

IMPROVEMENT OF DIDACTIC METHODS USED IN SCIENCE DOMAIN

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Abstract:

One problem of modern didactics is related to application of proper scientific and efficient pedagogical methods. The didactic methods should be permanently adapted to the new generation background. In the designing process as reference point should be considered the attractiveness of the proposed technique, but without neglecting the desired outputs considered. One of the newest teaching and learning perspective suppose multidisciplinary and interdisciplinary approach of the teaching-learning process.

Classical teaching methods are principally based on teacher exposure and students individual study. Due to generation mentality changes and the inconveniences presented by the standard didactics the techniques described in the present paper are based on cooperation and discovery. The students are encouraged to actively participate in the learning process. This approach contributes to improvement of cognitive and critical thinking. This focuses on testing and evaluating possible solutions in specific situation, followed by choosing the optimal solution based on the arguments. These represent important attributes to future specialist in science domain.

Keywords: discovery learning, creativity, motivation, participative methods, heuristic conversation.

INTRODUCTION

Learning is a very complex and important social phenomenon for humans and society. It is studied by many sciences as psychology, pedagogy, ethics, and sociology, etc. Learning is situated and is the result of the contribution of several disciplines such as physiology, psychology, and pedagogy.

Psychology describes the learning process, discovering its regularities. Pedagogy studies learning as operational activity because it comprises different techniques for human transformation. Learning view as a product is especially the result of human and scholastic activity.

Some scientists consider education as everything that overlaps human behaviour. They consider that any man is capable to assimilate specific techniques from the simplest one to the more complex. Through learning all thinking forms are developed: human activity and behaviours, motivation, ideals, and aspirations.

The man is a very complex organism. It has an open nature, being capable of interact with the environment, modelling it for own purposes. It can self-regulate. It is the learning result and a learning necessity. Without education a person cannot achieve the goal necessary for each level, he cannot evolve for higher stages.

Education is possible due to specific human characteristics, nervous system and analyzers structure. Learning supposes development and this is realised through intuition. Our cerebral cortex has a synthetic analytical function. The information is shared through flexible informational structures which finally form the systems. Education change and reorganise those structures. The operative character of the nervous activity is realized, and as consequence, is evidenced by a specific human characteristic that of putting everything in modern and structured relation.

All these external influences perceived and realised by the organism are mediated through the internal activity. The humans acquire themselves interests, motivations, and sensitiveness during life. Not all experiences influence a person.

As learning in general can be considered any acquisition which allows a person to obtain a permanent equilibrium in itself and in its human activity. It means assimilation, knowledge, skills and ability achievements by acquiring different working techniques. This form of activity is specific to humans. Assimilation through interaction is specific to our activity. It supposes the entry into action of all human processes of the whole human being.

It is important for the educable to properly use the assimilated knowledge. They must understand that learning is learned. At the base of human learning lies the motivation embodied in needs.

Good results for increasing the level of cooperation have been obtained through the collaborative project techniques¹.

Another approach that may be suggested is that of organise meeting between educable and remarkable personalities from different scientific domains².

A good teacher should be able to maintain equilibrium between the society needs and expectations, the educible psycho-emotional profile and the educational system requirements³.

METHODS

The most frequent type of learning is by *conditioning that is carried out according to the pattern of conditioned reflexes*. It is developed through the formation of reactions and associations with different stimuli acquired during the life course. The most important of these reactions is the *anticipatory reaction*.

Motor learning (sensory-motor) supposes acquiring a system of criteria and standards of material objects. This type comprises learning the verbal systems of conventional signs. The activities involve the sensory and motor effectors organs.

Verbal learning allows knowledge systems assimilation: language, words, aso.

Intelligent learning (discovery learning) involves concepts, notions and abstract categories learning. It engages in a special way the qualities of thinking. Its modalities imply *originality, independence, divergence*. This learning type depends on the person's cognitive and affective desire of involment⁴.

The **algorithms** are used in different situations, improving the divergent thinking. It supposes to find more solutions to solve a problem. Also the divergent thinking is positively influenced by a creative learning atmosphere and good scientific results⁵.

Different **exposure** types are presented in table 1.

Table 1. Classic and modern exposure types

Classic	Modern
story	lecture debate
description	lecture application
explanation	conference debate
enunciating	exhibition with opponent
logical demonstration	informing
school lecture	microsymposium
master course	
training	

Heuristic conversation plays a very important role in teacher-student dialogue. The key to success is determined by the question, respectively its structure. Are recommended questions as: *Why? For what? How?*

Other suggested methods are the *discussions and debates, problematization or training by problem solving, written communication*.

