Journal of Engineering and Applied Sciences 12 (12): 3188-3193, 2017
ISSN: 1816-949X

Technological Approach to Teaching in the Theory of the Professional and Pedagogical Education

A.I. Uman, P.I. Obraztsov and M.A. Fedorova
Department of Pedagogics Orel State University Named after I.S. Turgenev, Orel, Russia

Abstract: The study elicits the peculiarities of constructing the educational process from the standpoint of the technological approach. It defined the didactic meaning of construction in teaching. The study highlighted the areas of constructing the teaching process: a holistic approach to construct the teaching process; the development of the technological potential of each individual didactic category and the corresponding element of the teaching process; the research and the technological formulation of the concepts "the goal of teaching" and "a learning task" as didactic categories. The researchers stated the connection of the process of implementing a learning task and learning independent activities and revealed its structure.

Key words: Technological approach to teaching, didactic category, technological potential, learning independent activities, technological potential

INTRODUCTION

"The technological approach to teaching is aimed at constructing the teaching process, starting from given initial settings (social order, educational orientation, objectives and the content of teaching)" (Seyedhosseini *et al*., 2016). Educating human resources for this industry in a joint behavioral and cultural base while providing special services (Ghasemi and Gholamalizadeh, 2015).

"Construction" in the didactic sense of the word refers to the teacher's process of development of the didactic model of the script for the upcoming teaching process (lesson). This definition is the most general and is aimed at the general characteristics of the result which is obtained during the construction. A more specific definition of construction assumes singling out the procedural component's which in generalized terms are called procedures. In the second half of the 60's in the theory of teaching, an important step was made in dividing the integrated teacher's activities into their components. Kuzmina (1967) singled out constructive organizing, communicative and gnostic activities of the teacher (Kuzmina, 1967) that allowed researchers to focus further attention on a deeper study of each kind of these activities. In-depth study of constructive activities as the leading kind of teacher's work among their diverse functions was of special importance. Thus, construction is a set and sequence of procedures, the implementation of which is the development of teacher's didactic model of the script of the upcoming teaching process.

MATERIALS AND METHODS

While writing the study we used the theoretical methods of pedagogical research, namely, analysis, synthesis, comparison, generalization, method of the study of causal relationships, etc. That allowed mentally to penetrate into the essence of the pedagogical phenomena under our study and to rethink it in a new educational reality.

RESULTS AND DISCUSSION

The results of the research: In pedagogics issues of constructing, the teaching process (lessons and classes) began to rise and be developed generally in line with the study of teacher's creative activities (V.I. Zagvyazinsky, V.V. Kraevsky, Yu. L. Lvova, R.P. Skulsky, V.A. Slastyonin, etc). The mechanism of creative activities is presented in the form of a set of procedures, most of which are directly related to the construction of the lesson script. Speaking about procedures of creative activities, it is necessary to pay attention to their fundamental difference from the procedures of strictly algorithmic nature. Creative activities presuppose taking original non-standard solutions. They "are not be reduced to a strict, pre-known technology but includes the need to evaluate the infinite variety of situations, reliance on a guess and intuition" (Zagvyazinsky, 1987). In addition, the creative activity procedures are not located in line of time and space they

Corresponding Author: A.I. Uman, Department of Pedagogics Orel State University Named after I.S. Turgenev, Orel, Russia

are impossible to line up-one after researcher. They can be combined, performed in parallel, repeat themselves, overlap.

On the basis it can be argued that the technological approach to teaching is closely connected with the development of the lesson scenario constructing procedures which inherently have creative character.

