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PROFESSIONAL TRAINING OF TEACHERS FOR THE IMPLEMENTATION OF TEACHING ABOUT NATURE AND SOCIETY BASED ON INNOVATIVE LEARNING AND TEACHING SYSTEMS

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The paper examines the need, significance, and methods of professional development for teachers to utilize innovative teaching systems when teaching about nature and society. These systems are equally applicable in teaching other subjects in the lower grades of elementary school and in subject-specific lessons in elementary and high school. The goal of the research is to identify teachers' assessments of their professional development for the realization of teaching about nature and society based on innovative educational systems of learning and teaching. It started from the general assumption that teachers are differently familiar with innovative educational systems of learning and teaching, and therefore do not apply them equally in teaching about nature and society at the level of initial education. It was also based on special assumptions that teachers' familiarity with innovative teaching and learning systems is significantly influenced by their academic education,

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and that the ways of their professional development are significantly influenced by the level of academic education and teaching experience. In order to determine this, in the December 2023, the research was conducted on a sample of 107 teachers employed in primary schools in the Zlatibor district (Serbia). The data collected have confirmed all research hypotheses. It is concluded that innovative educational systems of learning and teaching are significant in the implementation of teaching about nature and society at the level of initial education, but these are also present among teachers with less than 10 years of experience as well as those with over 30 years of practical experience. To empower teachers in utilizing innovative teaching systems, it is proposed to implement a different professional development approach, which involves a different initial education where they would acquire fundamental knowledge for the use of innovative teaching systems and classroom instruction. Subsequently, they would undergo further professional development through attending training programs on innovative teaching systems.

Keywords: *innovation in teaching; the role of the teacher; student learning; teacher training*

1. Introduction

A modern society is characterized by changes in all aspects of life and work, largely driven by the rapid development of science and technology. In recent decades, ICTas a field has transformed the functioning of modern society, and today, the functioning of society without ICT is unimaginable. Under such circumstances, the school, as an educational institution, holds a significant place. To keep up with these changes, education undergoes constant reform.

In order to overcome the current situation in education, there is a continuous search for new approaches. The introduction of innovations has become imperative in schools. Although there is a continuous effort to modernize the teaching process, we cannot be, in general, entirely satisfied with the current state of teaching practices. Discussions also revolve around innovative teaching methods. However, despite these efforts, revolutionary changes have yet to occur. A key problem when it comes to innovative teaching is in its definition. On one hand, every form of teaching was innovative in its time, and on the other hand, there is no teaching method that is not considered innovative. In contem-

porary didactic theory and methodological practice (Vasilijević 2022; Vilotijević, 1999; Laketa and Vasilijević, 2006), various teaching systems and models are studied. There are opinions that some are outdated, while others are modern and innovative. When it comes to this, "... judgments should not be hastily made, and unsupported conclusions should not be drawn because if something is being evaluated, it must be well understood, as that is a condition for objectivity" (Laketa and Vasilijević, 2006, 155).

In recent years, innovation in education is reflected in its planning, implementation, and evaluation. Recent domestic and foreign studies indicate that it is based on innovative approaches, specifically on innovative educational systems (Güçlü Yilmaz, 2021; Farmer, 2020; Skomorac Pezer and Rustempašić, 2020; Lai *et al*., 2020; Stamatović and Milošević, 2017). Instruction according to these models is different. The key difference compared to traditional instruction lies in the changed roles of both the teacher and the student. The student is no longer a passive participant and receiver of information but an active participant in education, while the teacher increasingly becomes a partner to the student in teaching and learning (Speldewinde, 2022). Based on innovative educational systems, teaching in natural and social sciences is also implemented.

Teaching process that is planned, implemented, and evaluated according to innovative educational systems, the roles of teachers and students have been transformed. The teacher takes on roles such as an accommodator, facilitator, moderator, organizer, and partner to the students. The role of the student has also changed. They are no longer passive participants in education but rather explorers and researchers who, through innovative and creative work, independently, in pairs, or in groups, arrive at solutions to assignments and problems. The knowledge acquired in this way becomes foundational knowledge with values for students beyond the classroom. After each lesson, the objectives and procedural qualities of the lesson, teacher work, and student participation are identified (Ilić, 2020).

According to these systems, instruction is planned, implemented, and evaluated based on innovative didactic-methodological flipped learning models, involving four stages: 1) identification of expected objectives; 2) identification of acceptable evidence that the learning

objectives have been achieved; 3) planning active learning and effective teaching; and 4) ensuring that material-technical requirements of instruction are met (Milenović, 2013; Ilić, 2010). This different approach to education, implemented according to innovative educational systems, points to the need for a deeper analysis and research into this issue, which is insufficiently explored, creating a scientific gap in this field.

