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What is the Role of Science in Post-Socialist Education and Society? Insights from a Survey of Preschool Teachers from Croatia, Serbia and Slovenia

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The paper presents the results of a survey conducted among preschool teachers in Croatia, Serbia and Slovenia, the aim of which was to investigate the attitudes of the participants towards the role of science in education and society. Recent global trends in economic development have introduced new educational concepts in national curricula worldwide, one of which is scientific literacy. Preschool teachers have been encouraged to introduce scientific activities with children into their practice and adopt a new outlook on the role of the natural sciences in education. Social change within the post-socialist context implied that adopting the new outlook required a value shift for all members of the education community. We therefore wanted to explore whether this process was actually taking place, and whether it was impacting the perception of science amongst preschool teachers. We applied Inglehart's modernisation theory of materialist and postmaterialist values. The results showed that preschool teachers in all three countries were inclined to a postmaterialist view of science, but that it was possible to distinguish between two value-orientations, which we named "post-materialism" and the "materialist image of the child". Older teachers accepted the "materialist image of the child" more than younger teachers, confirming a certain intergenerational value change, which we have interpreted as a shift from a collectivist to an individualistic approach to education.

Keywords: natural sciences, post-socialist education, preschool teachers, social development

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Kakšna je vloga znanosti v postsocialističnem izobraževanju in družbi? Spoznanja iz raziskave med vzgojitelji predšolskih otrok iz Hrvaške, Srbije in iz Slovenije

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V prispevku so predstavljeni izsledki ankete, izvedene med vzgojitelji predšolskih otrok na Hrvaškem, v Srbiji in Sloveniji, katere namen je bil raziskati odnos sodelujočih do vloge znanosti v izobraževanju in družbi. Nedavne globalne smernice gospodarskega razvoja so v nacionalne učne načrte po vsem svetu uvedle nove izobraževalne koncepte, med katerimi je tudi znanstvena pismenost. Vzgojitelje se spodbuja, da v svojo prakso uvedejo znanstvene dejavnosti z otroki in sprejmejo nov pogled na vlogo naravoslovja v izobraževanju. Družbene spremembe v postsocialističnem kontekstu so pomenile, da je sprejetje novega pogleda zahtevalo spremembo vrednot vseh članov izobraževalne skupnosti. Tako smo želeli raziskati, ali ta proces dejansko poteka in ali vpliva na dojemanje znanosti med vzgojitelji. Uporabili smo Inglehartovo teorijo modernizacije materialističnih in postmaterialističnih vrednot. Izsledki so pokazali, da so se vzgojitelji v vseh treh državah nagibali k postmaterialističnemu pogledu na znanost, vendar je bilo mogoče razlikovati med dvema vrednostnima usmeritvama, ki smo ju poimenovali »postmaterializem« in »materialistična podoba otroka«. Starejši učitelji so bolj kot mlajši sprejemali »materialistično podobo otroka«, kar potrjuje določeno medgeneracijsko spremembo vrednot, ki smo jo interpretirali kot premik od kolektivističnega k individualističnemu pristopu k izobraževanju.

Ključne besede: naravoslovje, postsocialistično izobraževanje, vzgojitelji predšolskih otrok, socialni razvoj

Introduction

Educational concepts such as scientific literacy or STEM (science, technology, engineering, and mathematics) have been globally popularised during the last decade. This is a consequence of the global advocacy for an educational paradigm that focuses on preparation for the labour market as the main outcome of the education system. The main narrative of this paradigm is that the economic future of the world is uncertain, and that people can no longer expect to be engaged in the same profession all their lives. Education should therefore prepare children to be flexible, which means that the focus in the educational process should be shifted from the acquisition of content to the acquisition of practical and transferable skills. In this sense, the field of the natural sciences seems particularly suitable, given that, on the one hand, it enables the acquisition of skills, and on the other hand, it enables the acquisition of qualifications relevant to propulsive occupations.

Although this approach to education has been widely criticised (e.g., Ball, 2016; Roberts-Holmes & Moss, 2021; Sardoč, 2021), it currently remains the dominant educational perspective implemented in national curricula around the world, as it represents the educational dimension of the dominant neoliberal paradigm of social development. Practitioners of the entire educational vertical are required to adopt principles and values of this educational paradigm and to introduce new ("innovative") practices into the educational process. The present paper represents an attempt to determine whether these values have been accepted among educational workers. Specifically, we present part of an interdisciplinary study of preschool teachers conducted in Croatia, Serbia and Slovenia in 2016. The main goal of the research was to examine the attitudes of the respondents towards the relationship between the natural sciences and education in the context of social development.