The technique the *ideas tree* is used as a way of synthesizing knowledge about a given topic, in the form of ideas. It can be used both in the evocation and sense realization phase.

Objective:

- training the synthesis capacities of all the knowledge related to a given topic;
- forming the ability to group ideas into sub-themes.

Stages:

- the proposed theme for the respective activity is announced;

- the class is divided into groups. The number of groups will coincide with the number of subtopics;

- a representative of each group will extract from a bowl a ticket with a subtopic about which his/hers group will have to write. After the representatives return to the group, all members will consult and write on a sheet of paper, cut in leaf form, all the ideas that come to mind regarding the subtopic received;

- after all the groups have exhausted their ideas, one representative will read what was written. The teacher will present the logical order of the subtopics, thus achieving coherence.

DISCUSSIONS

The teaching-learning process can be classified using different criteria. It can involve the *direct personal experience*, a *verbal association* or *multiple discrimination*. From the point of view of the *psychic activity* the studying process can be: *latent* (unconscious immediately, spontaneous), *spontaneous*, *hypnotic learning*, *conscious* (through understanding and anticipation), *intelligent* (by making the bypass road), by *discovery/creative/inventive* (through trials and errors).

According to the administering human experience the acquisition information can be: *algorithmic*, *heuristic*, by *modelling* and *analogy*, through *creations*.

A new method frequently used is the *discovery learning* which is characterised by creativity.

Over time have been develop many theories regarding the educational system. Initially the principal roll was put on memory (retention) by rehearsal and their timing over time. Another aspect regarded the influence of the exercise and its value. Also the theory of trial and error needs to be mentioned. It considered that the education could be adjusted through replays. Another theory considers opportune the transferring into learning. The information thus perceived could have a positive or negative impact on the educable. It is considered that a well-formed skill facilitates the formation of other one. But in reality there are situations in which some already formed habits negatively influence the learning process.

The modern theories have the purpose to synthesize and order what has been achieved in the educational process and bring *new elements*. The central problem was and still is the clarification of the essence and the mechanism of notions formation and learning.

According to some educational currents notions can be learned *through perception*, creating an image about the object. Another sustain that concepts could be assimilated through *objects actions*, *perception* being *included in the action*. The action with objects becomes internalized and on the plane of thought becomes a logical, abstract operation. The thinking essential feature is to be operative.

It is known that interests evolve with age, the cognitive concern not being completely outlined. The learning process through objects is a permanent source of educable interest formation. The lectures can be scientifically prepared. Educable motivation through active action⁶, persistent and selective orientation towards a preferred direction, guides and directs human behaviour. It is a force which propels the learner energy and effort. Significance has the capacity to transform the *constraint* motivation into *ambition*, *success* motivation, or *desire to know as much as possible*. The reasons to overcome the limits can be inherent or extrinsical, social, cognitive (scientific curiosities) or of self-realization.

The learners present different affective states, temperament, aptitudes, social stage. Our emotions are like a clock, or a control device. It is said that a person's power is more than he feels. Irritability, instability, insecurity and inferiority complexes are often the results of emotional shocks suffered in the family or school with consequences in learning performance. The teacher attitude plays an important role in students tensile states, being able to positively influence it. The temperament often put its mark on learning activity.

Reconsideration of the *student-teacher* relationship ensures the didactic success. It is also recommended the reevaluation of the pedagogy concepts about didactics and learning process, and change the report between teaching and learning in the net value of the last one. The concept of modern teaching outlines the atmosphere in which the learner is in the center

of the learning process⁷. Knowledge acquisition is an active process in which the student's freedom of action is dominant. The teacher guides the training so as to contribute to the learning interest activation. He has to advise them how to learn to learn.

The **interactive methods** base is *action*, by stimulating imagination, intelligence, creativity and thinking. The students are actively involved in the process, increasing their responsabilization, and analytical capacity, facilitating the information acquisition. Considering their principal function these techniques have four directions: actual *teaching-learning methods* (cascade, share pair cycles, reciprocal teaching), *fixing, systematizing and knowledge verification* (causes and effect diagram, lotus technique), *solving problems by stimulating creativity* (brainstorming, study case) and *group research* (team experiment, research group experiment)^{8, 9}.

Utilisation of such methods by students from technical domain for three years, improved their abilities, knowledge, independency and interest for work, but also the desire to take part at conferences and develop patents ideas¹⁰.

Attractiveness of theoretical courses can be increased by interactive means. Short filmed demonstrations or multimedia transmissions could be successfully integrated into lectures¹¹.

