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THE FORMATION OF THE ANALYTICAL SKILLS OF PROSPECTIVE TEACHERS BY MEANS OF INTERACTIVE TECHNOLOGY

The peculiarities of professional work activity under new sociocultural conditions require that in the process of degree training prospective teachers develop a system of logical and methodological knowledge, analytical skills, intellectual practice of communication, pedagogical and scientific culture.

Therefore, an efficient pedagogical education involves achieving maximum developmental impact aimed at the development of the personality of the future teacher, realization of his/her creative potential. The development of science, which is now expanding to embrace the professional work activity of both the university professor and the student, necessitates the rethinking of all the factors that influence this process.

In this regard, it is important to define the theoretical foundation of the changes in the orientation of the specialized training of future teachers relating to the formation of their analytical skills. This task illuminates the problem of the inadequate elaboration of the scientific and methodological aspects of the process of the formation of those analytical skills of future teachers that would be relevant to the current trends in the society.

The analysis of the scientific psychological and pedagogical literature on the specialized training in tertiary educational institutions or universities defined the following research areas in this field:

- specialized educational training (degree training) of prospective teachers (O. Abdulina, A. Aleksyuk, S. Honcharenko, M. Yevtukh, I. Zyazyun, N. Kichuk, I. Pidlasyi, et. al.);

- forms and means of teaching/learning centered on the person (H. Ball, I. Bekh, Ye. Bondarevs'ka, O. Pekhota, C. Rogers, V. Semychenko, I. Yakymans'ka, et al.);

- systematic and comprehensive approaches to the study of the personality in the context of its professional work activity (B. Anan'yev, N. Kuz'mina, A. Derkach); and

- organization of the process of interactive learning (L. Karamushka, M. Malykhina, T. Pirozhenko, O. Pometun, H. Syrotenko).

The purpose of this article is to clarify the nature of the impact of research work on the process of shaping analytical skills of future teachers by means of interactive technology.

Numerous surveys suggest that not only the graduates of tertiary teacher-training institutions, but practicing teachers as well, regardless of their qualifications, experience in the workplace, and age, are virtually unprepared to carry out their profession on this level and experience significant difficulties when attempting to restructure and organize their professional work activity on the research basis. In other words, there is a total lack of preparedness for the creative re-thinking and re-prioritizing in their everyday professional work activity, which is so essential today. The roots of the problem are in the established practice of teacher training, which still does not ensure the formation of analytical skills, as well as fails to introduce prospective teachers to the experience of creative research.

Analyzing the ways of forming skills, N. Talyzina notes that "... instead of two tasks – transferring knowledge and building skills to use it, there is one - forming such types of activity that already include the desired system of knowledge and ensure its use within certain range" [5, p. 42.].

Yu. Kurnosov and P. Konotopov [2], for example, describe the notion of the *analytics* as an integrated set of the principles of the methodological, organizational, and technological support of individual and collective intellectual activity that ensures a more effective information processing leading to the improvement of the quality of the existing and the acquisition of the new knowledge, as well as to the

formation of the information base necessary for making optimal management decisions.

I. Kuznetsov [1] defines the concept of the analytical work. The researcher interprets its content as bringing fragmented, unconnected data into a logical system of relations (space-time, cause-effect, etc.), which allows the correct assessment of these data in their entirety, as well as each separate fact.

It is important to note that only systematic innovative changes in the system of specialized educational training in the modern universities can enable the implementation of these approaches . Therefore, we are proceeding to the deliberation of the changes that, in our view, will help in the development of the new directions of research work, new educational framework, its new level, content, functional loading that will ensure the formation of the analytical skills of future teachers by means of interactive technology.

When organizing research work with students, we introduced a system of exploration and research tasks that are based on the requirements to the specialized training of future teachers. This approach helps students to better master the objectives, content, tools, forms, methods, and techniques of research; it leads to a deeper knowledge, broader worldview, encourages discussion, etc.

The essence of *précis writing* is the systematization of the material on the topic. However, in order for a précis to become a research piece, it is absolutely necessary to choose the right topic. We only select those topics that reflect the new vision of the problem, are within mainstream research, and require independent conclusions and generalizations based on the established causal relations. In other words, the systematization should be sufficiently novel, logical, introduce new items, and extract new aspects. All this can lead to new conclusions and inferences. Only if these conclusions are made independently, the work can be counted as a research piece.

