Teachers’ Implementation of Teaching Strategies in Teaching Different Subjects

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Abstract

Modern teaching strategies include students’ abilities and interests and enable them to be actively involved in planning, implementation and evaluation of the educational process, all of which plays a decisive role in acquiring a deeper insight into learning content, better content comprehension and long-lasting knowledge.
In the following research, we examined the use of didactic strategies among the teachers teaching various subjects. We conducted the research as part of the project ‘Education of teachers as a factor of providing high-quality, life-long learning in the learning society / the society of fast socio-economic changes and an unsure future,’ funded by the Slovenian Research Agency (ARRS).
350 teachers, teaching primary school students of grades from 6 to 9, participated in our research. We selected a stratified random sample according to statistical regions, including 5% of all Slovenian primary schools. One-third of the included teachers are multiple or single subject teachers; one-fifth are general teachers; and a few are teachers of foreign languages, Slovene, physical education (P.E.), math and art.
Our one-factor analysis of variance showed statistically significant differences in the use of different teaching strategies among various subject teachers. The most statistically significant differences in the use of project-based and experiential learning strategies were found among math and general education teachers. Moreover, we found that in addition to problem- and research-based learning, experiential learning strategies were the most commonly integrated in teaching all subjects.
These findings provide important insights into educational practice and can serve for further, more in-depth empirical research.

Key words

primary school; student; research; learning strategies; teacher; teaching

Introduction

It is common knowledge that listening to a frontal explanation and learning from a textbook are less appealing to students than active participation in classes enabled by various teaching strategies, such as research- and problem-based learning strategies. Students want to be actively involved in the learning process and to take part in decision-making. It is therefore important that

teachers consider students' needs and wishes and encourage them to be active, thus increasing their motivation, which contributes to better learning outcomes (Kovač, 2008; Mithans, 2017). This is why the teacher's role in modern schools has shifted (Kalin et al., 2017; Tahirsylaj et al., 2021), and the teacher is no longer the primary and sole source of knowledge (Holt-Reynolds, 2000; Blažič et al., 2003; Javornik Krečič, 2003b).

Teachers create conditions for quality work, guide students on the path to knowledge and synchronously learn themselves (Blažič et al., 2003). It is precisely the teachers' effectiveness that enables a quality educational process (Yar Yildirim, 2021).

Students are required to play an active role in the educational process of contemporary schools, however, a large portion of this responsibility is placed on teachers' shoulders (Rebec & Skalec, 2015). Teachers are constantly expected to strive for quality classes in which students are the subjects, while the teacher selects learning strategies that allow students to actively co-create the learning process (Kalin, 2011). Marentič Požarnik (2005) shares this viewpoint, claiming that the path to quality knowledge in the classroom should be aimed at students rather than teachers. Students should be active participants in the educational process (Štefanc, 2004). Students should be subjects that are granted the possibility of active participation (Mithans & Ivanuš Grmek, 2012; Blažič et al., 2003; Javornik Krečič, 2003).

The focus of independent and active learning is a two-way communication, challenging the activity of the teacher and the students to express their own thoughts and ideas (Ivanuš Grmek et al., 2009) and encouraging the active participation and involvement of the students during the lesson (Mithans, 2017; Mithans et al., 2017).

Research results show that the traditional concept of teaching is still prevalent in pedagogical practice (Javornik Krečič, 2003), which prevents students from developing a subjective position (Čagran, 2011; Javornik Krečič & Konečnik Kotnik, 2011), so students continue to have limited opportunities to participate in lesson planning and implementation (Kovač, 2008; Gril et al., 2009; Kurt-Buchholz, 2011; Mithans, 2017). The modest sustainability of knowledge at primary, secondary, and higher education levels can be attributed to teaching based on the reproduction of what is heard and read (Pelc, 2008). Pelc (2008) believes that students' acquired knowledge is more sustainable and useful if they acquire it through their own activity during lessons.

In pedagogical practice, the above-mentioned requirements for most effective learning are met most effectively by applying contemporary learning strategies, commonly known as open learning (Blažič et al., 2003; Strmčnik, 2003). In accordance with these learning strategies, learning objectives, content, and methods are tailored to students' abilities and interests, allowing for learning differentiation, individualisation, and student participation (Strmčnik, 2003). Consequently, the student's role shifts from passive listener to active creator of their own learning, and the knowledge gained through these strategies is more long-lasting and useful (Alvia & Gillies, 2020; Cencič et al., 2008; Fernandes, 2021). In order to effectively implement open learning, it should be introduced gradually and with due care (Götz, 1993).

