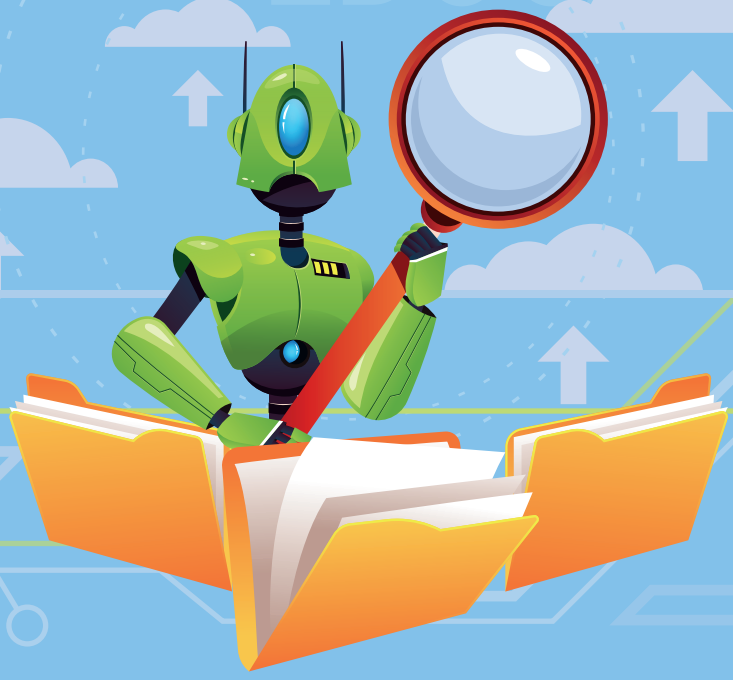
PROBLEMS AND PERSPECTIVES OF CONTEMPORARY EDUCATION



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PROJECT-BASED LEARNING: CHALLENGES AND IMPLEMENTATION SUPPORT[1]

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INTRODUCTION

The popularity of the project method was especially enhanced by the interest of progressive educators and practitioners in changes in education that were conditioned by social, economic, and political developments in the United States during the first decades of the twentieth century[2]. Under the strong influence of the philosophical understanding of Ch. S. Peirce, progressive theories of J. Dewey, and the psychology of learning of E. L. Thorndike, W. Kilpatrick advocated the implementation of the project method in education. This method was created to enrich traditional teaching as well as to increase students' engagement in teaching through research activities (Prtljaga, 2017). The project method encourages autonomy, initiative, and cooperation of students, regardless of whether the method is aimed at creating products, solving practical issues, overcoming problems in the local/wider environment, or scientific research activities in teaching. Through projects, students independently or in cooperation with others acquire knowledge from various sources, solve open and practical tasks, develop research skills,

1 This research was funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia (Contract No. 451-03-9/2021-14/200018).

2 It is interesting that the essay by B. Kilpatrick on the project method sold 65,000 copies in the early twentieth century (Knoll, 2012).

and practice higher levels of reasoning (Kilpatrick, 1918). The project method is characterized by reflective thinking, based on the scientific method of defining, analysing, and solving problems (Dewey, 1910).

Project-based learning is becoming relevant again in European schools under the influence of the constructivist paradigm of education (Matijević, 2008/9). Project-based learning is placed within the real context of the school, family, and local community. It takes place through different research practices, individually or in smaller or larger groups. The project approach integrates different learning strategies, such as learning through investigation, learning through play, learning based on imagination, learning through problem solving, experiential learning, and situational learning (Krnjaja & Pavlović Breneselović, 2017). Students create research questions and work on cognitively demanding tasks i.e., solve open problem-based tasks that cause cognitive conflict (Kolodner *et al*., 2003; Meyer, 2002). Taking responsibility for one's own learning is encouraged while simultaneously fostering students' autonomy. Thus, project-based learning contributes to the development of motivation, autonomy, as well as research, creative, and constructive abilities of students in relation to traditional teaching (Gojkov & Stojanović, 2011; Ivić, Antić, & Pešikan, 2011; Prtljaga, 2017; Prtljaga, Stojanović, & Blagdanić, 2018; Vilotijević & Vilotijević, 2010).

In this paper, we will first try to point out the characteristics of three similar approaches to learning. Then, we will present initiatives for the preparation and implementation of project-based learning in the Serbian education system. We will look at systemic training and manuals that have been created as forms of support for teachers and school counsellors in the implementation of project-based learning in our country. Finally, we will point out certain challenges and difficulties in the process of implementing project-based learning, as well as ways in such difficulties can be prevented.

