



**PROBLEM-BASED LEARNING IN PEDAGOGIC TERTIARY
EDUCATION: EUROPEAN CONTEXT THROUGH DENMARK
ENVIRONMENT**

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ABSTRACT

Nowadays every European knowledge-based society demands a highly qualified, competent workforce being able to adjust to modern innovative production. To educate such specialists is the aim of contemporary teachers. So efficient and innovative pedagogic education becomes an integral part of the European education system. The article deals with the analysis of problem-based technology in the modern system of Danish teacher training in pedagogical higher educational institutions. Analyzing works of European scientists and problem-based model of teacher education in Denmark, working with university and college programs and documents we came to the conclusion that principles of problem-based technology in professional teacher training are similar in the whole European educational environment and in general they may be described as an approach to learning and instruction that



has the following characteristics: 1) the use of problems as the starting point for learning, 2) small-group collaboration, 3) flexible guidance of a tutor, 4) student-initiated learning, 5) time availability for self-study. The findings imply that well-designed problem-based learning may lead to better educational results. Multiple sources in Ukrainian, European, and Danish educational environments at various time points from 1990 till 2020 have been used in data collection for this study. Pedagogic education in Ukraine requires a substantial adjustment at the legislative, structural, and technological levels. European experience in this sphere of teacher education modernization can become a valuable asset of the comparative pedagogic science. This practice will lead to effective technological change in teacher professional training in Ukraine.

Keywords: Pedagogic Education; Problem-Based Educational Technology; Well-Designed; Determinants; European Context; Lifelong Learning; Danish Dimension

1. INTRODUCTION

Deep transformations in the social, economic, cultural, and spiritual life of modern knowledge-based society, the necessity of creation of the European and world global system of high education and research, the affiliation of a great number of countries to the Bologna process and Lisbon convention, update the social order on the education of a new generation teacher, proclaimed by UNESCO the main driving force in social challenges of the XXI century (Schratz, 2014).

We realize that the development of a society depends on teacher's individuality and competent professional activity. That is why it is so important to find out new ways of the teacher education system improvement from the point of view of the world, European and national context.

One of the most important stages of continuing teacher education process takes place in a pedagogic high educational institution. We will note that the present puts forward new requirements for the professional training of the teacher. The learning process of the future teacher is an interconnected activity of the teacher and the student, in other words, a two-way inseparable process of teaching and learning (Borhan, 2014).



Moreover, the trends of teacher training modernization require a change in the position of the student in this process. At the present stage of development of the new-age pedagogic education, students – future teachers, can no longer be simple recipients of information. They must be able to accumulate, select, and analyze information obtained from various sources, creating their own new knowledge that will further help them to build up professional competencies (Ogienko, 2009).

Thus, the training of the future teacher should not focus him on the passive acquisition of knowledge, but on the creative, active implementation of problem tasks or projects in interaction and cooperation with other subjects of learning.

Studying the experience of teacher training through problem-based learning in European countries, we highlight Denmark, a country where the strategy of personal progress is reflected in modern technologies of pedagogic education, characterized by orientation on individuality, a high degree of free choice and democracy (Ogienko & Rolyak, 2010). We believe that such experience and balanced adaptation of European and Danish ideas into the Ukrainian educational environment can lead to positive changes in the system of life-long teacher education.

1. LITERATURE REVIEW

To examine problem-based pedagogic education in a contemporary environment, we should review the main concepts, ideas, and principles our study is based on. The analysis of scientific sources made it possible to state that this research encloses the following:

- the conceptual provisions of problem-based learning technology that were first formulated by the American philosopher, psychologist, and educator Dewey (1916);
- the principles of comparative analysis in pedagogic education of European countries, substantiated by Kremen (2017), Ogienko (2016) and Pukhovska (2018),
- the definitions of the problem-based learning in different perspectives: as a method of teaching, at first proposed by Okon (1991); as the postmodern type of training, grounded by Timets (2011); as a principle of learning, substantiated by Linkov (2014); as an interactive learning strategy and learning technology, analyzed by Tsankov (2018); and as a pedagogical approach, offered by Jensen, Stentoft and

Ravn (2019) through its potential for opening interdisciplinary learning spaces.

