

Biljana Stojanović, Dušan Ristanović and Predrag Živković
University of Kragujevac, Faculty of Education
Jagodina, Serbia

UDC 371.314.6
37.026

APPLICATION OF PROJECT MODEL OF TEACHING IN INITIAL TEACHER EDUCATION – STUDENTS’ OPINIONS

Abstract: The application of the project model of teaching in today’s education system becomes imperative, and it is necessary to implement it in the initial education of future teachers. In addition to the benefits, project teaching poses numerous challenges to teachers and schools. Accordingly, the aim of this research is to examine the attitudes of students of the Faculty of Education, about the application of project teaching and the advantages and disadvantages of this model. The research was carried out at the Faculty of Education, on a sample of 72 students of the second year at the department Teacher. The questionnaire, which was made for the purposes of this research, was applied. The questionnaire contained questions of open type and questions in the form of an assessment scale. The obtained results have shown that students-future teachers are aware of the benefits of project teaching and especially emphasize the contribution to the improvement of students’ social skills. As key problems in the implementation of project teaching, the interviewed students stated that: it requires a lot of time, it is necessary to align the project teaching with the curriculum and train the teachers for the use of this model. The results of this study point to the need for adequate training of future teachers in initial education, since the implementation of project teaching has become a mandatory part of the curriculum of teaching and education in primary schools.

Keywords: project teaching, university education, teacher, student.

INTRODUCTION

Overall changes in society put in front of schools new and high demands that involve changing the paradigm of teaching and learning. The need to change the existing traditional education system stems from a different concept of life and a world that requires a different concept of the school whose goals should be shifted from the cognitive to aspects that include the cultivation of social relations, democratic values and collaborative learning. These changes relate to all levels of the education system, in particular university education in the part dealing with the education of future teachers.

One of the key features of modern teaching, even the one that takes place at universities, is the gradual abandonment of lecturing (frontal teaching) and the establishment of methodical diversity (Bezinović, 2010). In finding the best ways to achieve the goals of teaching, one of the possible didactic solutions is found in the project teaching. The concept of a project in didactic works (Meyer, 2002, according to Visković, 2016) is defined as a joint effort of teachers and students to connect life, learning and work so that the socially significant and participant-related problem is jointly processed (= process) and results in a result (= product) that has a usable value for students. The project is a complex task based on a challenging and interesting issue or problem, which requires students to set up a research, carry out the research, solve the problem over a longer period of time and bring the final product that is publicly presented. Project teaching is also described as the concept of creating conditions in which students can learn the more complex knowledge and skills they need to live in the 21st century (Ravitz et al., 2012). Other definitions include authentic content, authentic assessment, teacher support, explicit education goals, collaborative learning, a community in which one explores or which is explored, the use of technological tools, out-of-the-classroom teaching and multidisciplinary topics.

The application of project teaching in today's university education is based on several essential assumptions of a constructivist approach (Gojkov, 2013):

- Learning must have a purpose which is clear to the student;
- The student must have the support in the adoption of a general goal or task;
- The tasks students are assigned should be authentic;
- Tasks and learning environment should reflect the complexity of the real environment;
- Students need to develop procedural knowledge, for example, how to solve a problem;
- It is necessary to create a learning environment that will encourage and support students' thinking;
- Learning should take place as much as possible in the "learning community", where a student is encouraged to test ideas according to alternative views and contexts.

The interpretation of the purpose of applying this model in university education has developed in three directions: 1) students receive concrete and holistic experience in the process of project work; 2) the implementation of project teaching promotes the integration of contents of various scientific and study disciplines and the development of the skills of applying knowledge; 3) project teaching can be used to promote self-regulated learning at the deepest level. The degree of students' independence in project activities entails a question of the role

and importance of teachers, but also the problems that the teacher will inevitably encounter. A unique approach to project teaching offers not only more flexibility for students, but also transforms the role of teachers (Vasilien-Vasilioskiene, Butviliene & Butvilas, 2016).