Without delving into a more detailed analysis, this research will examine teachers' assessments of their familiarity with the 20 most commonly used innovative educational systems and their significance in natural and social science education. These systems are: 1) Individualized instruction – Teaching system tailored to the individual needs and capabilities of students (Vasilijević, 2007), 2); Programmed instruction – Teaching system in which educational content is logically structured in a way that students acquire it in smaller segments (Laketa and Vasilijević, 2006); 3) Integrated instruction – Teaching system based on the organization of instruction, and learning the integrated educational content (Sas *et al.,* 2023); 4) Exemplar instruction – Teaching system implemented through representative examples and analogous content (Green, 2023; Mitić and Vasilijević, 2014); 5) Heuristic instruction – Teaching system based on students' inventive and investigative work (Al-Fayez *et al.,* 2012); 6) Modular instruction – A teaching system based on innovative consideration of the purpose and function of learning, aiming to acquire knowledge from various scientific fields (Bystritskaqya *et al*., 2016); 7) Project-based instruction – A teaching system focused on students' interests in learning authentic educational content based on a project-based approach (Sisamud *et al*., 2023); 8) Interactive instruction – A teaching system based on greater student involvement in their learning and participation in class (Milenović and Botić, 2023); 9) Problem-based instruction – A teaching system based on transforming content, creating problem-solving situations, and developing students' creative and innovative potentials (Duc *et al*., 2022); 10) Developmental instruction – A teaching system in which students, acquiring various knowledge, develop their creative and innovative abilities to solve specific tasks and problems (Polotskaia and Sevard, 2021); 11) Artificially-generated instruction – A teaching system based on fostering students' experiential learning (Vilotijević and Vilotijević,

2009); 12) Role-playing instruction – A teaching system based on learning content infused with play and fun, focusing on creative gaming elements (Milenović and Botić, 2023); 13) Distance education – A teaching system based on various forms of distance learning (Bal and Pamuk, 2023); 14) Meaningful-verbal instruction – A teaching system based on learning educational content by relying on concepts already present in the student's cognitive structure (prior learning experience of the student) (Vilotijević and Vilotijević, 2009); 15) Computer-based instruction – A teaching implementation system utilizing ICT in all forms of instruction (Milenović *et al*., 2023); 16) Precursory instruction – A teaching system that anticipates potential passivity factors in students' learning and methods to overcome them (Milenović and Botić, 2023); 17) Productive instruction – Teaching determined by democracy of choice by students with the assistance of teachers (a responsible approach) (Vilotijević and Vilotijević, 2009); 18) Personalized instruction – A teaching system based on an individualized approach to each student (Milenović and Botić, 2023); 19) Team-based instruction – A teaching system where teachers organize the teaching process through collaborative creative and research work in large, medium, and small groups. (Tsybulsky, 2019; Vasilijević and Stepić, 2016); and 20) Micro instruction – A teaching system based on learning short educational content in small groups (Vilotijević and Vilotijević, 2009). All innovative teaching systems applicable to all subjects will be studied in this research within the context of natural and social science education in the first cycle of education.

In addition to student *learning* in the natural and social science education within the first cycle of education, there is an increasing focus on *student education*. Teaching and educative actions are particularly significant pedagogical categories in preschool education and the first cycle of primary school education. In an integrated curriculum, instruction is mentioned as the fifth field, alongside the student development. It is considered one of the important elements for student well-being through their relationships and actions in education, along with principles, starting points, fundamental values, and specific objectives.

The teaching of students by teachers involves

> "... four categories: 1) teacher presence: *being there*, i.e., being available for students, getting to know them, and building a close relationship with

> them; 2) promoting learning: engaging students in finding meaning in their education; 3) consistency: students can maintain discipline and know how to implement certain teaching strategies; and 4) enthusiasm: conveying interest in teaching topics and arousing passion for learning." (Rosseti and Fox, 2009, according to: Šejtanić, 2019, 70)

It can be observed that teaching, as a pedagogical category, differs from learning. Teaching has a counselling dimension, primarily indicated by the need for the teacher's presence, i.e., the accessibility of the teacher to the students. The teacher is a professional who should know all of their students well. It is also necessary for them to know him. More precisely, the closeness of the teacher with the students is a significant element of teaching (Shanmugavelu *et al*., 2020).