CHARACTERISTICS OF THREE SIMILAR LEARNING APPROACHES

There is no consensus among authors on the terminology and meaning of learning based on projects. Different names are used, such as project-oriented teaching/ project-based approach to teaching, project-based teaching model, project-based

learning, project method, inquire teaching, problem-based learning. Common to all definitions is that they emphasise the concept of learning in which students are autonomous, encouraged in active learning through thinking and reasoning, problem solving, and the emphasis is on developing research, creative and constructive abilities (Prtljaga, 2017). In the pedagogical literature and empirical studies, we have encountered three similar approaches to learning: 1) Inquire-Based Learning/Inquire-Based Scientific Education (IBL/IBSE); 2) Problem-Based Learning (PBL); 3) Project-Based Learning (PjBL).

INQUIRE-BASED LEARNING/INQUIRE-BASED SCIENTIFIC EDUCATION (IBL/IBSE)

This form of learning is often applied in the natural sciences. It is most similar to the scientific method, i.e., the process of preparing and conducting scientific research, but in the context of the classroom and school. It requires research practices, such as generating research questions, formulating scientific explanations, and drawing conclusions. In a learning model based on research, the role of the teacher is to guide students through the whole process and to give instructions. The teacher can organise the research in accordance with the different degree of autonomy expected from the students in that process. Thus, we can talk about: 1) highly structured research, a pre-defined question and a research procedure designed by the teacher; 2) guided research in which a research question is asked, where students independently find the answer to it; and 3) open research in which students independently formulate research questions and research procedure. Students in the role of researchers learn the contents covered by the research and gain knowledge and experience about the research process itself (how to ask a research question, how to handle data, etc.). Starting from familiar content, through data collection, analysis and interpretation of evidence, students develop scientific ideas while explaining new events and phenomena. It is a complex process that includes a nonlinear set of stages and is similar to the way scientists realise their work (Jokić, 2011; Harlen, 2011).

Empirical studies on inquiry-based learning have been conducted at different ages of students – at primary school level (e.g., Houle & Barnett, 2008), at secondary level (Taraban, Box, Myers, Pollard, & Bowen, 2007) and at university level (Casotti, Rieser-Danner, & Knabb, 2008). Also, the effects of inquiry-based

learning on outcomes achieved by students in different areas were studied, such as physics (e.g., Wolf & Fraser, 2008) and chemistry (e.g., Lewis & Lewis, 2008), cognitive domains such as knowledge application and reasoning (e.g., Houle & Barnett, 2008) and finally in the domain of developing scientific research competencies (Pine et al., 2006). One group of studies indicates that this type of learning especially contributes to advancing knowledge, development of research abilities and skills, while other studies did not find significant differences in the outcome measures they studied. However, there is no doubt that this process of learning contributes to the development of scientific literacy and positive attitudes of children and young people towards science (Jokić, 2011; Harlen, 2011).

PROBLEM-BASED LEARNING (PBL)

The purpose of this approach is that students learn through analysis and solving a specific problem that is chosen from everyday life and which can have several different solutions. A defined problem in the learning process simultaneously serves as an incentive to seek the information or knowledge needed to discover an adequate solution and understand the mechanisms responsible for the problem (Gijbels et al., 2005). The problem is approached thematically, so that students can integrate information from several different disciplines and thus gain a deeper understanding of the problem as well as find a fundamental solution (Savery, 2006). Learning is initiated when the problem from real life experience is set in a semi-structured way. This means that: 1) the problem is defined and described through the form of narrative, 2) the context of the problem is given, 3) a learning situation is created in which students do not have all the necessary information to solve the problem, 4) the problem develops further as information is collected, 5) there is not one “right” way to solve the problem, 6) students identify issues relevant to the defined problem, and 7) students develop a research blueprint on how to arrive at an appropriate solution (Chin & Chia, 2004). The students then in a group analyse, synthesize, and evaluate the sustainability of the solution. Thus, before any preparation, the students pose a problem that serves them as a tool for acquiring the necessary knowledge and skills. In the learning process students make decisions, while the teacher as a facilitator and mentor leads them to think about the problem and possible solutions through the questions and challenges. Learning takes place in small groups under the guidance of a mentor, but the

emphasis is on students' responsibility for their own learning outcomes (Barrows, 1996, 2002).