According to Graziene (2012), at the beginning of the 21st century, project teaching is perceived as a learning method, as a philosophy or didactically imperative in the construction of knowledge and research approach. Research overview (Roessingh, 2011) indicates that the increasing application of project teaching in educational practice has resulted in changes in the scope and methodology of research. This research has shown that the implementation of teaching through projects improves the quality of teaching and learning and contributes to cognitive development at a higher level which enables students to solve complicated problems and reach innovative solutions.

Numerous pieces of research point to the benefits of applying project teaching, such as better quality adoption and understanding of content, better student achievement, high motivation, etc. (Al-Balushi & Al-Aamri, 2014; Hsu, Van Dike, Chen & Smith, 2015). Studies conducted in Israel (Barak & Asad, 2012) and Taiwan (Koutrouba & Karageorgou, 2013) that focused on learning based on project teaching have shown that such an environment has led to greater motivation and increased interest in learning, as well as greater satisfaction and engagement of students in learning different subjects.

In addition to the advantages, some research, as well as educational practice, showed certain shortcomings in the application of project teaching. According to the opinion of the teachers who participated in the research of Marx and associates (Marx et al., 1997), the main obstacles in the implementation of project teaching are: a) time consumption is too high; b) classrooms are often in disarray, c) teachers can not successfully control the flow of information, d) it is difficult to establish a balance between student autonomy and support, d) difficulties arise in the adequate use of teaching facilities, e) it is difficult to evaluate the work of an individual. The authors also found that the attention of teachers is mainly focused on solving only one or two at the most of these problems, and that there is a conflict between old habits and new ideas (Marx et al., 1997, according to Ristanovic, 2016). Other authors cite some of the difficulties encountered by teachers in implementing project teaching: the duration of the project; the problem of creating a flexible schedule as well as inadequate teaching technology; harmonization with the curriculum established at the state or local level; integrating a large number of subjects and areas; monitoring and evaluation of individual / group activities and results of project teaching, etc. (Viskovic, 2016).

METHOD

Starting from the above results, especially those pointing to the need for more significant use of project activities and subjects of a wider research carried out within the bilateral project of the Faculty of Education of the University of Kragujevac, Jagodina and the Faculty of Education of the University of Primorska, Koper, the aim of this research is to examine student attitudes on the implementation of project teaching in initial teacher education. In line with the goal, the following research tasks were set: 1) to examine the students' attitudes about the advantages of applying the project model of teaching in the initial teacher education; 2) to examine the connection of the students' attitudes with the assessment of their ability to apply the project teaching model; 3) to examine students' attitudes about the limitations and difficulties they may encounter when applying the project model of instruction in primary schools.

Sample. The survey was conducted on a sample of 72 students of the second year of undergraduate studies (study program Teacher) of the Faculty of Education in Jagodina ($N = 72$, $M = 35.19$, $SD = 14.99$)

The instrument used in the research is a questionnaire containing 10 questions – 9 closed questions and one open-type question. Closed-type questions were given in the form of a five-step scale of the Likert type (from 1 – I do not agree at all to 5 – I fully agree) and they concerned the examination of attitudes and the assessment of the importance of the positive aspects of the implementation of the project model of teaching in the initial teacher education. The last question in the questionnaire was of an open type and had the task of examining student attitudes about the limitations and difficulties in the implementation of project teaching.

An independent variable was an assessment of initial training for the application of the teaching model of the teaching (dichotomous categorical variable). The dependent variable made an assessment of the importance of certain benefits of project teaching. The statistical significance of the differences in the estimates of two variables (assessment of the importance of the project model and assessment of the qualification for the project model of teaching) were calculated by the Leven equation of variance and Mann-Whitney U test. In the reliability test, the value of the Crombach's alpha coefficient $\alpha = 0.871$ was obtained.

The process of research. Students who participated in the research, during 2017/18 school year attended for a month Didactics classes working on research projects. The implementation implied the application of all stages of the project model of teaching from preparation, introduction to methodology, the realization of research and data processing, conclusion, presentation of results to reflection on work (Ristanović, Stojanović, Živković, 2018).

