

Comparative Review of Pedagogical Technologies in the Educational Process of Higher Educational Institutions

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ABSTRACT

The present rapid technological progress and the post-crisis period determine the increasing demand for revision of existing concepts and strategies aimed at maintaining global development. This article describes pedagogical technologies, indicates the need to reform the outdated education systems or to reject them completely in order to improve productivity of students. The authors provided a comparative analysis of pedagogical technologies used in higher educational institutions, their strengths, weaknesses and development prospects. The study considered the approaches suggested by domestic and foreign researchers, clarified definitions, classification, typology, as well as specific features and setbacks of pedagogical technologies. The authors developed a training system, which implies direct involvement of each student into the learning process. The study specified the purpose of learning, which implied development of student creative abilities to get new experience. The authors proposed substitution of "authoritarian" relations between the student and the teacher for "partnerships" that could improve their relationship, mutual understanding and general efficiency. Comparison of pedagogical technologies provides their detailed description, the ability to select the most appropriate methods and approaches based on the requirements of relevant disciplines that will meet the highest quality standards for students and teachers.

KEYWORDS

Pedagogical technology, higher educational institution, comparative review, teaching and learning process, teaching experience

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Introduction

The authors of this paper considered modern teaching experience and its types with the view of improving the efficiency of material assimilation by the students. The technology of the educational process is a key factor in the training of future

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specialists (Rock et al, 2016). The paper outlined basic types of teaching techniques (Babanskii, 1977), their advantages and setbacks, development and influence methods. The methods were discussed in order to select the most appropriate, which could be used by teachers in order to achieve the best result. The paper also considered their future prospects and historical development (Bespalko, 1995).

Being one of the key social development instruments education involves improvement of training and retraining of highly qualified specialists in different fields, both at the local and international level. In general, the term "pedagogical technology" implies a specifically normalized educational process (form, content, training methods, products and output results) or educational activity that purposefully changes the students, or provides the possibility to change by themselves (Rudy, 2016). Each technology has its own specific purpose, application limits and innovative possibilities (Ai-lan, 2007).

The analysis of training shows a contradiction between the need to train students for life in a different type of socio-cultural development and the existing educational system, which does not provide the development of student autonomy and responsibility in learning, intrinsic motivation activities and teaching skills to plan their own work, including the decision-making process. The learning conditions characteristic of reproductive pedagogy significantly slow down the inclusion of high school graduates into the modern society.

This article includes data providing a detailed comparative description of pedagogical technologies that could be used in the teaching system. The authors provided a qualitative assessment of each approach in order to identify the most appropriate both for the teacher and for the student.

Literature Review

Selection of teaching and learning technology is the main goal of modern education (Tondeur et al., 2012; Watson & Tinsley, 2013; Yu & Jo, 2014; Galimova & Shvetsova, 2016); the teaching technology is an important factor in training each student as an individual and a qualified person in the modern world (Cohen, Manion & Morrison, 2013).

In the present-day information age, society should be able to think critically, solving various problems, cooperating with other people, communicating, taking the initiative (Angeli & Valanides, 2009). Therefore, the appropriate teaching approach can solve this problem with minimum efforts and maximum training results (Sarkar, 2012; Peeraer & Van Petegem, 2012; García-Peñalvo, Colomo-Palacios & Lytras, 2012; Selwyn, 2012).

Depending on the nature of the training environment (or condition), all the present technological training methods of can be divided into three groups:

1. Technological methods which can be used in the traditional time system (problem-based teaching (Makhmutov, 1975, Kudryavtsev, 1991), developmental teaching (Davydov, 1995), role playing and others);
2. Technological methods that require organizational restructuring of the university work (concentrated training (Gitman, 2015; Ostapenko, 1999), collective training (Dyachenko, 2004; Myasoyed, 2004) and other methods);
3. Technological methods, which require changes in the content of education ("dialogue of cultures", probability education (Lobok, 1996; Khristosenko, 1996) and others).

It is impossible to ignore the importance and necessity of using pedagogical technologies in the training process, since their correct application greatly simplifies and improves the quality of the educational process (Willis, 2008). Choosing poor or outdated teaching technology causes inability of higher education institutions to provide high-quality professionals for the labor market.

Aim of the Study

The aim of this study was to conduct comparative analysis of the existing educational technologies in the higher education system with due regard to the pedagogical research experience; clarification of their definition, classification, typology, as well as their specific features and setbacks.

Research questions

The overarching research question of this study was as follows:

What pedagogical technology of the educational process is the most effective?

