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Theoretical Premises and Methodological Aspects of Learning through Multiple Interpretations

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Abstract
In learning we often appeal to interpretation, defining our own identity by activating certain cognitive and affective strategies. We achieve a kind of apprenticeship in our scientific knowledge by raising "the scaffolding of knowledge". From the perspective of the teacher, the stimulation of communication and the acceptance of all types of questions from students is the way we can help them think freely, build and positively value themselves in relation with the others. The possibility of having quick access to information, the need to find things out without an effort or with a minimum effort has advantages and limitations. There is the danger that technology facilities might question the man's ability to think critically, to question, to reflect, to interpret, to find and give meaning to the complex world where he lives. Technology itself, although it does not guarantee results, is useful, but matters more how we relate to technology, our ability to use it and to develop our own resources. There are a number of learning models, but we focused our attention on those concerning our ability to question, to interpret situations and problems specific to our world. We were interested in the circular approach, which we consider to be superior due to its resuming the initial stages and to valorizing previous experience of the learners. From a teaching perspective, we consider important the methodological suggestions on the art of asking questions, of using different types of questions (depending on different variables), of answering and interpreting.

Keywords: *learning, multiple interpretations, learning cycle, interrogation, question types*

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Introduction

The present work proposes a framework for the application of learning through multiple interpretations, starting from the role of the question types and their contribution to the cognitive development. Many of the current research prove that the learning process is best seen from multiple perspectives, as a fusion between the personal and social constructivist approaches and the socio-cultural guidelines.

Constructivists postulate the idea according to which knowledge is always a construction and a reconstruction. Learning through multiple interpretations is an active learning, which involves the construction and reconstruction, the interpretation of the meaning (of different people, from different angles in relation to paradigms and/or different criteria).

Constructivist teaching practices challenge students to become active participants in managing their own investigations and in building basic knowledge. The circular approaches are preferable to the linear ones as they integrate the steps taken along the new approach, repeating certain stages. It is acknowledged that significant learning does not come from direct motivation or from pressure, from environment constraint, but rather from the reorganization of the psychological structures during the interaction between the organism and the environment (apud Gilbert and Watts, 1983). Building interpretation is one aspect of the cognitive apprenticeship, it stimulates active learning and places students at the center of the activity.

Used in solving certain situations, real problems with a certain degree of difficulty, the cognitive flexibility theory capitalizes the understanding of the meaning, of data as well as the relations between them by presenting several approaching perspectives. It states that cognitive flexibility is "the ability to spontaneously restructure one's knowledge, in many ways, in adaptive response to radically changing situational demands" (Spiro and Jeng, 1990: 165).

Having examined several cases in different contexts, the students will build new cognitive structures which are capable to take into account and integrate the new cases. This is possible if (Joița, 2006: 155): there is an informational field that is big enough and varied in theme; the previous cognitive experiences are updated and can be exploited by transfer and recombination; students are increasingly gaining the skills of self-expressing the mental operations of processing information; enough time for search and recovery-expression is given; students are encouraged to do so; the personal formulations, regardless of the quality, during the production stage, are kept; even the preexisting data in the mental development are valorized.

Cognitive flexibility is embodied here in formulating predictions, assumptions, representations of how to know the essence of the problem, in the procedural solving versions. This is the cause as well the effect of effective learning and interpretation from several perspectives requires the understanding of concepts but also the call on previous experience and adaptation to the context.

By multiple interpretations we understand the plurality of angles, perspectives, viewpoints, ways of approaching and not vague or meaningless sentences that generate confusion and express ambiguity, understood as the oscillation between different accomplishments of the conceptual merger between multiple meanings, between different voices and degrees of assuming the discourse.