The fact that the presentation of students' précises is a rather straightforward form of the instructor-students interaction does not mean that the instructor does not need to thoroughly prepare for it. He/she is not an ordinary participant of the

conversation, but a guide, whose direction allows reaching the *exploration and research purposes* in view. To achieve this, the instructor has to plan the instructional conversation in details, possess the technique of asking questions aimed at the establishment of cause-effect relations, and be able to respond quickly to the answers and remarks of students.

The tasks on *finding arguments to prove a fact, law, or formula* turned out to be quite challenging for students. Such work is most often required to prove obvious, at first glance, things, to confirm the patterns and regularities that act in practice, but of which no strong evidence has ever been provided. In this case, the problem has already been outlined, the tasks have been assigned, and the only remaining challenge is to resolve them. This part is quite demanding. It requires the scientific intuition that is based on the knowledge in the field and a far-reaching thinking, as the sought argument can have systemic (multicomponent and complex) or mediated (indirect) nature.

After students have presented their arguments, to enrich them intellectually, the instructor offers to discuss and deliberate over a piece from a book by the Ukrainian psychologist I. Rusynka: "... The most dangerous to man is the *inability to think*. If you carefully watch yourself, you'll soon notice that, in the most cases, the thoughts you articulate are based exclusively on the desire for something to happen or not to happen. Unfortunately, people have developed a habit of forming opinion without examining facts. That is why their thinking remains inadequate, i.e., it lacks contact with reality. Conversely, those who strive to think should see *facts* instead of illusions and prejudices and deal with them judiciously. Anyone who wants to deal with reality should keep in mind that the true wisdom begins with the recognition of facts, no matter how unpleasant, unwelcome, uncomfortable, unbelievable, and even absurd they may seem, because these are facts that give us the opportunity to learn about the true state of affairs, to see the hidden nature of the phenomenon or event that we face. *A true researcher* (and every thinking person can be viewed as a research scientist who attempts to put forward his/her hypothesis about what is happening in reality) must be related to facts, limited by facts, because they are based

on impartiality and objectivity and, as such, most accurately describe reality in which he/she will have to settle oneself in ...” [4, p. 143].

During the discussion, we offer the following questions:

• Do you share the views of the author? Why?

• How did you come to this conclusion?

• What information or the analysis of which of your own observations persuaded you that author's judgments were correct?

Thus, the introduction of the research situation requires that the instructor *encourage students' active intellectual cooperation,* which should be done unobtrusively, without undue coercion, thus preparing future teachers to more complex types of cooperation.

In addition, we oriented future teachers to *description practices*. Students are asked to provide a most detailed description of an object, phenomenon, or person, but a description that has never been done before. For example, student's biographical writing won't have any research value if the description contained in it already exists. In case the student does have an interest in writing about this particular person, he/she may attempt to produce a comparative or summarizing piece, contrasting different points of view, discovering new facts, documents, and testimonies that relate to a given biography. Or, else, a biography that is written anew can interpret well-known data in a new way. In other words, descriptions made by student may (a) be completely new, (b) be comparative, or (c) expand the existing description, clarify it, disclose contradictions in it, etc.

In our opinion, among the methods to be used during lectures, dispute is an appropriate one. Its application ensures that already during lecture sessions not only the lecturer, but students are actively involved as well. To conduct a dispute, an academic group is divided into subgroups of three to five, each representing different views on the problem. Using various teaching techniques, the instructor makes sure that each student is part of the dispute and discussion. Controversial thoughts and misconceptions should not be disregarded: the instructor can use additional questions to help students find their mistakes. Particularly important is the independent

discussion and evaluation of the decisions made, as well as the analysis of the views expressed; final decisions should always be well-grounded. The structure of the lecture/dispute can be as follows:

1. Introduction. The instructor announces the topic and the purpose of the lecture, outlines the range of issues/problems to be addressed during the class, defines the requirements to the solutions that can be offered to resolve these problems, and forms subgroups.

2. Discussion in subgroups. The instructor should create conditions for a comprehensive discussion of all proposed questions and answers.

3. Summarizing, articulating final decision.

The topic "Methodological principles of scientific research" is usually introduced to students during such lectures-disputes. Each subgroup presents different interpretations of the concept "scientific research". After a thorough discussion, students come to the conclusion that science develops by means of scientific research, i.e., the purposeful study of phenomena and processes with the help of scientific methods, the analysis of how various factors influence them, as well as the study of interaction between phenomena in order to get accurate and valuable for science and practice decisions.

