DOI: 10.46793/pctja.19.145R
UDK: 371.136:371.68]:37.015.3

Chapter X

SELF-ASSESSMENT OF TEACHER COMPETENCIES FOR IMPLEMENTING PROJECT BASED TEACHING: RESULTS OF AN EMPIRICAL STUDY

Dušan P. Ristanović*
University of Kragujevac, Faculty of Education, Jagodina, Serbia

Predrag Ž. Živković
University of Kragujevac, Faculty of Education, Jagodina, Serbia

Biljana J. Stojanović
University of Kragujevac, Faculty of Education, Jagodina, Serbia

Abstract: Since the project model of teaching was introduced as a compulsory way of working in elementary schools in Serbia, the question of teachers' competence for its implementation has been raised. The aim of this research was to examine the attitudes of primary school teachers towards the competencies for applying the project model of teaching, to confirm the psychometric characteristics of a constructed competence assessment tool, and to determine the basic factors and dimensions of competence. In addition to the descriptive method, elementary procedures of nonparametric and inferential statistics were used. The sample consisted of 619 elementary school teachers from the territory of eight municipalities in Serbia (M = 67,40, SD = 10,68). For the needs of the research, *Self-assessment of teacher competency for project model of teaching scale* (STC-PMT), a five-step Likert type scale of 18 positively formulated items in the preliminary phase of the study and 9 items of the final form of the scale were constructed. Satisfactory internal consistency indices (α = 0.907) were obtained. In the preliminary examination of the psychometric characteristics of the scale, explanatory factor analysis, parallel analysis, and confirmatory factor analysis were used. A unique factor of competence was obtained which explains 57.53% of the total competency variance. On the basis of the obtained results it can be concluded that in order to increase teachers' competence for the implementation of the project model of teaching, theoretical education is necessary, but, above all, practical experience is crucial.

Keywords: *project model of teaching, competencies, factor analysis, teachers.*

*E-mail: dusan.ristanovic@pefja.kg.ac.rs

Introduction

Social and technological changes that greatly affect the formation of the education system also make teaching competencies take an increasingly important place in the study of issues related to the teaching profession (Stanković, 2010). As educational paradigms change according to the social trends, changes in the whole or parts of educational systems are also being initiated (new goals and outcomes of different levels of education are proclaimed, new curricula are created, new modes are introduced, etc.). When it comes to the competencies that students need to acquire during formal education, it can be noticed that a new long-term goal is set in the educational space – to develop key competencies for lifelong learning among young people[1]. In the literature dealing with the study of reform processes in the education of these competences, they are often referred to as 'skills for the 21st century', the main characteristic of which is the transferability of knowledge, and through the process of their development, an individual passes along the path from beginner to expert (Pellegrino & Hilton, 2012). This situation inevitably leads to the question of which competencies teachers should have in order to achieve this successfully. The expectation that during formal education, students are trained for teamwork, timely decision-making, effective time management, different planning strategies, advanced technologies, etc., causes the need for innovative, creative, critically oriented, and culturally competent professionals (Nessipbayeva 2012). In other words, the target competencies of students determine the necessary competencies of teachers (Lončarić & Pejić Papak, 2009).

Developing student competencies, and especially key competencies for lifelong learning, is in the focus of the current reform of basic education and upbringing in Serbia. In contrast to curriculum-oriented curricula and their implementation, new teaching and learning programs are being introduced, which put students first, developing their functional knowledge and process and learning outcomes. The concept of new programs implies that "the achievement of outcomes leads to the development of competencies, general and specific, subject and key ones" (*Program nastave i učenja za I razred osnovnog obrazovanja i vaspitanja*, 2018: 3). In this regard, one of the most important novelties is the introduction of project teaching as a compulsory model of work in the first cycle of elementary education and upbringing. This teaching model should serve to develop interpersonal competencies of students, it is aimed at "reaching outcomes that relate primarily to logical and critical thinking" (*Program nastave i učenja za I razred osnovnog obrazovanja i vaspitanja*, 2018: 269),

[1] Key competences for lifelong learning include: communication in the mother tongue, communication in foreign languages, mathematical competences and basic competencies in natural sciences and technology, digital competence, learning to learn, social and civic competence, sensitivity for initiative and entrepreneurship and cultural awareness and expression.

as well as the construction (primarily procedural) knowledge and abilities of pupils through work on research projects (Ristanović, 2019).