The results of meta-analysis showed that the PBL approach had a positive impact on student achievement in mathematics and science in the higher grades of primary schools (Jensen, 2015). Other studies examining the effects of PBL on student achievement have shown that this approach had an impact on improving students' problem-solving abilities (Moallem, 2019). However, when it comes to declarative knowledge and results on achievement tests, there were no effects. There is great variability between studies that advocate the application of PBL approach and those that oppose its application in relation to traditional ways of teaching, which may be partly due to different definitions of this approach, the way the learning process is performed, students' age, and their previous knowledge (Dochy, Segers, Van den Bossche, & Gijbels, 2003).

PROJECT-BASED LEARNING (PjBL)

According to some authors, project-based learning is an improved version of Kilpatrick's understanding of the project method (Pecore, 2015). It is a form of situational learning in which students actively construct knowledge that they are personally interested in and/or that the community benefits from, but through a research process (Krajcik & Blumenfeld, 2006). In project-based learning, the research question/task/focus has a very important role. The students project is carried out under the guidance of a teacher and the topics in the project have a life-practical character (Pecore, 2015; Thomas, 2000). Students choose a topic and activities, but the teacher determines the degree of autonomy of students in such projects (Moust, Van Berkel, & Schmidt, 2005). Respecting and encouraging teacher and student autonomy in projects helps students build a sense of ownership, control over their own learning, and to develop perseverance in this endeavour (Mergendoller & Thomas, 2005; Lam, Cheng, & Choy, 2010). In this approach, the purpose is that students design their own research project based on a real research question. The goal of such projects is to make a specific product, while the product development process can vary, i.e., be performed in different ways (Loyens & Rikers, 2011). The product can be a thesis, video animation, presentation, report, or artistic performance. Students can work individually or in a

group. The role of teachers in project-based learning is to facilitate, assist, advise, guide, monitor, and mentor students throughout the process.

Research findings have shown that project-based learning in primary school had positive effects on the quality of student knowledge, motivation, group work skills and peer relationships (Blumenfeld et al., 1991; Kaldi, Filippatou & Govaris, 2011; Karaçalli & Korur, 2014; Loyens & Rikers, 2011; Mioduser & Betzer, 2007). Other authors report on the positive impact of project-based learning on student engagement in class, as well as on the development of critical thinking skills (Geier et al., 2008; Hernandez-Ramos & De La Paz, 2009).

Different approaches have essentially similar key characteristics, such as the nature and organisation of the learning process or the position and role of students and teachers in the process. Basically, all three approaches in learning are based on constructivist theories of learning, because they take into account the prior knowledge and experience of students, emphasising the importance of self-regulated processes in learning, establishing learning through interaction, solving tasks of higher cognitive order, as well as individual or group research questions (Loyens & Rikers, 2011). Some authors even argue that problem-based learning and project-based learning are in fact variations of inquiry-based learning (Buchanan, Harlan, Bruce, & Edwards, 2016). During the organisation of the teaching process, it is possible to combine all three described approaches (Kwan, 2008; Matijević, 2008/9). The choice of approach depends on the level of ability, maturity and age of students, their motivation to learn, the nature of the subject, curriculum goals and outcomes to be achieved, available resources, knowledge and skills of teachers, their motivation for work, and willingness to improve their practice.

INITIATIVES IN THE IMPLEMENTATION OF PROJECT-BASED LEARNING IN THE EDUCATION SYSTEM OF SERBIA

Before the systematic introduction of project-based learning in Serbian schools, the idea of implementing the project method in educational practice again became topical in the scientific community. On the one hand, some empirical studies show the positive effects of project method on the better quality of knowledge of

students in lower grades of primary school (Prtljaga & Veselinov, 2017; Ristanović, 2015). On the other hand, a comprehensive pedagogical approach to educational practice was developed, called *Trefoil*, in which student projects were one of the modalities for encouraging the development of initiative, cooperation, and creativity of students (Đerić, 2015; Šefer, 2018). In this approach, projects were organised through individual and/or joint activity, in accordance with the teaching content, practical life topics, and interests of students. The goal of these activities was to deepen students' knowledge, build their research skills, encourage cooperative relationships with others, develop higher thought processes, and gain authentic experiences. The project approach within the pedagogical paradigm *Trefoil* was designed so that at the conceptual level, as well as at the level of implementation, it was closest to the key elements of project-based learning.

Project-based learning was implemented in the educational system of Serbia in the 2018/2019 school year. It was introduced in the first cycle of education as a mandatory form of teaching, implemented once a week, i.e., through 36 classes a year. In educational documents, project-based learning is defined as a form of teaching practice that develops cross-curricular competences with the use of information and communication technologies (*Rulebook of the curriculum for the first cycle of primary education and the curriculum for the first grade of primary education*, 2017). To support the implementation of project-based learning in Serbian schools, the following were developed: 1) in-service training of teachers and school counsellors and 2) manuals with other supportive materials.