The role of education in development paradigms

The idea that education policies can promote national development has been globally present since the end of the Second World War. There are two main approaches to education policies in the context of social development: education as an investment in human capital and education as a human right (Chabott & Ramirez, 2000). Investment in human capital should increase labour productivity at the individual level and consequently contribute to economic growth and development at the societal level. This is closely related to global norms about science, progress, material wellbeing and economic development (Chabott & Ramirez, 2000). On the other hand, education is seen as

the basic mechanism by which people can improve themselves and participate in the economy, culture and politics of their societies. We can connect this understanding with the concepts of social justice, equality and human rights (Chabott & Ramirez, 2000). Chabott and Ramirez (2000) state that the positive relationship between education and economic, political and cultural development in the modern and modernising world is self-evident; however, they point out that research shows that this relationship is problematic, because although there is a positive relationship between education and development at the individual level, the effects of education at the collective level are ambiguous.

In the twenty-first century, international economic organisations such as the OECD and the World Bank have nevertheless intensified activities to promote their educational concepts and programmes. There are two basic reasons for the intensification of such activities: new geopolitical relations and the global hegemony of the neoliberal economic doctrine. New geopolitical relations entered the scene after "9/11", when, as Novelli (2013) claims, a turn from the "Cold War" to the "Holy War" took place. The new US security agenda influenced development policy and practice, and education became its central component (Novelli, 2013). On the other hand, China emerged as a new global force offering an alternative development model to the American one (Nordveit, 2009). Although the Chinese development discourse based on sustainable growth and autonomy seems different, Nordveit (2009) notes that the education models it promotes through cooperation activities in Africa are very similar to the Western development paradigm based on economic growth.

The implementation of the global neoliberal economic doctrine can be traced back to the beginning of the 2000s in many Western industrialised countries (Mannion et al., 2011). National curricula emphasise that children should acquire knowledge, skills and dispositions that will make them more aware of and involved in global issues and phenomena. Mannion et al. (2011) call this convergence the "curricular global turn", and it is usually formulated as "the challenge of preparing students for life in a global society and work in a global economy" (Mannion et al., 2011, p. 449). Today, educational theorists deal with neoliberalism as the dominant discourse in global education (e.g., Ball & Olmeda, 2013; Mead & Silova, 2013; Ball, 2016; Roberts-Holmes & Moss, 2021). Neoliberalism can be defined as a specific form of rationality that reshapes the state, society and the human subject (Brown, 2015). It is about the "economisation" of political life and other non-economic spheres and activities (Brown, 2015). Neoliberal rationality disseminates the market model to all domains of human activity, including education (Hart & Boyden, 2019). Martha Nussbaum calls the period of the 2000s in global education a period of silent

crisis (Nussbaum, 2012). Radical changes are taking place in what democratic societies teach young people. In the pursuit of economic growth and national profit, states and their education systems are removing the humanities and arts from the entire educational vertical and promoting the natural sciences, technology and engineering (Nussbaum, 2012). In other words, the natural sciences and STEM occupy the first place in the social development model that promotes "education for profit" (Nussbaum, 2012). However, it should be noted that the natural sciences had a special place in former hegemonic development paradigms as well, only the framework of the development model was industrialisation, not economisation (financialisation). Apple (2012) states that teaching about science in schools always boils down to the same characteristic: emphasising methodological and value consensus and avoiding the topic of scientific conflict. Science is thus an important link in the school's hidden curriculum that serves to maintain the social and class status quo (Apple, 2012).

Education and social development in post-socialist countries

Although different in many aspects, post-socialist countries share commonalities such as a socialist past, the transition to market economies, and the aspiration to embrace so-called Western values. This process of political, economic and social transformation affected the educational realm as well. The positive aspects of the socialist educational heritage include solid infrastructures for educational provision and administration, fee-free education for all children, nearly universal general education enrolments, and high literacy rates, while the negative aspects include rigid bureaucracy, uniform conceptions of pedagogy, authoritarian and teacher-centred learning, overloaded and centrally mandated curricula, and insufficient attention to individual student learning (Silova, 2009). During the transformation processes, educational discourse has been remarkably similar across all post-socialist countries. All countries have adopted "learning from elsewhere" as the central principle of their educational transformation (Silova, 2009). This is a consequence of post-socialist countries being developmentally in a position of the world semi-periphery, which had to "catch-up" with the developed countries, meaning that the knowledge is transferred from the world centre to them, not the other way around (Zgaga, 2013; Domazet & Marinović Jerolimov, 2014; Hughson, 2015).