RESULTS

When it comes to examining students' attitudes about the importance of applying the project model of teaching in the initial teacher education, the Kolmogorov-Smirnov test for normality of distribution showed uncompromising distribution ($Z = 1.873$, $p = 0.000$, $M = 2.59$, $SD = .693$).

Table 1. Descriptors

Items	Mean	Std.deviation
Development of the research opinion	2.92	2.019
Developing creative behavior	3.74	2.116
Linking knowledge and skills with other school subjects	3.81	2.336
Application of knowledge and skills in life circumstances	3.35	2.502
Receiving and displaying information via different media	4.40	2.499
Durability and knowledge transfer	4.10	2.369
Developing collaborative, leadership, communication and organizational skills through group work	4.29	2.468
Developing internal motivation for learning	3.97	2.472
Creating a good atmosphere and positive emotions	4.63	2.542

The obtained KMO values = 0.633 and Bartlett's sphericity test $p = 0.000$, indicate the possibility of checking the factor structure of the scale. By factor analysis, by the method of the main components, an initial two-factor solution was obtained.

Table 2. Factor structure of the scale of the assessment of the importance of the project model of teaching (Rotated Component Matrix)

Items	Component	
	1	2
Linking knowledge and skills with other school subjects or correlation	.828	
Application of knowledge and skills in life circumstances	.825	
Durability and knowledge transfer	.762	
Receiving and displaying information via different media	.684	

Development of the research opinion	.465	
Developing collaborative, leadership, communication and organizational skills through group work		.815
Developing internal motivation for learning		.809
Creating a good atmosphere and positive emotions		.800
Developing creative behavior		.630
Variance explained	49.683%	14.332%

In checking the internal consistency of the scale, the current researchers obtained satisfactory values of the Cronbach alpha confidence coefficients for reliability (Table 3), for both obtained factors based on EFA (exploratory factor analysis).

Table 3. Internal consistency for two EFA factors.

	Factors	Reliability (α)	Items
1.	ACQUISITION AND APPLICATION OF KNOWLEDGE	.771	1,3,4,5,7
2.	SOCIAL COMPETENCES	.773	2,6,8,9

Both factors explain as much as 64.06% of the variance, with the contribution of the first 49.68% of the explanation and the other 14.33% of the total explained variance. Since the first factor consists of items oriented to the cognitive components and factors of the project model of teaching, the current researchers called it ACQUISITION AND APPLICATION OF KNOWLEDGE (items 1, 3, 4, 5, 7). The second factor consists of items oriented to the social component of the importance of the project model of teaching (items 2, 6, 8, 9), and was called the SOCIAL COMPETENCES of the model. The obtained coefficient of factor correlation (FAC1 acquisition and application of knowledge x FAC2 social competences; $r = .774$) indicates the existence of a latent dimension of the importance assessment of the project model of teaching that can be interpreted as the importance of the project model of teaching and it is possible to calculate the overall score on the scale for it (TS).

The current researchers used a parallel analysis (Monte Carlo PCA) to verify this factor solution. Although the factorial analysis of the first order pointed to the existence of two factors, a parallel analysis indicates the justification of a

single-factor solution. This supports the one-factor solution for the entire scale and calculates the total (one) score on the scale (TS).

Table 4. Results of the parallel analysis

Root	Raw data	Means	Percentile
1,000000	4,471508	1,580451	1,774487
2,000000	1,289888	1,371963	1,494644
3,000000	868397	1,218133	1,318545

The results of the parallel analysis and the correlation of the factors obtained by exploratory factor analysis indicate the existence of **one latent factor** and the possibility of calculating *one overall score of the scale* of importance of the project model of teaching. This is expected since the research is organized on a relatively small sample of respondents and items.

Leven equality test of variance shows that there are no statistically significant differences in estimates for all scales and an assessment of initial education's ability to apply the project teaching model ($F = 2.802$, sig. = .099, $p \leq 0.05$). Thus, it can be concluded that respondents who consider themselves to be qualified for the implementation of the project teaching model do not differ (statistically) in items scores from those who are not qualified.