- different approaches and technologies in teacher training both in the world and European educational space as a whole are depicted by the following researchers: Boud and Feletti (1991), Hargreaves (1994), Hillman (2003), Hmelo-Silver (2004), Littleton, Scanlon, and Sharples (2012), Filipenko and Naslund (2016), Bridges (2019).

Our comparative study of the modern European environment demonstrated that the number of studies on the subject of problem-based teacher education has increased significantly. The results show that the subject matter of pedagogical practices using projects and problems as key technologies in the process of teacher training is ever more investigated by Danish scholars: Kolmos, Krogh and Fink (2004), Borhan (2014), Clausen and Anderson (2018), Monrad and Merete (2017).

Besides, European scholars consider Denmark, as a country that has accumulated significant positive experience in building an effective, non-authoritarian, democratic system of teacher training with its key feature - Problem Based Learning (PBL) as the key interactive learning strategy, implemented in the majority of high educational institutions (Howe & Littleton, 2010).

2. DATA AND METHODOLOGY

2.1. Data

In conducted comparative analysis of pedagogical phenomena the systematic, synergetic, cultural, axiological approaches were used while collecting facts and data for this study. Empirical research articles, scientific literature, surveys, and educational reports serve as the basic information, gathered from multiple sources of Ukrainian, European, and Danish educational environments at various time points from 1990 till 2020.

Three social and cultural generations of 50 scientific articles were analyzed. The following sources were generalized: Eurydice reports and monitoring on teacher education in Europe and Denmark; documents of European Teacher Education Association (ETEA); Denmark tertiary education factsheets; Bachelors and Masters programs of Danish teacher education in Alborg University, University of Southern Denmark; B.Ed. programs for primary and lower secondary school teachers approved by Danish Ministry of Education and Science; European pedagogical periodicals, in particular: European Journal of

Education, European Educational Research Journal, Scandinavian Journal of Educational Research, Pædagogik, DPU Quarterly: Teacher Education, Årbog for Dansk Skolehistorie; materials and theses of scientific conferences conducted by national and international scientific organizations on problems of teachers professional training.

2.2. Participants and Process

The basic sources analysis and general data collection took place through Internet resources, in a short-term research project within the funds of the Royal Library of Denmark in Copenhagen and during the author's personal participation in European ECER Conferences, seminars and round tables, arranged in Baltic, Nordic countries, including Denmark.

To accomplish comprehensiveness in a literature search a case study with the “snowball method” of continuous exploration process has been applied (Rickinson, 2001). Through a case study approach that includes qualitative methods and is based on analytical induction and generalization, a “contextualized comparison” has been carried out to identify characteristic features and relevant methods in the process of teachers candidates training. These helped to develop a clearer understanding of problem-based learning implementation in the context of Danish teacher training in the system of tertiary education (Borhan, 2014; Stake, 2005; Yin, 2003).

2.3. Research aims and tasks

Thus, in the context of comparative research, there are almost no fundamental studies of PBL modern technology in the system of tertiary pedagogic education in Denmark (Borhan, 2014). In our opinion, such analysis should be useful in formulating new provisions for modernizing methods and technologies of Ukrainian teacher training. These circumstances facilitate us to choose the topic of this article with the main goal – to analyze the methods and principles of problem-based learning technology, used to prepare Danish secondary school teachers in tertiary institutions of pedagogic profile.

Accordingly, we have identified the following tasks: 1) to formulate a definition of problem-based learning technology; 2) to outline the features, and 3) to characterize the relevant methods of problem-based learning in the context of Danish teacher training in the system of higher education.

3. RESULTS

3.1. PBL definitions

We have investigated that one of the first definitions of PBL in the Danish and European context was suggested in 1974 by Illeris in his innovative book on problem orientation of the educational process through its close interaction with practice. According to Illeris original idea of PBL, it is an educational approach in which the process of learning and teaching is organised in small groups of collaborative studying, researching, reporting on the chosen problem, and then presenting and evaluating the final product (Ravn, & Jensen, 2016). So the backbone of PBL model is a learning problem with a strong focus of its incorporation into process of development of the following three categories: skills, adaptability and creativity (Illeris).