Thus, education policies in post-socialist countries consist of similar elements: extension of the curriculum to 11 or 12 years of schooling, introduction of new subjects, student-centred learning, electives in upper-secondary schools, introduction of standards and/or outcome-based education, decentralisation of educational finance and governance, reorganisation of schools

("rationalisation" of staff), privatisation of higher education, standardisation of student assessment, liberalisation of textbook publishing, and the establishment of education management and information systems (Silova, 2009). Less attention in education policy has been devoted to teacher education, rural education and inclusive education targeting students with special needs (Silova, 2009). Ideologically, the educational transformation encompassed a value-shift represented in official discourses, from the "new socialist man" (Duda, 2015) and the "happy child" (Erdei, 2004), to the neoliberal "homo economicus" (Hart & Boyden, 2019) and the "competent child" (Pechtelidis & Stamou, 2017). The process of educational transformation was accelerated with the aid of international donors such as Council of Europe, World Bank, USAID and UN organisations, but the EU has been probably the most influential in affecting educational discourse, introducing concepts of "globalisation" and the "knowledge society" (Silova, 2009), as well as "lifelong learning", "vocational training", "educational cooperation", "language learning" and "mobility" (Arriazu Muñoz, 2015). Some of the concepts promoted through EU funding and similar aid programmes have been "scientific literacy" and "STEM", usually translated into education practice as the "natural sciences" and/or "hard science".

Development in socialism rested, among other things, on the so-called paleo-industries (Rogić, 1996), so the natural sciences had an important social status, as did the engineering professions associated with them. It was considered that only the best students could continue their education in technical and natural sciences, and that it was important to encourage their personal development in this area for the purpose of social progress. The nationalist period of the 1990s, which was marked by wars, political and economic transformation, and privatisation, brought about the irreversible destruction of industry and production in many post-socialist countries. The economy subsequently underwent a process of tertiarisation (Peračković, 2007), during which new principal economic branches emerged, such as trade, tourism, financial and creative industries. Although the natural sciences no longer have the same role in social development as in socialism, they have maintained their high status in education field thanks to both socialist heritage and the new global economic agenda. Since the last world economic crisis in 2008, international and supranational organisations such as the OECD and the European Union have begun to encourage the previously described "education for profit" as part of the neoliberal perspective on social development (Nussbaum, 2012). The countries of the former Yugoslavia, whether they were already part of the EU or just in the process of joining the EU, implemented the terminology and goals of that concept in their education policies by inertia. Given that EU funds have become

a significant source of financing for educational institutions, concepts such as STEM and (natural) scientific literacy have been popularised.

Theoretical framework

Previous research on scientific literacy and teachers' attitudes towards the natural sciences has primarily been undertaken from a pedagogical or psychological perspective (e.g., Belova & Eilks, 2014; Jarvis et al., 2021; Kapsala et al., 2022; Novljan & Pavlin, 2022; Timur & Fatih Tasar, 2011; Walan & Chang Rundgren, 2014). Several sociological studies have linked the natural sciences in education with socioeconomic indicators (Gregurović & Kuti, 2010; Turmo, 2004), religiosity (Sherkat, 2011) and gender (Crowley et al., 2001), but not social values. Social values are usually investigated as part of the cultural modernisation theories of social development, which have been widely applied in sociological research in the countries of the former Yugoslavia (e.g., Rogić, 1994; Županov, 1995; Štulhofer & Kufrin, 1996; Adam et al., 2005; Lažnjak, 2011; Sekulić, 2014; Tomić-Koludrović, 2015; Pavlović, 2018; Burić & Štulhofer, 2020), although, interestingly, they have not been applied in the field of education and scientific literacy. The cultural modernisation theory assumes that there is a certain cultural norm or a set of cultural values that enable faster socioeconomic development and progress, and that any deviation from that ideal therefore represents a developmental limitation (e.g., Županov, 1995; Hofstede, 2001; Inglehart & Welzel, 2007). For example, Županov (1995) claimed that for historical reasons, some of the dominant social values in the countries of the former Yugoslavia were redistributive ethics, anti-professionalism and a negative attitude towards private entrepreneurship, which slowed down the modernisation processes. Similarly, Hofstede (2001) theorised that countries that value individualism over collectivism are more likely to develop a culture of innovation. Empirical research of social values in post-socialist countries has shown mixed results, and some authors argue that the whole perspective of cultural modernisation is orientalist or self-racist, since progressive values always seem to be the so-called Western values, and post-socialist countries must always "catch-up" with them, thus undermining the semi-peripheral structural position of these countries within the world system (Domazet & Marinović Jerolimov, 2014; Hughson, 2015). If the values, skills and knowledge should flow only from the world centre to the semi-periphery and never vice-versa, what does this mean for the education at the semi-periphery in the long term? Does this assumption serve the education at the semi-periphery and what could post-socialist countries bring to the global educational table?