Our empirical research findings are presented below. The focus of our research is to examine the use of teaching strategies among primary school teachers teaching a variety of subjects.

Methods

Purpose of the empirical research

Based on the above presented statements, we were interested to find what teaching strategies primary school teachers implement while teaching various subjects to students from grades 6 to 9. We assumed that, depending on the specifics of each subject, there would be statistically significant differences in their use of various contemporary teaching strategies that encouraged open learning.

Research method

This is a non-experimental research with a cross-sectional design and an on-site questionnaire.

Research sample

Table 1 shows the measurement characteristics of the included sample. A total of 350 primary school teachers teaching grades 6 to 9 participated in the research. We selected a random stratified representative sample by statistical region, including 5% of Slovenian primary schools.

Table 1. Demographic characteristics of the sample

Characteristic		n	f %	AV (SD)*	Min.-Max.
Gender	female	296	85.1	/	/
	male	52	14.9		
Age	25-35 years old	61	17.8	45.60 (9.81)	25-66
	36-45 years old	120	35.1		
	46-55 years old	90	26.3		
	56+ years old	71	20.8		
Professional title	no title	58	16.9	/	/
	mentor	110	32.0		
	advisor	145	42.2		

councillor	31	9.0			
Formal education	pedagogical education	329	94.8	/	/
	non-pedagogical education with PAI	18	5.2		
Subject area	foreign languages	41	12.1	/	/
	Slovene	30	8.8		
	math	25	7.4		
	P.E.	30	8.8		
	art subjects	21	6.2		
	general education	61	18.0		
	multiple subjects	116	34.2		
	other professionals	15	4.4		

Legend: * - AV = average value; SD = standard deviation; / - it was not possible to calculate according to the type of test variables.

Table 1 shows that 85.1% of female teachers participated in the research. The participants' average age is 45.6 years. There is a standard deviation of 10 years, implying that the majority of participating teachers are between the ages of 36 and 56. This is confirmed by the frequency distribution of the sample according to age category, which shows that 61.4% teachers are between the ages of 36 and 55. The oldest participating teacher is 66 and the youngest is 25 years old. Depending on the age range, the majority of participants, 42.2%, have already attained the title of councillor or mentor, 32.0%. 94.8% were formally educated before beginning their teaching profession, and 18 of the participating teachers obtained a vocational qualification for the teaching profession through pedagogical training (PAI).

Our research includes one-third or 34.2% of subject teachers who teach two or more subjects, one-fifth or 18.0% of general teachers, about one-tenth or 12.1% of foreign language teachers, 8.8% of Slovenian language teachers, 8.8% of physical education teachers, 7.4% of math teachers, and 6.2% of art teachers. A small proportion, 4.4%, of other professional school workers also participated, however, they were excluded from further analysis because they were not involved in direct work with students in the classroom.

Procedures for the collection and processing of data

A quantitative structured questionnaire with closed-ended questions was used to collect the data. The questionnaire was designed in accordance with previous research and findings related to the integration of teaching strategies in primary school teaching. The participating teachers evaluated the frequency of use of individual teaching strategies through 14 evaluated claims, each claim having a three-point scale with 3 meaning frequently, 2 rarely, and 1 never. Five teaching strategies were evaluated: ‘research-based learning,’ ‘problem-based learning,’ ‘experiential learning,’ ‘project-based learning,’ and ‘cross-curricular learning.

We used different statistical tests to analyse the data. All analyses were carried out with the version 26.0 SPSS statistical programme. First, descriptive statistics rates were calculated for all variables. We used the calculation of frequencies and percentages, as well as the calculation of the dimensions of the front values and the dimensions of the data dispersion, depending on the type of variable (average value, standard deviation). The Kolmogorov-Smirnov test of normality of distribution and the Levene test of variance homogeneity were used to ensure compliance with the conditions for inferential statistics. A single-factor analysis of variance (ANOVA) was used to search for differences in teachers' use of teaching strategies based on the subjects they teach. The Sheffe test, which is suitable for comparing groups of different sizes, was used to determine the differences between individual compared subjects. Non-parametric ANOVA measures, namely the Welch test and the Brown-Forsythe test, were used to analyse variables for which the conditions for F statistics were not met, either because the assumption of homogeneity of variances between the compared groups was not accepted or because the data were not distributed normally. Differences in value $P \leq 0.05$ were considered statistically significant. The effect measures of the obtained statistical test results were also considered in the interpretation of results.