In addition to the teacher's presence, which indicates a parental, friendly, collaborative, and partnership relationship with the students, *promoting learning is crucial when teaching students. This involves encouraging students to learn and participate in class* (Bibson *et al*., 2023). The teacher should utilize every situation in the classroom to guide students towards learning and direct them to engage in the learning process. Children in initial education come from various families with different views toward learning. Teachers are expected to, based on their knowledge of the students, encourage them to be more involved in their learning and participation in class. This is necessary always, especially in situations where the teacher observes that certain instructional content is not clear enough or interesting to a particular student. Motivating students and directing them toward more effective learning and increased participation in class are significant for students to consistently find meaning in what they are learning (Nikolić Vesković, 2023).

Consistency of the teachers is the next important element to effectively teach students. A democratic approach by the teacher that largely meets the needs and interests of students should not become overly liberal. The teacher should maintain consistency in disciplinary actions to uphold order in the classroom, implement planned teaching strategies, and contribute to the efficiency of teaching, learning, and student participation in class (Frolova *et al*., 2019). The teacher does not achieve all of this through authoritarian demands but, depending on specific teaching situations, provides guidance in an appropriate manner. The goal is to guide students toward more effective learning and channel

their behaviour so that it remains within the framework suitable for education. The mentioned points indicate that teaching is closely connected to educational actions on a daily basis.

For effective teaching of students, the *enthusiasm of the teacher* is also significant. Through their behaviour in the classroom, the teacher should convince their students that they love their job. They should assure them that they want to help them in their learning. The teacher's commitment and dedication to the profession should be accompanied by their enthusiasm in teaching, which the students should notice. Similar to the previous element of teaching related to the consistency of the teacher, enthusiasm should not lead to chaos in the classroom. On the one hand, the teacher is expected to have a critical approach in teaching and actions, and on the other hand, to inspire passion and interest in students for more effective learning and increased participation in class (Milenovic *et al*., 2020).

All the qualities expected of a teacher are professionalism, versatility, and excellence. The teacher is a person perceived as a role model in many aspects by the students. They are also a beloved figure in society, and both students and parents want to be close to them. The teacher's image is often idealized. However, the community's positive attitude toward the teacher should not lead to their self-aggrandizement as an individual. As a professional, the societal goodwill towards the teacher should serve as a means for more effective work in school and for their educational influence on students' learning and teaching (Brenner *et al*., 2023).

For the effective implementation of all the mentioned innovative educational systems, the training of both teachers and students is crucial. The latter depends on the professional development of teachers. Today's teachers are primarily educated for traditional teaching methods. Although there is an increasing creation of appropriate training programs for the professional development of teachers in using innovative teaching systems, it cannot be asserted that teachers are fully trained for their utilization (Mirosavljević *et al*., 2023; Jurić Vukelić and Bušljeta Kardum, 2020). Schools in countries with more developed education systems (European Union, USA, Canada, China, Japan, Australia...) also face challenges related to insufficient teacher training for using innovative teaching systems. This is evidenced by the results of

numerous research studies (Cooper, 2022; Pollock *et al*., 2021; Acharya, 2019).

The reasons for the insufficient implementation of innovative teaching systems in education are numerous. One common reason is directly related to teachers and their implementation of certain types of instruction (Milenović, 2010), as well as for the implementation of specific learning content (Milenović, 2020). The implementation of specific teaching formats and content involves greater student involvement in their learning and participation in class through exploratory and research work. All these are based on the aforementioned innovative teaching systems. These are some of the key reasons for defining the subject of this research. The subject of the research is the professional development of teachers for the purposes of the implementation of nature and society lessons at the initial education level according to innovative teaching systems.

2. Methodology

2.1. Research problem

The research problem focuses on the professional development of teachers for the purposes of planning, implementing, and evaluating the teaching process based on innovative teaching systems in the field of nature and society at the initial education level. The subject taught in the lower grades of elementary school, through which students acquire basic knowledge about concepts and content related to the countries of the Western Balkans, is generally called "Nature and Society." In primary schools in the Republic of Serbia, this subject is called "The World Around Us" in the first and second grades, and "Nature and Society" in the third and fourth grades. Due to this reason, the decision was made to use the term "teaching about nature and society," which encompasses both subjects. Five research questions have been formulated: 1) To what extent are teachers familiar with innovative teaching systems?; 2) Does the educational level of teachers influence their assessments of familiarity and importance of using innovative teaching systems?; 3) Does the level of academic education of teachers influence the ways in which they enhance their skills for implementing nature

and society lessons based on innovative teaching systems?; 4) Does the teaching experience of teachers influence the ways in which they enhance their skills for implementing nature and society lessons based on innovative teaching systems?; and 5) Is there a difference in the dependency of the influence of teachers' academic education and experience in the teaching profession on their assessments of professional development strategies for teaching nature and society in the lower grades of primary school?

