanding of the change in time and the positions that they fill in the scheme of cognitive activity make them a starting point, a completion landmark as well as a control link thanks to which the expected outcome is possible (Golu, 2004). These positioning support the profound, quality learning (Ricci & Pritscher, 2015; Tytler et al., 2013).

The importance of representations in the learning process was mentioned both by education experts (Dulamă, 2004, 2009; Joița, 2002) and by documents on education policies (OCDE, 2016). In order to support pupils in their learning process, teachers make use of representations conveyed visually or with the help of explanations (Reid & Amanat, 2020) and other different resources: textbooks, didactic films, photos (Dulamă, 2008b). The use of such resources is intrinsically linked to didactic knowledge and teaching experience (Kalman, 2008; Trouche, Gueudet & Pepin, 2019); teacher take responsibility for the materials they introduce in class and which provide answers to the pupils’ specific training needs (Costa, 2012).

METHODOLOGY

Objectives. The two objectives of the study are: analysis of the teachers' opinions on the concept of representation; identification of some predictors favourable in the processualism of the representation. The research questions are correlated with the objectives of the research:

Q1. According to the teachers, what is the lexical field of the representation?

Q2. Which are the predictors favourable to the creation of quality representations in pupils through teachers?

Instruments. The research instrument was an interview guide (Garreau & Romelaer, 2019). Nine questions were used in order to collect the teachers' opinions on the following themes of interest: concept of representation, creation of representations, difference between representation of an object and the respective object, importance of creating representations in the learning process, characteristics of representations, methods which teachers may use and help pupils to create their best representations, the factors influencing the creation of representations in the teaching process, characteristics of textbooks so as to ensure the premises necessary to generate the best representations of the reality and the principles which teachers should respect so as to ensure constructions of some quality representations in pupils.

Participants. To the interview participated: a professor, with a Ph.D. in the field of "Psychology", a school inspector – primary education teacher, and a primary education teacher (Table 1). The level of expertise of the persons interviewed and the years of teaching experience ensure the credibility of the answers.

Table 1. Profile of the persons interviewed

Interviewees	Gender	Profession	Teaching experience
I1	M	University professor	22 years
I2	F	Pre-university teacher	31 years
I3	F	Pre-university teacher	20 years

Procedure. The study was coordinated by the author of this paper and was conducted between October and November 2020. An exploratory interview was carried out in October 2020. Three school inspectorates and three universities were invited to participate. Three teachers accepted our invitation. The interviews were organized on the ZOOM platform and the recordings were transcribed using the WordPad processor.

Data analysis. In the analysis process, no screenshots were added as we focused on words as basic form to find data. The corpus of the data was inventoried, transcribed in full and presented in tables. We identified the key terms in the responses of the people interviewed. These phrases were

highlighted in italics. Using an inductive strategy, there were manually attached a series of codes assigning symbolical meaning to the descriptive or inferential information compiled in this study. The codes were used to take over and classify the data extracted from the opinions of the persons interviewed, on the one hand (Creswell & Creswell, 2018), and to formulate conclusions, on the other hand (Dafinoiu, 2007). To avoid a monolithic perspective over the content, we compared the codes to find the differences (Băban, 2002). The results are signalled in relation to the theoretical substantiation and described using questions.

RESULTS AND DISCUSSION

Opinions on representations. To deepen the understanding of the phenomenon under analysis, the first question aimed to identify how the persons interviewed defined representation in their own manner (Table 2). Following analysis of the data, we see that that interviewees simultaneously perceive representation as both a process and a product, by relating to perceptions (I1 and I2) or only by stating the result of structuring and reorganizing previous sensory experiences (I3). The interviewees do not indicate that representation as a product is a concrete-intuitive, generalized, schematic and figurative image. The considerations of the interviewees lead to clarification of the concept.