The theoretical framework

Interrogation – a starting point in making interpretations

The interrogation or *question* indicates a state of curiosity or indecision, a problematic state, a situation which requires the subject to take a particular decision or to have a certain attitude, using inherent cognitive resources or resorting to other sources. As bases of any human knowledge, the question is an operating state of an informational system, a meeting place of various linguistic theories, but also an important aspect of communication, a cognitive area specific to interrogation. The phrasing of questions in the analysis and development of a theme can support the understanding of its different aspects and can cause personal reflection, stimulating the updates, intradisciplinary and interdisciplinary associations, the formulation of hypotheses. Many times a question can generate other questions, thus providing teaching questioning a constructive role and a dynamic character. In terms of the criteria we relate to, there are several *types of questions* (Nicola, 1996: 379; Zabotin, apud Cerghit, 1997: 119; Popescu, apud Cerghit, 1997: 128; Gostini, apud Albulescu and Albulescu, 2000: 131-132; Erickson 2007: 10-73; Gagnon and Collay 2001: 66-77):

1. According to the intended purpose: *Limitative* or *closed*: they allow only one valid answer, one judgment, comparison, decision, closely directing the students' judgment; *Comprehensive* or *open*: they allow choosing the response out of ideas, multiple viewpoints and methods, different techniques, dependent on possibilities, interests, level of development, they encourage initiative, clarify ideas and develop feelings; *Demanding* and *exploratory*: they stimulate students to look for the answer, urge them to express more widely and clearly without forcing into their thinking a certain direction.
2. According to function: *Nomothetic* (what is it? what is it about?) or *reproductive-cognitive* (which is/are?, what?, who?, when?): they check memory; appreciate the amount of knowledge, the precise reproduction; *Productive-cognitive* (why?): they stimulate thinking as well as individual and group creativity; they appreciate the quality of answers, the critical approach, the interpretation of knowledge, states.
3. According to the cognitive domain objectives: *Of information, of knowledge* (when?, which are they?, what is it?, who?): they recquire appointment, enumeration, repetition, reproduction; *Of explanation, of understanding* (how is it demonstrated?, what role does it have?, where can I find out from?): they ask for description, classification, explanation, recognition, selection, translation; *Of analysis* (which is the difference?, what is the connection?): they recquire analysis, categorization, comparison, differentiation; *Of synthesis* (how is it possible to?, what happens if?): they recquire arranging, collection, integration, organization; *Of evaluation, valorisation* (do you think that?, what is more important?, when it is it right?): they recquire evaluation, judgement, estimation, valorization.
4. According to the thinking operations: *Of classification* (what is this?); *Of comparison* (more or less?); *Of ordering in time and space* (where?, when?); *Of explanation* (why?); *Of evaluation* (what for?); *Of counting* (how much?).
5. According to addressability: *Frontal, general or as a whole* (addressed to the whole group): What is the cause?, Why?; *Direct* (addressed to a particular participant): "X, what makes you support/ deny/ reject?"; *Reversed* (question that one of the participants addresses the leader who answers it back to him – the classical answer by asking): "The participant: What happens if?; The leader: What do you think?"; *Of relay and communication* (question that a participant addresses to the leader, and the leader addresses to another participant or when the answer to the same question is given by

completions from other participants): "Participant Z: Don't you think that ...?; The leader: Z raised a very interesting problem. What do you think about that?"; *Of return* (question that the leader asks by taking up an idea, an observation, an opinion previously uttered by one of the participants whose intervention is not done at the right time): "Z has already expressed his opinion that ... How can it be influenced by...?"; *Imperative* (a categorical and unconditional request is, in fact, formulated): "Summarize your own opinion", "Explain the differences", "Explain the causes"; *Of controversy* (involves conflicting answers in important matters): "Is there life on Mars or not?";

6. According to the role performed while working with the students: *Of guidance, leadership*: they appear in the first episode of learning and support or conduct the activity by challenging the students to answer; they create opportunities of thinking and allow multiple answers or enough ways of formulating a reply; *Of anticipation*: they help the teacher to open the learning episode, to explain himself how students think, how they understand, to imagine how they will be able to fullfill their training tasks; *Of clarification*: they appear during learning, in response to the students' requests; they do not need to imply the answer, but to show an understanding of how students think, to support their ideas; *Of integration*: they occur during synthesis, quickly checking understanding at the group level; they challenge the students to express their own ideas, to externalize or reflect on them, they explore understanding at the level of group work.