In view of the stated demands which are placed in front of the teachers by reformed teaching and learning programs, teaching competencies are necessarily multidimensional and involve mastering a wide range of knowledge, skills, attitudes and values (Stojanović, 2008). In order to successfully apply the project model of teaching with students for developing the competencies of adequate choice or independent formulation of the research problem, planning of research procedures and designing a research project, realization of the projected research, co-construction of knowledge, presentation of research results, critical analysis of work and results (Ristanović, 2019), teachers themselves must have those competencies. This is especially important if we considerate results of the research aimed at determining how teachers are informed about individual innovative models and how much they apply them in practice (Vilotijević, Maričić, Starijaš, 2014). According to this study, conducted on a sample of 180 teachers from Serbia, the examined teachers stated that during initial education about project teaching they learned much less than about other innovative models and least applied it in practice. Similarly, in a survey conducted on a sample of 271 teachers from the territory of Vojvodina (Bošnjak, Branković, Gorjanac Ranitović, 2013), it turned out that the examined teachers were not sufficiently trained in the implementation of mini-projects in teaching. Also, in our research on the attitudes of students of the Faculty of Education in Jagodina on the ability to apply the project model of teaching (Stojanović, Ristanović, Živković, 2018), it was concluded that future teachers in the course of initial undergraduate] education need more adequate training for the quality application of this model.

Thus, taking all aspects into consideration, the main issue of this research is to examine self-reported attitudes toward teacher competency for teaching project model dimensions. Similar to that, the second aim of the present study was examining of the psychometric characteristics of *Self-assessment of teacher competency for project model of teaching scale* (STC-PMT) which was designed for the purpose of this research. It is expected that there is one plausible and interpretable teacher competency dimension that expresses teacher competency characteristics according to the STC-PMT and research results, respectively.

Method

Participants

The sample consisted of 619 elementary schools teachers from the territory of eight municipalities in the Republic of Serbia (M = 67.40, SD = 10.68). The sample comprised 26.20% male and 73.80% female participants. The

study group consisted of 84.30% of teachers with BA and MA degrees, 25% with 10 years of experience and below, 39.20% with 20 years of experience and above, 51.10% of urban and 48.80% of suburban schools sub-sample. Test distribution for self-reported competency (Kolmogorov–Smirnov Z = 1.937, p = 0.001, M = 67.40, SD = 10.68), and for all of the independent variables (Z = 3.095-11.503, p = 0.000) are normal and uncorrupted.

Measurements

The final version of the *Self-assessment of teacher competency for project model of teaching scale* (STC-PMT) consists of 9 items. The initial set consisted of 18 items. On the basis of the obtained indicators of inter-item statistics, the factor loadings and communalities, the selection of items for the final form of the test was made. This questionnaire examines teachers' attitudes towards competence for implementing the project model in teaching. The teachers were asked to what extent they agreed with the items on a five-point scale, ranging from 1: complete disagreement, to 5: complete agreement. The questionnaire contains structured items presented in a Likert scale format (e.g. "The topic of the project is always formulated in the form of a problem issue") and teachers were required to rate the frequency of the behaviour.

Research proceeding

The questionnaire was developed based on an extensive review of the literature that provided the most important aspects to be evaluated, which were later reflected in the different items. The drafting of those items emerged from the fieldwork of different university professors who are experts in the subject matter. A first version with 18 items was drafted, which was reduced to 9 items. Theoretical background for the preliminary set of 18 items was based on content analysis of relevant references from the literature on teacher comepetence research. The questionnaires were completed in classrooms and before lessons in the presence of the main researcher. The main researcher informed the teachers of the research objective and instructed them on how to properly complete the questionnaire. He/she also resolved any doubts that the teachers had, and the whole process required approximately 10–15 minutes. Participation was voluntary and the participants' anonymity was preserved.

Data analysis

In order to determine and evaluate the instrument's factor structure, an exploratory factor analysis, confirmatory factor analysis and parallel analysis were carried out, respectively. The instrument's internal consistency was also analysed using Cronbach's alpha coefficient, and the descriptive statistics (av-

erages and standard deviations) and bivariate correlations of all items were obtained. The SPSS 17.0 and LISREL 8.0 statistical packages were used for the data analysis. The FACTOR 10.3 program was used to decide on the appropriate factor analysis.