2.2. Sample and procedure

The research was conducted in December 2023 on a sample of 107 teachers employed in primary schools in the Zlatibor District (Republic of Serbia). Descriptive and inferential methods were used. The sample structure is as follows: 1) according to academic education – a) UAS (Undergraduate Academic Studies) – 96 (89.70%); and b) MAS (Master's Academic Studies) – 11 (10.30%); and 2) according to teaching experience – a) up to 10 years – 34 (31.80%); b) 10-30 years – 62 (57.90%); and c) over 30 years – 11 (10.30%).

2.3. Research instrument

The data were collected through surveys and scaling. A combined instrument was used – the *Use of innovative teaching systems in nature and science lessons at the initial education level* (Scaler – UITS-NSL-IEL). The scaler was designed for the purposes of this research. It consists of introductory questions related to the academic education of teachers (Undergraduate Academic Studies and Master's Studies), their teaching experience (up to 10 years, 10–30 years, and over 30 years), methods of professional development of teachers (during studies, seminars, self-education, and through colleagues), and three-point scales of agreement (completely, mostly, and partially) regarding the familiarity of teachers with the innovative teaching systems mentioned in the theoretical approach to the problem of this research. Since these are deterministic innovative teaching systems, the metric characteristics of the scaler were not tested.

Table 1. Reliability of the second part of the Scaler - UITS-NSL-IEL

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.997	.997	10

The second part of the scale relates to a three-step scale of agreement intensity (agree, uncertain, disagree) in which teachers' assessments of the use of innovative teaching systems in teaching about nature and society in the lower grades of primary school are examined, consisting of 10 items. The scale is standardized and was previously used in a study conducted in the first half of the 2022/2023 school year on a sample of 116 teachers working in primary schools in the Zlatibor district, where its excellent reliability was determined (α = .924) (Milenović *et al*., 2023: 58). The meaning of certain terms in the items was partially adapted to the needs of this study, representing only terminological but not substantive differences. The reliability of the instrument in the sample of this study was tested using the Cronbach's alpha coefficient, which showed an excellent value (α = .997) (Table 1), representing slightly better reliability compared to the previous study conducted in the first half of the 2022/2023 school year.

2.4. Data analysis

The data collected with this research were analysed using the statistical software package SPSS 24.0. Statistical analysis such as χ^2 (chi-square), linear correlation, and analysis of variance were applied. The research results are presented in tables.

3. Research results

The first research objective was set with the intention of evaluating the situation status. Specifically, innovative teaching models are covered in the study programs of initial teacher education as well as professional development programs. However, it is evident that there is a discrepancy in their representation in teaching practice. This may partly indicate a potential problem –insufficient understanding of the taught

content. Additionally, it is worth emphasizing that the obtained results should be interpreted with caution since self-assessment is often subjective and frequently tends towards improving the existing situation.

Data on teachers' familiarity with innovative teaching systems are presented according to calculated frequencies and percentages.

Table 2. The teachers' familiarity with innovative teaching systems

Innovative teaching systems (ITS)	Familiarity with ITS		
	fully	**generally**	**partially**
Individualized instruction	107 (100%)	/	/
Programmed instruction	101 (94.40%)	6 (5.60%)	/
Integrated instruction	104 (97.20%)	3 (2.80%)	/
Exemplar instruction	90 (84.10%)	13 (12.20%)	4 (3.70%)
Heuristic instruction	100 (93.50%)	7 (6.50%)	/
Modular instruction	75 (70.10%)	32 (29.90%)	/
Project-based instruction	107 (100%)	/	/
Interactive instruction	107 (100%)	/	/
Problem-based instruction	107 (100%)	/	/
Developmental instruction	68 (63.50%)	25 (23.40%)	14 (13.10%)
Artificially-generated instruction	62 (57.90%)	33 (30.80%)	12 (11.30%)
Role-playing instruction	94 (87.80%)	8 (7.50%)	5 (4.70%)
Distance ionstruction	107 (100%)	/	/