Let us note the main approaches related to the search of a method for the teaching process construction and a set of procedures that makes it up. This is an approach from the perspective of the teacher's activities typology (N.V. Kuzmin) an approach from the perspective of formulating and solving pedagogical tasks (V.A. Kan-Kalik, N.D. Nikandrov, V.A. Slastyonin, etc.), an approach from the perspective of scientific organization of teacher's labor (I.P. Rachenko), a didactic-methodological approach (I.M. Gritsevsky, S.E. Gritsevskaya, V.V. Kraevsky, N.V. Kukharev, Yu.L. Lvova, R.P. Skulsky, S.D. Shevchenko and others), an approach from the perspective of the pedagogical foresight (V.I. Zagvyazinsky). The greatest interest in terms of constructing the teaching process is the latter approach. It deals with revealing and describing the most complete set of construction procedures which includes: an analysis of the initial state of the object, forecasting, goal-setting, planning and scheduling. However, even with this approach, the degree of procedures elaboration does not allow to present the construction process as a complete integrity. The development of didactics categorical apparatus, the identification of the technological characteristics of the main teaching elements that would allow a meaningful description of each procedure and the construction process as a whole should play an important role in solving this problem.

The following concepts are considered to be the major ones in didactics: the teaching process, the principles of teaching, the content of education, the methods and forms of education organization. The concept "the goal of teaching" sometimes is added to the basic ones. However, in traditional categorial didactics the concept of goal has essentially remained undeveloped and the category has not got a real status.

The basic didactic categories in relation to the practice of teaching are discussed and interpreted as main elements in the mechanism of the course of the teaching process including the mechanism itself (the teaching process). As the didactic technology is a kind of projection of the didactic theory to the practice of teaching, in the technological aspect along with the categories, the same-name elements (components, features) of teaching are significant.

The main elements of the teaching process are "the concepts about the goals, contents, forms and methods of teaching and principles of its optimal functioning" (Babanskiy, 1978).

The elements of the teaching process, in turn are refracted in their specific technological characteristics. These characteristics are involved in the process of constructing teaching.

Several directions of developing issues which are related to teaching technology, have been singled out in the categorical didactics.

The first of these involves a holistic approach to constructing the teaching process: This direction was elaborated in didactics by Yu.K. Babanskiy. It is called "the optimization of teaching" and deals, first with an attempt to highlight the technological characteristics of all the main elements of the teaching process and, secondly with the introduction of these characteristics into the interaction between them for the subsequent construction of teaching. It should be noted that Yu.K. Babanskiy managed to identify technological characteristics, not in all of the basic elements of teaching but only in some of them (it will be discussed more specifically in the analysis of the following areas). Therefore, no effective way for constructing the teaching process was developed considering the idea of the optimization of teaching and the idea of optimization was not widely used in teacher's practice. This circumstance is due to the fact that at the time of development of the theory of optimization of teaching (and this is the first half of the 70's) the technological potential of the didactic categories just started to form and were not developed enough for the organization of scientific search for the technologies themselves. But, on the other hand, the theory of optimization of teaching outlined a strategic line of elaborating the technological approach in didactics. This line actually became realized in the second direction.

The second direction presupposes the development of the technological potential of each individual didactic category and the corresponding element of the teaching process: Thus, I.Y. Lerner and M.N. Skatkin investigated the problems of the education content in this aspect. The researchers identify the most complete structure of the modern educational content: knowledge, ways of activity (skills and abilities), experience of creative activities, experience of emotionally-valuable relations to the world. Technological characteristics of these content elements are their types and characteristics. A number of these characteristics have already been singled out, for example, the types of knowledge. The researchers identify the

following set of types: basic concepts and terms; facts of reality and science; laws of science and reality; theory; knowledge about the ways of activities and the methods of knowledge; evaluative knowledge. Types of skills and abilities are singled out in the same way. N.A. Sorokin suggests their most successful description. These include the following types: intellectual (analysis, synthesis, abstraction, generalization, etc.), practical (design, labor, etc.), special or subject (work with a map, measurement with instruments, etc.), general educational (work with a book, planning, reading and writing speed, self-control, etc.) (Tahmassebpour, 2016a, b). I.Y. Lerner outlined the signs of creative activities in the most concentrated form. He identifies the following seven characteristics: independent transfer of acquired knowledge and skills in a new situation; the vision of the problem in a familiar situation; the vision of a new function of the object; the vision of the structure of the object; the vision of alternative solutions to problems; combining of known methods of activities into a new one; building of an original way to solve a problem.