IN-SERVICE TRAINING OF TEACHERS AND SCHOOL COUNSELLORS

The Institute for Improvement of Education, in cooperation with the Teacher Education Faculty of the University of Belgrade, prepared educators for training teachers and school counsellors who would organise the work in accordance with the new teaching and learning programmes focused on outcomes. Part of that training was dedicated to project-based learning issues. According to the available data from the Institute for Improvement of Education, during 2018, 2019, and 2020, about 55,000 teachers, subject teachers, and school counsellors attended the above-mentioned training. In addition, during 2020, online training was organised for another 420 teachers. The training for implementation of

project-based learning consisted of several segments. At the beginning, through an introductory lecture, participants were introduced to the basic characteristics, advantages, and limitations of project-based learning. Then, the participants were divided into groups in which they chose some of the outcomes set in the Curriculum, and for the selected outcome they designed the topic, goal, questions, tasks, evaluation methods and monitoring student progress in the context of project-based learning. In addition, the practitioners were given homework to design a project that they planned to put into practice, with the help of training materials and a recommended manual for project based-learning from one of the publishers. Educators' feedback on project quality was provided as part of the training.

A discussion has developed in the professional public about whether this way of organising in-service training has achieved the desired effects. Although in-service training is a prerequisite for innovating educational practice, the question is whether cascading and short-term training is sufficient to introduce teachers to the many challenges of project-based learning. It should be remembered that reform initiatives may look attractive when prescribed, but that they take time to come to life in practice, which is a process that can take several years (Stanković, 2011; Teodorović & Stanković, 2012). Also, it is not enough for school staff to develop and improve their professional competencies for successful implementation of innovations, but there should also be continuous communication and systemic support in the implementation of educational changes (Vujačić et al., 2011; Đerić & Vujačić, 2012).

MANUALS WITH OTHER SUPPORTIVE MATERIALS

Support for the introduction of project-based learning was provided by publishers through several manuals and materials. A study revealed that these manuals rarely showed examples of research projects, which is unusual given that the development of critical and logical thinking in the focus of project-based learning (Ševa & Đerić, 2019). Also, it was noticed that topics and goals of the project were not problematized to a sufficient extent, and that students' activities that involve the synthesis of their experiences and knowledge about the topic and products of the project were rarely foreseen. Based on the above, it can be said that the contents of the manuals do not adequately respond to some of the objectives of project-based

learning that are stated in educational documents, such as developing knowledge through planning, research, and teamwork within the subject and cross-curricular contents (*Rulebook of the curriculum for the first cycle of primary education and the curriculum for the first grade of primary education*, 2017).

Two years after the introduction of project-based learning in Serbian schools, the Ministry of Education decided on its abolition as a mandatory form of teaching and learning in the first cycle of education. From the school year 2020/21, instead of project-based learning in the first grade of primary school, the obligatory use of digital technologies was introduced through the subject *Digital World*. The new subject is planned to be implemented in the same number of classes previously planned for project-based learning. However, teachers who have already started implementing the project-based learning, i.e., who in the 2020/21 school year are teaching second and third grade students, will continue to apply the project-based learning to the end of the first cycle of education of these students. This decision will prevent the process of continuously monitoring the implementation of project-based learning for a longer period, as well as provide insights into the effects of its implementation on learning outcomes. However, an official decision does not necessarily mean the exclusion of project-based learning in practice, just as it does not mean that project-based learning was not present in the school before its official introduction. Thus, for example, the study of Prtljaga and Veselinov, which was published in 2017, indicated the positive effects of the project method on the quality of knowledge of fourth grade students in the subject *Nature and Society*. More precisely, it was determined that a group of students who learned the topic using the project method, compared to students who processed the same content in the usual way, achieved better results in the final test that measured different levels of knowledge – from reproduction to applying. Similar conclusions were reached by Ristanović, who conducted a study in two schools in 2012, with the aim of "determining the impact of the project model of improving learning outcomes in the subject *Nature and society*, in relation to the traditional teaching model" (Ristanović, 2015: 111). This experimental study confirmed that there is a statistically significant difference in student achievement in the final test of procedural knowledge between the two groups of students, as well as positively influencing cooperation among students in groups.