The main goal of the present research was to examine the attitudes of preschool teachers towards the relationship between the natural sciences and

education in the context of social development. Specifically, we were interested in whether there were any differences between the post-socialist countries involved in our research (Croatia, Slovenia and Serbia), and whether a value shift had occurred between older and younger teachers. To examine this, we applied Inglehart's theory of materialist and post-materialist values (Inglehart & Welzel, 2007), a cultural theory of modernisation that stands out from other similar theories by bringing the perspective of intergenerational change into the cross-cultural perspective. The presence of intergenerational differences depends on whether society has achieved high levels of socioeconomic development (Inglehart & Welzel, 2007). Inglehart based intergenerational change in values on two hypotheses: the scarcity hypothesis and the socialisation hypothesis. In conditions of material scarcity, people's priorities are physical and economic security (materialist values), while with social progress, priorities shift to post-materialist values (self-actualisation and quality of life). A person's fundamental values are not a reflection of his or her immediate environment, but of the circumstances in which he or she lived during his or her formative years (Inglehart & Welzel, 2007). Given that our sample will include generations of preschool teachers born in the 1950s and 1960s and socialised in the first part of socialism, marked by a recovery from material scarcity through the process of mass industrialisation, we expect that the oldest respondents will be more accepting of materialist values, while younger generations, socialised in a time of generally better living standards and socialist and capitalist mass consumption, will be more accepting of post-materialist values. The materialist value-type views the natural sciences as part of mass industrialisation and production in an economically prosperous society, where engineering is a highly valued profession and gifted children are encouraged to pursue an education in areas dealing with mathematics or physics. For the post-materialist value-type, the natural sciences still have an important socio-educational role. However, this role is no longer in the context of economic growth and industrial development, but rather in the context of environmental protection and human rights.

These types do, of course, represent artificial constructs, and the reality is much more complex, but we believe that the perception of science in post-socialist countries is guided by these dominant stereotypes and that preschool teachers and other stakeholders in the education system are guided by them in their daily practice. We believe that the scarcity and the socialisation hypotheses allow this theory to move from the orientalist perspective of other theories of cultural modernisation and to open a discussion with critical perspectives on the global knowledge dissemination.

Research aims

The aim of the research was to examine the attitudes of preschool teachers towards the relationship between the natural sciences and education in the context of social development. The main sub-goals were:

- to determine whether there are two main value orientations among preschool teachers: materialism and post-materialism;
- to examine whether there has been an intergenerational shift among preschool teachers in the acceptance of value orientations;
- to examine whether there are regional differences among preschool teachers in the acceptance of value orientations.

Hypotheses

Several basic hypotheses based on Inglehart's theory of modernisation were put forward.

H1: There are two value-types: a materialist and a post-materialist type. Considering the socio-educational changes in post-socialist countries described above, we assumed there would be two value-orientations.

H2a: Older respondents (with more work experience) accept materialist values more than younger respondents (with less work experience).

H2b: Younger respondents (with less work experience) accept post-materialist values more than older respondents (with more work experience).

Hypothesis H2 (a and b) refers to the intergenerational change in values described in the theoretical framework (Inglehart & Welzel, 2007), by which we assume that older generations of preschool teachers born in the 1950s and 1960s and socialised in the first part of socialism, marked by a recovery from material scarcity through the process of mass industrialisation, will be more accepting of materialist values, while younger generations, socialised in a time of generally better living standards and socialist and capitalist mass consumption, will be more accepting of post-materialist values.

H3a: Preschool teachers in Slovenia (Ljubljana and Koper) and Croatia (Zagreb and Rijeka) accept post-materialist values more than preschool teachers in Serbia (Belgrade and Subotica).

H3b: Preschool teachers in Serbia (Belgrade and Subotica) accept materialist values more than preschool teachers in Slovenia (Ljubljana and Koper) and Croatia (Zagreb and Rijeka).

The assumption is that earlier access to supranational organisations is an indicator of earlier adoption of post-materialist values and abandonment of materialist values. The counterargument is that all of these countries and cities are part of the same post-socialist entity that has the same developmental (Hughson, 2015) and educational (Silova, 2009) characteristics, so there will be no differences. Given that we derive the hypothesis based on Inglehart's theory, we follow the former argumentation.

Method

Participants

The research was conducted in 2016 using the survey method on a sample of N = 680 preschool teachers from six cities in three countries: Zagreb and Rijeka in Croatia, Belgrade and Subotica in Serbia, and Ljubljana and Koper in Slovenia. The survey was anonymous and voluntary. Preschool teachers in Croatia and Serbia filled out questionnaires at vocational conventions in the presence of researchers (paper and pencil method), while the research in Slovenia was conducted online.