Results

Construct validity in the context of rating scale design refers to assessing whether or not the scale measures the hypothesized construct it claims to measure. To test the extent to which the newly designed rating scale has meaningful structures stated in the hypothesized framework, factor analysis was employed. Factor loading was used as a criterion to select items for the scale, since items with higher loadings on a factor represent the underlying dimension.

The total number of valid responses (619 respondents for 18 items) is much higher than the 10 subjects to 1 variable ratio commonly used in most studies of factor analysis (Costello & Osborne, 2005). Kaiser–Meyer–Olkin's (KMO) index of sampling adequacy was high (.89), as compared to the recommended value of 0.60, implies that the sample size was adequate. Bartlett's Test of Sphericty was also significant ($p < .00$), suggesting factorability of the correlation matrix.

The factors were selected after factor analysis has been conducted and rotated using varimax rotation to identify orthogonal (independent) factors. Although it was assumed that the new scale would represent more than one dimension, factor analysis revealed one factor with Eigen values exceeding one. That one factor explained 57.53% of the total variance. The minimum value for retaining an item was .32, a value suggested as a good rule of thumb for the minimum loading of an item. Nine items have communalities above 0.4, a minimum value suggested for social sciences (Costello & Osborne 2005). All the 9 items have loaded into the various categories and showed acceptable values of communalities. Absolute values less than .10 were suppressed and omitted from the cells.

Exploratory factor analysis

After several exploratory factor analyses, certain items were eliminated due to their not reaching a minimum rotation of .40. Finally, factor analysis was carried out on one main component with direct oblimin rotation with subsample 1, the results of which were 9 items grouped into one factor: competence (7, 8, 9, 10, 11, 12, 13, 14, 17). The eigenvalues obtained were greater than 1.00 (5.178), explaining a total variation of 57.53% (Table 1).

Table 1: Component matrix

	Items	M	SD	Com.
1.	When formulating the project theme as a starting point I use the current events or students experiences	4.07	1.085	.803
2.	When formulating the project theme, I take care that students have sufficient knowledge about it	4.20	.951	.796
3.	When formulating the project theme, I take care that the students are particularly interested in it	4.02	.979	.792
4.	When working on projects, students must to a great extent use cognitive and social skills	4.06	.939	.779
5.	I define a project theme in agreement with students	3.86	1.075	.777
6.	The project theme is always formulated in the form of a problem	3.93	.938	.763
7.	During the project work, I insist that students write a project and plan their research	3.74	1.057	.753
8.	I encourage students to use multimedia to present the results of the research	3.97	1,027	.730
9.	During the project work it is sufficient that the students collect data from textbooks, books, magazines or from the Internet	3.90	1.089	.616

Extraction Method: Principal Component Analysis. 1 component extracted

Table 2: Scale Statistics

Mean	Variance	Std. Deviation	N of Items
35,74	46,270	6,802	9

Confirmatory factor analysis

The validity of the measuring model was considered using a series of fit coefficients, also called goodness of fit measures: $\chi 2$, $\chi 2/df.$, RMSEA, and the incremental indices (CFI, NFI and TLI). The maximum likelihood estimation method was used along with the bootstrapping procedure, since the result of Mardia's multivariate coefficient was 61.56, which indicated a lack of multivariate normality of the data. For this reason, following the example of Finney and DiStefano (2006), the robust maximum likelihood estimation method was used (Byrne, 2001). After an initial analysis, the overall results of the model indicated a moderate fit ($\chi 2$ (59, N = 619) = 1899.01, p = .000; $\chi 2/df.$ = 5.47; CFI = .80; NFI = .77; TLI = .81; RSMR = .05; RMSEA = .08). With the goal of improving the

fit, we proceeded to carry out an analysis of the Lagrange test (LMtest), which showed that the fit was increased if the errors (9 interactions) of certain items belonging to a single factor, and whose significance level was $p < .000$, were correlated. All items belonging to the competence factor. The indices obtained were adequate: $\chi 2$ (69, N = 619) = 1051.03, p = .000; $\chi 2/df.$ = 3.12; CFI = .91; NFI = .90; TLI = .90; RSMR = .06; RMSEA = .06.

Parallel analysis

To verify this factor solution, we used a Horn (1965) parallel analysis (PA-Monte Carlo), which confirms the justification of the one-factor structure.

Table 3: Results of parallel analysis.