Following the above considerations, we believe that teachers who have grasped the potential of project-based learning will continue to use this model

when the conditions in school allow it. To make it easier for them, we will point out certain difficulties in the process of preparation and implementation of project-based learning, as well as possible ways to prevent the occurrence of these difficulties. We will be guided by professional and practical experiences gained during the implementation of the *Trefoil* project, as well as the experiences of other authors that are recognized in pedagogical literature and research, providing useful tools in the implementation of project-based learning.

DIFFICULTIES IN THE PREPARATION AND IMPLEMENTATION OF PROJECT-BASED LEARNING, AND THEIR PREVENTION

The novelties that are introduced may be accompanied by dilemmas and challenges during their implementation. It is often pointed out that in addition to investing intellectual resources, time, and energy, the emotional component of reform initiatives is neglected, which contributes to teachers feeling resistant, hopeless, guilty, and overwhelmed (Hargreaves, 2005). Some studies show that during professional development on project-based learning, teachers experienced a "high cognitive load" and insecurity, and researchers found that this in turn led to the development of superficial student projects (Rosenfeld *et al*., 1998, according to: Thomas, 2000).

Various studies that have followed the process of implementing projects in practice have shown that teachers face several difficulties. Some authors point out that teachers do not have sufficiently developed skills needed to prepare and carry out projects in practice (Tamim & Grant, 2013). The results of a case study showed that reform efforts related to project-based learning were opposed because they were not in line with the philosophies, practices, and experiences of teachers, which led to numerous difficulties in implementing this change in practice (Ladewski, Krajcik, & Harvey, 1994). According to some authors, it is not necessary to change teachers' pedagogical beliefs about project-based learning during reform initiatives, but it is important to focus on their strengths and inclinations in order to transform learning practices during project implementation (Clark, 2006). Nevertheless, this assumption can be called into question if the philosophical, epistemological, and educational paradigm that underlies a particular innovation

differs substantially from practice, as well as from the explicit and implicit beliefs of practitioners.

Based on a review of the studies, we single out the difficulties that teachers most often face during the implementation of project-based learning (Blumenfeld et al., 1991; Harris, 2014; Knoll, 2014; Marx et al., 1994; Pecore, 2012; Thomas, 2000):

- declining teacher motivation during project preparation and implementation (e.g., due to the complexity of project tasks),
- difficulties in choosing the methodology in projects (e.g., proposing research ideas, defining research questions, and designing the nature/type and course of projects),
- inadequate measures to monitor progress with undeveloped assessment tools, both in the process of project preparation and execution, and in students' results,
- unclear and insufficient feedback for students during projects
- insufficiently developed time management skills during project preparation and implementation,
- lack of support from school colleagues and/or from system level.

In addition to these difficulties, which are in the domain of teacher's work, the unwillingness of students to independent, creative, and innovative learning in continuity can be an aggravating factor in project preparation and implementation. Students enjoy the freedom of action offered by projects, but may use negotiation and avoidance strategies to reduce the extra time or energy required to invest in preparation and realization of projects (Knoll, 2014).

A significant difficulty in the preparation and implementation of project-based learning is the inadequate application of information and communication technologies (ICT). For example, in some Serbians schools with computer classrooms, access for use by teachers and students is restricted. In addition, a significant obstacle in the use of new technologies is the insufficient digital competences of teachers. Most often, the use of ICT is based on making presentations and posters, as the crown of project-based learning. Effective use of ICT requires that this technology be used as a cognitive tool, not just as an instructional tool (Marx et al., 1994). Thus, teachers and students should be given better access to ICT and, if necessary, teachers prepared for its application in project-based learning. It should be taken into account that the use of ICT in the

implementation of project-based learning allows students: 1) access to collect a variety of scientific data and information; 2) the use of tools to visualize and analyse data similar to those used by scientists; 3) cooperation and information sharing on websites; 4) planning, building, and testing models; and 5) developing multimedia documents that illustrate a scientific understanding of the concepts and phenomena being explored in projects (Novak & Krajcik, 2004).

In the following text, suggestions on how to prevent difficulties in the implementation of project-based learning are highlighted. Although there are several ways in which difficulties can be prevented, we have chosen to focus on providing professional support to teachers through: a) the process of facilitating their work, b) learning about the importance and ways of formative evaluation and monitoring in projects; c) techniques/methods for the conceptualization of research questions.