Results and interpretation

Table 2 shows the teaching strategies that teachers consider to be the most commonly used in primary school instruction. Problem-based learning strategies (AV=2.70) are the most commonly used, followed by research-based learning (AV=2.58), experiential learning (AV=2.55), and cross-curricular learning strategies (AV=2.44). Project-based learning is the least represented (AV=2.01). The participating teachers were the most unanimous (SD=0.28) when evaluating the integration of research-based learning strategies. 75.2% claim they use them frequently. The most diverse opinions were expressed in the self-evaluation of teaching with the project-based approach (SD=0.60), which is used frequently by 34.6% and used never by 11.6% of teachers.

Table 2. Teaching strategies most frequently used by teachers

Teaching strategy	TEACHERS
	AV (SD)*
PROBLEM-BASED LEARNING	2.70 (0.35)
RESEARCH-BASED LEARNING	2.58 (0.28)
EXPERIENTIAL LEARNING	2.55 (0.45)

cross-curricular learning	2.44 (0.39)
PROJECT-BASED LEARNING	2.01 (0.60)

Legend: * AV = average value; SD = standard deviation; scale: 1-never, 2- rarely, 3-frequently

Table 3. Identification of teaching strategy differences according to subject

Strategy	Levene test (p)	ANOVA F (p)	Welch test	Brown-Forsythe test
PROJECT-BASED LEARNING	0.269	19.776 (< 0.001)	/	/
PROBLEM-BASED LEARNING	<0.001	/	3.868 (0.002)	3.543 (0.003)
RESEARCH-BASED LEARNING	0.207	5.359 (< 0.001)	/	/
cross-curricular learning	0.006	/	3.949 (0.001)	3.813 (0.001)
EXPERIENTIAL LEARNING	<0.001	/	33.613 (< 0.001)	27.626 (< 0.001)

Legend: ANOVA - single-factor analysis of variance; / - the test could not be calculated according to the type of variables.

Table 3 shows the results of testing statistically significant differences in the use of individual teaching strategies among teachers of different subjects. A single-factor analysis of variance showed that there are statistically significant differences between teachers using all teaching strategies while teaching individual subjects, as shown in Table 3. At a risk level of less than 1%, differences in the use of all strategies were statistically significant. In this regard, the partial eta square (ηp2) showed medium effects of differences between teachers teaching different subjects while integrating experiential learning strategies (33.5% of the explained variance), project-based learning strategies (27.3%), and a small percentage of effects for research-based learning strategies (9.4%), cross-curricular learning strategies (7.3%) and problem-based strategies (7.3%). The observed power of analysis in all statistically significant analyses was greater than 0.80, confirming the model's appropriate statistical strength or justification.

Multiple comparisons using Post Hoc testing (Scheffe test) revealed several statistically significant differences in the use of teaching strategies among the various groups of the analysed teachers. Statistically significant differences are shown in Table 4. The most statistically significant differences in the use of individual teaching strategies were found among math teachers (n=12) and general teachers (n=12), followed by the P.E. (n=8), foreign language (n=6), art (n=6), and Slovene language (n=4) teachers.

Table 4. Multiple comparisons of learning strategy differences in accordance with the subject (ANOVA, Scheffe test)

Strategy	Subject	Compared area	AV (SD)*	Difference of averages (I-J)	P
EXPERIENTIAL LEARNING	math (AV=1.89, SD=0.38)	P.E.	2.31 (0.47	-0.418	0.010
		art subjects	2.51 (0.40)	-0.615	<0.001
		Slovene	2.71 (0.30)	-0.818	<0.001
		foreign languages	2.77 (0.26)	-0.879	<0.001
		general education	2.87 (0.20)	-0.973	<0.001
	P.E. (AV=2.31, SD=0.47)	Slovene	2.71 (0.30)	-0.400	0.009
		foreign languages	2.77 (0.26)	-0.461	<0.001
		general education	2.87 (0.20)	-0.556	<0.001
	art subjects (AV=2.51, SD=0.40)	general education	2.87 (0.20)	-0.359	0.027
	multiple subjects (AV=2.49, SD=0.45)	foreign languages	2.77 (0.26)	-0.284	0.008
		math	1.90 (0.38)	0.595	<0.001
		general education	2.87 (0.20)	-0.378	<0.001
PROJECT-BASED LEARNING	math (AV=1.40, SD=0.38)	Slovene	2.25 (0.52)	-0.850	<0.001
		general education	2.39 (0.44)	-0.993	<0.001
		art subjects	2.52 (0.51)	1.124	<0.001
	P.E. (AV=1.65, SD=0.42)	Slovene	2.25 (0.52)	-0.600	0.003
		general education	2.39 (0.44)	-0.743	<0.001
		art subjects	2.52 (0.51)	-0.874	<0.001
	foreign languages (AV=1.84, SD=0.57)	general education	2.39 (0.44)	-0.552	<0.001
		art subjects	2.52 (0.51)	-0.682	<0.001
	multiple subjects (AV=1.95, SD=0.56)	math	1.40 (0.38)	0.548	<0.001
		art subjects	2.52 (0.51)	-0.576	0.001
		general education	2.39 (0.44)	-0.446	<0.001

