

PROJECT APPROACH TO LEARNING: EXPERIENCE IN DIFFERENT COUNTRIES

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Summary

Different countries in their educational systems have accumulated extensive experience in using project technology in education. This technology is an alternative to traditional lecture teaching: it helps to connect theoretical material with practice in real life; to change the roles of students and teachers: students have the opportunity to become an active subject in the educational process, and teachers are engaged in organizing, managing and directing this process, and not just broadcasting ready-made information.

The purpose of the article is an analytical review of the options for implementing project-based learning for students in Finland, France, Australia, China and the USA described in foreign peer-reviewed journals.

A brief excursion into the history of the origin and development of the project-based learning method is given. The main characteristics of different approaches to its application are highlighted, which differ in the attitudes towards solving certain problems, the choice of goals and means of implementing educational projects.

The article is an attempt to comprehend and generalize the world experience in the application of project technology in education.

The materials of the publication provide an opportunity for managers of the education system of different levels and practicing teachers to get acquainted with the potential and diversity of project-based learning practices in order to adopt the best of them and the most acceptable for Ukrainian realities, adapting them to the conditions of specific educational institutions.

Keywords: project-based learning, project approach, social skills, case study, educational effectiveness.

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1. Introduction

Project technology in education has a long history, which began in France and Italy in the XVI–XVII centuries: it was used by architects and engineers to train their apprentices (Pecore, 2015).

In 1918, the book "The Project Method" by William Kilpatrick was published, the author of which popularized this way of acquiring knowledge and skills in pedagogy. The new method, linking real life and theory, was opposed to classical lecture teaching. The role of students changed: they became more active participants in the educational process and the role of teachers: they had to guide the work of students, not to transmit ready-made information.

For 100 years after the publication of William Kilpatrick's book, a huge experience of using project technology in education has been accumulated.

2. Purpose and objectives

To analyze the practice of project technology in education and the peculiarities of its use in the educational systems of different foreign countries in order to predict the possibility of further development and dissemination in Ukraine.

3. Methods of research

Based on the purpose of our study, we chose the case study methodology as the main tool of work (*Gerring*). In the absence of the possibility of studying all existing practices of using project technology in education in different countries, cases of its use were selected on the principle of maximizing the differences between them. This approach allowed to evaluate and analyze the most complete range of existing options for the implementation of the methodology. The source of information about each case was articles published over the past 20 years in scientific journals (however, it should be noted that preference was given to foreign studies of the last 7 years).

We analyzed papers that meet two criteria:

- the presence in the paper of a detailed description of the experience of using project technology in one of the educational organizations;
- the presence of references to relevant literature on project technology.

Based on scientific publications, we were able to obtain reliable information on the use of project technology in different countries.

Based on the analytical review of scientific sources on project-based learning and social design, we selected some of the most illustrative and different cases describing the implementation of this methodology in France, Australia, Finland, USA and China. In each of the selected cases we tried to find answers to two questions

- who sets the goal of implementing project technology in education (market, state, participants themselves);
- who determines the means that can be used to achieve the selected goals.

4. Results

Some modern researchers question the effectiveness of project technology in teaching, but even they do not deny that it has positive "additional effects" of developing various social competencies in students, including interpersonal skills, time management, conflict resolution and others.

Experience of France. In the French system of higher education, the methodological tools considered by us are called "industrial project method" (*Ginestié, 1997*). Researchers distinguish three stages of its development.

In 1985-1991, a new program was introduced, which provides for the formation of technical specialization classes and retraining of teachers who teach relevant disciplines (*Ginestié, 2002*). It was an important step in the process of modernization of education, but often the practical significance of the educational material was lost when using traditional classroom teaching.

In 1992, by the decision of the Ministry of Education, French schools introduced training based on the "industrial project method" (Ginestié, 2002), the idea of which is close to the one inherent in the project-based learning technology: students were offered tasks to implement educational projects relevant to modern business. However, the future of such training remained unthought: every year students received a new task that almost did not overlap with the previous one.

At the third stage, which began in 1999, the "industrial project method" underwent significant transformations, caused by changes in socio-economic conditions of development. One-year projects were replaced by long-term projects lasting 2-3 years. Their subject and content became obligatory to be connected with the needs of specific companies, and the success of the work began to be evaluated by the degree of formation of additional resource potential for commercialization.

The study by J. Ginesty, conducted in 2002, analyzed the experience of 212 French companies that offered their projects for educational organizations in France. The analysis revealed a certain gap between the so-called desired projects (goals) and real educational projects (results). The reason for the gap, according to J. Ginesti, is that the organization of work in companies (production) is fundamentally different from the organization of the educational process (Mo, Tang, 2017). That is, for more effective technological training of students, further improvement of methodological tools is needed to adapt the practices of commercial enterprises to the educational process.