Root	Raw data	Means	Percentile
1.	5.177911	1.186772	1.243549
2.	.843911	1.124955	1.164819
3.	.650589	1.077585	1.111052
4.	.559430	1.036282	1.066065
5.	.486022	.996429	1.024139
6.	.375678	.958537	.985700
7.	.353634	.918672	.947138
8.	.302775	.875519	.907156
9.	.250050	.825249	.866044

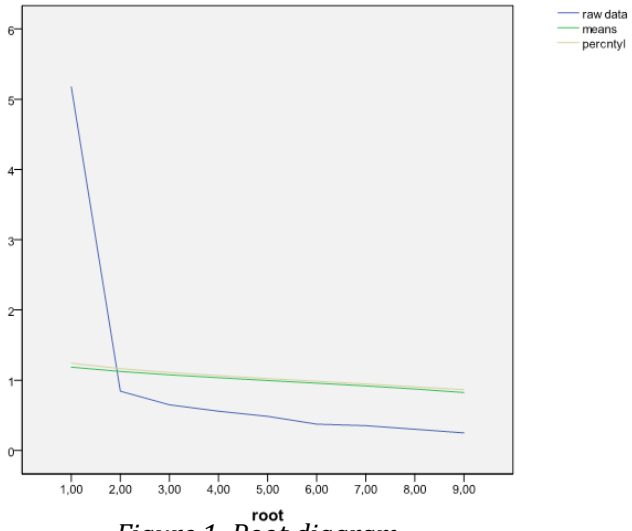

Figure 1: Root diagram

Analysis of internal consistency

Internal consistency reliability using Cronbach's alpha was conducted on the 9-item scale. Results indicated that the standardized alpha coefficient for the scale was α = 0.907, revealing a high degree of reliability. Item-scale correlation confirmed this statistics, with all items exhibiting strong item-to-scale correlation.

Table 4: Internal consistency

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	Mean	Variance	Std. Deviation	N of Items
.905	.907	35,74	46,270	6,802	9

Table 5: Inter-Item Correlation Matrix

Inter-Item Correlation Matrix									
	1	2	3	4	5	6	7	8	9
1	1,000	,685	,580	,573	,479	,542	,497	,395	,514
2	,685	1,000	,689	,625	,538	,513	,520	,384	,467
3	,580	,689	1,000	,703	,555	,426	,543	,381	,472
4	,573	,625	,703	1,000	,555	,482	,530	,451	,469
5	,479	,538	,555	,555	1,000	,587	,587	,405	,486
6	,542	,513	,426	,482	,587	1,000	,596	,432	,567
7	,497	,520	,543	,530	,587	,596	1,000	,440	,589
8	,395	,384	,381	,451	,405	,432	,440	1,000	,440
9	,514	,467	,472	,469	,486	,567	,589	,440	1,000

Regression analysis

The possibility of prediction of teachers' competence for project model of teaching on the basic set of independent variables was also examined. In the regression analysis of the items constituting the obtained factor and the total score of the initial set of items, very good results were obtained $R^2 = .866$; this factor explains 86% of the total competency variance; it gives a significant unique contribution to the prediction of total competence β = .931 and the semi-partial coefficient of correlation (SCC) indicates a unique contribution of 86% in explaining the variance of overall competence. For this, we used the technique of multiple regression analysis, enter procedure.

Nonparametric tests

The Mann Whitney U test did not reveal a significant difference of competency for set of independent variables (gender (U = 36224,500, Z = -.406, p = .685), work position (U = 44061,500, Z = -1,091, p = .308), and suburban–urban schools (U = 44609,000, Z = -1.403, p = .161). The Kruskal Wallis H test revealed a no statistically significant difference for six different groups of professional qualifications (χ^2 = 7.771, df = 4, p = 0.100), and a statistically significant difference on second factor for seven different working age groups (χ^2 = 9.591, df = 6, p = 0.146). The competence factor did not yield statistically significant differences in estimates for any category of independent variable.

Discussion

In a unique competence factor, the items that mostly deal with the activities of students and teachers characteristic for individual stages of the project model of instruction are highlighted. It is interesting to note that more than half of the items relate to the design of student projects, namely on the formulation of the research topic – 5 items, and the design of the project – 1 item, and that teachers estimate that they are highly competent when this activity is in question. The two activities are an integral part of the procedural stage of the project model of teaching, which is the primary function of acquiring and developing procedural knowledge of students (Ristanović, 2019), so recognition of their importance by teachers can be considered a significant result.