Meaningful-verbal instruction	94 (87.80%)	13 (12.20%)	/
Computer-based instruction	84 (78.50%)	23 (21.50%)	/
Precursory instruction	53 (49.50%)	54 (50.50%)	/
Productive instruction	15 (14%)	49 (45.80%)	43 (40.20%)
Personalized instruction	64 (59.80%)	26 (24.30%)	17 (15.90%)
Team-based instruction	107 (100%)	/	/
Micro instruction	87 (81.30%)	13 (12.20%)	7 (6.50%)

The findings indicate that teachers assess that they are fully familiar with individualized, project-based, interactive, problem-based, distance, and team teaching (100%), somewhat less with integrative (97.20%), programmed (94.40%), and heuristic instruction (93.50%). Productive teaching is the least known to teachers, with only 14% of respondents stating that they are fully familiar with this type of instruction, while 40.20% stated that they are partially familiar with it. Interestingly, project-based teaching (49.50%), artificially-generated (57.90%), and personally-directed teaching (59.80%) are fully known to half of the respondents. According to teachers' evaluations, besides the mentioned types, developing teaching, artificially-generated teaching, personally-directed teaching, micro-teaching, exemplary teaching, and role-playing teaching are still insufficiently known to teachers. This suggests that there is room for further improvement in the implementation of some other innovative teaching models (Table 2, column - generally agree). The obtained research results raise several research dilemmas, for example, how it is possible to fully understand individualized instruction without a complete understanding of personally-directed or, alternatively, developing or project-based teaching. Moreover, there is a noticeable difference in the understanding of computer-based and distance learning, etc. These findings bring to the forefront research dilemmas: whether familiarity with a teaching system is conditioned

by the level of academic education and professional experience of the respondents (hence the importance of the other two research tasks), and whether there is a gap between familiarity and the ability to apply them in daily practice or incorrect assessments of familiarity (which necessitates future comprehensive research on this issue). Moreover, there is a dilemma regarding the terminological definition of the innovativeness of teaching models. Namely, if a teaching model is partially known to teachers, is it still considered innovative for them or not? All of these are reasons for further, more in-depth research into the issue of the innovativeness of teaching models.

The impact of the academic education level of teachers on their assessments of the familiarity and importance of innovative teaching systems is presented based on data calculated through linear correlation. According to academic education, teachers are divided into two groups: Group 1 (UAS - Undergraduate Academic Studies) and Group 2 (MAS - Master's Academic Studies).

Table 3. The level of academic education and teachers' assessments of familiarity and importance of UITS-NSL-IEL

		Academic education	**Assessments**
Academic education	r	1	.603**
	p		.000
	N	107	107
Assessments	r	.603**	1
	p	.000	
	N	107	107

A positive correlation has been established between the level of teachers' academic education and their assessments of their familiarity with innovative teaching systems and their importance in the teaching process. This means that a higher level of academic education among teachers simultaneously indicates a higher level of their familiarity with innovative teaching systems and their importance (Table 3). According to Cohen's criterion, this influence is seen as significant. The shared variance of teacher groups based on their level of academic education

in relation to their assessments of familiarity with innovative teaching systems and their importance for the teaching process amounts to 33.64% (d = 33.36).

Data on the impact of the level of teachers' academic education on the ways they enhance their professional development for the use of innovative teaching systems are presented based on the calculated χ^2 (chi-square) test, frequencies, and percentages.

Table 4. Level of academic education (UAS - Undergraduate Academic Studies, MAS - Master's Academic Studies) and teachers' professional development methods for using UITS-NSL-IEL

Teacher education level	Types of professional development			
	During studies	Seminars	Self-education	Through peers
UAC	18 (18.80%)	72 (75.0%)	5 (5.20%)	1 (1%)
MAC	1 (9.10%)	3 (27.30%)	0 (0%)	7 (63.60%)

$\chi^2 = 56.018$; df = 3; p = .000

The data indicate that there is a statistically significant difference in teachers' assessments of their use of innovative teaching systems based on the level of academic education. Regarding the total number of teachers covered by the research, teachers with completed Undergraduate Academic Studies most commonly enhance their knowledge by attending seminars; a smaller number consider the knowledge acquired during their studies sufficient for using innovative teaching systems, while the least common method is self-education or learning from colleagues. For teachers with completed Master's degree, the situation is somewhat different. The majority of them improve their knowledge by considering the knowledge acquired during their studies sufficient for using innovative teaching systems. There were no teachers with completed Master's degrees who indicated that they improve their knowledge through self-education (Table 4).

The analysis of variance was used to examine the impact of teachers' teaching experience on the ways they enhance their knowledge necessary for using innovative teaching systems. Based on teaching experience, teachers are divided into three groups: Group 1 (up to 10 years), Group 2 (10–30 years), and Group 3 (over 30 years).