Table 2. Interviewees' considerations on the concept of representation

Q1. What do you consider representations to be?		
Interviewees	Responses	Code
I1	Representation is the <i>process</i> of elaborating the <i>image of an object</i> when such object is not in the perceptive field, in line with the cognitive or practical activities of people. I consider that it is a <i>mechanism of re-expressing information</i> .	<i>process and product</i>
I2	Representation is the <i>process</i> which entails the passage from direct to indirect knowledge through <i>mental images</i> .	
I3	Representation is an <i>image</i> , a <i>symbol</i> or a <i>scheme</i> which substitutes the object.	<i>product</i>

Creation of representations. The second question invited the persons interviewed to formulate opinions on how representations are created (Table 3). The teachers interviewed consider that representations emerge under two circumstances: when an object/group of objects is re-expressed under the form of a new object and when there is correspondence between the object considered and the image resulted. Emergence of representations implies interactions at a general mental level, with the intelligence and the promptness of thinking (Zlate, 1999).

Assigning the code "mental transposition" to the set of information presented in Table 3 brings about a profound reflection on the meaning of the data: the representation shapes when an image detaches itself from the spatial and temporal context in which the object or the event was initially

perceived. Within this detachment, the general characteristics are selected and the representation stores in the conscience both information relating to previous perceptions and the unity and the objective meaning of such information. Once emerged, the representation will be present in behaviours and activities and will ensure people the suitable adaptation to tasks which they are assigned. The participants to this study designate only the conceptual aspect and disregard aspects relating to ontogenesis or the triggers (motivations, interests, emotional experiences).

Table 3. Interviewees' opinions on how representations are created

Q2. How are representations created?		
Interviewees	Responses	Code
I1	Starting from elements signalled by perceptions, <i>images are reproduced at mental level</i> ; these images may be modified depending on how the mental activity is performed.	<i>mental transposition</i>
I2	Representations are created in <i>the absence of the direct action of a stimulus</i> over the analysers.	
I3	Representations emerge when we express <i>reality under a different form</i> .	

Distinction between reality and its representation. The third question aims to emphasize an interesting element for this analysis, the interviewees' opinions on the distinction between reality and representation of reality. The conclusions of a psychology research highlight that both children and adults have the capacity to distinguish between reality and the way they create a representation of such reality (Mitchell, 1992). The phrases highlighted in Table 4 are relevant and important to make the difference between reality and representation of reality. The analysis of the set of assertions indicates that representation means not only objects and events, but also ideas which one may reach through other representations.

Table 4. Interviewees' opinions on differentiation between reality and representation of reality

Q3. How can one distinguish between reality and its representation?		
Interviewees	Responses	Code
I1	In my opinion, human activities lead to a series of conducts highlighting the capacity to recall absent objects: <i>delayed imitation</i> , by making some gestures materializing in symbols, <i>the symbolic activities</i> "of doing it the same way as", <i>drawings</i> and <i>verbal messages</i> which allow bringing some past events to the consciousness.	adaptation to immediate reality
I2	<i>Mental maps</i> represent a proof in this respect. Let us not forget that spatial representations guide orientation in both known and unknown environments where objects relate to one another. Or photos. They maintain snapshots which no longer exist or will exist. We open the album, and we speak of people and past events.	
I3	I can offer you the example of some children <i>producing a narrative</i> after they have watched some educational videos or cartoons.	

Importance of representations. Representations are highly important to the learning process. The teacher proceeds to initial assessments in order to check the level of knowledge acquisition and to collect information: the pupils' previous acquisitions, their learning potential, the effort that the pupil is willing to make. This information will enable the teacher to diagnose and, depending on their diagnosis, to decide on the didactic strategy (Dulamă, 2010a). The representations may, however, be used throughout a teaching activity in order to make adjustments, where required, or at the end of this activity so as to see how much children know in relation to a specific topic (Dulamă, 2011).

Representations allow pupils to become aware of what they know and to compare the knowledge they acquired to that of their colleagues (Dulamă, 2010b). Sometimes, the discussions among pupils may lead to removal of some wrong representations (Dulamă, 2006, 2008a). The presence of the representations favour emergence of questions, which children ask themselves concerning the subject under discussion. They force argumentation of the reasoning and adoption of a structured thinking in close relation to the subject proposed. Representations enrich the pupils' level of knowledge, help them to become more quick-witted and activate their inborn endowment. Representations are generated in an increasingly active manner when pupils are presented with the opportunity to inform themselves, discover, and experiment.