FACILITATION OF TEACHERS' WORK DURING THE INTRODUCTION AND IMPLEMENTATION OF PROJECT-BASED LEARNING

In the face of individuals or groups with increasingly complex requirements in the field of education, facilitation is perceived as an important and indispensable link (Stojnov, 2018). Facilitation has been shown to be one of the key elements of teacher support for the introduction, implementation, and maintenance of innovations in educational practice (Đerić, Malinić, & Šefer, 2017; Malinić, Đerić, & Šefer, 2018; Džinović & Đerić, 2012; Džinović, 2016). The role of the facilitator is to guide, direct, and provide professional assistance to individuals, teams, and organisations during the short-term and long-term introduction of educational changes in practice (Harvey *et al*., 2002). The facilitator encourages teachers to produce, apply, and revise professional knowledge and skills, inspires them to change, and helps them overcome the dilemmas and difficulties they face during innovation of practice (Avalos, 2011; Darling-Hammond & McLaughlin, 1995; Jenlink & Kinnucan-Welsch, 2001; Le Fevre & Richardson, 2002; Molle, 2013; Wei et al., 2009).

Šefer and colleagues (Šefer, Stanković, Đerić, & Džinović, 2015) described a facilitation process based on the experience gained with the *Trefoil* pedagogical approach. Basically, the process of facilitation was focused on: "a) encouraging

teachers to reflexively rethink the beliefs that led to the failure to innovate, b) encouraging group support by providing affirmative messages and encouraging persistence in the implementation of the novelty, c) strengthening positive experiences by focusing on those aspects of the class in which the teacher was successful, d) encouraging exploration for creative solutions to problems by looking at several different perspectives in the group and e) referring to relevant literature" (Džinović, 2017: 48).

Data collected during the implementation of the *Trefoil* approach showed that researchers as facilitators helped teachers to overcome negative beliefs and anxiety when introducing innovations in practice (Đević & Vujačić, 2020; Džinović, 2017; Šefer, 2018). Also, it was found that facilitation activities had positive effects on teacher motivation to apply innovative teaching methods that encourage initiative, cooperation, and creativity of students (Malinić, Đerić, & Šefer, 2018; Đević & Vujačić, 2020).

To summarise: facilitation could be useful to support teachers in facing the challenges that the process of designing and implementing project-based learning brings with it. The facilitator, as a "critical friend" (Ponte, Ax, Beijaard, & Wubbels, 2004), can encourage the activities of a professional learning of teacher, through cooperation and dialogue, during the whole process of introduction and implementation of innovations (Borko, 2004; Putnam & Borko, 2000). Therefore, educational decision-makers should systematically provide this type of professional support to teachers when implementing innovations in practice, especially when it comes to complex innovations or the introduction of multiple innovations at the same time.

FORMATIVE EVALUATION AND MONITORING IN PROJECT-BASED LEARNING

Formative evaluation is one of the main principles on which project-based learning should be based (Barron et al., 1998; Barron & Darling-Hammond, 2008; English & Kitsantas, 2013). This form of monitoring and evaluating students is not a one-time event, nor an individual technique used in teaching from time to time, but involves the continuous and regular process of monitoring and evaluating students' progress, intending that the student understands: 1) goals and learning outcomes (what s/he needs to know and be able to do); 2) criteria on the basis of which her/his progress is evaluated (on the basis of a joint agreement with

the teacher); 3) their actual level of knowledge and skills; and 4) zone of proximal development (in which direction it should progress). Thus, this type of evaluation provides students with feedback on what they currently know and where they are in relation to the defined learning objectives, as well as on what they can do to improve their knowledge and skills and to learn more effectively (Black & Wiliam, 2010). Monitoring in project-based learning can include various techniques of (self) reflection, self-evaluation, and peer evaluation, as this ensures that both teachers and students monitor and record the process and find evidence of their learning progress (Kokotsaki, Menzies, & Wiggins, 2016; Krajcik & Blumenfeld, 2006). The absence of monitoring in projects is considered to be a missed learning opportunity.

It has been found that most teachers do not include formative assessment techniques during project-based learning, and those who do, do so *ad hoc* (Barron et al., 1998; Barron & Darling-Hammond, 2008). Teachers in large classes often do not have enough time during the day or week to give quality and comprehensive feedback to students (Krajcik & Blumenfeld, 2006). In addition, many teachers lack knowledge on how to give quality feedback to students. For this reason, teachers should be trained to apply various formative monitoring and evaluation techniques during project implementation, such as, the *Peer Evaluation Aquarium* technique; the *I know, I want to know, learn by yourself* technique; *Summarising* technique; *Think, exchange, match* technique; *Test analysis* technique. It is also important that teachers are aware that formative evaluation can significantly help them in the process of summative assessment and contribute to the objectivity of assessment.