Table 5. Teaching experience and teachers' professional development methods for using UITS-NSL-IEL (ANOVA)

	Sum of Squares	df	Mean	F	p	η
Within Groups	9.873	2	4.937	11.139	.000	.18
Between Groups	46.089	104	.443			
Total:	55.963	106				

A statistically significant difference at the $p<0.001$ level was found in the results of the three groups of teachers based on their teaching experience regarding the ways they enhance their knowledge for using innovative teaching systems (Table 5). The actual difference between the mean values of teacher groups is significant. To determine which groups of teachers, based on teaching experience, differ from each other, the Tukey's Honestly Significant Difference (HSD) test was conducted.

Table 6. Teaching experience and teachers' professional development methods for using UITS-NSL-IEL (Multiple Comparisons)

(I) Teaching experience	(J) Teaching experience	Mean difference (I-J)	Σ	p
up to 10	10-30	.08349	.14206	.827
	over 30	-.93850*	.23092	.000
10-30	up to 10	-.08349	.14206	.827
	over 30	-1.02199*	.21780	.000
over 30	up to 10	.93850*	.23092	.000
	10-30	1.02199*	.21780	.000

The data indicate that a significant difference in the ways teachers enhance their knowledge for using innovative teaching systems was found at the $p<0.001$ level between the group of teachers with teaching experience over 30 years and the group of teachers with teaching expe-

rience up to 10 years, as well as between the group with 10-30 years of teaching experience (Table 6).

In order to examine the interdependence of the influence of teachers' academic education and their experience in the teaching profession regarding their professional development for using innovative teaching systems in teaching about nature and society in the lower grades of primary school, a two-way univariate analysis of variance (ANOVA) was conducted.

Table 7. Interdependence of the influence of teachers' academic education and their experience in the teaching profession and teachers' professional development methods for using innovative educational systems in teaching about nature and society in lower grades of primary school (tests of between-subjects effects)

Source	Type III Sum of Squares	df	M	F	p
Corrected Model	18.252[a]	4	4.563	12.342	.000
Intercept	217.738	1	217.738	588.938	.000
VAR Academic education	8.373	1	8.373	22.648	.000
VAR Teaching experience	1.662	2	.831	2.248	.111
VAR Academic education * VAR Teaching experience	.388	1	.388	1.050	.308
Error	37.711	102	.370		
Total	492.000	107			
Corrected Total	55.963	106			

According to the data shown in Table 7, it is observed that regarding the interdependence of the influence of teachers' academic education and their experience in the teaching profession concerning professional development for using innovative teaching systems in teaching about nature and society in the lower grades of primary school, there is no statistically significant difference ($F = 1.050$; $p = .308$). According

to the data from the same table, it is observed that there is a statistically significant difference among categories of teachers based on academic education at the level of $p < 0.001$ ($F = 22.648$; $p = .000$), while among categories of teachers based on experience in the teaching profession, there is no statistically significant difference ($F = 2.248$; $p = .111$).

4. Discussion and conclusion

The innovation of instruction becomes an imperative in the modern school. The acceptance of innovations in schools depends on the spread of innovations, their contribution to the quality of instruction, and the speed of innovation exchange among schools and teachers (Topolovčan, 2022; Kovačić and Čović, 2021). In this paper, the results related to the professional development of teachers for the purposes of planning, implementing, and evaluating instruction based on innovative teaching systems are presented. The importance and possibilities of teachers' professional development for their application are highlighted. For innovations to become an integral part of the teaching process, they need to be accepted by teachers, who should be motivated for to professionally develop further.

However, the initial analysis of the current state of familiarity with 20 teaching models has shown that, according to their own assessments, teachers are most familiar with individualized, project-based, interactive, problem-based, distance, and team teaching, while they are least familiar with productive teaching. The degree of familiarity with different teaching models varies widely, ranging from 14% to 100%, indicating that there is room for further improvement in teachers' expertise in this area. There is also a notable discrepancy in the assessment of familiarity levels between compatible teaching systems and learning models (e.g., individualized and productive teaching). This discrepancy is unacceptable in terms of gaining a complete understanding of the nature and assessing the effectiveness of innovative teaching models. The findings from the first research objective have identified directions for further research focused on assessing teachers' competencies regarding their readiness and skills in implementing various teaching models and understanding their innovative characteristics.