If we turn to more recent definitions, we must remember that in European pedagogical literature a learning problem “is a description of phenomena or situations that need an explanation, often presented in textual format, sometimes with illustrations, diagrams, video material, and modeling” (Schmidt, 1993: 423). A review of the literature showed that the basis for the formulation of educational problems has traditionally been the principles of cognitive theories and experimental knowledge (Boud & Feletti, 1991).

The problem, both theoretical and practical, is the starting point directing the student’s educational process. Learning problems are also called tasks, triggers, statements that describe a particular scenario, and even projects in much wider meaning. In the Danish context such problems should be relevant to a real world situations, “comprehensible and may be analyzed and solved, taking an interdisciplinary approach” (Aalborg University, 2016).

According to PBL-model principles outlined in 2015 by Aalborg University the ideal learning situation for students is to work with an authentic problem: “the Aalborg model assumes that students learn best when applying theory and research based knowledge in their work with an authentic problem. At the same time, the model supports students in the development of their communication and cooperation competences, and in acquiring the skills required when taking an analytical and result-oriented approach” (Aalborg University, 2016).

3.2. PBL in teacher education of Denmark

In the Danish environment problem-based learning (PBL) first appeared about 40 years ago in engineering and medical professional education. In teacher training, it was originally used only as an interesting and worthy experiment in pre-service pedagogic courses (Borhan, 2014).



Our research has demonstrated that a strong position in Problem-Based Learning holds Aalborg University (AAU) and a great number of the world and European Universities are looking for support and cooperation with this institution in this subject. Since 2002 Aalborg University initiates a continuous process of interactive problem-based learning strategy introduction into the system of teacher education (Roliak, 2020).

So in the postmodern era PBL evolved into the tertiary sector of Danish pedagogic education and was extensively applied in numerous fields and a variety of interdisciplinary courses such as Introduction into Educational Psychology, Foundations of Philosophy and Education, Professional Competencies of a Folks Skole Teacher, Pedagogic Theories and Concepts, Folks Skole, Løft først viden (Educational Institutions in a Knowledge-based Society), etc.

Moreover within the last decade Aalborg and Roskilde Universities have developed new interdisciplinary programs transmitting “Psychology” into “Product and Design Psychology”, long-established “Teaching and Learning” into “Learning and Innovative Change” (Ravn & Aarup Jensen, 2016).

From the point of view of the Danish environment, the problem-based learning in teacher education should be: 1) inductive and motivating, requiring the student to solve a problem or make decisions based on practical actions, rather than based on abstract conclusions; 2) active, encouraging students to learn through practice; 3) relevant, creating learning activities around real situations in the school environment; 4) collaborative, that unites learners with those who teach; 5) interactive, involving the discussion and perception of different points of view of those who take part in the learning process; 6) critical, encouraging students to think independently, analyzing different approaches and drawing conclusions based on proven facts; 7) participatory, which allows the student to participate in building their educational paths (Ogienko & Rolyak, 2010).

European pedagogic education today grounds on the thesis that problem-based learning technology is a system of methods aimed at organizing the educational process in such a way as to encourage students to acquire knowledge through their trajectories and develop innovative skills and competencies during active cognitive activity or in meta-cognition process. The purpose of meta-cognition is to plan and control, then to solve various pedagogical tasks and implement their results in practice (Howe & Littleton, 2010).

Recently many leading Danish, universities, and colleges were included into a PBL project “Creative Learning Lab”. This project outlines that the main educational technology in teacher training programs is problem-oriented learning of the disciplines from both the subject-oriented or psychological-pedagogic blocks, with a basic approach - "one day, one problem", prioritizing intellectual stimulation within the mini group phases work (Howe & Littleton, 2010).