TECHNIQUES/METHODS FOR CONCEPTUALIZATION OF RESEARCH QUESTIONS

One of the difficulties faced by teachers during the implementation of project-based learning is the creation of a research question (Almeida, 2012; Blumenfeld *et al*., 1991; Jokić, 2011 Krajcik, Czerniak, & Berger, 2002). If we want projects in schools to be based on adequate research questions, it is necessary that everyone knows what they represent, how they are formulated, and how they further lead the project research process. Primarily, research questions require an understanding of the relationship between two phenomena (causal-consequential,

comparing phenomena – determining similarities and differences). They should enable students to articulate a current understanding of the topic, to connect with other ideas, to think critically, as well as to solve given problems more successfully (Chin, 2002; Chin & Chia, 2004). Moreover, research questions have the potential to help students in the process of self-assessment and peer assessment of knowledge, so that through questions they become aware of what they know or do not know (Chin & Osborne, 2008). One study found that students in groups produce a significantly higher number of research questions after being shown an example than they do at individual level (Chin & Kayalvizhi, 2002).

There are various methodological techniques for asking questions (Chin, 2004; Rothstein, Santana, & Minigan, 2015). These techniques help teachers to teach students to formulate research questions. For example, a questioning technique involves the teacher devising and presenting a provocation in the form of a picture, word, statement, or mathematical expression. Students are required to produce as many closed and open questions as possible based on the given stimulus. Then the students in the group jointly analyse the questions they created (how many open or closed questions they have, group the questions, revise the questions), and choose the priority questions according to the criteria determined by the teacher. A criterion might be the degree of priority of a question or the degree to which a questions will help students to understand, learn, and research. Finally, students argue the reasons why these questions were chosen, with reflections on what they learned during the question-making process (Rothstein & Santana, 2011).

The ability to create and assign open tasks of an unstructured type is closely related to the ability to ask questions, which is increasingly insisted on in project-based learning. These are tasks that provide the opportunity to solve them in different ways and that offer different solutions or require the design of a new approach in the process of reaching a new solution (Šefer, 2018). Tasks vary according to the degree of openness in the domain of intellectual abilities, so the most open task requires the engagement of the highest thought processes. When solving a completely open task, the student, as a scientist or artist in the creative process, starts by asking and preparing a problem/research question, followed by problem analysis, how to deal with not finding a solution, followed by the sudden discovery of a solution (Šefer, 2018). This change of divergent and convergent thinking occurs during the solution of open tasks and in projects, i.e., these types

of thinking intertwine and alternate. That is why it is important that during various activities and tasks in projects, students are in a situation to create open-ended research questions/problems as often as possible. Developing students' skills to create research questions should continue to be part of the systematic in-service training for teachers during initial phase of implementation of innovation or through the facilitation during teachers' professional learning.

CONCLUSION

Successful implementation of project-based learning requires longer and more comprehensive professional learning activities, continuous professional support in the classroom, and horizontal learning (Krajicik et al., 1994). The process of implementation also involves professional support regarding ways to define research questions, develop project work methodologies, ways of formative evaluation and monitoring in projects, and creating challenging tasks and activities for students (Thomas, 2000). It would be desirable to envisage activities during the implementation of project-based learning that would enable monitoring of challenges, obstacles, and difficulties during this educational change at system, teacher, and student levels. Finally, when introducing innovations in teaching, it is necessary to pay attention to the attitude of teachers towards novelties, their motivation to accept and sustain changes in practice, as well as reducing their resistance (Fullan, 2007; Hargreaves, 2005). Implementing project-based learning is obviously a complex and challenging task for the education system, teachers, and students, which requires additional professional, emotional, and organisational support.