In general, it can be stated that in France great attention is paid to ensuring the links of project-based learning with practice and market needs. The success of this approach is determined by the extent to which educators and employers are able to translate commercial needs into the format of a training project, and the results of training projects to use in the real activities of enterprises.

Australian experience. The application of project-based learning in some higher education institutions of this country shows an interesting applied specificity of its capabilities. Project technology in education is used here not as a means of achieving any clear goal (creation of a specific product), but as a methodological framework for the introduction of innovative technologies, such as 3D modeling, into the educational process. From the point of view of Australian higher education teachers, on the one hand, such technologies sooner or later become part of educational practice, regardless of the chosen method of implementation. On the other hand, the project technology, which was created without taking into account the emergence of such innovative technologies, is nevertheless a good guide to understanding how best to integrate them into the educational process.

The main difficulty faced by modern engineers in Australia is the problem of managing a team of specialists with different competencies. Scientists from the Royal Melbourne University of Technology believe that these problems can be overcome by creating a V-system of the development cycle of a specific engineering project (Mo, Tang, 2017). The system received this name because all stages of work on an engineering project according to this model are arranged in the form of the letter "V" and are divided into two parts: the left part of the letter-symbol is the sequential phase development of the product, which is planned as the ultimate goal of the project, the right part is its sequential creation. Each stage of creation corresponds to its own stage of development, which are interconnected by planning systems.

The article by T. John Mo and M. Tang describes the practice of using the V-model in teaching students. University teachers began to use this scheme, realizing that it can be quite difficult for students to see the overall picture of the engineering project. The opportunity printers. One of the first experiences with the use of the educational V-model was as follows.

The participants of the training project (students) were divided into 6 groups of 4 people each and performed the same task. The purpose of the training project was to create a robot that could walk a distance of 1 meter, jump on an obstacle, overcome it, jump off and walk at least another meter. Students had not only to come up with a technical solution, but also to implement it using 3D modeling and 3D printer. In the process of completing the task, students proposed several options for achieving the goal and successfully implemented their group projects (*Mo, Tang, 2017*).

Another example of the effectiveness of project technology is a training project implemented in 2011-2013 at the University of Queensland. Students of the 4th year of the Faculty of Cybernetics were divided into groups of 4 people and after a series of lectures were offered to design a ship that can sail through the terrain modeled on a 3D printer, with various obstacles (shoals, reefs, strong winds, etc.). The project was carried out during the semester under the supervision of teachers. The team's score depended on how difficult obstacles their ship could overcome. Game elements and the winning team receiving the award (a gilded idol hidden on one of the islands) did not in any way reduce the seriousness and complexity of the project, the implementation of which required deep knowledge of many disciplines and well-formed social skills from the participants (*Pounds, 2015*).

The practices presented in the Australasian Journal of Engineering Education show how the introduction of new technologies can be combined with project-based learning. The tasks set for the students were in line with the basic principles of this type of training described earlier: the problems were both challenging and possible to overcome; their solution required teamwork; success depended on the involvement of knowledge from different fields.

The above-mentioned projects are designed for well-prepared students who are completing a university degree programme. However, educational project activities can involve not only senior students, but also undergraduate students. For example, at Griffith University, freshmen are offered various project tasks such as designing a racing car, developing graphic models for a website, etc. (*Palmer, 2011*). A survey of participants in such projects shows a significant increase in their motivation to learn in the development of projects and a high degree of satisfaction with their own activities.

Thus, in Australia, within the framework of project-based learning, there is an active development of innovative educational technologies.

Experience of Finland. Based on the positive impact of project-based learning, a number of educational programs in Finnish higher education institutions are designed to develop the skills of teamwork, negotiation, communication skills, leadership, etc. (*Vahtikari, 2012*) - that is, those basic social competencies, without which the vast majority of modern professionals, regardless of employment, can not do.

Thus, the School of Chemical Technology of Aalto University has launched an interdisciplinary course dedicated to the treatment of wooden surfaces. The course, which uses project-based learning methods, brings together students studying under different programs: technologists, engineers and architects. As part of the course, students perform practical tasks to develop engineering and design solutions and create specific products (for example, a wooden light switch). Analyzing the results of the projects completed in recent years, K. Watakari, D. Silvo and M. Kairi concluded that the students who have completed the course have been very positive about the experience they have gained. It is especially important that in the process of practical work, the project participants learned to communicate with each other, distribute responsibilities among themselves and independently overcome difficulties (*Vahtikari, 2012*).