The obtained results show a positive correlation between the level of teachers' academic education and their assessments of their familiarity with innovative teaching systems and their importance in teaching. Teachers with higher levels of education have a higher level of familiarity compared to teachers with lower levels of education. Teachers with Bachelor's degree stated that they acquire knowledge for using innovative teaching systems through attending seminars, followed by initial education, self-education, and exchanging information and experience with colleagues (Table 2). Regarding the education level, it is concluded that teachers with higher education level exchange experiences more with colleagues compared to teachers with lower education level. A significant difference is also observed in attending seminars, as teachers with higher education level attend fewer seminars than teachers with lower level of education. The research results related to the professional development of teachers indicate that professional development is caused by dissatisfaction with the existing state in teaching practice or mandatory obligation. Only 2–3% of teachers, enthusiasts in their profession, engage in professional development out of internal need (Vujičić, 2007).

When it comes to teaching experience and the ways in which teachers enhance their skills for using innovative teaching systems, statistically significant differences in values were found among teachers who have been teaching for more than 30 years, compared to those with 10 years of experience and those with between 10 and 30 years of experience (Table 4). Based on their needs, teachers create objectives for professional development. The choice of professional development depends on the teacher's preferences. Highly motivated teachers in the process of professional development will choose models and content that will enable them to be even more effective in their work (Pintar, 2020).

These results are in contrast to the findings of psychologists. According to them, younger individuals (which applies to teachers as well) are eager for success and proving themselves in their work (as teachers in education). Therefore, they are more energetic, ambitious, and willing to further enhance their professional skills to achieve desired success. In contrast, older individuals (teachers as well) are accustomed to a consistent way of working, and their interest in making changes

in their work or stepping out of their usual comfort zone is lower and understandable for this reason (Guzina, 1986). This conducted research yielded diametrically opposite results compared to studies where older teachers showed greater motivation for professional training to effectively use innovative teaching systems in nature and society lessons. This is indicated by the results of the subsequent comparison using Tukey's HSD test (Table 4).

The results of the two-way univariate analysis of variance showed that regarding the interdependence of the influence of teachers' academic education and their experience in the teaching profession on their professional development for using innovative teaching systems in teaching about nature and society in the lower grades of primary school, there is no statistically significant difference in teachers' assessments. According to the same data, in terms of examining the difference in teachers' assessments of their own professional development for using innovative teaching systems in teaching about nature and society in the lower grades of primary school in individual categories of teachers, it was found that there is a statistically significant difference depending on teachers' academic education, but not depending on their experience in the teaching profession. The primacy of teachers' academic education over their experience in the teaching profession in terms of their assessments of their own professional development for using innovative teaching systems in teaching about nature and society in the lower grades of primary school can be justified by the fact that higher levels of education imply learning more complex and innovative educational content, thus such assessments by teachers are understandable for this reason. This is also indicated by the results of numerous studies on this issue (Milenović and Botić, 2023; Milenović *et al*., 2023; Evanovich and Scott, 2022; Tabatabaee-Yazdi *et al*., 2018; Toraby and Modarresi, 2018).

The significance of teachers' professional development is evident from the fact that it is legally mandated as compulsory. Appropriate sanctions are prescribed for insufficient participation of teachers in offered training programs. Despite legal regulations, there are still teachers who do not engage in professional development. The reason for this is that, in practice, prescribed sanctions are not consistently implemented, and teachers do not face consequences for not meeting a

certain number of hours of professional development in the observed period. For a school to have skilful and successful teachers, it is necessary to provide conditions for improving the quality of the social status of teachers and enhancing their legal, material, and professional position in society and the school (Đorđević, 2011, 194).

It can be concluded that continuous innovation in nature and society lessons ensures better achievement of learning objectives. Teachers need to be initiators in applying innovation in the classroom, being responsible for preparation, programming, implementation, monitoring, and evaluation of the obtained results (Gould-Yakovleva *et al*., 2020). The question arises about how much professional development can contribute to a greater implementation of innovation in the classroom because external pressure on teachers may lead to counter-effects. Therefore, it is necessary for teachers to independently apply innovation in their work and choose appropriate methods and forms of professional development. This approach to teachers' professional development makes sense when considering the general characteristics of education: variability, universality, fundamentality, and comprehensiveness (Vilotijević, 1999).

It can be concluded that improving education is essential to respond to the challenges of the modern environment. Embracing the concept of lifelong learning, a teacher becomes a lifelong learner, and their competencies and professionalism gain significance. A part of the teacher's professional development and progress is reflected in their continuous professional development. Through various forms of development, teachers can acquire additional skills, accepting them as challenges in their journey of personal and professional growth. For such actions by teachers, models of educational and teaching practices based on innovative teaching systems are necessary. Currently, such models are lacking, and in the future, they should be a subject of interest for educational and methodological experts. Teachers are currently expected to implement educational and teaching practices in accordance with specific teaching situations, as well as the needs, interests, and capabilities of each individual student.