The technological aspect of the teaching methods was developed by Yu.K. Babanskiy. The researcher analyzed all the existing classification methods of teaching and developed a unified typology. The most important factor in the construction of the teaching process is the interrelation of the methods and the choice of their specific combination for a particular part of the training content.

A.A. Budarnyi developed the technological characteristics of the forms of the organization of teaching. The author proceeds from the basic form of the organization of teaching-a lesson and highlights its basic structural unit-a case study (a learning situation). Case studies are divided into potential and actual. The first is a planned learning situation. When teacher and students get involved in such situations they become actual.

The main elements of a potential learning situation are the following: partial objective that defines what should be obtained in this situation; the content; the means and the methods of work; time; employment; the means of verification of results. If we approach the planning and the construction of a learning situation from the point of view of the main characteristics of the teaching process we should consider the specific purpose, the part of the educational content which is relevant to it and the relevant set and combination of teaching methods. Based on this, it is possible to make the description of options of a learning situation. Making the description we hereby include these features in the context of the learning situation (there are three of the above-mentioned the goal, contents and methods).

Regarding the didactic functions of the teaching organization, A.A. Budarnyi notes that the main of them is "to bind, to connect, to relate separate elements of learning situations as well as situations themselves into a unified whole to ensure the achievement of the lesson objectives".

The technological component of the teaching process is expressed by its definite parts (units) which are constructed by a teacher. The question about the units of the teaching process in scientific and pedagogical literature has not yet been developed sufficiently. Therefore, different researchers while describing these areas of the teaching process use different formulations (names) for units. In our view, the most appropriate in terms of technology, set of units is offered by N.M. Yakovlev and A.M. Sokhor. They are the following: learning new material at a lesson, the initial and subsequent revision of the material, knowledge testing, homework and the organization of home preparation for lessons (Yakovlev and Sokhor, 1985).

When constructing the teaching process, the teacher should be guided by a different set of teaching principles. The technological aspect of the teaching principles was developed by Babanskiy (1978). In addition to traditional principles, the author proposes to develop and formulate new ones which reflect modern practice of teaching. "Some increase in the number of didactic principles will allow to reflect the actual planning procedure of teaching more fully" (Babanskiy, 1978). Yu.K. Babanskiy represents the process of planning as part of a unified process of constructing and implementing optimal teaching.

In accordance with the characteristics of the didactic categories that are included in planning, Yu. K. Babanskiy offers to formulate and to classify the principles of teaching. In this case, all the principles are divided into several groups each of which "serves" their didactic category and their technological characteristics. For example, the category of "the content of education" is supported by the principles of "the scientific, systematic and consistency", etc., the principles of "optimal combination of verbal, visual, practical methods" support the category of "the teaching methods" "the optimal combination of reproductive and problem-search methods", etc. It should be noted that the approach the application of principles to specific parts of the construction of the teaching process-is important itself in the question of the principles of teaching. It should be remembered that the principles themselves are not included in the procedure of construction; they are "behind the scenes" of the technological process. However, their consistent use at all stages of the construction depends on the quality of the result the scenario of the educational process.

We do not exclude other characteristics that can be directly related to teaching technologies (e.g., the quality of knowledge and the ways of their forming in students, teaching techniques and their classification, etc). In this study, we propose only those that can be practically used to describe a way of constructing the educational process.

The third direction is the development of the ideas of categorical didactics outside the established tradition, i.e., outside of the study of traditional didactic categories: The investigation and the technological development of the concepts of "the goal of teaching" and "the learning problem" or "learning task" should be included in this direction.