Table 1 shows the sociodemographic characteristics of the participants. As expected, most of the participants were women (94.6%). The average age of the participants was 41 years (the youngest participant was 21 and the oldest was 62), while the average length of service was 17 years. Most of the participants had completed college (50.9%), while 29.0% had completed university education (five years) and 15.6% had completed secondary education. This corresponds to the professionalisation trends in early childhood teacher education, in which higher education is given a significant place. About half of the participants grew up in small towns (43.7%), while the other half grew up in larger towns and cities (45.9%), and, surprisingly, 10.4% of the participants did not give any answer to this question. The largest number of preschool teachers was surveyed in Serbia (40.4%), and the smallest in Slovenia (24.6%), which corresponds to the population ratio between the countries. As for cities, slightly more of the participants were surveyed in Rijeka (20.3%), while the distribution of percentages in other cities was as expected (the highest number of participants was in Belgrade 21.9%, and the lowest number of participants was in Koper, 11.3%).

Table 1
Sociodemographic characteristics of the participants

Gender	**f**	**%**
Male	14	2.1
Female	643	94.6
n/a	23	3.4
Total	680	100.0

Level of education	**f**	**%**
Secondary school	106	15.6
College	346	50.9
University	197	29.0
n/a	31	4.6
Total	680	100.0

Size of the settlement of growing up	**f**	**%**
Less than 1,000 inhabitants	112	16.5
from 1,001 to 10,000	185	27.2
from 10,001 to 100,000	138	20.3
More than 100,000 inhabitants	174	25.6
n/a	71	10.4
Total	680	100.0

	M	**s.d.**	**min-max**
Age	40.92	10.26	21-62
Length of service	17.62	11.48	0.5-42.5

City	**f**	**%**
Rijeka	138	20.3
Zagreb	100	14.7
Subotica	126	18.5
Belgrade	149	21.9
Koper	90	13.2
Ljubljana	77	11.3
n/a	-	-
Total	680	100.0

Country	**f**	**%**
Croatia	238	35.0
Serbia	275	40.4
Slovenia	167	24.6
n/a	-	-
Total	680	100.0

Instruments

Dependent variables

Preschool teachers' attitudes towards the role of the natural sciences in society and education

This instrument was designed specifically for the purpose of measuring attitudes towards science and education in the context of social development, and it had already been applied in a research with kindergarten parents (Ivković et al., 2014). The Likert-type scale contains 12 items to which a five-point assessment scale is attached (from 1 – I do not agree at all, to 5 – I completely agree). The items are arranged into two subscales, each containing six items: the first measures materialism, the second post-materialism.

The items of the materialism subscale are:

- *Society is built on the foundation of natural science studies.*
- *Only a child who knows the natural sciences has a chance to succeed in life.*
- *If more children knew the natural sciences, we would start production*

faster in the future.

- *The natural sciences provide fundamental knowledge about the world.*
- *If a child likes to learn, he or she should be guided into the natural sciences.*
- *The natural sciences help economic development.*
- The items of the post-materialism subscale are:
- *The basic task of the study of the natural sciences should be the preservation of planet Earth for future generations.*
- *The goal of studying the natural sciences is the enrichment of human culture.*
- *Preventing the misuse of the natural sciences is more important than social progress.*
- *The natural sciences should primarily develop creativity in children.*
- *The natural sciences teach children that all parts of the universe are interconnected and intertwined.*
- *By knowing the natural sciences, modern man can preserve some skills that are slowly being forgotten today.*

Independent variables

Socio-demographic variables: Gender was measured as a dichotomous variable *(male/female),* level of education in three categories *(secondary school, college and university),* size of the settlement of upbringing in four categories *(less than 1,000 inhabitants, from 1,000 to 10,000, from 10,001 to 100,000, and more than 100,000 inhabitants),* country in three categories *(Croatia, Serbia and Slovenia),* city in six categories *(Rijeka, Zagreb, Subotica, Belgrade, Koper and Ljubljana),* and the age and length of service of the participants were open questions in which the respondent entered a numerical value.

The collected data were processed using IBM SPSS software. The scales of materialism and post-materialism were subjected to component factor analysis, while parametric tests, t-test for independent samples and one-way analysis of variance were used to test differences in averages between individual groups.

Results and discussion

In this section, the results of the research are presented along with a factor analysis of preschool teachers' attitudes towards the role of the natural sciences in education and society, and the differences between preschool teachers in accepting the factors regarding their age and the country and city in which they live. Only the statistically significant data are shown in the tables.