The general conclusion is that teachers are familiar with various forms of innovative teaching systems, recognize their importance for improving the overall quality of teaching, particularly in teaching about

nature and society (Table 2), but not all teachers are equally competent in their successful use in the classroom. The findings are in line with critical theoretical observations. Supporting these claims are the research results obtained through linear correlation (Table 3) and the chi-square test (Table 4), particularly concerning teachers' work experience in class teaching, where teachers with greater work experience excel, as well as teachers with work experience in class teaching up to 10 years (Tables 5 and 6). This also indicates the contribution of academic education, which is constantly innovated by introducing new teaching subjects (such as Innovative Teaching Models, Contemporary Concepts in Teaching Methods of Nature and Society, Selected Chapters of Teaching Methods of Nature and Society, etc.) and reshaping the content of syllabi for teaching methods of nature and society at all levels of education. This is consistent with the research results obtained through two-way analysis of variance (Table 7).

Based on the research results and the presented analyses, recommendations can be made regarding the need for more comprehensive professional development of teachers for the implementation of innovative teaching systems in teaching nature and society in the lower grades of primary school. We are confident that these recommendations can also apply to teachers who are teaching older grades of primary school, as well as in secondary schools. Given the fact that employed teachers generally consider themselves insufficiently competent to implement teaching according to innovative teaching systems (Milenović *et al*., 2023), the following is recommended: more thorough and detailed preparation of teacher training programs coordinated by university subject teachers; An adequate number of diverse and differentiated programs at multiple levels of complexity for the professional development of teachers to implement innovative teaching systems in the lower grades of primary school. Professional development for teachers in this profession is especially important given that novel teaching techniques are not characterized as permanent, final, or unambiguous. Their development is influenced by changes and advances in other teaching aspects (objectives, tasks, material, teaching technology, student, and instructor). As a result, they must be regularly examined, altered, and enhanced in order to keep up with the evolving discourse of educational and didactic-methodological innovative scientific reality.

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STRUČNO USAVRŠAVANJE UČITELJA ZA REALIZACIJU NASTAVE O PRIRODI I DRUŠTVU PREMA INOVATIVNIM SUSTAVIMA NASTAVE

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U radu se proučava potreba, značaj i načini profesionalnog usavršavanja učitelja za upotrebu inovativnih nastavnih sustava u nastavi o prirodi i društvu koji su podjednako primjenjivi i u drugim predmetima u osnovnoj i srednjoj školi. Cilj istraživanja je utvrditi procjene učitelja o svom stručnom usavršavanju za realizaciju nastave prema novim sustavima. Pošlo se od opće pretpostavke

da su učitelji različito upoznati s inovativnim nastavnim sustavima pa ih stoga ne primjenjuju jednako u nastavi o prirodi i društvu na razini inicijalnog obrazovanja, te posebnih pretpostavki da je upoznatost učitelja s inovativnim nastavnim sustavima pod značajnim utjecajem akademskog obrazovanja te da stupanj akademskog obrazovanja i nastavno iskustvo značajno utječu na njihov profesionalni razvoj. Kako bi se to utvrdilo, u prosincu 2023. godine na uzorku od 107 učitelja zaposlenih u osnovnim školama zlatiborskog okruga (Republika Srbija) provedeno je istraživanje prikazano u ovom radu. Prikupljeni podaci potvrdili su sve istraživačke hipoteze. Zaključeno je da su inovativni nastavni sustavi učenja i poučavanja značajni u realizaciji nastave o prirodi i društvu na razini inicijalnog obrazovanja, ali da su prisutni u provođenju kod učitelja do 10 godina i s više od 30 godina rada u praksi. Kako bi učitelji osnažili svoje kompetencije za upotrebu inovativnih nastavnih sustava, predlaže se drugačiji profesionalni razvoj koji podrazumijeva drugačije inicijalno obrazovanje tijekom kojeg bi budući učitelji stekli temeljna znanja za upotrebu inovativnih nastavnih sustava u realizaciji razredne nastave, kao i kasnije stručno usavršavanje koje podrazumijeva pohađanje edukacija o inovativnim sustavima nastave.

Ključne riječi: *inovativnost u nastavi; uloga učitelja; poučavanje učenika; usavršavanje učitelja*