Mann-Whitney U test of the difference between two independent groups (assessment of skills – yes / no) by comparing the median also shows that there is no statistically significant difference between the level of assessment of the importance of the project model and the self-assessment of competence/incompetence ($U = 584$; $z = -0.675$, $p = 0.500$, $r = 0.07$).

Table 5. Results of Mann-Whitney U test.

Test Statistics for Mann-Whitney U	
	TS_importance
Mann-Whitney U	584,000
Wilcoxon W	1404,000
Z	-,675
Asymp. Sig. (2-tailed)	,500

a. Grouping Variable: Are you capable in initial education of the implementation of the Project Teaching Model?

In the regression analysis, in the evaluation of the model, the value of the determination coefficient $r^2 = 0.004$ was obtained (our model explains only 4% of the variance of the importance of the project model). However, if the corrected r^2 for adjusted samples (adjusted R square) is applied, given the size of our sample, a slightly better result $r^2 = 0.011$ (explains 11% of the variance) is obtained. Statistical significance is not reached, since in ANOVA we get $F = .250$, $\text{sig.} = .619$, $p \geq 0.05$. *The obtained standardized coefficient $\beta = 0.060$ and the respective significance value $\text{sig.} = 0.619$ indicate that it should be concluded that our variability (assessment of capability) does not make a significant contribution to the prediction of the dependent variable (estimation of importance).*

Table 6. Results of regression analysis (r^2 coefficient, ANOVA and standardized β).

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,060 ^a	,004	-,011	15,0771

a. Predictors: (Constant) Are you capable in initial education of the implementation of the Project Teaching Model?

b. Dependent Variable: TS_importance

ANOVA^b

	Model	Sum of Squares	df	Mean Square	F	Sig.
	Regression	56,803	1	56,803	,250	,619 ^a
1	Residual	15912,475	70	227,321		
	Total	15969,278	71			

a. Predictors: (Constant), Are you capable in initial education of the implementation of the Project Teaching Model?

b. Dependent Variable: TS_importance

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics		
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF	
1	(Constant)	32,613	5,462		5,971	,000					
	Capability	1,787	3,576	,060	,500	,619	,060	,060	,060	1,000	1,000

a. Dependent Variable: TS_importance

By examining the last task of our research we obtained the results shown in Table 7.

Table 7. Expected difficulties in the realization of project teaching in primary schools

Difficulties	N	%
Lack of material and technical tools	13	18
It takes a lot of time	18	25
Requires additional teacher preparation	13	18
Hard to fit into the curriculum	18	25
Insufficient teacher training	6	8,4
Difficulties in grading pupils	4	5,6
Total:	72	100

The results show that the opinions of students are different in terms of seeing problems and difficulties in applying project teaching.

DISCUSSION

By examining students' opinions about the positive aspects of the implementation of the project model of teaching, the current researchers have come to the conclusion that the largest number of students ($M = 4.63$) believe that the basic contribution is the creation of a good atmosphere and positive emotions within this model of work. The studies that reported on the results of the research on project teaching mostly emphasized the students' satisfaction in the project work and linked them with motivation for learning, increased interest in topics that were being processed, activation of students, etc. (Gibbes and Carson, 2013).

In the further ranking of the positive aspects of project teaching, students ($M = 4.29$) estimate that developing collaborative, leadership, communication and organizational skills through group work is very important for project teaching. These findings confirm the results of the research, which were also conducted by Hanney & Savin Baden (2013) and Harmer and Stokes (2017). In the application of group forms of work within the framework of project teaching, student activities are based on a complex series of interactions between team members at a given time. Students also pointed out that receiving and sharing information through the senses and the media, as well as knowledge transfer, were a significant

advantage of project teaching. These results coincide with the results of the La-sauskiene & Rauduvaite (2015) research, which conclude that the application of project teaching enables students to apply theoretical knowledge and skills.