Methods

This research was based on a pilot study. This research method has a clear methodological basis and performs the theoretical function. It is used prior to basic research and acts as a specific means of testing hypotheses and tasks, as well as professional skills and methodological tools. Pilot study presents a study according to the "shortcut" plan - it is based on using small samples, not full information is gathered, the obtained information is analyzed only by the most important criteria. The pilot method used in this article provides the possibility to "refine" research tools, to identify and to eliminate defects and defects in the mathematical analysis. Conducting pilot study in this case gives the possibility to avoid collecting "empty" information and it is generally used at the initial stage of a major study.

Data, Analysis, and Results

Pedagogical technologies are characterized by a wide range of classifications providing their various definitions.

Based on the above scientific literature, the authors of this research concluded that the idea of "pedagogical technology" was characterized by typological division, similar to classification features. The present-day research papers dedicated to various educational aspects indicate the presence of different types of educational technologies, which suggest the following assumptions.

It should be pointed out that the following pedagogical technologies (Rock et al, 2016; Bepalko, 1995; Rudy, 2016) presented at Figure 1 are the most widespread and common.

The authors of this research formed a table illustrating detailed classifications of pedagogical technologies, taking into account a wide range of approaches and the aforementioned aspects (Table 1).

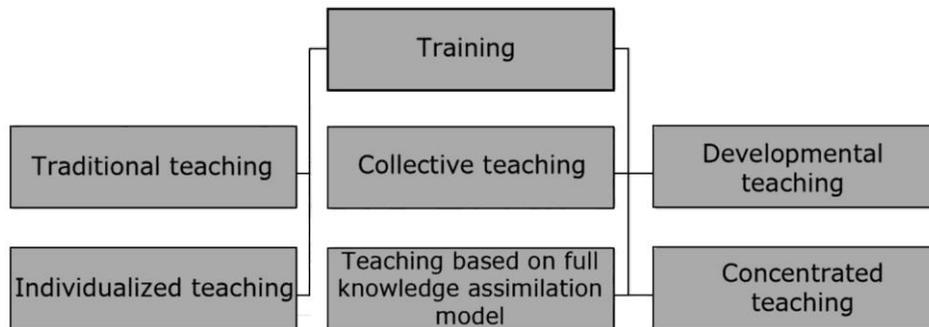


Figure 1. Structural and functional model of dialectical explanation of the objective contradictions.

Table 1. Classification of pedagogical technologies

<i>Depending on the teaching environment (or conditions)</i>	<ul style="list-style-type: none"> – Technological methods, which can be used in the traditional time system (problem-based learning, developmental teaching, role playing, etc.); – Technological processes that require organizational restructuring of the university work (concentrated training, collective training, etc.); – Technological methods, which require changes in the content of education ("dialogue of cultures", probability education and other methods).
<i>By the level of their use:</i>	General pedagogical, specific methodical (subject) and local (modular) technologies.
<i>By their philosophical basis:</i>	<ul style="list-style-type: none"> – Materialistic and idealistic; – Dialectical and metaphysical; – Scientific (scientistic) and religious; – Humanistic and inhumane; – Anthroposophical and theosophical; – Pragmatic and existentialist;
<i>By the leading factor of mental development</i>	<ul style="list-style-type: none"> – Free education and enforcement and other technologies – Biogenic; – Sociogenic; – Psychogenic;
<i>By the scientific concept of learning by experience</i>	<ul style="list-style-type: none"> – Idealistic technologies – Associative reflexive; – Behavioral; – Gestalt technologies; – Interior technologies; – Developing technologies; – Suggestive technologies; – Neurolinguistic technologies

Table 1. Classification of pedagogical technologies (*Continued*)

<i>By orientation at personality structures:</i>	<ul style="list-style-type: none"> – Information (formation of knowledge and skills); – Operating (formation of mental action methods); – Emotional-artistic and emotional-moral (formation of aesthetic and moral relations); – Self-development technologies (formation of self-governing mechanisms of the person); – Heuristic (development of creative abilities); – Applied (formation of effective and practical sphere) technologies
<i>By content and structure:</i>	<ul style="list-style-type: none"> – Training and educational; – Secular and religious; – General and professionally oriented; – Humanitarian and technocratic; – Various sectoral; – Specific thematic; – Monotechnologies, complex (politechnologies) and penetrating technologies.
<i>By organizational forms:</i>	<ul style="list-style-type: none"> – Group-oriented and alternative; – Academic and club; – Individual and collective ways of teaching; – Differentiated teaching
<i>By the type of organization and management of cognitive activities (according to V.P. Bepalko):</i>	<ul style="list-style-type: none"> – Lecture training; – Training through audiovisual means; – “Consultant” system; – Education via textbooks; – “Small groups” system; – Differentiated teaching methods; – Computer training; – “Tutor” system;
<i>Combinations of these “monodidactic” systems: the traditional system developed by Y.L. Komenskiy</i>	<ul style="list-style-type: none"> – Individual training; – “Software training” – Lecture method + self-study by using books; – Modern traditional learning (group system + hardware); – Group and differentiated ways of learning (system of small groups + tutor); – Programmed learning (software control with partial use of all other technologies).