7. According to the degree of activism: *Factual*: they recquire relatively simple, final answers; *Conceptual*: could be the convergent, divergent or evaluation ones (they recquire more sophisticated levels of cognitive processing and thinking); *Challenging*: are those that attract, but cannot be easily answered; have a motivational character and can be called essential questions.

Interrogative techniques are effective as long as the students have enough knowledge to be able to debate certain subjects or to approach a subject. They are indicated where the topic under discussion offers the possibility of an approach from several angles, of revealing some aspects or controversial nuances. Any question articulates both the cognitive dimension and the interactional dimension of communication and superior questions force students to create their own views on the subject they have learnt. We know that "essential questions support deep and lasting understanding" (Mack-Kirschner, 2005: 43), that is why it matters how we formulate questions and what types of questions we ask according to the stages of teaching.

Training models which valorize interrogation as part of the learning cycle

The complexity of learning is reflected at the level of a spherical, circular model during the constructivist approach to learning. The learning cycle is a concept which helps people learn by appealing to experience. It has a number of stages or phases and can be repeated several times during a training program or learning units.

The Learning Cycle is a model of the learning process that was first used in science education. The first direct application of a learning cycle in science teaching was proposed by R. Karplus. Together with his colleagues, he proposed a training model based on the activity of J. Piaget. The learning cycle has three phases during which students learn through their own actions, then introduce the concept with the help of the teacher and apply it to new situations by exercising in practice. This cycle is repeated several times throughout a lesson or during a training unit. *The stages* can be used as a general framework for many types of constructivist activities (Karplus, 1977: 5-6): the exploration (the teacher encourages the students to generate questions and hypotheses based on

working with different materials); the introduction and explanation of concepts (the teacher concentrates the students' questions and helps them create hypotheses and design experiments); the application of concepts (the students discover, solve new problems that reconsider the concepts studied in the first two rounds).

In presenting the specific of the circular pattern in teaching science, D.W. Sunal uses a comparative analysis of the models of strategies used in the conceptual reconstruction and it valorizes the previous research on the subject: Barnes, 1976; Karplus, 1977; Erickson, 1979; Driver, 1986; Nussbaum and Novic, 1981; Renner, 1982; Rowell, Dawson, 1983 et al. The circular learning frames are different, but they all help to change each student's ideas, as transformation, reconstruction (apud Sunal, 1995):

Table 1. Stages of the training models based on the Learning Cycle

Models of using the learning cycle	***Stages***
Renner	Experiences, Interpretation, Exploration
Karplus	Exploration, Explanation, Application
Driver	Discovery, Presentation, Application
Nussbaum and Novak	Exposing alternative frameworks, Creating conceptual conflict, Encouraging cognitive accommodation
Erikson	Experiential maneuvers, Anomaly maneuvers, Restructuring maneuvers
Barnes	Focusing, Exploration, Reorganizing, Public
Rowell and Dawson	Establish initial ideas, Introduce new ideas, Comparison of ideas
Osbourne and Whittroch	Assess student ideas, Exchange points of view, Use ideas
Riverina and Murray	Identify naive ideas and select events, Exploratory activities, Organize ideas and establish links, Practice and apply new idea
Hewson and Hewson	Diagnose, Opportunity to clarify and contrast, Practice new idea, Apply idea
Lawson and Abraham	Exploration, Conceptual invention, Expansion
Driver and Oldham	Orientation and motivation, Elicitation of ideas, Restructuring ideas through exchange, Application and review

Source: Sunal, 1995

Over time, the learning cycle has been revised by adding to it several stages, as in the case of *Bybee Cycle* (*the 5E Model*), proposed by R.W. Bybee, (Bybee, 2009: 5-8): Commitment (attention is focused on pre-assessing previous knowledge); Exploration (students share a common experience of laboratory and actively collect); Explanation: data are used to solve the problem and introduce concepts; Development: transfer is done and new concepts and information are applied; Evaluation: it occurs during the other phases of the cycle, too.