In this context, the fourth question invited the respondents to formulate opinions on the importance of creating representations in the learning process (Table 5). Following corroboration of the data presented above, we attached the code "factors favourable to learning", as representations allow thinking to process a variety of previous experiences in a complex manner. This cluster of responses indicates that representations correspond to an ensemble of knowledge, attitudes, values, meanings, connotations, associations, and a series of elements of cognitive or emotional nature. The code attributed also indicates that representation is the central point of learning a content. By observing the activity, the teacher records the pupil's cognitive or emotional experiences or actions in relation to the proposed theme. Providing a representation is formulated correctly, it will be easily used in new learning contexts.

Table 5. Respondents' opinions on the importance of creating representations in the learning process

Q4. How important are representations in the learning process?		
Interviewees	Responses	Code
I1	Representations are <i>an intuitive support for reasoning</i> .	<i>factors favourable to learning</i>
I2	Representations constitute <i>an essential support in creating meanings of new words</i> .	
I3	Representations <i>support quality completion of tasks</i> indicated, because they may be integrated in games, problem-solving or creation activities.	

Characteristics of representations. The characteristics enumerated in the psychology literature emphasize that representation is a superior level of organizing the human mind at cognitive level (Golu, 2007). Images - representations come to surface every time an object or an ensemble of objects takes the form of a new ensemble of elements and when there is a systemic correspondence between the starting ensemble and the finishing one. The cognitive activity is the actual origin of this correspondence between the two (Golu, 2007). The result of this activity (representation) is the image transformed through codes. The representation has a directional nature: "A" represents "B" and not vice versa. It is "A" which stands for a partial substitute of "B" (Denis, 1989).

Moreover, representation is considered a "surgical reconstruction" performed only when intellectual operations and external language are present. The surgical nature comes from the recreation of objects at the level of defining features, which allows detachment from the structural scheme of the object recalled. The surgical nature enables the simultaneous playback of the successive or the transformation of the simultaneous into a succession (Piaget, 2012).

The fifth question invited the respondents to formulate opinions on the importance of the characteristics of the representation for the learning process (Table 6). The code "high level of generalization" attributed to the set of opinions presented in Table 3 indicates that the schematization and generalization used to reach representation does not go beyond concrete configurations and the possibility of object representation. On the other hand, without the panoramic image rendered by the representation, some processes are difficult to understand (continuous circulation of water in the water system of the Earth, annual rotation of the Earth around the Sun).

Table 6. Interviewees' opinions on characteristics of representations

Q5. What are the most important characteristics of the representations for the learning process and which should we consider when conducting activities with pupils?		
Interviewees	Responses	Code
I1	I consider that <i>intensity</i> is the most important characteristic of the representation because it highlights the clarity of the contouring lines and the figure - background contrast. Intensity is followed by stability, degree of completeness, degree of relevance, but also the degree of generality as they all ensure cognitive completions.	high level of generality
I2	Generalization because representations replace several objects of the same type.	
I3	I consider that it is extremely important to consider what pupils already know and what they are able to do.	

Supporting methods in creation of representations. In teaching activities, certain words may surprise pupils because they do not fall into their system of knowledge and create a difficulty, while other words are considered as

"self-evident". To understand pupils' representations, the teacher designs a learning activity suitable to solve a problem or represent an object. One image is used as starting point to see what it represents to the pupils. The image may be accompanied by a set of general questions enticing the pupils to describe and argue. The activity is led by the teacher who formulates some precise questions. Other responses may consist in making drawings supported by oral explanations or formulating some written answers on what the pupils already know on the proposed theme (Dulamă, 2000).

Another method used by teachers to support their pupils in creating the best representations is performing an experiment by which the pupils are requested to describe what they see and explain what happens (Dulamă, 2001). Equally efficient is the proposal of two or several conceptions; the pupil individually selects the representation which he or she finds the closest to reality and provides arguments for his or her choice.