Table 1. Classification of pedagogical technologies (*Continued*)

<i>By an approach to the child:</i>	<ul style="list-style-type: none"> – Authoritarian; – Didactic-centered; – Person-oriented (anthropocentric); – Humane and personal; – Technology cooperation; – Free education; – Esoteric technologies.
<i>By the dominant method:</i>	<ul style="list-style-type: none"> – Dogmatic; – Reproductive; – Explanatory and illustrative; – Programmed instruction; – Problem-based learning; – Developmental teaching; – Self-development training; – Dialogic; – Communicative; – Role playing; – Creative information (computer-assisted) and other technologies.
<i>By student categories:</i>	<ul style="list-style-type: none"> – Mass (traditional academic technology, designed for the average student); – Advanced technologies (in-depth study of subjects, special education, etc.); – Compensatory education technologies (pedagogical correction, support, alignment, etc.); – Victim technology (surdo-, ortho, tiflo-oligophrenopedagogics).
<i>By modernization of the existing traditional system:</i>	<ul style="list-style-type: none"> – Based on humanization and democratization of the pedagogical relationship; – Based on revitalization and intensification of student activity; – Based on the effectiveness of the organization and management of the learning process; – Based on methodological improvements and didactic reconstruction of teaching material; – Nature-aligned, alternative, holistic technologies used by experimental schools.

The suggestive type of training is one of the most discussed and controversial types of pedagogical technology. Being part of suggestive pedagogy, this type is characterized by highly visible psychological concept, originating from 1920s. Suggestive training is particularly relevant in the study of foreign languages. This type of learning implies unconscious perception of learning material by students; it is characterized by their absolute passivity in the learning process. Specificity of this method includes presentation of the teaching material focused on:

- “Sentinel” functionality in one’s sleep (hypnopedia);
- Organization of the transition states of biorhythms - hypnotic phases (rythmopedia) and associated states;
- Progressive muscle relaxation and autogenous training (relaxopedia).

Dogmatic teaching became the first widespread teaching type. This teaching type emphasized mechanistic learning of the teaching material, its memorizing without understanding the meaning (cramming). Historically, this demanded many literate people, who were able to count and to write, but not to think. Any deviation from the dogma was immediately suppressed, and the most crucial means of combating heresy was the guaranteed human inability to provide critical assessment of any memorized material, to analyze and to evaluate the facts. Only few people made their way through cramming to their own opinion, to the truth.

With the development of production means, complexity of labor process and specificity of problems solved by employees required skillful work instead of the “template” actions along with the use of best labor practices in various situations; time required the real “homo sapiens” instead of the machine “appendage”. In this respect, it is easy to see the result of the reproductive type of the training process.

The reproductive type of training was no less important. Reproductive training aimed at the fastest possible learning of the individual human experience is self-explanatory, because it implies common traditions. Curricula, textbooks, the usual style of student interaction, the established forms of learning and, above all, the academic process itself, offices and academic buildings - all this is adapted today in the most effective way to the requirements of this type of the teaching and learning process.

Reproductive types of educational technologies require competent experts, but at the same time – executives who are unable to create new knowledge. Reproductive knowledge results in human understanding, and in the ability to reproduce.

The productive type of pedagogical technologies is one of the important modern training types. The productive type of pedagogical technologies is based on independent student activities, not organized by teachers, aimed at the development of creative thinking as key training moment. This results in the development of creative thinking.

The personality-oriented type of pedagogical technologies results in personality development. Participation in role (business) plays provides the possibility to detect personal qualities of students, i.e., control involves simulation of personality situations. The foregoing types are presented in Table 2.