The model is known as the *Biological Sciences Curriculum Study* (BSCS) – The BSCS Instructional Model – and it is used to develop skills related to the scientific investigation of the students and the development of some skills aimed at identifying

research questions. In 1990, A. Smith developed an *accelerated learning cycle*, emphasizing the importance of how we learn. Accelerated learning involves a series of techniques that improve the learning process (Smith, 2000). This way of learning is dynamic, innovative, relaxing and efficient. Unlike other similar models, it requires a *staging* that involves the transition from the last step to the second: creating the supportive learning environment; connecting to the learning process; presentation of the big picture; description of the learning results we want to achieve; introduction of new information that enables the activity; accomplishing the activity; demonstration of activity results; reviewing to remember and memorize.

The experiential learning cycle proposed by D.A.N. Kolb (1984) is one of the most popular models and it integrates experiential components of several influential theorists (eg. J. Dewey, J. Piaget, C. G. Jung, K. Lewin). It includes the following *stages*: practical experience: the learners have active encounters during the activity; reflexive observation: the learners consciously reflect on experience; formation of abstract concepts: the learners are present and try to be aware of the model (theory) to be followed; testing in new situations: the learners try to test the planning of the model (theory) for future experiences. It states that "experiential learning is most often compared to academic learning, the accumulation of knowledge through the study of the subject, without requiring a direct sensory experience as an information transfer pathway. While the dimensions of experiential learning are analysis, initiative and immersion, academic learning is based on constructive and reproductive learning" (Jong, Wierstra, Hermanussen, 2006: 155-169).

The ICON Model (*Interpretation Constuction*) starts from capitalizing the interpretations of specific texts as hermeneutical approaches, as circumstances that facilitate understanding, cognition. This model is suitable for bigger projects or training units, which contain a certain level of complexity and have the required time for proper involvement in each of the seven stages. In building interpretations there are presented the following *steps* (Black, McClintock, 1998): observation in authentic activities; building performances by the students; contextualizing by an independent expanding of the observations and the initial interpretation, by additional documentation, by comparison with other materials or models, by ordering their own ideas; cognitive apprenticeship by confronting their own previous interpretations with those offered by the teacher as an expert in the problem, with the scientific reasoning model; collaboration with the others on observations and interpretations by resuming and expanding the context; formulation, presentation and discussion of multiple outlined interpretations, as a sign of cognitive flexibility, their synthesizing by the teacher, the assessment of their value as products and of the building activity; applying these interpretations in multiple situations and events, transfer of proceedings in the achievement of other interpretations of problems, texts. The model summarizes the essence of other intrinsic developed models, such as: the situational learning model, the discovery learning model, the collaborative learning model, the initiation model in scientific research etc. Some of these principles are older adaptations of key concepts. These include the "collaboration" (Johnson, Johnson and Holubec, 1984), the "cognitive apprenticeship" (Collins, Brown and Newman, 1988), the "observation" (Brown, Collins and Duiguid, 1989).

A similar model is the one proposed by Gagnon and Collay and it involves the following *stages* (Gagnon and Collay, 2001: 9-10): the presentation of the framework, the context, the situation, the problem under analysis and the development; the selection of a method of grouping students and materials; the building of a structure, a diagram,

networks of the theme ideas as a basis for the debate, interpretation, learning, of a bridge between what students know and what the teacher wants them to learn; the formulation of exploratory questions; the encouragement of students to formulate as many interpretations and arguments as possible, to link them with other topics, to refer to applications, to share with others, to expose publicly what they have learned; the request for reflections on the learning process, the conducting of assessments on the understanding and learning approach. The idea that learning is not a linear process, but it is built through a cyclical process is also encountered in designing the *ETER Model*, proposed by Y.J. Beliveau and D. Peter (2002). The defining elements are found in the four stages that capitalize the following perspectives: theoretical, empirical, experiential, experimental, scientific and critical-reflective.

This model is found in school learning and practice and it covers the following steps: theory: the theoretical approach supports the interpretation of information, situations, the understanding of the relationship between them; experience: the concrete experience that follows leads to the application of concepts in a context, supports the formulation of new interpretations for understanding; experimentation: it introduces investigation into the scientific research (checks the assumptions made, developing new generalizations etc.); reflection: reflexive reporting allows analysis of goals and tasks, conditions and procedures for resolution, resorting to critical dialogue. We notice that all these models have in common the constructivist learning, which focuses on building knowledge on a circular path, based on the work of the learner, appealing to intrinsic perspectives and ways of interpretation.