Considering the larger number of items in the scale, factor analysis provided an initially two-factor solution as follows: Factor 1 ACQUISITION AND APPLICATION OF KNOWLEDGE, Factor 2 SOCIAL COMPETENCES. According to students' opinions, F2 – building social competences represents a greater contribution to project teaching in relation to the F1 process of acquiring and applying knowledge. In further processing of data, the current researchers wanted to examine whether there is a correlation between students' attitudes about the positive effects of project teaching and the experiences students have with the project model of teaching. The coefficient $\beta = 0.060$ and the relative significance $\text{sig} = 0.619$, showed that the assessment of students' competence **does not make** a significant contribution to the prediction of the importance of different aspects of project teaching.

Regarding the limitations and difficulties that can be encountered when applying the project model of primary school education, students' opinions are different, and four-quarters of respondents (25%) believe that the implementation of this model requires a lot of time. Too much time consuming as a difficulty in the implementation of project teaching is stated by many authors who have studied this problem (Ristanović, 2016; Visković, 2016; Harmer & Stokes, 2017). In the same proportion (25% of respondents), students also answered regarding the compatibility of project teaching with the requirements of the curriculum. In a research conducted by Ristanović (2016) on a sample of experienced teachers, they came to the conclusion that insufficient coherence with the curriculum was one of the key problems in the implementation of project teaching in primary schools as the respondents ranked this problem in the first place. However, the concept of out-of-school education, on which new, reformed plans and teaching and learning programs for the first cycle of basic education are based, treats project teaching as one of the priorities. In this way, the creators of national educational policies seek to change the role of the curriculum, so teachers are no longer perceived as an obstacle, but as an incentive to innovate the teaching process.

A somewhat smaller number of students (18%) points out as aggravating circumstances for the implementation of project teaching, lack of material and technical resources in schools. The results of the research conducted in Croatia by Tomljenović, Novaković (2012) confirm this problem.

Finally, it is important to note that 18% of students believe that project teaching requires better preparation of teachers for this kind of work. These findings are confirmed by other studies (Lasauskiene & Rauduvaite, 2015; Ristanović, 2016; Vujačić, Đević and Stanišić, 2017). "Insufficient teacher training can be a serious

obstacle to the implementation of the project model of teaching work, especially if we take into account the fact that our teachers have little theoretical insight and practical experience in working with this model during their formal education” (Ristanović, 2016: 14). This should be added to the conclusion derived from the results of the research, conducted by Gojkov (2013), according to which insufficient instruction was seen as the main obstacle from the angle of the students.

CONCLUSION

The results obtained by this research indicate that students-future teachers recognize not only the positive effects of project teaching, but also the obstacles in the implementation of this model. As the most important advantages of the project model of teaching, students emphasize the development of students’ social competences, and above all the satisfaction in work, high motivation and positive climate in the classroom. When it comes to disadvantages and difficulties that they may encounter in their work, their attitudes coincide with the opinion of experienced teachers in that the main obstacles are that the project teaching requires a lot of time, good teacher preparation and that it is necessary to harmonize the curriculum and program with the requirements of project teaching.

The results of this study indicate the need for adequate training of future teachers in initial education, since the implementation of project teaching has become a mandatory part of the curriculum and teaching in primary schools.

In order to prevent the functioning of factors that diminish the effectiveness of the project model of teaching in university education, teachers are advised to specifically address the issues of: a) students’ motivation, b) techniques of project design, realization of research, analysis of data and presentation of results, c) using existing knowledge and experience of organization and coordination of activities and resource management. In other words, university teaching based on a constructivist approach in front of teachers sets high demands, not only in terms of possessing expert knowledge from a certain scientific field, but also by possessing appropriate pedagogical competences. For these reasons, the transformation of the role of university teachers comes to a point where they turn them into life-long students and reflective practitioners.