The highest factor loading was for the following entries: "When formulating the subject of the project as a starting point, I use current events or students experiences" (.803), "When formulating the project theme, I take care that students have sufficient knowledge about it" (.796) and "When formulating the project theme, I take care that the students are particularly interested in it" (.792). Focusing on previously acquired knowledge and experiences of students is one of the basic postulates of the modern teaching approach (Pešikan, 2010), and it is also stated in the instruction for realization of project teaching given in the Program of Teaching and Learning (*Program nastave i učenja za I razred osnovnog obrazovanja i vaspitanja*, 2018), so this result was somewhat expected. As for personal learners' interest in specific topics, their appreciation by teachers has a highly motivating role in school learning (Brofi, 2015). Authors who are studying the project model of teaching note that one of the main features of the project and research topic is the importance they have for students. Significant questions are those that are interesting for students and are closely related to their lives and culture (Krajcik & Czerniak, 2008), so teachers are advised to direct the project to a greater extent to solving real problems.

The above items add to the phrase "I define a project theme in agreement with students" whose correlation is slightly lower than the previous (.777), but indicates a positive attitude of the examined teachers towards the position of students during the work on projects. Although the establishment of partnership relations and the increase in student autonomy as a way of overcoming the asymmetry between the roles of teachers and students (Havelka, 2000) appears to be one of the tasks of a modern school, research shows that students rarely have the opportunity to participate in decision making related to teaching (Lalić Vučetić, 2016). In the project model of teaching, the autonomy of the students takes a significant place, so by some authors it is taken as the main criterion for the classification of teaching projects. On this basis, they can be distinguished from the structured (teachers are assigned), semi-structured (usually, but not always, formulated by pupils) and unstructured projects (students are largely independent in the choice of topics) (Ristanović, 2019). As the student's experience in project work increases, their autonomy and responsibility should also be increased, and the obtained result can be seen as a significant element of teachers' competence for the application of the project model of teaching.

The last item that achieved a high correlation (.763), and within the framework of a unique competence factor related to the problem of formulating the topic of the project research, was: "The project theme is always formulated in the form of a problem". Defining the theme of the project in the form of a leading problem (research problem) is defined by many authors as the central concept on which the project model of teaching is based (Blumenfeld et al., 1991), but teachers often do not perceive it in such a way (Marshall et al., 2010, Ristanović, 2019). Therefore, the high degree of agreement between the participants in this research with this assertion can be interpreted as a positive tendency in understanding the essence of teaching projects and a more significant focus on the development of students' mental abilities.

A problem-defined topic implies that during the process of designing a project, conducting research, and producing and presenting reports, various mental operations (analysis, comparison, identification, classification, abstraction, etc.) are engaged and developed and thereby build knowledge (Milutinović, 2011), which implies the exchange of information between pupils (Bošnjak, Branković, Gorjanac Ranitović, 2013) and ensuring the development of collaborative,, communication and organizational skills through group work (Šefer, 2005). In practice, these requirements may also be an obstacle to the application of the project model of teaching, especially for teachers who do not have a range of expectations from their students (Condliffe et al., 2017). However, in our research, the teachers asked to recognize the necessity of encouraging students' cognitive and social skills, which showed the correlation value of .779 in the program "When working on projects, students have to a great extent use cognitive and social skills".

In this regard, we would mention the results of an experimental study conducted with students of the fourth grade of primary school who showed that the adoption of all three categories of procedural knowledge (knowledge of specific skills and algorithms, specific techniques and methods and criteria for determining the use of the appropriate procedure) with pupils who studied by project model, but with students who studied by traditional model of teaching (Ristanović, 2019). We assume that for these reasons teachers value the importance of developing cognitive and social skills of students.

Writing of the research project is recognized by the teachers as a key characteristic that makes the project model different from other research oriented models of teaching, so in the teacher competence factor the item "During the project work, I insist that students write a project and plan their research" was entered with the correlation of .753. Here we should draw attention to the fact that elementary school students still do not have enough experience in writing research projects, and by the fourth grade they are not even in development. The priority task of teachers at that age should be to provide support to pupils in practicing project writing (Ristanović, 2019).