Methodical suggestions related to the role of multiple interpretations in learning

Asking questions sets on to reflection and multiple interpretations. Because there are multiple realities, any situation is open to multiple interpretations. Interpretation is related to perceiving and making sense of things, it offers multiple perspectives and generate diversity within the group, giving an integrative picture of the elements of reality.

From a psycho-pedagogic perspective, *the features of the approach of building questions are important*: the holistic approach to the topic/problem/school subject allows a larger vision, integrating and generating pertinent questions; the type of question, the nature and weight of the question in activity depend largely on the circulated contents, the theme, the previous experience; the value of the question depends on the proportion between the formulation and context of the information it is framed in; the formative and constructive value of the question is facilitated by the organization of teaching, by the way the teacher understands to essentialize the content, to integrate it, to highlight the key concepts etc.; if in younger students the questions of information, identification and the causal ones dominate, in older students, in relation with the richer cognitive experience, the share of aversive, anticipation and systematization questions increases; the students' motivation, the continuous encouraging of searching for solutions, of the attempt to answer questions is one of the conditions of quality training; teachers should give students enough time to formulate answers and avoid equivocal questions. If interrogation is a starting point in the effort to interpretation, *the cognitive map* (*mental*) or *the conceptual map* is a technique of visual representation of concepts and the links between them in graphical, diagrammatic, consisting of nodes form (concepts) and networks of relationships between concepts. The conceptual map (the graphic organizer) occurred as a result of the cognitive theories of D. Ausubel and subsequently as a result of J.D.

Novak's research, since the 70s, at Cornell University, U. S. A. The answers to the questions can be expressed in a number of ways of representation: cobweb/radial or clustering form (in the center there is an important concept, a unifying theme from where there start links in the form of rays to the other secondary concepts), hierarchic/ tree of derivation or chronological (it presents information decreasingly in importance or occurrence), linear (the information is presented in a linear format), circular (the information is related and dependent upon one another), systems maps (comprising many concepts and a large number of relationships between the elements).

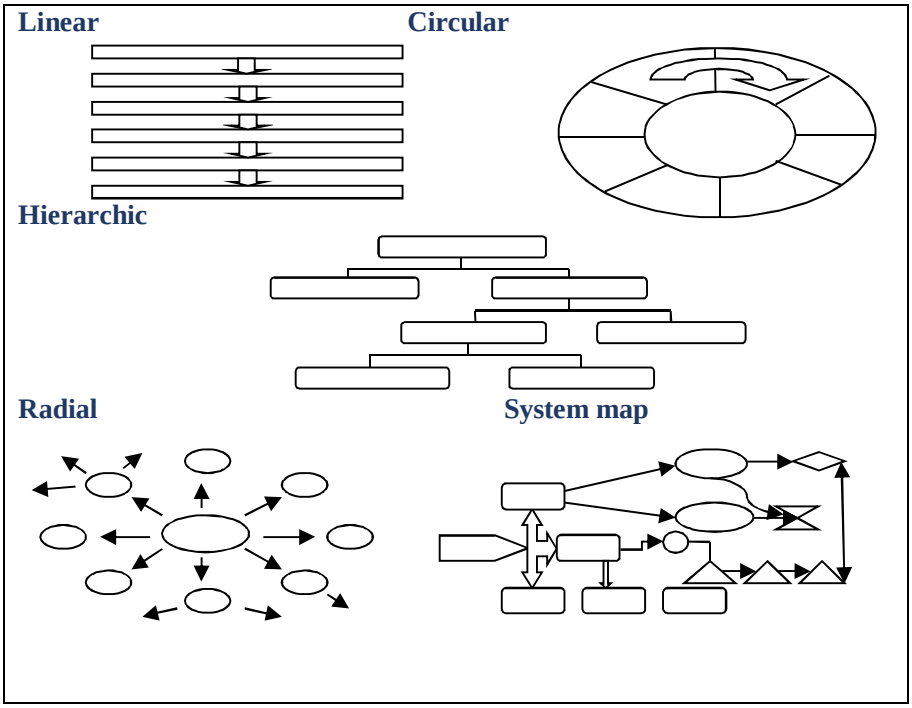

Figure 1. Models of cognitive maps
Source: Our adaptation by Novak, 1977; Novak and Cañas, 2006