Preschool teachers' attitudes towards the role of the natural sciences in society and education

Table 2 shows the distribution of percentages of the teachers' responses on the scales of materialism and post-materialism. From the distribution of the percentages of the respondents' answers, we can see that the only left-asymmetric variable, meaning the variable that the respondents rejected, is variable v2: "Only a child who knows the natural sciences has a chance to succeed in life." This is a variable that we assumed belongs to the materialism factor. The rejection of this variable is not surprising if we consider the contemporary educational context, in which it is emphasised that each child should be approached individually, and that each child is "rich" in terms of Reggio pedagogy.

The right-asymmetric variables, meaning the variables that the respondents accepted more strongly, are the following: v4, v5, v6, v9, v10, v11 and v12. The content of these variables refers to the role of the natural sciences in preserving the planet and old skills for future generations, as well as awakening creativity in children. The natural sciences are understood here as fundamental human knowledge in the sense that they enrich human culture. These variables relate to what we assume will be the post-materialism factor.

It should be noted that most of the responses to all of the variables are clustered around the middle degree (verbal label: "I do not agree or disagree"), which may mean that the subject of science was not interesting to the respondents, or that they are not sufficiently familiar with it. On the other hand, it may also mean and that the wording of the claims is unclear and not sufficiently close to the surveyed population. This is most true for variables v3 (If more children knew the natural sciences, we would start production faster in the future) and v7 (Preventing the misuse of the natural sciences is more important than social progress). These are statements that speak more explicitly about the relationship between science and economics, and not so much about the relationship between science and education, which is most likely why there were more undecided respondents. A contribution to this interpretation is provided by the research of Rogišić et al. (2020), according to which Zagreb preschool teachers have a lower level of belief in the idea that the main tasks of education are to serve political and economic goals.

Table 2

Distribution of response percentages (%) on the scales of materialism and post-materialism (1 – I do not agree at all, 2 – I mostly do not agree, 3 – I do not agree or disagree, 4 – I mostly agree, 5 – I completely agree)

Label	Item	1	2	3	4	5	M	s.d.
V_1	Society is built on the foundation of the natural science studies.	4.9	14.3	46.7	26.1	8.0	3.18	.942
V_2	Only a child who knows the natural sciences has a chance to succeed in life.	19.6	35.2	36.5	7.0	1.6	2.36	.929
V_3	If more children knew the natural sciences, we would start production faster in the future.	7.9	22.3	50.6	16.6	2.5	2.84	.885
V_4	The basic task of the study of the natural sciences should be the preservation of planet Earth for future generations.	.9	5.4	34.1	41.9	17.8	3.70	.853
V_5	The natural sciences provide fundamental knowledge about the world.	.9	6.8	33.9	47.7	10.6	3.60	.802
V_6	The goal of studying the natural sciences is the enrichment of human culture.	1.4	7.2	34.4	45.0	12.1	3.59	.843
V_7	Preventing the misuse of the natural sciences is more important than social progress.	3.7	15.7	54.2	19.7	6.8	3.10	.874
V_8	If a child likes to learn, he or she should be guided into the natural sciences.	8.5	26.1	44.1	17.1	4.2	2.83	.955
V_9	The natural sciences should primarily develop creativity in children.	3.2	10.7	40.5	38.2	7.5	3.36	.887
V_{10}	The natural sciences help economic development.	1.5	6.4	37.4	45.2	9.4	3.55	.810
V_{11}	The natural sciences teach children that all parts of the universe are interconnected and intertwined.	1.4	5.8	40.2	42.0	10.7	3.55	.812
V_{12}	By knowing the natural sciences, modern man can preserve some skills that are slowly being forgotten today.	.9	4.4	37.7	44.8	12.2	3.63	.788

Factor analysis under the component model with the GK criterion and varimax rotation of the basic solution extracted two factors that explain 51.64% of the total variance (Table 3).

Table 3
Varimax transformation of preschool teachers' attitudes towards the role of the natural sciences in society and education

Label	Item	Saturation with factor	
		F1 – Post-materialism	F2 – Materialist image of the child
V_{11}	The natural sciences teach children that all parts of the universe are interconnected and intertwined.	.762	
V_{12}	By knowing the natural sciences, modern man can preserve some skills that are slowly being forgotten today.	**.744**	.167
V_{6}	The goal of studying the natural sciences is the enrichment of human culture.	**.704**	.243
V_{10}	The natural sciences help economic development.	**.683**	.268
V_{5}	The natural sciences provide fundamental knowledge about the world.	**.664**	.305
V_{4}	The basic task of the study of the natural sciences should be the preservation of planet Earth for future generations.	**.624**	.228
V_{9}	The natural sciences should primarily develop creativity in children.	**.546**	.376
V_{7}	Preventing the misuse of the natural sciences is more important than social progress.	**.458**	.274
V_{2}	Only a child who knows the natural sciences has a chance to succeed in life.		**.853**
V_{3}	If more children knew the natural sciences, we would start production faster in the future.	.286	**.759**
V_{8}	If a child likes to learn, he or she should be guided into the natural sciences.	.277	**.581**
V_{1}	Society is built on the foundation of natural science studies.	.300	**.579**

Cronbach's alpha is 0.872. The first factor is highly saturated by a total of eight variables (30.77% of the total variance). These are six variables that we assumed would make up the Post-materialism factor. They were joined by two "materialist" variables: v10 (The natural sciences help economic development) and v5 (The natural sciences provide fundamental knowledge about the world). These are two statements that highlight the role of science in social development.