This approach requires students to study a professional problem for one day. During the day, students have three workshops or meetings and periods of self-preparation between meetings. A typical group of 25 people under the guidance of a tutor is divided into mini teams of 5 students.

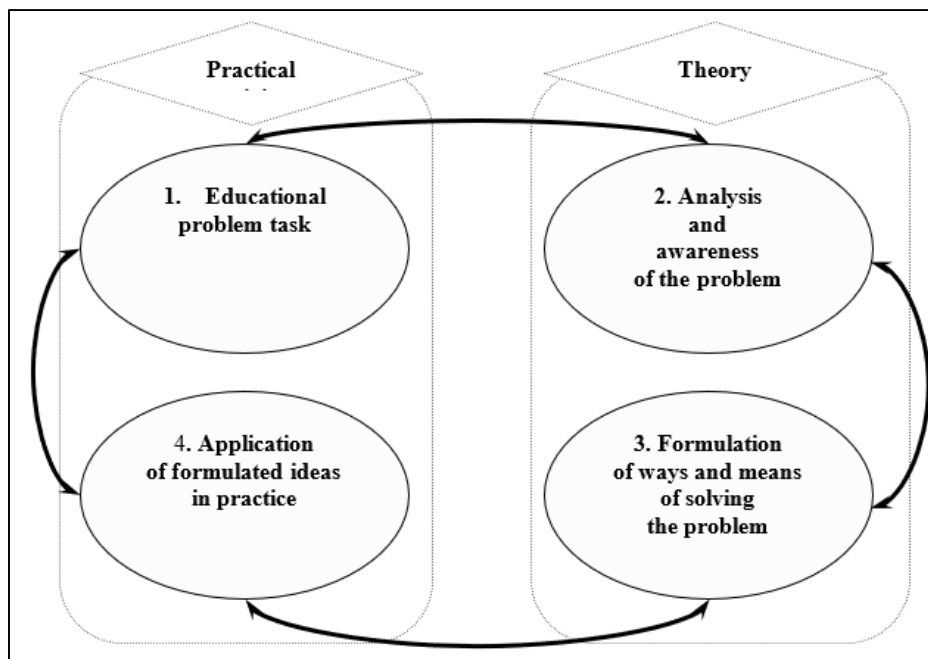


Figure 1: Scheme of PBL tutorial organization
 Source: prepared by the authors based on Aalborg University (2016)

The diagram of Figure 1. depicts the mechanism of students activity organization within the PBL tutorial According to the scheme, the technology of problem-based learning is a sequence of logically-combined procedures that include: 1) the educational problem statement by the tutor; 2) awareness and analysis of the problem situation, in the process of which the student is directed to independent search and mastery of new knowledge; 3) student’s independent formulation of the general ways which lead to the problem-solving; 4) the application of the proposed ideas and approaches in specific practical systems or situations (Clausen & Andersson, 2018).

The represented in the Figure 1 schematic circle, which combines all the above-mentioned procedures, reflects the mechanism of organization of the educational process in the system of Danish teachers training. This circular diagram illustrates that the way to solve the problem cannot always be the same. But to achieve the best results in problem-solving the sequence of stages should not be missed.

This process is designed for different ways of thinking, and, consequently, involves different ways to achieve goals (Murray-Harvey et al., 2005). Having put forward one constructive idea, the student can go back to the previous stage to clarify the general approach or to go deeper into the analysis of the problem situation for a more accurate understanding of it.

As a result, the most productive ideas are singled out, which are critically evaluated by both the student and the tutor to identify the most effective ones. At the final stage, ways to improve and apply the most promising ideas in the practice of schooling are usually proposed. However, we note that even the final phase of solving the problem, if necessary, does not preclude the possibility of returning to the previous stages of the process.

4. DISCUSSION

The findings of the current study support the idea that during the organization of the PBL tutorials in the system of Danish teachers education, there are certain rules for working with future teachers, namely:

- a) do not restrict students in the process of formulating new ideas;
- b) do not try to find the only right way to solve the problem;
- c) avoid intervening without reason so as not to disrupt group autonomy (Chiu, 2004);
- d) prematurely do not criticize the new ideas;
- e) give the students complete freedom in search of new theoretical and information sources for the assembling of their own approaches to the problem-solving situations;
- f) engage teacher candidates in the process of experience-centered scaffolding (Hillman, 2003).