When describing the example, the authors noted the classic difficulties for project-based learning, such as the need to maintain student motivation for a long time (*Hameen-Anttila, 2010*) and the limited competence of teachers (*Vahtikari, 2012*).

Thus, in Finnish educational institutions, project-based learning is aimed at developing general skills and forming meta-subject competencies in students, which contributes to both the acquisition of knowledge within the framework of obtaining a particular education and harmonious social development.

USA experience. In the United States of America, project technology in education has been practiced for decades, and in all the variety of versions described above. In American universities and colleges, with the help of this approach, comprehensive environmental programs are created, social skills of students are developed, innovative technologies are introduced into the educational process, project tools are used both to establish links between the education system and the market, and in teaching foreign languages, etc.

Some American authors even believe that the whole modern world (not only the education system) can be considered as a set of various projects (there is even a special term "project-based world" - the world based on projects) (*Larmer, 2016*). Indeed, a significant part of educational, labor, and even socially significant activities of the US population is carried out in the project mode. Thus, according to some estimates, one third of all able-bodied Americans are currently freelancers or engaged in any project activity. The work of programmers, designers, journalists, scientists, financial analysts, which cannot be unified, is based on projects. In "non-project" areas, on the contrary, the need for labour is increasingly decreasing, as such functions can usually be easily standardized or even outsourced. Against this background, project-based learning is becoming even more relevant and in demand, as it does not imitate real, creative activity, but in fact is it.

Project technology as an effective alternative option for obtaining education is beginning to be widely used in general educational institutions. For example, the article by Y. Cho and S. Brown presents not only the experience of its use in American schools (Columbus Signature Academy), but also makes specific recommendations for the development of the method at this level of education, and emphasizes the need to organize specialized retraining of teachers (*Cho, Brown, 2013*).

If in Europe and the United States the project method has been known for a long time and managed to gain both supporters and opponents among researchers and practitioners (*Morawski, 2017*), in modern China it is only beginning to rapidly gain popularity and is almost unanimously assessed positively by scientists and teachers (*Xu Liu, 2010*).

Judging by the available literature in Chinese schools and higher education institutions, this technique is most widely used in the context of solving two problems: environmental and integration. The first is connected with the need to solve internal state environmental problems caused by the rapid industrial development of the country in recent decades. The second - with the need to teach Chinese students English as a means of international communication in order to more effectively integrate the country's economy into the global market system.

According to the Talore Declaration of Sustainable Development, signed in 1990 by the heads of 500 universities from 50 countries, educational institutions see environmental protection as one of their priorities. Many higher education institutions have begun to include in their educational programs elements aimed at increasing students' environmental responsibility. Chinese higher education institutions have recently embarked on this path, and project-based learning technology has proven to be the most appropriate and suitable for achieving the goals (*Hopwood, Mellor, O'Brien, 2005*).

The concept of sustainable development with its environmental and cultural components proved to be organic for modern China. Such development involves, in particular, the search for options to establish a balance between the interests of man and society, the elimination of distortions and unconditional attention to cultural traditions. In this regard, interesting is the experience of Shenyang University, which has become a platform for a large-scale experiment to create a "green" university. Previously, similar initiatives took place in Sweden, Germany, the Netherlands and Mexico (*Geng, Liu, 2013*).

The idea of a "green" university is to organize an educational institution that demonstrates a high degree of environmental friendliness at all levels of its activities. Thanks to the application of project technology at Shenyang University, it was possible to harmoniously combine the assimilation of the content of the main educational programs by students with the solution of urgent problems of the city in which the higher education institution is located and the country as a whole.

One of the publications of the Journal of Biological Education gives an interesting example of involving students in the life of the local population of Guangzhou (*Cheung, Chow, 2011*). In 2008, as part of a training project, 20 students were given the task of studying local turtle markets. This allowed the students not only to develop research skills that they could not get during lectures and seminars, but also to feel in a sense as pioneers, as it turned out that earlier the trade in live turtles as an independent cultural phenomenon did not fall into the field of view of scientists. In addition, the author of the publication S. Cheung emphasizes that participation in the project had a positive impact on the value orientations of students, on the development and consolidation of such qualities as respect for other people and traditions, responsibility, personal identification of themselves in society.

The same results are noted in the application of the project method in teaching Chinese students English. Training specialists with knowledge of English (and other foreign languages) is one of the key tasks for modern higher education in China. For a country that seeks to strengthen its leadership position in a globalizing world and to consolidate the success of the processes of integration of the national economy into the world economy. Project technology in this case can be combined with a problem-oriented approach. Thus, teaching business English often takes place in the format of discussing individual problem situations.