The sixth question invited the respondents to give their opinions on the supporting methods used in formulating representations (Table 7). The analysis of the data referring to methods used by teachers to help their pupils formulate their best representations indicates that: the teacher listens carefully and creates a climate of confidence. The more active the pupil is, the more consistently the pupil will prepare and mentally illustrate everything the teacher explains. Whenever pupils express incorrect opinions (coming from memories or erroneous observations), the teacher will reframe the status of the representation and will invite other pupils to explain why a certain conception is wrong. Identification of wrong conceptions may be difficult; nevertheless, it is a key process for learning (Allen, 2014).

Table 7. Respondents' opinions on supporting methods used to create representations

Q6. What are the ways/modalities/methods used by teachers to help pupils to generate their best representations?		
Interviewees	Responses	Codes
I1	I consider that by attributing an <i>active role in the learning process</i> .	<i>activization</i>
I2	By ensuring intuitiveness in the learning activity by using life experience in understanding phenomena, combining explanations and presentations of the intuitive material, rationally dosing the intuitive material or the pupil's actions in relation to the object under analysis.	<i>sensory-reason correlation</i>
I3	By helping pupils to develop their capacity to systematically observe based on given criteria and to formulate some <i>simple explanations</i> .	<i>verbal mechanisms</i>

Factors influencing the creation of representations in the teaching process. The literature mentions various factors (Dulamă, 1996; Dulamă & Roșcovan, 2007). In terms of ensuring a positive evolution, starting from literature and the direct activity with the pupils, we consider it important for the teacher to pay attention to a series of factors among which: pupil's

attitude to learning (responsibility/deteriorated attachment), scope of cognitive interests of the pupils, stability and intensity (long-term, operational acquisitions), pupils' capacity to organize their own school activity, presence/absence of intellectual instruments (expressing what they see, hear or read using their own words), rhythm of the concept creation and also pupils' feelings when they are successful/unsuccessful in class.

Irrespective of the instruction circumstances (i.e. traditional or online), of the employed strategies or of the fact that the instruction sequence is a continuation of the previous stages or the experimenting of a new model, in all these cases, the pupil's learning effort is guided by the image that he or she forms about what it is to be learnt:

"Learning from experience depends on the degree of logical structuring of the object to learn, the ideas or semantic meanings to which one may relate the new content (preliminary knowledge), the willpower to learn to a significant extent by establishing some relations between the ideas in the current cognitive structure and the new ideas generated from this experience" (Dulamă, 2004, p. 50).

The seventh question invited the interviewees to formulate opinions on the factors influencing the creation of representations in the teaching process (Table 8). The teachers give their opinions on the absence of the syncope in monitoring the rhythm of learning. We are referring to the presence of a genuine dialogue with the pupils and to the possibility to observe how pupils take notes. Additional focus is also on knowing and respecting the stages of development of thinking and the applicative character of learning.

Table 8. Respondents' opinions on factors influencing the creation of representations in the teaching process

Q7. What are the factors influencing the creation of representations in the teaching process?		
Interviewees	Responses	Codes
I1	The teacher often lays emphasis on speciality training in the didactics of teaching. However, <i>the teacher's psychology knowledge is essential</i> so as to know how mental and attitudinal processes of the child function and to be able to manoeuvre them cautiously.	psychology- didactics convergence
I2	Permanent <i>monitoring of the learning process</i> .	training methodologies
I3	It is the <i>interest of the pupils</i> which should be stirred first, then demonstrate the utility of the activity. Additionally, previous relevant knowledge should be updated for the benefit of the learning activity.	

Characteristics of textbooks in ensuring premises required to create the best representations of reality. In printed or digital format, the textbook continues to be the most important instrument of learning for pupils (Buzilă et al., 2017; Dulamă et al., 2017; Ilovan et al., 2018; Magdaş & Drăngu, 2016; Magdaş et al., 2017). Based on our own observations in activities with pupils, we consider that their instructive value depends on the types of images accompanying the text (the images may contain information present in texts or information additional to texts) and the way these images meet

the main learning objectives (omission of the image makes understanding of the text impossible).