The goal of teaching is a fundamental component of educational technology. In didactics the goal is declared as the main didactic category but none of the domestic textbook on pedagogy or didactics has a fundamental chapter on teaching goals. While describing the main didactic categories in a number of textbooks, the goal of teaching is not mentioned at all. In some manuals there is a confusion of the terms "goals" and "tasks" of teaching, i.e., the substitution of one concept by the other. In practical terms, the teacher is invited to formulate a vague, nondiagnostic description of the teaching, educational and developing goals of the lesson. Often, the teacher rejects the procedure of setting goals because of their imprecision and vagueness.

In the technological aspect, particularly, the diagnostical goal setting is valuable. This is when: such a description of the forming personal quality is given that it can be differentiated from other qualities of the personality; there is a way a "tool" to identify uniquely a diagnosable person's quality in the process of objective control of its formedness; it is possible to measure the intensity of the diagnosed quality taking into account monitoring data; there is a scale of quality assessment which is based on the measurement results (Bespalko, 1989).

Teachers can use the questions of clear, diagnostic setting of the teaching goals to develop student's curriculum activities. Attempts to build such programmes and their theoretical substantiation have been carried out recently in the development of the so-called modular training. "Modular programs and modules are constructed in accordance with the following general principles: the purpose of informational material; combinations of complex, integrating and private didactic purposes; completeness of learning material in the module; relative independence of the elements of the module; feedback implementation; optimal transmission of information and methodological material" (Yutsyavichene, 1990).

V.I. Zagvyazinsky notes that the stage of the transformation of pedagogical goals into the system of learning and cognitive tasks and assignments which are addressed to students has a crucial role in their implementation (Zagvyazinsky, 1987). In the early 70's, N.D. Nikandrov pointed to the connection of learning goals and tasks. He wrote that every learning step which a learner masters, can be viewed as some supporting goal of study or as a specific learning task (Nikandrov, 1970).

Thus, teaching goals are closely linked to the learning objectives (or tasks). But teaching goals are also linked to the educational content, methods and forms of organization of teaching. If we trace the relationship of these concepts which is associated with transformation goals, it will look like the following. Teaching goals are embodied in the teaching content, teaching methods and then in the organization and ultimately are transformed into learning objectives and tasks. Therefore, learning objectives (tasks) are a necessary element of the teaching process as well as the goals, content and other elements. This implies that learning objectives (tasks) should be considered as one of the main didactic categories along with goal, educational content, teaching methods and other categories.

Technological characteristics of educational tasks should include the set of types of tasks their coherence with teaching goals. Questions of classification and typology of tasks have been discussed in several of our publications (Tahmassebpour, 2016a, b; Uman, 2007, 1998). In addition, we have developed a technological model of the course of the teaching process, one of the basic and necessary elements of which is the educational task. This mechanism can be expressed in the following way: "the teacher asks students to complete a learning task. Students in their activities meet a learning task, accept it perform it (correctly). And only in this case they master the educational content which is incorporated in the task".

It follows that the model of the teaching process generated by the teacher's constructing activity, ultimately is expressed in the categories of "teacher's activities", "student's activities" and "learning task".

Taking into account the highlighted technological potential of all didactic categories (traditional and new), let us consider the method of constructing the scenario of the teaching process. It is a progressive teacher's construction of four models-target, informative, methodical and procedural in the context of a specific topic (Uman, 1998).

In the target model, first the goals of studying the content sections (informative) are formulated and second, the categories which belong to B. Bloom's taxonomy of

objectives (knowledge, comprehension, application, analysis, synthesis, estimation) are indicated. In order to build the target model, it is necessary to formulate an informative purpose of a fragment of the theme and to correlate it with the required categorical purpose, noting the intersection of both. And so on, for all informative purposes.