RESEARCH-BASED LEARNING	general education (AV=2.71, SD=0.23)	math	2.40 (0.28)	0.313	0.001
		foreign languages	2.48 (0.27)	0.233	0.008
cross-curricular learning	math (AV=2.23, SD=0.55)	general education	2.58 (0.33)	-0.347	0.026
PROBLEM-BASED LEARNING	P.E. AV=2.52, SD=0.46)	general education	2.81 (0.22)	-0.289	0.027

Legend: * - AV = average value; SD = standard deviation; scale: 1-never, 2- rarely, 3-frequently

As seen in Table 4, the ‘experiential learning’ (n=12) and ‘project-based learning’ (n=11) strategies show the most statistically significant differences between the teachers of the six analysed subjects. Teaching method differences of these subjects seem to be less related to the use of research-based, cross-curricular, and problem-based learning strategies.

Compared to the other six subjects, math teachers are statistically significantly less likely to use experiential learning strategies ($P \leq 0.010$). Similarly, P.E. teachers estimate that they use experiential lessons less frequently than Slovene, foreign language, and general education teachers ($P < 0.010$). Teachers of art subjects use experiential learning strategies even less frequently, especially when compared to subjects where experiential learning strategies are most frequently used, such as general education ($P < 0.05$). Teachers who teach at least two or more subjects believe they include statistically significantly more experiential learning strategies in their teaching than single-subject math teachers and statistically significantly less than foreign language and general education teachers ($P < 0.010$).

According to teachers, project-based learning strategies are statistically significantly less common in math, P.E. and foreign language subjects. Statistically significant differences were found in all three subjects when compared to Slovene, general education, and art classes, where teachers reported a more frequent use of project-based learning strategies. At a risk level of less than 1%, all comparisons were statistically significant. Teachers teaching multiple subjects note a statistically significant more frequent use of project-based learning strategies in their teaching than math teachers and statistically significantly less frequent use of project-based learning strategies than art subjects and general education teachers ($P \leq 0.001$).

In comparison with the general education teachers, who use the research-based learning strategies more frequently (AV=2.71), the math teachers ($A = 0.001$) and foreign language teachers ($A = 0.008$) use these strategies statistically significantly less frequently. Similarly, in math classes, cross-curricular learning strategies are less frequently used, compared to general education classes ($A = 0.026$). Teachers of general education include problem-solving strategies in their teaching significantly more frequently than teachers of P.E. ($A = 0.027$).

Conclusion

Teaching is a reciprocal activity of students and teachers in which learning, the activity of the students, and teaching, as the activity of the teacher, are interconnected (Adamič, 2005). The goal of this reciprocal activity is to assist and encourage students to learn as independently and creatively as possible (Strmčnik, 2001). The quality of teaching has a direct impact on the quality and acquisition of knowledge (Adamič, 2005; Hattie, 2008; Rowe, 2003; Timperley & Alton-Lee, 2008). As a result, quality teaching is the essential factor in successful learning (Adamič, 2005). But it is necessary to be aware that learning is determined by the student's prior knowledge, the student's perception of a situation and previous experience with this learning situation (Košir et al., 2020).

It is the responsibility of teachers to adapt their teaching to contemporary times and their students' needs, as the effectiveness of their teaching depends largely on the effectiveness of the whole educational process (Yar Yildirim, 2021). One path to a better educational process is undoubtedly the well-planned and thought-out use and combination of various teaching strategies.

In the context of open teaching strategies, attention is being paid to adapting the learning process to different learners and linking their prior knowledge with their past and present experience. Strong emphasis is placed on identifying students' unique abilities and interests, as well as strengthening the individualisation of the learning process (Blažič et al., 2003; Filippatou & Kaldi, 2010).