The method of the analysis of real situations (case method) can be used during lectures as well. This teaching approach is based on the group exploration and research, when students and professors discuss business situations and tasks. During our lectures, we have used all possible types of situations that may be a basis for a *case*:

• situation-problem, which is a certain combination of real life facts that are intended for discussion and decision-making;

• situation-evaluation, which offers a description of the problem and proposes a method to solve it, which is to be evaluated by students;

• situation-illustration, which is an example that explains a difficult situation; and

• situation-drill, which contains a specific case requiring certain actions on the part of students [3].

During the lectures that employed case method, our aim was to motivate and engage every student to participate in the analysis of the situation, as well as in the decision-making. Therefore, the academic group was usually divided into subgroups of three to five. The groups (teams) are formed according to students' choices. Each team selects the leader, who is responsible for the organization of work in the subgroup, the distribution of questions among the participants, and decision-making. There are two ways to work on the case: either each subgroup works on its own case or all subgroups work simultaneously on the same case, competing with each other in the search for the most appropriate solution.

Then, a general group discussion takes place. As a rule, each group shares the reasoning behind their views on the range of the problems contained in the case. The effectiveness of the discussion depends on the instructor's ability to control the course of conversation. The result of this stage's work is the articulation of the group's decision that satisfies the majority of the group and effectively resolves the problem. It is important for students to summarize conclusions (text, graphics, tables) using modern information technology.

The apparent advantage of the case method is not limited to the expansion of students' knowledge. It forms a system of values in students, their professional and personal attitudes. Case method helps students develop the ability to express thoughts, ideas, offers, as well as to listen to alternative views and explain and argue their own.

We employed this method during lectures on Pedagogy and Scientific Research Methodology to introduce the following topics: "Scientific Research and its Stages", "Scientific (Empirical) Research Methods", "Course and Graduation Projects Preparation Sequence". The case method was also used to teach the specialty course "Scientific Research Techniques", within which we offer students real life problem situations.

Lectures involving discussions in subgroups are yet another type of lectures that employ group learning. At the beginning of the lecture, the instructor divides students of the academic group into subgroups of two or three according to their choices and introduces the problem for students to discuss in subgroups. Following the discussion, each subgroup presents its decisions and conclusions, which are evaluated by their fellow students; the instructor's role here is limited to the adjustment of the ideas put forward by students. Group work routine culminates with the articulation of the final decision. Assignments for discussions can be quite extensive, covering larger pieces of learning material. For example, during the lecture "Creative Core of Research", we ask students to answer the following questions: "Can researchers be satisfied with the analysis of the advanced teaching practices of other educators and forgo their own research and teaching experiment?" "Is it possible to apply the pedagogical practices of the past today? In what situations might it be productive?"

Or, else, during the lecture "Pedagogical Experiment", we ask students to analyze the innovative practices of some prominent teachers, validate the relevance of their research, look at the problem their dealt with, the idea, method of research, novelty and significance of the results.

Lectures can also employ such methods of cooperative learning as *team learning* and *Jigsaw method*. Team learning requires that every student not just learn something during the lesson, but do something together with the members of his/her team as well. Team members help each other with their tasks. As learning outcomes are measured against the success of the entire team, to which students contribute their individual efforts, it is important that each member of the group master the learning material. Team learning, therefore, promotes cooperativeness and provides equal opportunities both for both most successful and less successful students.

Team learning can be utilized during, for example, the lecture "Creating the New on the Basis of the Existing Best Practices". This same lecture can be conducted with the help of the Jigsaw method. The methodology of conducting jigsaw method-based lectures is the following. Students are divided into subgroups of four to five.

Each member of the subgroup is assigned to study a certain piece of learning material, which is a constituent part of a larger and more complex learning piece. Then, the instructor brings together those members of different subgroups who studied the same material so that they could discuss it. After that, they go back to their subgroups and introduce other members of their subgroups to this material. Students know that to learn the material under this learning routine they must listen attentively to their fellow students. On the other hand, each student understands that the learning outcomes of his/her fellow students depend on him/her.