The second factor is highly saturated by four variables (20.87% of the total variance) related to materialism. These are three variables that speak specifically about the need for children to focus on the natural sciences for their own and social wellbeing. The last statement about social development deviates somewhat from the other three, and at the same time significantly saturates

the first factor. Although this factor is materialist, it is primarily reduced to children and the meaning of education and science in their lives. If we connect this with the descriptive analysis of the percentage of responses, we can state that these are the items about which the preschool teachers had the most pronounced negative opinion. It seems that the image of the child guided the preschool teachers in filling out the questionnaire and was the main criterion for the distribution of items by factors, which is why the second factor was named Materialist image of the child. The image of the child is considered the starting point of every educational practice, whether at the individual or institutional level, and therefore every practitioner and every education policy should determine what the child is for them.

Table 4

Factor scores

	F1	F2
Skewness	-.192	-.059
Std. error skewness	.098	.098
Kurtosis	.854	.080
Std. error kurtosis	.196	.196

Considering the percentage distribution of the respondents' answers, as well as the distribution of factor scores (Table 4), it is evident that preschool teachers accept the Post-materialism factor somewhat more than the factor Materialist image of the child, although there is a clustering of answers in the middle, i.e., the distribution is pointed, which again tells us that there are a lot of undecided respondents. In the end, we can conclude that we have obtained the two assumed value types – materialist and post-materialist – and although they are slightly modified, hypothesis H1 is confirmed.

The factors Post-materialism and Materialist image of the child in relation to age and length of service of the preschool teachers

In Table 5, we can see that both factors are positively correlated with length of service; however, only the factor Materialist image of the child is statistically significantly correlated with the age of the preschool teachers, also positively. It should also be noted that the correlation coefficients are low. While the positive correlation of the preschool teacher's age with Materialism is expected, the relationship between the factors and length of service is unclear. The correlation coefficient between age and length of service is 0.516 ($p < 0.01$),

which is not a high correlation. It seems that there is some discontinuity in the time of entry and/or exit from the teaching profession, which is why, unexpectedly, both factors are more accepted by preschool teachers with more work experience.

Table 5

Bivariate correlation of factors with age and length of service

		N	Pearson's correlation coefficient (r)	p
Post-materialism	Teacher's age	555	0.053	0.209
	Length of service	555	0.112	0.008*
Materialist image of the child	Teacher's age	555	0.148	0.001*
	Length of service	555	0.138	0.001*

*p < .01

We can conclude that the intergenerational value-shift hypothesis (H2 a and b) is only partially confirmed: while older preschool teachers accept materialist values more than younger ones, post-materialist values are not statistically significantly related to age.

The factors Post-materialism and Materialist image of the child in relation to the country and city where the preschool teachers live

The results in Table 6 show that the factor Materialist image of the child is accepted more by Croatian preschool teachers than Slovenian and Serbian ones, while there are no statistically significant differences in the factor Post-materialism.

Table 6

One-way analysis of variance of factors with countries

		M	Levene's statistic	p	F	p	Bonferroni's test of multiple comparison		
								M (I-J)	p
Materialist image of the child	Croatia (I)	.19	.144	.866	6.031	.003	Cro (I)		
	Serbia (J)	-.09					Ser (J)	.27	.009*
	Slovenia (J)	-.13					Slo (J)	.32	.009*

*p < .01

As expected, the situation is similar with cities (Table 7). While there are no statistically significant differences in the factor Post-materialism, the factor Materialist image of the child is more accepted by preschool teachers from Rijeka and Zagreb than preschool teachers from Belgrade. Differences between other combinations of cities are not statistically significant.