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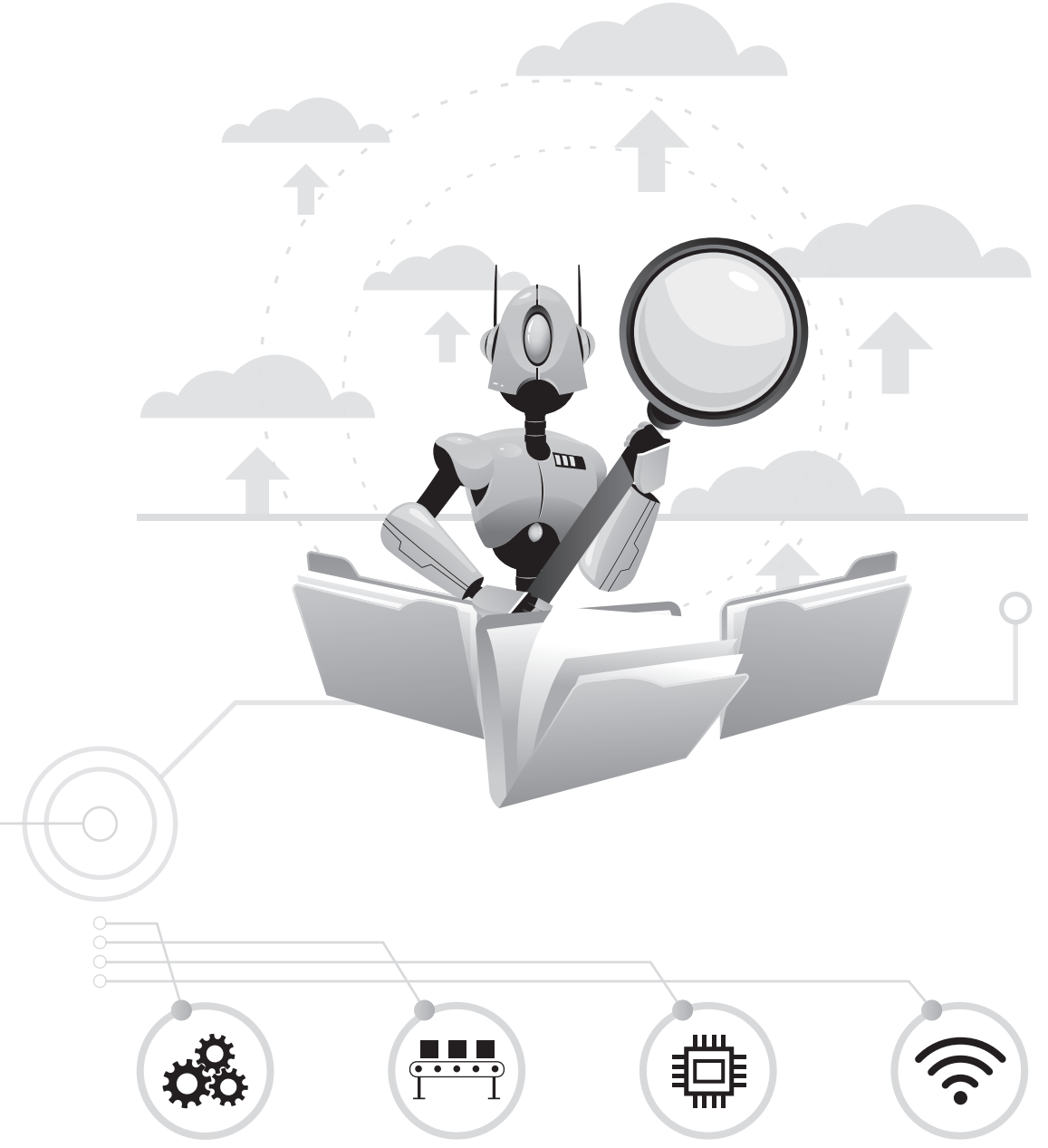

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FROM REVIEWS

Main aim of the monograph titled *Problems and perspectives of contemporary education*, is to thorough explore, critically analyze and elaborate complex, dynamic, multilayers and reciprocal relationship between significant changes in educational social environment and readiness, of educational system to anticipate, recognize, understand and adequately respond to those challenges. All contributing authors enthusiastically embraced the notion that education presents an important and proactive agent of social changes and consequently accepted all challenges as an opportunity for improvement and development of both society and educational system.

Professor Emeritus Djuradj Stakic
Pennsylvania State University, USA

The monograph is dedicated to looking into extremely significant and current concerns within educational policy and educational practice. The selected topic is viewed from the perspectives of contemporary theoretical approaches, but it is also empirically researched. A very large and relevant literature was used both for explaining the selected research subject and discussing the obtained results. A diverse, contemporary methodology was applied in researches, and the authors of works, starting from the existing results, analysed issues at a deeper level and illuminated some aspects that had not been studied thus far.

Professor Marina Mikhailovna Mishina
Russian State University for the Humanities, Russia

The main topics covered by the monograph can be classified as traditional to some extent — related to approaches to learning, language culture etc., and modern — connected with the andragogical view, coaching in teacher training, also the problem of distance learning during the covid pandemic, and models for preventing problem behaviors…The main leitmotif that permeates the content of all presented articles is the topic of the development of key skills, attitudes, experience, creativity — by both subjects in the educational process, and it gives semantic integrity to the monograph.… In view of the new social realities, a reasonable emphasis is placed on the continuing education and development of the teachers themselves, dictated by the accelerated pace of social change.

Professor Teodora Stoytcheva Stoeva
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