Then, an informative model of the theme is being developed. For its development we need every informative purpose to correlate with the corresponding fragment of the material which is then present in the form of sequences of small discrete and logically complete smaller fragments. The goal is set for each small fragment and at the same time this goal relates to other small goals in their sequence and with a common goal of studying the entire piece of material. All (together) pieces of the content of the theme form an informative or the base model of the theme.

The next step which is to build a methodological model is performed by correlating each small piece of material with definite teaching methods. Based on the combination of the content and teaching methods, different possible learning situations are predicted. The latter gives the opportunity to express the teacher's activities by a set the variable learning tasks. In the course of constructing a methodological model, the sequence of units of constructing a lesson is shaping in general terms.

The fourth model, the procedural model appears at the last stage of developing the lesson scenario. Its specific content is two interrelated components: teacher's activities which are expressed by the sequence of learning tasks and student's activities which are connected with fulfillment of learning tasks in order to extract the content of education.

In turn, student's activities while completing learning tasks represents in our view learning and independent activities which include actions such as self-reflection, self-esteem, self-projection and self-realization (Fedorova and Uman, 2009).

Self-reflection is a set of actions that characterize intellectual activities to compare the new content which is proposed in the form of task and the content which a student has in their personal reflexive experience (available) and which can be considered as a base for the development of the new one. Self-reflection includes a number of smaller procedures: reflexive examination, reflexive classification, reflexive identity and reflexive subjectivation. Reflective examination is an initial study of the assignment text (oral or written), student's fixing their minds on all information components which have the meaning. Reflexive classification of selected information units is their splitting into two groups: the "condition" and the "requirement". Reflexive identification is the correlation of the structural components of the task from their own reflective experience, the result of which is that the structure of the task is converted by the performer to the "known-unknown". Reflexive subjectivation transfers fully the learning task in the subject plane and its structure for the learner takes the form: the "given-required".

Self-esteem is a set of actions to establish a "gap situation" and the contradiction between the existing level of performer's knowledge, skills and abilities and the knowledge, skill and ability level that is required for performing a learning task is formulated on its base.

In the beginning there is a reflexive inventory of the "given" and "required" with consideration of establishing a certain distance between them which characterizes "the situation of the gap" as a source of contradictions between the existing level of knowledge, skills and abilities (included in "given") and the level of knowledge, skills and abilities required to perform a learning task (included in "required").

Self-projection is the development of a student's project for solving the existing contradiction between the "given" and "required". Self-projection also contains a number of smaller procedures. So, reflective recoding means the transition of the contradictory structure of "given" and "required" into the task structure (internal for the performer). In the result of recoding, the distance between the "given" and "required" is overcome and in fact, the problem which the performer has stated to themselves, arises in their reflective sphere. The following procedure is a reflexive actualization of structural units of the task due to which logical connections between the structural units of the task are set and the performer's willingness to find a way of solving the task is determined. Reflective construction is directly aimed at developing a method of solving the problem.

After self-projection is self-realization. It includes reflexive activation, i.e., a reflexive implementation of the solution to the problem with implementing, in the reflective plane, the sequence of procedures that make it up; presentation, i.e., procedural orderly solution to the problem in the external, practical plane; self-control including the substitution of answer to the problem in the structure of its solution, the reflexive checking of the progress and results of solutions; reflexive adjustment that performs a control function enabling the search of the error in the solution to the problem, its removal and bringing the problem to the structure of a true proposition.

The above sequence of steps is an algorithm for the solution of specific didactic objectives and can be considered as a private technology as a component of a

more general technology-technology of constructing learning activities in the teaching process, presenting its local level.

CONCLUSION

Thus, we can conclude the following: the technological approach to teaching develops itself mainly in two ways: the generalization of practices of creative working teachers and through more in-depth study of didactic categories (up to the level of eliciting their technological characteristics). The development of the method of constructing the teaching process is connected; first with the creation of a unified theory of the construction of teaching which is represented by the above-mentioned directions and second with the creation of a set of nonlinear models which reflect the process of teacher's making of a lesson scenario.

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