The purpose of the presented empirical research was to examine which teaching strategies are used by primary school teachers teaching various subjects.

According to teacher self-evaluation, teachers most frequently included problem-based learning strategies (AV=2.70), followed by research-based learning strategies (AV=2.58), experiential learning strategies (AV=2.53), and cross-curricular learning strategies (AV=2.45). Teachers rarely used project-based learning strategies (AV=2.03).

The research findings reveal that there are statistically significant differences in the use of all teaching strategies among teachers of different subjects (experiential learning, project-based learning, research-based learning, cross-curricular learning, problem-based learning). The most statistically significant differences in the use of individual teaching strategies were found among math teachers (n=12) and general education teachers (n=12), followed by P.E. teachers (n=8), foreign language teachers (n=6), art subject teachers (n=6), and Slovene language teachers (n=4).

The use of experiential learning strategies (n=12) and project-based learning strategies (n=11) revealed the most statistically significant differences. Lesser differences in teaching methods, on the other hand, were associated with the use of research-, cross-curricular-, and problem-based learning strategies.

According to the findings of our research, teachers believe they use a variety of teaching strategies in their classes. Project-based learning strategies are among the least used strategies, which can be attributed to the fact that this strategy extends beyond the framework of classical learning

strategies. This also suggests that there is no content, organisational, temporal, or spatial limitation for integrating the project-based learning strategies (Čagran et al., 2011). Learning about interdisciplinary learning topics in the context of project-based learning is difficult. In addition, project-based learning requires careful planning, the preparation of a stimulating learning environment, active participation of students, and frequently, the involvement of other, external experts. Also, in a research by Jančič and Hus (2019), with a purpose to examine the representation of teaching strategies used in the 4th and 5th grades, results showed that it is the project-based learning that the teachers use most seldom. Teachers highlighted that the reason for not using project- based learning to a larger extent is a lack of time and too many students in class.

Thus, the complexity of implementing the afore-mentioned learning strategies is most certainly one of the reasons for their less frequent use in practice.

As evident from participating teachers' perspective, various strategies are integrated in the regular teaching. With our following research, we shall also examine the students' perspectives and compare them to the teachers'.

Regardless of our research findings, we can conclude that the quality of pedagogical practice depends on its institutions, and particularly its teachers, who must constantly educate and upgrade their pedagogical, didactic, and methodical knowledge in order to successfully perform their profession.

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Primjena nastavnih strategija od strane nastavnika različitih predmetnih područja

Sažetak

Suvremene nastavne strategije uzimaju u obzir sposobnosti i interese učenika te im omogućuju aktivno uključivanje u planiranje, provedbu i procjenu obrazovnog procesa. To znatno pridonosi dubljem uvidu u sadržaj učenja, boljem razumijevanju i trajnijem znanju.
U okviru projekta „Edukacija nastavnika kao čimbenik pružanja kvalitetnog cjeloživotnog učenja u društvu učenja/društvu brzih društveno-ekonomskih promjena i nesigurne budućnosti ” , financiranog od strane Slovenske istraživačke agencije (ARRS), ispitali smo korištenje didaktičkih strategija nastavnika različitih predmetnih područja.
U ispitivanju je sudjelovalo 350 nastavnika. Odabran je slučajni stratificirani reprezentativni uzorak po statističkim regijama (5 % svih slovenskih osnovnih škola). Trećinu uključenih nastavnika čine predmetni nastavnici koji su predavali dvije ili više kombinacija različitih školskih predmeta, jedna petina su razredni nastavnici i, u manjoj mjeri, nastavnici stranih jezika, slovenskog jezika, sporta, matematike i umjetnosti.
Jednofaktorska analiza odstupanja pokazala je da postoje statistički značajne razlike u korištenju različitih nastavnih strategija među nastavnicima pojedinih predmetnih područja. Statistički najznačajnije razlike u korištenju pojedinih strategija učenja pronađene su kod nastavnika matematike i razredne nastave. Statistički najznačajnije razlike pokazale su se u korištenju projektne nastave i iskustveno orijentirane nastave. Uz problemsku nastavui istraživački podržanu nastavu, iskustvena nastava bila je i najčešća nastavna strategija, bez obzira na predmetno područje.
Ovi zaključci pružaju važne uvide u obrazovnu praksu i mogu poslužiti za daljnja, dublja empirijska istraživanja.

Ključne riječi

nastava; osnovna škola; učenik; anketno istraživanje; nastavne strategije; nastavnik

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