The analytical review of available scientific sources describing the implementation of the project method in the Chinese education system allows us to conclude that there is an obvious difference between Chinese practice and the experience of other countries. In China, the described technology is at the peak of popularity and is regarded as the most productive. At the same time, very few publications by Chinese authors were found that cover objective measurements of the degree of effectiveness of the relevant techniques. Probably, in China, unlike the United States and Europe, this kind of research has hardly been conducted.

In general, based on the results of our scientific analysis of publications on the use of project technology in education, we can state that this approach is actively used in various educational organizations around the world. The advantages of project technology are

- the ability for the student to repeatedly process educational information at a pace and at a convenient time;
- the presence of a sufficiently stable "value core";
- contextuality;
- collectivity of learning;
- problem orientation;
- interdisciplinarity;
- learning through practice.

The listed values are almost unchanged in all the examples given in the article.

The introduction of project technology into the practice of education is dictated by the needs of society and the challenges of the time, which nevertheless may vary in different countries depending on the peculiarities of the existing internal economic, political, social and other realities, and even the mentality of the population. For example, in Australia, such challenges include the rapid development of high technology, which actively penetrates into education, and in China – environmental problems that have become more acute in China due to industrial growth.

Options for specifying project technology in education and its target orientation in different countries are summarized in the table below.

Table 1

Focus of project technology in education in foreign countries

Country	Orientation of project technology	Setting goals/problems problems	Selection of means/tools
France	Market interests	Determined by market needs	Driven by the objectives
Australia	Professional skills	Driven by new learning tools	Technology/market related
Finland	Social skills	Free choice	
USA	Educational efficiency	Produced based on the analysis of the experience of previous projects	
China	Social effectiveness	Determined by interests держави	Driven by the objectives

5. Conclusions

Thus, the experience of different countries shows that the request for the formation of meta-subject competencies: teamwork, leadership, communication competencies, etc. can be satisfied with the help of project technology in the organization of educational and educational activities at all levels of education (*Burnik, 2017; Pecore, 2015*). A holistic view of the application of educational design in modern socio-cultural reality allows us to talk about it as a special personality-oriented educational technology that is developing.

The available variants of project technology do not contradict each other and can potentially be combined in different combinations, but they will be conditioned by different attitudes to the choice of the problem posed to students and the means available to them to solve it. If we consider project technology in education as a way to improve basic social skills (e.g., communication, time management, etc.), then neither the choice of goals nor the choice of means of implementation is important: the project will work for the result by itself, and to increase the motivation of its participants, the choice can be given to them. In case the project is oriented to the market needs, simultaneously with the specific goal and the proposed means of its achievement, various additional conditions are formed (relevance to the needs of the company, the possibility of commercialization, etc.) If the basis is professional skills, it is necessary to focus on the vital means of achieving goals - the tools with which professionals work. They will determine the tasks that the vessels must cope with (for example, the development of robots). When the main result is social efficiency (for example, solving environmental problems), the goal is known in advance, and it also determines the range of

possibilities available to the vessels. Finally, the focus on educational effectiveness implies the organization of project-oriented learning in such a way that its results are measurable and allow to adjust the methodology at the next stages.

It should be recognized that the modern world is actually becoming one big laboratory in which, in particular, different versions of project-based learning are being experimentally created. Nevertheless, the statement that in the modern developed society "everything is based on projects" (Morawski, 2017), which appeals to the widespread use of project technology in education and work, in our opinion, is an excessive opportunistic generalization and unacceptable simplification.

The publications analyzed above practically do not pay attention to the shortcomings of project-based education. However, there are works that show its weaknesses. The effective implementation of the method can be hindered by the following mistakes, which are not so rare: the use of materials that are not suitable for project activities and are not related to it; insufficient qualification of teachers for the full organization of project work; non-systematic, fragmentary project activities or, conversely, training based solely on this approach, regardless of the goals and specifics of the educational work performed, the conditions of its implementation and the actual needs of the students.

Further discussion requires the problems of the appropriate scope of project technology use in educational institutions of different levels; balance in the educational process of using this method and other means and forms of learning; priority in the ratio of context and interdisciplinary project work, etc.

Various practices of project-based learning described in this article can become a reference point for Ukrainian educational organizations of different levels. Continuation of our research will be associated with identifying a range of approaches to the implementation of project technology in the national education system, as well as identifying practical problems and ways to solve them.

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