Table 2. Types of pedagogical technologies

<i>Type</i>	<i>Result</i>	<i>Student cognitive activity</i>	<i>Typical training methods</i>
Suggestive	Psychological readiness	Neutral activity	–
Dogmatic	Formal attitude	Cramming	Communicative
Reproductive	Formal knowledge	Understanding, reproductive activity	Explanatory-illustrative
Productive	Creative thinking	Independent search, creative activity	Problem-based learning
Personality-oriented	Personality	Collective search	Solution of tasks having personal, vital sense

Having classified and outlined the main types of pedagogical technologies, the authors of this study consider it necessary that the purpose of their use be clarified. Setting and achieving the purposes are complex and multifaceted processes. The apparent purpose, of course, does not automatically lead to the desired result; however, it contributes to the request of the teacher and the student to proceed with training. As A. V. Khutorskoy (2002) rightly noted, "Targeting in training implies establishment of the main training goals and objectives by the teacher and students at certain stages. It is necessary for the design of student educational activities associated with the external social order, educational standards, with the specific internal learning conditions - the level of student development, motives of their teaching, specific features of the taught subject, available means of training, pedagogical views of the teacher, etc." (Khutorskoy, 2002).

E. A. Kryukova (2013) indicates that the analysis of modern pedagogical knowledge showed the absence of coherent theory in modern pedagogy that could revealing the relationship between the pedagogical goals and related tools. Target attitudes in the traditional pedagogy are achieved by certain types of subject activity, based on the study of concepts and rules. The personal model of education has different goals; the main one is to master the experience of "being a personality", the emergence of individual self-organization. Activity in the personality model is feasible only provided free exchange of views, ideas, personal involvement of both students and teachers in the training process. Activities in terms of personality development acts a background for any other learning activities. Its subject implies meaning-making, development of personal qualities of the individual. The ultimate goal of these activities implies development of the meaning-making relationship of the subject.

Therefore, it implies development of the training process in which students act as active learners who acquire knowledge and skills, understanding the need for such activities. Such learning environment can be created through research focus of training and the dialogue as one of its elements.

The research focus in training is based on personal experience of students, which is organized by their teachers. The purpose of training is to develop student creative abilities to explore new experiences. This development is based on a purposeful formation of creative and critical thinking, experience and tools to be used during teaching and research activities, role-playing and simulation, search and definition of one's personality meanings and value orientations. The training itself and its outcomes acquire personal character.

Modern education is oriented not only at the formation of new knowledge but also at the restructuring of existing knowledge. This implies stimulating cognitive activity of students by all means, using different types of educational dialogue, imagination, analogies and metaphors, working with conceptual models, etc. Moreover, the teacher will have to live with the fact that the results of independent student "discoveries" can be clearly incomplete and conceptually "unfinished." Modern psycho-pedagogical study are oriented at tools that could be used to work both with the existing and with the new ideas in the teaching and learning process.

These guidelines can be represented as a set of psychological and didactic requirements:

1. Students should have a feeling of dissatisfaction with the existing knowledge and skills;

2. New knowledge, acquired by the student should be accessible and comprehensible;

3. New ideas need to be credible in the student perception and combined with the existing student worldview;

4. New ideas should be more useful than the old ones; they should be helpful in solving the problem, lead to new ideas and give more explanation or prediction opportunities (Zeer, 2015).

Modular training technology

The origin of modular training ideas is associated with the emergence of a concept based on teaching content units (Postlethwait, Novak & Murray, 1972; Goldshmid & Goldshmid, 1972).

The essence of this concept lies in the fact that a relatively small portion of the teaching material can be taken as an autonomous subject and a training course can be formed by using these autonomous subjects. Originally, such units was called "micro-courses", later - "mini-courses". Then these units were called "modules", as a generalizing concept.

The modular technology of training gradually acquired the self-didactic system status, relying on a number of essential aspects of programmed teaching: individualized pace of learning and cognitive activity, constant reinforcement of student actions by self-control, consistency, and logical character of these actions.

Modular training (MT) integrated theoretical and practical experience and generalizations of problem-based learning, as well as the principle of individuation and training differentiation. Features of reflexive approach largely contributed to the creation of MT foundations, definition of principles and rules of its construction, methods and forms of its realization.

Modular technology, didactic system, individual courses based on MT principles, have been developed and are currently used in many colleges and high schools, universities in the US and Western Europe.

Module (from Latin "modulies") is understood as "measure" or "method". Developers of modular technologies highlight correlation of the didactic module definition with its understanding in natural sciences, technology: module presents a certain integral functional system, limited in scope, which provides performance of a specific function from the beginning up to the end. In other words, any module presents a functionally and structurally independent unit, which can be a relatively independent part – an object within another more complex object or as a single product, unit or object.