"Brainstorming" is also an effective method to be used during lectures. There are many modifications of this method. One of them involves the division of students into subgroups depending on their abilities: some students can generate ideas, others are skilled in their critical analysis. "Brainstorming" begins in the subgroup of the generators of ideas and, then, continues in the subgroup of critics. During the ideas-generating stage, criticism is forbidden, while any statements, opinions, remarks, jokes relating to the problem are encouraged. The goal is to produce as many ideas as possible; it is also allowed to improve the ideas or combine them.

Another variant of organizing group works during lectures is the preparation of reports, memos, illustrated materials, computer presentations. For example, as part of the lecture "Methods as Tools of Empirical and Theoretical Research", a group of students was asked to make a computer presentation on the characteristics of complex research methods.

According to our observations, group research during lectures usually leads to better learning outcomes compared to those achieved during ordinary lectures employing frontal work. But group learning has certain challenges as well. It is, for example, difficult to compose balanced groups, as not all students are skilled enough to independently search for information, objectively evaluate and control themselves and others. All these require thorough preparation on the part of the instructor [3].

Therefore, we can conclude that group learning during lectures leads to better learning outcomes, develops students' heuristic inclinations and independence, and improves interpersonal relationships. Students acquire analytical skills, learn to

control themselves, evaluate the actions of other people, and articulate their decisions. Students become more responsible, learn to defend their points of view, help others in mastering learning material.

Further study of the analytical skills of future teachers will help to determine different types of these skills, develop the methods to form them during specialized educational training, and identify the specifics of the information analytics needs of future teachers.

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Сущенко Л. О. Формування аналітичних умінь майбутніх педагогів засобами інтерактивних технологій

У статті з'ясувано вплив науково-дослідної роботи на процес формування аналітичних умінь майбутніх педагогів засобами інтерактивних технологій. Проведено аналіз наукової психолого-педагогічної літератури щодо професійної підготовки у вищій школі, де провідні науковці аналізують шляхи формування умінь, характеризують поняття „аналітика", виокремлюють поняття аналітичної роботи.

Автор надає детальний опис експериментальної роботи зі студентами, де було запроваджено систему пошуково-дослідницьких завдань, яка заснована на вимогах до майбутніх педагогів, що висуваються до їхньої підготовки. На конкретних прикладах доводиться доцільність застосування диспуту на лекційних заняттях. Окрема увага приділяється груповій формі навчання студентів із застосуванням обговорення у підгрупах.

Ключові слова: аналітичні вміння, науково-дослідна робота, майбутній педагог, професійна підготовка.

Сущенко Л. А. Формирование аналитических умений будущих педагогов средствами интерактивных технологий

В статье определено влияние научно-исследовательской работы на процесс формирования аналитических умений будущих педагогов средствами интерактивных технологий. Проведен анализ научной психолого-педагоги-ческой литературы по профессиональной подготовке в высшей школе, где ведущие ученые анализируют пути формирования умений, характеризуют понятие „аналитика", выделяют понятие аналитической работы.

Автор предоставляет детальное описание экспериментальной работы со студентами, где была введена система поисково-исследовательских заданий, которая основана на требованиях к будущим педагогам, предъявляемым к их подготовке. На конкретных примерах показана целесообразность применения

диспута на лекционных занятиях. Особое внимание уделяется групповой форме обучения студентов с применением обсуждения в подгруппах.

Ключевые слова: аналитические умения, научно-исследовательская работа, будущий педагог, профессиональная подготовка.

Sushchenko L. O. The Formation of the Analytical Skills of Prospective Teachers by means of Interactive Technology

The article attempts to clarify the nature of the impact of research work on the process of the formation of the analytical skills of future teachers by means of interactive technology. The article features the analysis of psychological and pedagogical works on university education, in which leading scholars explore the ways these skills are formed, characterize the concept of analytics, and introduce the concept of analytical work.

The author provides the detailed description of the experimental work with the students that incorporates the system of research tasks and is based on the requirements to the training of future teachers. Concrete examples show the usefulness of the dispute during lectures. Special attention is paid to the organization of students' work in groups using discussions as a form of educative interactions in subgroups.

Along with the advantages of the students' group work, such as a better understanding and retention of learning material, development of the heuristic inclinations and independence of students, and improvement of interpersonal relations among students, the author highlights some weaknesses of this form of training, as well as the challenges to be considered when introducing it into the university classroom.

Key words: analytical skills, research work, future teacher, professional training.