Studies show that young pupils' representations are connected to the quality of the contents presented in the textbooks (Sievert, Van den Ham & Heinze, 2021), because this curricular product is considered a substantial factor in the pupils' learning process (Van den Ham & Heinze, 2018).

The penultimate question requested formulation of opinions on characteristics of school textbooks in ensuring premises required to create some representations (Table 9). Analysing the data on the characteristics of the school textbooks in ensuring creation of quality representations, we see that quality criteria were mentioned. Some of the criteria were: scientific accuracy and relevance of information, suitable content of learning for the level of development of the pupils, organization of content in accordance with the curriculum, the degree of using previous and new acquisitions, quality, and accessibility of language and also the quality of typewriting and aesthetics. Primary school teachers also advanced some interesting opinions: proposing some learning tasks, relevance of information offered through texts, images and multimedia elements and use of simple methods to activate previous knowledge and acquire new information.

Table 9. Interviewees' opinions on characteristics of school textbooks in ensuring premises required to create representations

Q8. What characteristics should textbooks have to ensure premises required to create the best representations of reality?		
Interviewees	Responses	Codes
I1	School textbooks are pupils' working instruments. I consider that the authors address scientific, psycho-pedagogical, and aesthetic rigour set forth in the elaboration methodologies.	quality standards
I2	Textbooks should include tasks which should aim to directly involve the pupil when learning, propose practical activities and concrete manoeuvring suggestions. They also mention suitable illustrations with intuitive support role in learning.	developing the capacity of learning to learn
I3	The information should be presented by sections to motivate pupils to independently explore and research.	

Principles/ rules ensuring creation of some quality representations in pupils. Contemporary pedagogy mentions the following principles: structuring and restructuring of information depending on the pupils' age, selection of working aids and techniques and their optimal integration into activities, scientific rigour of knowledge, applicability of knowledge in everyday life as current knowledge becomes sound support for future knowledge. It is also as important for the teachers who prepare learning situations to take into consideration what pupils already know. One problem, one obstacle should be created so that the pupil should find the motivation to come up with a solution and therefore learn something new (Clement, 2008; Schunk, 2012).

Studies recently conducted highlight the advantages of technology on anticipatory and participatory learning (Atoum & Reziq 2018; Ha & Im,

2020). Additionally, technology favours learning by the creation of learning situations focused on the use of multimedia elements (Commodari et al., 2020; Ilie et al., 2020; Tricot & Chesné, 2020).

The last question invited participants to formulate some rules which teachers should observe in the process of creating representations (Table 10). The analysis of the responses emphasizes three points of view regarding guiding principles in the process of creating quality representations in pupils. Every time a model is understood, the pupil's mental structure is completely reorganized. Use of digital instruments also has a positive impact on efficient learning, both for face-to-face and virtually-conducted activities, and on relating the learning tasks to pupils' interests.

Table 10. Interviewees' opinions on rules that teachers should observe in the process of creating representations

Q9. What principles/rules should we observe to ensure creation of some quality representations in pupils?		
Interviewees	Responses	Codes
I1	Respecting <i>age-related features</i> of pupils.	suitable contents
I2	Including <i>digital instruments</i> in the learning process.	modernization of training
I3	Interaction of children with <i>concrete objects</i> and introduction of themes in close connection with <i>everyday experiences</i> .	authentic learning

CONCLUSIONS

Reflections on the teachers' opinions presented in this study allow us to draw the following conclusions. First, teachers consider that the representation is an intellectual mechanism, an organized, simple, and coherent structure closely related to the level of previous knowledge that the pupils possess. In case of trainables – pupils and university students –, it emerges as a result of processing, combining and recombining the perceptively-recorded information.

Secondly, in terms of predictors favourable to the process of creation of quality representations in formal activities, we enumerate: the use of previous cognitive experiences, and the accessibility and monitoring of learning and the quality of the teaching aids. Didactic resources containing quality representations are used by teachers who therefore facilitate pupils' learning.

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