The WebQuest technique is also valuable, and it is based on constructivist principles using specific Internet instruments. This technique was developed and implemented in 1995 in the U.S.A. by Bernie Dodge and Tom March, teachers at San Diego State University. A WebQuest simulation (individual or in teams) offers a simple training design for learners, by reference to the following steps or components: introduction: it sets the stage and provides background information; task: it refers to what the students will achieve; it must be interesting and involve intense participation; the process: refers to the description of steps for the learner in order to accomplish the task; information resources: the web documents of the data bases searched on the Internet, the research results, the books (e-books) and articles from the virtual environment help to describe the organization of the information gained through the use of questions, conceptual maps or the cause and effect diagrams; evaluation: it reminds the learner what he has learned and encourages him to extend the experience to other areas; it materializes

through video and audio presentations and take into account both the content and the manner of exposure; conclusion: it leaves room to reflections and discussions with a synthesis character. WebQuest includes a series of questions that invite the students to investigate, to ask questions to each other, to analyze and synthesize multiple sources of information. WebQuests must be "real, rich, and relevant" (March, 2003: 45).

Whether we use the cognitive maps or the WebQuest technique, whether we turn to other methods and training means, it is worth considering the *offer of exercises* that help us formulate good questions (Seghedin, Ioachim and Domunco, 2006: 222): Whenever you do not understand something, ask a question to clarify; Whenever you face a complex issue, formulate the question you want to answer in a few different ways (being as exact as possible) until you find the one that best expresses the issue in question; Whenever you plan to discuss a topic or an important issue, write beforehand the most significant questions you think you need to ask during the discussion. Be ready to change the main question, but once clarified, help the participants in the discussion to settle the question, making sure the dialogue is built towards an answer that makes sense.

There can be added various *suggestions with a methodical character*: creating the context, ensuring a state of communication, mastering emotions, respecting the age particularities and the individual ones, patience in waiting for a response, avoiding offensive questions, those which encourage arguing, the appeal for prompts, the awareness of paraverbal and nonverbal language, improving the negotiation techniques etc. If students assign the difficulty of the learning tasks to their shortcomings (ie. the lack of skills), then the teacher should turn its attention to difficulties, to outside obstacles (Hartman and Glasgow, 2002: 43): "Pay attention to the choice of a more difficult part of the problem", "this is a new type of problem, and we have not talked about it yet, so do not expect to know how to solve it", "Do not expect your mind to work very quickly. It takes more time", "There is no problem, many of us choose this approach".

Conclusions

Giving up the limiting behavior patterns that restrict freedom of thought and expression generates a different approach to education. Training models based on using questioning in the learning cycle represents some theoretical constructs that allow translating into practice the principles of teaching and learning. Even if, in essence, these models are themselves some templates, they have the merit to encourage learners to rely on previous experience, to make room for the construction, de-construction and re-construction, to provide opportunities of affirmation for each student, through the opportunity to suggest meanings, to interpret and reinterpret. In order to configure or reconfigure a personal point of view, it is necessary to put the students in front of opinion diversity. This can be the aim of some organized debates, focused on heuristic strategies, where the role of the teacher is to organize discussion, to animate the dialogue, to mediate possible disputes. All these aspects lead towards the communicative competence (one of the key competencies recognized at EU level) and contribute to the training and personal development of learners. The person who has a certain facility in asking questions, who permanently doubts and looks for more answers to the same problem/ question is characterized by divergent thinking and is interested in innovative ideas. Divergent thinking is a natural thing in people with a creative mind, but can be also cultivated by practicing the various techniques of improving creativity. Asking questions (to ourselves and to others) is an art that is refined while we train and expand our sphere of social interaction. Moreover, this is a necessary condition in the attempt of understanding the

show of the world, with lights and shadows, with permanent changing opportunities, of renewal and improvement.

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