Although it has a slightly lower correlation (.730), the item "I encourage students to use multimedia to present the results of the research" can lead us to the conclusion that teachers take care of the application of ICT in the project model of teaching. Some other studies show that in the lecture there is a lot of insisting on the fact that the reports on the realized project are given in a combination of oral explanations and posters (Bošnjak, Branković, Gorjanac Ranitović, 2013), and the poster form is often recommended as a preferred type of presentation in elementary students schools (Šefer, 2005). In the case of this research, it is necessary to take into account that in the teaching and learning program the project model of teaching is also seen as a means for developing the basics of digital literacy, which could affect the attitudes of teachers. However, when it comes to training students to make product work on projects visible, there are many different ways to do this, but without explicit reference to the use of ICT (*Program nastave i učenja za I razred osnovnog obrazovanja i vaspitanja*, 2018).

At the very end there is an item "During the project work it is sufficient that the students collect data from textbooks, books, magazines or from the Internet", with a correlation value of .616, significantly lower than the previously mentioned items. The aforementioned item also had a control role, because in the theoretical settings of the project model of teaching, it is emphasized that acquaintance with the data collected by others was significant, but it is only the beginning of student research (Polman, 1998). Due to the lack of significant teacher experience in the work with school projects, the obtained result can be qualified as a starting error. In order to implement the project activities properly, it is necessary to conduct 'first hand research' (Vulfolk i dr., 2014), which

implies the independent approach to facts through field research, systematic observation, experiments, and the like. It can be assumed that the increase in the experience of teachers will increase the corpus of activities that are elements of the methodological propaedeutic.

Conclusion

Based on the results we can conclude that teacher competency for the project model of teaching identity scale meets the criterion of reliability and construct validity. The exploratory factor analysis confirmatory factor analysis and parallel analysis singled out a one-factor solution (teacher competence). The criteria for confirmatory analysis satisfy the nine-item solution, and it is applicable to the sample of respondents in the Republic of Serbia. This factor explains the competence of primary school teachers for the implementation of the project teaching model. It contains important elements of the project model, such as: designing a problematic question, formulated so that it can 'guide' students through the design process and the realization of the research, keeping their attention in a certain period of time; developing different cognitive and social skills; training students to write projects in order to plan their own activities; training students to present the obtained research results. However, some other elements have been omitted, which theory also recognizes as the essential determinants of the project model of teaching, and as a very possible reason it is a lack of the necessary practical experience. According to Marx et al. (1997), in order to fully understand the essence of a particular innovation, teachers must try it out in practice. Until then they are in a sort of 'transitional' status, which is a combination of new theoretical knowledge with existing ideas and experiences, which are influenced by various subjective factors and contextual constraints. In such situations, as one of the effective solutions, the team work of more teachers is recommended in the processes of planning, realization, and reflection.

The limitations of this research are reflected above all in the applied instrument. First, in the initial version of the scale, more than 18 items could be found, which would describe in more detail the characteristics of the project model of teaching. Secondly, the obtained results must be considered with a certain reserve, since consideration must also be given to respondents choosing socially desirable responses, which is characteristic of research in which the self-assessment of respondents is sought. Therefore, other methods such as systematic observation, case studies, different tests for insisting on learners' achievement, etc. should be applied to determine the competence of teachers for the application of the project model of teaching.

The curriculum of teaching and learning envisages that the project model of teaching is applied in both cycles of elementary education, which means that teachers and subject teachers must adapt equally to it. Since there are differences in the quantity and quality of their pedagogical-psychological and didactic-methodical education, it would also be worthwhile to investigate possible differences in the competence for applying the project model of teaching between these two groups of teachers.

References

Blumenfeld, P. C. et al. (1991). Motivating project-based learning: Sustaining the doing, supporting the learning. *Educational Psychologist*, 26(3&4), 369–398.

Bošnjak, M., Branković, N. & Grojanac Ranitović, M. (2013). Osposobljenost učitelja za primenu mini projekata. In Cvjetićanin, S. (Ed.), *Miniprojekti u nastavi integrisanih prirodnih nauka i matematike* (pp. 21–40). Sombor: Pedagoški fakultet.

Brofi, Dž. (2015). *Kako motivisati učenike da uče.* Beograd: CLIO.

Byrne, B. M. (2001). *Structural Equation Modeling with AMOS: Basic Concepts, Applications, and Programming.* Mahwah, NJ: Lawrence Erlbaum Associates.