Our research shows that in the context of teacher education, Danish scholars use the updated notion of scaffolding which, according to N. Mercer, refers to another principle of PBL, known as the expansion of “intermental development zone” (IDZ), where teaching-and-learning occurs as an “interthinking” process (Mercer, 2000). We emphasize that in our

opinion, the application of these recommendations creates a unique, typical for Denmark system of non-authoritarian democratic methods of training creative, critical thinking teachers who can make decisions independently and find the best way out of any difficult situation in the professional sphere.

Moreover, in the Danish academic community there is sustained persuasion that educational learning problems are aimed at students' interest and inclusion in the active cognition process through the use of their experience, basic knowledge, participation in discussions, and encouragement of cooperation in a mini group (Andersson & Clausen, 2018).

All these factors in total promote the development of self-learning skills and lead to the accumulation of relevant knowledge in a problem-solving process. The learner is placed in a position similar to that of a researching scientist (Borhan, 2014).

When a task is offered to the students to initiate the scientific process, they begin to confront the problem using their initial knowledge. Questions that arise in the process of group discussion and require further in-depth study can guide students in their individual search. After a period of independent preparation, students are again going to discuss complex issues, share information and synthesize general answers to their questions formulated by the group, integrating new knowledge in the context of the relevant problem. As a result, students report their findings to the group and reflect on the learning process (Dolmans, Schmidt & Gijsselaers, 1995).

In general, on one hand, the process of problem-based learning is directed more by the students themselves than by the tutors. In accordance with the present results of the study, we can highlight that on the other hand, the students' responsibility of the meta-cognitive results increases rapidly. It is the student who is liable for the synthesis and generation of knowledge content through self-study, group discussions and critical thinking. So the role of students, future teachers, becomes more complicated and diversified.

The position of a tutor in problem-based learning is radically different from the role played by the teacher in preparing the student within the traditional curriculum. It is true that postmodern tutors, like traditional teachers, take an active part in the learning process but, when we speak about the European and Danish context, the authoritarian approach has gone into the past.

The tutors within the PBL model take on the function of facilitators, consultants, or even coaches. They only contribute to the students' process of decision-making by observing them, encouraging group discussion, stimulating mental activity, enhancing group work, and providing feedback to the students in appropriate cases (Clausen & Andersson, 2018).



5. CONCLUSIONS

Our investigation proves that post-modern Denmark is constructing a highly efficient teacher education system in which its content and methodology correspond to the major goal: to educate independent, creative and competent pedagogues, needed in every knowledge-based and contemporary labor market.

The results of this study indicate that:

- due to problem-based learning strategy implementation Denmark has gained a unique experience in creating learner-centered, freedom-based, and evidence-oriented teacher training system;
- the definitions of problem-based learning are grounded in different perspectives: as a post-modern type of training; as a principle of learning; as an interactive learning strategy and learning technology;
- in the system of Danish teacher education PBL is introduced as an interactive learning technology with the following characteristic features: independence, inductiveness, practice-based, experience-oriented, collaboration, and participation;
- co-existence of non-authoritarian, democratic methods of PBL training technologies construct an atmosphere where learners can make efficient educational decisions, be responsible for their learning, and be successful;
- PBL as innovative learning technology, combining non-standard and meta-cognitive approaches increase teacher candidates' participation in tertiary education programs and create a better response to the learners' requirements.

We assume that in the process of Danish experience implementation in the Ukrainian educational environment, the outcomes of this particular research may give a clearer insight into the general prospects of problem-based technology promoting into the system of teacher higher education

This research is not exhaustive. The necessity of continuous study is determined by the importance of the discussed problems. The observed decline in the popularity of the teaching profession forces us to formulate the prospects for further comparative investigation in the design of the content and methods for the building motivation of students to apply to various teacher education programs both in Nordic and Ukrainian dimensions.

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