Therefore, any module presents a target functional unit in which the educational content, mastering technology and the system of control and correction are combined in a system characterized by a high level of integrity.

Various researchers argue that a module can be regarded as a training program, customized by content, teaching methods, level of independence, and pace of learning and cognitive activity of students. Each module has its didactic purpose. It should comply with a sufficient integrity of the training material. This implies the following:

- The module sets out a fundamentally important content of educational information;
- The module provides explanation to this kind of information;

- The module determines conditions of “immersion” into such information (through educational technology, specific references, and methods of obtaining information);

- The module describes theoretical tasks and recommendations to them;
- The module includes practical tasks;
- The module provides a system of independent and external control.

In theory and practice of modular training, the ratio of the theoretical and practical material in the module makes 80/20%.

According to the target principle, there are three types of modules.

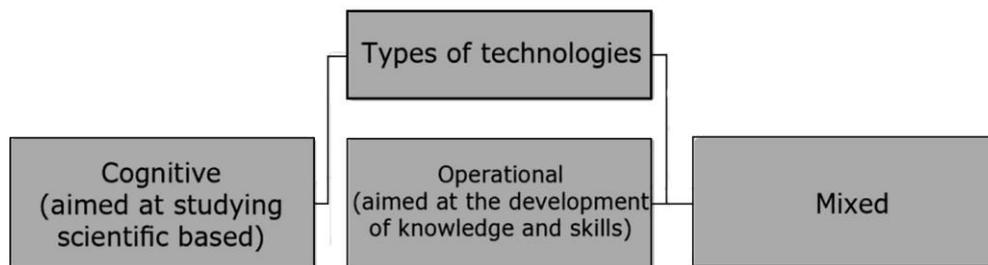


Figure 2. Three main types of technologies

Modular technology can be used in any system of training, including external studies: precise “dosing” of educational material, information and methodological support, which implies the program of coherent actions for the student, the opportunity to learn the material at any convenient time - all this provides the possibility to improve the general quality and efficiency of the training process.

Modular program based on relevant modules presents the main means of modular technology, in addition to the module as part of the program material related to a certain discipline.

The modular program is a system of means and methods, which helps to achieve the didactic goal by integrating all modules of a specific discipline. It is developed by a teacher with due regard to the main ideas of the course. Each idea corresponds to a certain module developed by the teacher. Their aggregate provides implementation of the main purpose of the entire discipline.

The researchers recommend starting each module with:

- 1) Input control of knowledge and skills (with the view of determining the level of student readiness to the subsequent independent work);
- 2) Setting the individual task, based on this analysis.

The tasks may include, for example, structural abstract based on the results of knowledge analysis, calculation and graphic tasks, colloquiums, tests, written questionnaires, etc. The module should always end with a control test. The intermediate and output control is designed to check the level of assimilated knowledge and skills within a single module or multiple modules. Then goes relevant revision, adjustment, and the next "round", i.e., the subsequent module.

Student activity structuring within the logical stages of knowledge mastering presents an important criterion for the module design: perception, understanding, comprehension, memorizing, application, systematization. In this respect, there are great opportunities for the problem-based learning.

Based on the above, modular training principles include the following:

1. Development of cognitive activities in students (module as part of the core training information, perceived as the required one);
2. Respective capabilities and abilities of students;
3. Psychological comfort: favorable learning conditions are provided by the training rhythm, differentiation of trainees by their knowledge level. On the other hand - maximum learning autonomy is possible, along with conditions for the implementation of temporary, physical, physiological and other specific features required for working with educational materials at the discretion of each student - all this minimizes stress conditions (or excludes them).

New technological approach requires a new technological orientation, namely:

- Preliminary design of the teaching and learning process;
- Spotlight - educational and cognitive activity of the student (successful learning is anyway achieved through the efficiency of educational activity);
- Diagnostics of feasibility and objective testing results;
- Integrity of the educational process as a pedagogical system.

In modular training, goals are formed in terms of business practices and student action methods.

Differences between the modular system and other didactic systems include:

1. The training content of training should be presented in complete independent information blocks. The didactic purpose is formed for students and contains not only the amount of learning content, but also the level of its assimilation;
2. The modules allow translating learning to the subject-subject basis;
3. The student largely performs self-studies and learns planning, organization, self-monitoring and assessment (self-esteem) of his/her actions and activities in general;
4. Modules allow the teacher to individualize work with a particular student by using consultations.