Table 7

One-way analysis of variance of factors with countries

		M	Levene's statistic	p	F	p	Bonferroni's test of multiple comparison		
								M (I-J)	p
Materialist image of the child	Rijeka (J)	.18	.220	.954	3.648	.003	Belg (I)		
	Zagreb (J)	.21					Rijeka (J)	-.39	.024*
	Subotica (J)	.07					Zagreb (J)	-.42	.025*
	Belgrade (I)	-.21					Subotica (J)	-.28	.353
	Koper (J)	-.05					Koper (J)	-.16	1.000
	Ljubljana (J)	-.21					Ljubljana (J)	-.01	1.000

*p < .05

The post-materialist perception of the role of science in society and education is generally accepted by the educational population in the observed countries, which means that the sociocultural, postmodern and neoliberal discourse on science and scientific literacy has taken root in the education systems of the semi-periphery of South-Eastern Europe. This is in accordance with analyses that view the entire post-socialist educational space as a single unit, in the sense that all post-socialist countries strive to adopt global educational values and practices, uncritically looking at the West as an educational and developmental ideal and ignoring local (regional) knowledge, practice and experience (Silova, 2009; Štremfel, 2021).

The second factor is confusing. How is it that it is more accepted in Croatia than in the other two countries, especially in Belgrade? Before engaging in speculations related to the socio-educational context, we verified whether there is a difference in the age and length of service of preschool teachers between countries. A simple analysis of variance showed that the respondents from Serbia (M = 37.5) were statistically significantly younger than the respondents from Croatia (M = 42.64) and Slovenia (M = 46.7; F = 13.969, p < 0.01). This is especially true for the respondents from Belgrade, where the average age is 36.12, while the range of arithmetic means in other cities are from 40 to 48 years. It

should be emphasised that everywhere the minimum age is in the early twenties, and the maximum age is in the early sixties, except in Belgrade where the maximum age is 55. The same statistically significant results were obtained for length of service: the average length of service in Serbia is 12.95 years, while in Croatia the length of service is 19.61 years, and in Slovenia 22.48 years ($F = 40.748$, $p < 0.01$). Given that the intergenerational hypothesis was confirmed in the previous section, we can state that the unexpected rejection of the second factor in Serbia/Belgrade reflects age differences in the sample. We can conclude that in our research, the third hypothesis (H3 a and b) was not confirmed.

Corresponding statistical tests were also conducted with the variables "level of education" and "size of the settlement of upbringing", but there were no statistically significant differences between the respondents.

Conclusion

Considering the initial theoretical implications described in the paper, we can conclude that the importance of the natural sciences and education in the context of social development is unquestionable in the population of preschool teachers. Considering that post-materialist and materialist views on social development are combined, we see that traditional understandings about the role of the natural sciences overlap with current global trends. Given that post-materialist values were accepted in unison, in all three countries and in all generations, we can state that the present research shows that, regardless of certain political and educational differences, there is a common post-socialist space that shares the same developmental (Hughson, 2015) and educational (Silova, 2009) features. The main point of contention that emerged was neither the natural sciences nor the concept of social development, but the approach to education. Emphasis on the freedom of individual choice, that is, on the individual approach to the child, is the mantra of contemporary educational sciences, but also the spirit of neoliberal times (Ball & Olmeda, 2013; Roberts-Holmes & Moss, 2021). That is why, in our view, it appeared as more significant among younger respondents. In other words, we conclude that the results of the research reflect an intergenerational change in the approach to education: from a collectivist to an individualistic one.

The implications of the research findings for educational practice are twofold. Firstly, the research showed that preschool teachers, especially younger teachers, refuse to base their practice on the traditional image of the child, i.e., to make choices for them according to certain social norms. According to them, teaching science is about educating for creativity and individuality

in accordance with the world we live in, which is in line with the literature on contemporary science education and literacy.

Secondly, the research also showed that preschool teachers make no clear distinctions between ecology, economic growth and pseudo-science, which is typical of the postmodern "anything-goes" thinking. This calls for the implementation of a critical-transformative perspective in early childhood and preschool education (kindergartens, faculties, vocational training) of the researched countries, which would allow for more awareness of the importance of the natural sciences and scientific literacy regarding issues such as Anthropocene, global climate and social crisis, and local knowledges and practices. A child must have the freedom to choose and develop according to his or her own individual needs and interests, but one cannot forget that children live in their local communities and a global society intersected with power relations of various kinds. This demands an activist role of the teacher, who should foster solidarity, not only individuality.

We should also refer to the limitations of the research. The first limitation is the sample. Data collection was not carried out using the same method: while field research was conducted in Serbia and Croatia, an online data collection method was used in Slovenia. In addition, surveying at vocational conventions did not allow for control of the selection of respondents by age and other socio-demographic characteristics, which is why the Serbian sample is statistically significantly younger than the Slovenian and Croatian ones. This affected the results of the research. Although, in the text, we talk about the post-socialist context, the research was conducted in only three such countries. Regardless of these limitations, we believe that the research provides new insights into the preschool teacher profession, and that broader social and political contexts should be applied to more empirical educational research in the future.

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