Condliffe, B. et al. (2017). *Project-based Learning – A Literature Review.* New York: MDRC

Costello, A. B. & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10(7), 1–9. https://doi.org/10.7275/jyj1-4868

Finney, S. & DiStefano, C. (2006). Non-normal and categorical data in structural equation modeling. In G. R. Hancock, R. O. Mueller (Eds.), *Structural equation modeling: A second course* (pp. 269–314). Greenwich: Information Age.

Havelka, N. (2000). *Učenik i nastavnik u obrazovnom procesu.* Beograd: Zavod za udžbenike i nastavna sredstva.

Horn, J. L. (1965). A rationale and test for the number of factor in factor analysis. *Psychometrika*, 30(2), 179–185.

Krajcik, J. & Czerniak, Ch. (2008). *Teaching Science in Elementary and Middle School – A Project-based Approach*. New York: Routledge.

Lalić Vučetić, N. (2016). Mogućnost razvijanja motivacije za učenje: perspektiva nastavnika i učenika. *Inovacije u nastavi*, 2016/1 (XXXIX), 1–15.

Lončarić, D. & Pejić Papak, P. (2009). Profiliranje učiteljskih kompetencija. *Odgojne znanosti*, 11(2), 479–497.

Marshall et al. (2010). Preservice teachers' conceptions and enactments of project-based instruction. *Journal of Science of Educational Technology*, 19, 370–386. https://doi.org/10.1007/s10956-010-9206-y

Marx et al. (1997). Enacting project-based science: Challenges for practice and policy, *Elementary School Journal*, 97, 341–358.

Milutinović, J. (2011). Socijalni konstruktivizam u oblasti obrazovanja i učenja. *Zbornik instituta za pedagoška istraživanja 2*, 177–194.

Nessipbayeva, O. (2012). The Competencies of the Modern Teacher. *Bulgarian Comparative Education Society*, Paper presented at the Annual Meeting of the Bulgarian Comparative Education Society (10th, Kyustendil, Bulgaria, June 12–15, 2012). Retrived March 28, 2019 from: https://files.eric.ed.gov/fulltext/ED567059.pdf.

Pellegrino, J. W. & Hilton M. L. (Eds.) (2012). *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*. Committee 011 Defining Deeper Learning and 21st Century Skills. National Research Council of the National Academies.

Pešikan, A. (2010). Savremeni pogled na prirodu školskog učenja i nastave: socio-konstruktivističko gledište i njegove praktične implikacije. *Psihološka istraživanja*, Vol. XIII (2), 157–184. https://doi.org/10.5937/PsIstra1002157P

Polman, J. (1998). Activity structures for project-based teaching & learning: Desing and adaptation of cultural tools. San Diego: Annual Meeting of AERA. Retrived March 28, 2019 from the http://www.cet.edu/pdf/tools.pdf .

Program nastave i učenja za I razred osnovnog obrazovanja i vaspitanja (2018). *Službeni glasnik RS – Prosvetni glasnik*, br. 12.

Ristanović, D. (2019). *Projektni model nastave.* Jagodina: Fakultet pedagoških nauka Univerziteta u Kragujevcu.

Stanković, D. (2010). Mesto kompetencija u profesionalnom razvoju nastavnika. U N. Polovina, J. Pavlović (Eds), *Teorija i praksa profesionalnog razvoja nastavnika* (pp. 63–84). Beograd: Institut za pedagoška istraživanja.

Stojanović, A. (2008). Kompetencije nastavnika u svetlu promena u savremenom obrazovanju. *Inovacije u nastavi*, 1/2008 (vol. 21), 61–69.

Stojanović, B., Ristanović, D. & Živković, P. (2018). Application of project model of teaching in initial teacher education – students' opinions. In E. Kopas Vukašinović, J. Lepičnik Vodopivec (Eds.), *Innovative teaching models in the system of university education: opportunities, challenges and dilemmas* (pp. 63–75). Jagodina, Koper: Faculty of Education.

Vilotijević, N., Maričić, S. & Starijaš, G. (2014). Uloga pedagoga u diseminaciji inovativnih modela nastave u kvalitetnoj školi. U N. Matović, V. Spasenović, R. Antonijević (ur.), *Identitet profesije pedagog u savremenom obrazovanju* (pp. 17–27). Beograd: Filozofski fakultet.

Vulfolk, A., Hjuz, M. & Volkap, V. (2014). *Psihologija u obrazovanju II.* Beograd: Clio.

Šefer, J. (2005). *Kreativne aktivnosti u tematskoj nastavi.* Beograd: Institut za pedagoška istraživanja.