Individualization as a kind of differentiated training is most fully embodied in the modular training. The most important feature of the modular approach is linked to the most urgent task - to train people capable to adapt quickly to changes in production and to the new circumstances, to take appropriate decisions and to solve problems.

The value of the modular training system is the development of reflective abilities in students by bringing up the ability to learn independently. It is essential that the modular system, where educational activity is structured on: learning situations, monitoring and evaluation, updates analytical and research skills of specialists.

P.Y. Yutsyavichene (1989) formulated eight principles of this technology:

1. Modularity (training is based on modules);
2. The content of each module is divided into separate elements (this principle requires dividing the material into small, closely related "portions");
3. Dynamism (this principle provides the freedom to change the content of the modules, taking into account the social order dynamics, or changes in the training program);

4. Method of work;
5. Flexibility;
6. Conscious perspective (the principle of student awareness on the near, medium and long-term teaching prospects);
7. Versatility of methodical consultations;
8. Parity (the principle of subject-subject interaction between teachers and students).

MT advantages include:

- Improved training quality, since the entire training is aimed at the development of practical skills;
- Competence defines the required personal qualities;
- Reduced training time;
- Real individualization of training along with the real possibility of creating individual training programs;
- Fast adaptation of educational and methodological materials to the changing conditions, flexible response.

The observed setbacks include:

- long-term development of curriculum and teaching materials along with significant time and cost of replication;
- The need to have modern furnished and well-equipped training places;
- Certain complexity of the teaching and learning process.

However, overcoming the difficulties depends mainly on the ability of the training process organizers.

Discussion and Conclusion

John Dewey, L.S. Vygotsky (1991), and many other researchers believed that the study transformed into development when the repertoire of knowledge of students underwent genuine qualitative changes, presented by new forms of thought, speech or action. During these training, old patterns of thought and actions are transformed and the student takes the brand new social position. The new worldview and relevant activities of the scheme are acquired only in the course of such activity. (Example: the student learns to eat with a spoon, not while talking about this process, but when this spoon is used by him for its intended purpose) (Cohen, Manion & Morrison, 2013).

In this regard, one should recall the idea once expressed by L.S. Vygotsky (1991): the study group should resemble a workshop in which each session implies reconstruction of newly obtained student knowledge. This occurs through the interaction between teachers and students, and among students along with understanding the new (acquired) knowledge.

In the course of this study students gain relevant skills and models of independent work (including research), they interact with each other having a desire to gain knowledge independently. Teaching of thinking occurs in the interaction between the teacher and the students in solving "real" problems, which imply the need of the teacher's questions and student responses. Meanwhile, L.S. Vygotsky (1991) noted that knowledge obtained by the student per se was not the goal. The goal was the embodiment of knowledge in the social activity for public benefit and cultural practices as well in the assimilated norms and values.

One should emphasize specific features of the teacher's role in such training. Authoritarian interaction is detrimental for productive learning. Consequently, the teacher should learn to occupy the partner position in the interaction with the students. Partner (the French word *partenaire* from Latin *pars* - part, share) means the participant, companion. The term is usually used to refer to human communication with those with whom he/she works with or is engaged in any kind of business. Besides awareness of common goals and the will to achieve them, partnerships are based on the ability to understand each other, to find something in common, which will help stakeholders interact, using the ability of both parties to act in a civilized manner, which is reasonable for the common good (Vygotsky, 1991).

The partnership, according to V.J. Liaudis (1972), is described as the highest form of pedagogical interactions in solving creative problems. The system of cyclically recurring forms implies the following: an introduction to the work, divided between the teacher and student activities, simulated actions, supported actions, self-regulatory actions, self-induced actions, and self-organized actions. As we move from one form to another, its self-organization level, modes of communication vary, the student freedom increases in terms of purposes and meanings of activities, as well as in setting the new activities. Students become proactive partners. The ability to partnership acts as an indicator of becoming an independent person, along with productive development of the personality and the highest form of his/her self-organization (Liadus, 1997).

Implications and Recommendations

This article presents a review and analysis of the available pedagogical technologies existing in the system of higher education. Practically, it can serve as a teaching tool for teachers of higher educational institutions.

Availability of pedagogical technologies in higher education greatly simplify the learning process. However, in practice, few teachers are familiar with this concept including its theoretical and practical aspects. Based on the analysis of various research sources, the authors of this article defined the term "pedagogical technology", specified its typological differences, and outlined the most relevant way of its application, disadvantages and specific features.

Disclosure statement

No potential conflict of interest was reported by the authors.

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