REFERENCES

- Al-Balushi, S. M. & Al-Aamri, S. S. (2014). The effect of environmental science projects on students' environmental knowledge and science attitudes. *International Research in Geographical and Environmental Education*, 23(3), 213–227.
- Barak, M. & Asad, K. (2012). Teaching image-processing concepts in junior high schools: boys' and girls' achievement and attitudes towards technology. *Research in Science and Technological Education*, 30(1), 81–105.
- Bezinović, P. (2010). Prikaz projekta – Samovrednovanje u osnovnim školama. U: P. Bezinović (ur.), *Samovrednovanje škola. Prva iskustva u osnovnim školama* (str. 53–117). Zagreb: Agencija za odgoj i obrazovanje/Institut za društvena istraživanja u Zagrebu.
- Gibbes, M. & Carson, L. (2013). Project-based language learning: an activity theory analysis. *Innovation in Language Learning and Teaching*, 8 (2), pp 171–189.
- Gojkov, G. (2013). *Fragmenti visokoškolske didaktike*, Vršac: Visoka škola strukovnih studija za obrazovanje vaspitača.
- Graziene, V. (2012). Applicability of Project Based Learning Approach in Final Thesis in Educology Studies. *Twenty Years for Sustainable Development: Learning from Each Other*. ATEE Spring University. Vilnius: Klaipeda University, 2, 36–52.
- Hanney, R. & Savin-Baden, M. (2013). The problem of projects: understanding the theoretical underpinnings of project-led PBL. *London Review of Education*, 11 (1), pp 7–19.
- Harmer, N. & Stokes, A. (2017). Choice may not necessarily be a good thing: student attitudes to autonomy in interdisciplinary project-based learning in GEES disciplines, *Journal of Geography in Higher Education*, Volume 40, 2016 – Issue 4, 531–545.
- Hsu, P., Van Dyke, M., Chen, Y. & Smith, T. J. (2015). The effect of a graph-oriented computer-assisted project-based learning environment on argumentation skills, *Journal of Computer Assisted Learning*, 31(1), 32–58.
- Koutrouba, K. & Karageorgou, E. (2013). Cognitive and socio-affective outcomes of project-based learning: Perceptions of Greek Second Chance School students. *Improving Schools*, 16(3), 244–260.
- Lasauskiene, J. & Rauduvaite, A. (2015). Project-Based Learning at University: Teaching Experiences of Lecturers, *7th World Conference on Educational Sciences (WCES-2015)*, 05–07 February 2015, Novotel Athens Convention Center, Athens, Greece.
- Marx et al. (1997). Enacting project-based science: Challenges for practice and policy, *Elementary School Journal*, 97, 341–358.
- Meyer, H. (2002). *Didaktika razredne kvake*. Zagreb: Educa.
- Ravitz, J., Hixson, N., English, M. & Mergendoller, J. (2012). Using project based learning to teach 21st century skills: Findings from a statewide initiative. Paper presented at *Annual meetings of the American Educational Research Association*. Vancouver, BC, April 16, 2012.
- Ristanović, D. (2016). Uloga projektnog modela nastave prirode i društva u razvoju saradničkog ponašanja učenika, *Nastava i vaspitanje* 3, 629–646.
- Ristanović, D., Stojanović, B. & Živković, P. (2018). Teorijski aspekti inoviranja univerzitetskog obrazovanja primenom projektnog modela nastave, *Uzdanica*, XV/1, str. 137–151.

- Roessingh, H. & Chambers, W. (2011). Project-Based Learning and Pedagogy in Teacher Preparation: Staking Out the Theoretical Mid-Ground. *International Journal of Teaching and Learning in Higher Education*, 23(1), 60–71.
- Tomljenović, Z. & Novaković, S. (2012). Integrated Teaching – A Project in Primary School Elective Art Classes, *Metodički obzori*, 7, 119–134.
- Vasiliene-Vasiliauskienė, V., Butviliene, J. & Butvilas, T. (2016). Project-Based Learning: the Complexity and Challenges in Higher Education Institutions, *Computer Modeling & New Technologies*, 20 (2), 7–10.
- Visković, I. (2016). Projektna nastava kao područje unaprjeđenja kvalitete škole. *Školski vjesnik: časopis za pedagošku teoriju*, Tematski broj, 381–391.
- Vujačić, M., Đević, R., Stanišić, J. (2017). Iskustva učitelja u primeni inovativnih nastavnih metoda u okviru programa stručnog usavršavanja. *Zbornik Instituta za pedagoška istraživanja*, 49, 2, 234–260.