Improvement of the teaching methodology-the training methods system

In developing the methods capable of modifying the students behaviour is start from:

- *the human socio-historical experience* (cultural heritage). The methods used to give such information could be based on **oral communication** (*oral language* or *expositive* (affirmations)), **written communication**, **visual-oral** or **interior**;

- *personal experience*. Could be used the organised reality exploration (objective, intuitive). The directions may be through *direct exploration of real objects and phenomena* or *indirect exploration through reality the substitutes*;

- *experience gained through practical action*, intervention, reality transformation. The methods are fundament on practical action

(operational). These could be made through *effective action* (real) or *simulative* (fictive).

The combination of training methods during the course hours must be an optimal one of all the components. The directions chosen must have high performance and maximum efficiency. There must be a dialectical unity between the learning content and the instruction methods. The methods used depend on:

- the teacher competence and personality;
- age psychology and educable individuality;
- group psycho sociology.

The use of different methods is usually associated with certain means of learning (material tools). The choice of methods is a deliberative act.

The new trends include concerns regarding the integration of education with practice and scientific research, creating priority directions for methods reinvigoration. Should be emphasizes the formative-educational character of the methods that have efficiency in cultivating the entire individual potential. It is recommended the utilisation of *active* and *participative* methods in all learning activity. The active methods are based on the educable intrinsic motivation. The emphasis is placed on the use of information in order to obtain new ones to solve the problem situations. It supposes that subjects have an independent action of search, research, reconstruction and truths reinvention. The system need to have an *applicative character* (practical methods) which promotes work spirit. It is recommended to combine the methods of individual work with those of team and collective work.

The *interactive didactic internships* offer beneficial opportunities for pedagogical organization of a thorough, easy and pleasant learning. At the same time it has a pronounced active-participatory character on the part of the students, with possibilities of cooperation and efficient communication. The systematic use of active and interactive methods leads to a mutual action of cognitive, social and affective influence within the groups, thus noting their formative values:

- contribution to critical thinking development;
- creativity stimulation;
- active involvement of educable in learning act;
- focusing on independent and collaborative learning;
- argued opinions forming;
- respect colleagues opinions.

Computer assisted learning is more and more present in the educational activities. It represents a viable alternative to develop collaborative projects, bringing together students from different institutions. Due to the limited face-to-face interaction some challenges are born. In planning such a teaching system is recommended to ensure the appropriate mechanisms to support the group internal emotional assistance, student-student and teacher-student reciprocation feedback. The learning process dynamization is directly influenced by the participants degree of involvement and interaction. The collaborative projects developed through virtual environment may have a determinant impact for students teamwork progress¹². Implementation of such techniques requires also the models and protocols predefined of in order to ensure the educable maximisation acquisition¹³.

An important part of the science domain is focus on research and developments. Currently many collaborative projects are developing. Was demonstrated that their success directly depend on the level of scientific knowledge of those involved, but especially of the strategic management adopted, and of the experience in field of the decider persons¹⁴. The students implication in collaborative projects during studies can ensure a valuable background for future.

Studies made regarding educational collaborative techniques present two types of groups: one characterised by a dominant member and another in which all members have an approximately equal contribution. For optimum results is recommended a combination of the two situations. It is considered that utilisation of a flexible collaborative approach increase the members self confidence and

personal acquisition level based on informal and group experience¹⁵.

For an interactive learning, one available action mean for the teacher are the *teaching methods*. The focus is on using actively participatory methods. Characteristic for these is participation, active involvement, and full commitment with all possible resources of the subject in the act of learning¹⁶.

There is a tendency to instrumentalization and technicization of contemporary teaching methods. The new didactic methodologies promote the principle of lifelong education which tends to ensure the acquisition of appropriate techniques of intellectual, independent (self-teaching) work, including effective methods of information and documentation that will serve as a tool of self-instruction and self-education throughout the life.

university lecture + debate → *debate lecture or conference debate*

CONCLUSIONS

- with Bologna system implementation, the vision on educational system had to be redesign in order to allow optimum learning achievements;
- the new methods and techniques proposed need to be chosen so as to avoid the prohibitions, and/or sanctions, such actions being able to lead to block the educable personality, reaching a possible imbalance state;
- learners intellectual and spiritual aspects must be perceived by the educator in order to adopt the optimum teaching system, if is necessary by integrating different procedures;
- independent of the approach, the tendency of self-realization and affirmation must be nurtured and directed to the educator avoiding the tutelage;
- the proposed alternatives for science domain are in accordance with the new educational directions. They are based on interdisciplinary system, on development of practical skills through

discovery and interaction, on educable native talents improvement.

The book provides access to humanity cultural values.

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