Št./No. 1/2019
Str./pp. 206–225
ISSN 0038 0474

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Creativity encouragement strategies at early age

Abstract: Analysis of prior research on creativity at an early age indicates a lack of data on the efficacy of existing, theoretically promoted strategies and procedures applied at older age. There are, however, certain findings in favour of these strategies at an early age. In addition to theoretical explication, the paper offers arguments for the empirical validation of strategies for creativity encouragement, based on broader international research carried out in Serbia and Romania that studied the didactic reaches of the Nikola Tesla Centre (NTC) program, intended for encouraging divergent thinking and focusing specifically on qualities of thinking, such as fluency, flexibility, and originality. The current study investigates what are the effects of a divergent production of tasks, created on the basis of one of the strategies of creativity development, saturated with processes of creative imagination and inventiveness, on preschool-age children. The experiment in the evaluation study was conducted on a group of respondents, measuring their performance in solving divergent production tasks in initial and final testing. The study included children between 6–7 years old from Romania and Serbia: 562 in the initial and 371 in final testing. The results show that over the course of the NTC learning and teaching program, children can be instructed in developing a wider mental structure in the sense of discovering unusual and remote relations between stimuli and responses.

Keywords: creativity, strategies for encouraging divergent thinking

UDC: 37.015.3

Scientific paper

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Introduction

Creativity, as one of most appreciated human features, has often been referred to as one of the basic upbringing and educational tasks for all ages of children, as well as one of the key competencies and factors of emancipator potential in a knowledgeable society (Đurišić-Bojanović 2011).

Creative work or creativity (Latin *creativnus, creation*—denoting creation of something new, invention, discovery, original work) refers to people's ability to find new solutions, consider problems from new angles, and create new ideas; creativity is accepted as something that has social, spiritual, scientific, aesthetic, or technological value (Banaji, Perrotta, and Cranmer 2010; Kim 2011; Runco 2007). In other words, the basic determinant is novelty and originality in the creation of new combinations of already known forms of poetry or music, reorganizations of ideas and notions, or theories in science (Kleibeuker, de Dreu, and Crone 2013; Kvaščev 1981).

Torrance et al. (in Gojkov 1995) considered whether creativity corresponds to a type of open or divergent thinking (and noticed a great diversity of solutions and responses), which is contrary to close or convergent thinking, when one considers problems only according to unique, singular answers (Runco and Acar 2010; Khandwalla 1993). Recently, divergent thinking has come to be considered one of the specific features of a creative personality (Beghetto and Kaufman 2007).

Guilford (1968) divided thinking to convergent (logical conclusion, finding the right solution) and divergent thinking (finding as many correct solutions as possible). The essential feature of divergent thinking is that it is opposite to convergent thinking and cognition is scattered across a variety of possible solutions. There are four aspects of divergent thinking: fluency, the skill of creating high quality ideas in the linguistic sense; flexibility, the ability to replace the existing form of thinking with new ones; originality, the ability to produce rare or new ideas; and elaboration, the skill of planning and organizing (ibid.). In more recent research (Gralewski et al. 2016), the same elements were attributed to the structure of observed creativity, or even considered the core elements, but also included another element: the motivational, or changes in cognitive development caused

by the transition from the preoperational phase to a range of concrete operations (Marchand 2012). To test this, the well-known Gilford's alternative[1] (1968) uses task can be utilized, where creativity is tested by asking respondents to list as many possible uses for an item (a brick, for example) in a certain period of time. Tests and programs for creativity identification and development of creativity have been developed according to Guilford's guidelines. Most famous are those created by Donald J. Treffinger and E. Paul Torrance. Guilford's conclusion was that creativity can be practiced, like skills, with more training leading to better effects in the sense of creative thinking patterns.

Many authors believe that the operational structure of creativity consists of the following: originality, flexibility, creative fantasy, tolerance to uncertainty, and problem development, as well as elements of the motivational and conative features of creative thinking (Gralewski et al. 2016). There is, however, no agreement regarding the structure of creativity in younger ages (Runco and Acar 2010).

Research within the framework of various scientific disciplines, real life experiences, as well as expert opinions and reflections all indicate that the foundations for later development are created in the first years of the child's life (Skalicky et al. 2017). It has been acknowledged in literature that the quality of early education has permanent consequences for subsequent processes of learning, education, and upbringing, and thus for the future of children's development (Runco 2007; Stojanović and Bogavac 2016; Vartanian, Martindale, and Matthews 2009).

Relevant research on creativity at early age

Up to now, research on creativity involved originality, flexibility, creative fantasy, tolerance to uncertainty, openness of experience, creative generalization, fluency of ideas, discovery and problem development, and motivational and conative features

[1] Guilford determines the following factors of divergent thinking: flexibility, fluency, originality and elaboration:

1. Flexibility—ability to produce many relevant ideas (Torrance 1981), to find as many solutions to a problem as fast as possible. There is: (a) spontaneous flexibility (divergent production of semantic classes) and (b) adaptive flexibility (divergent production of figure transformations).

2. Fluency—ability to process information and objects in different ways (Torrance 1981), ability to simultaneously consider as many different possibilities and categories as possible. There is: (a) word fluency (divergent production of symbolic units), (b) associative fluency (divergent production of semantic relations), (c) expressive fluency (divergent production of semantic systems), and (d) fluency of ideas (divergent production of semantic units).

3. Originality (divergent production of semantic transformations)—ability to produce rare or completely new ideas (Torrance 1981), arriving at ideas differing from other, already familiar ideas.

4. Elaboration—ability to elaborate and illuminate ideas with as many details in responses as possible. There is: (a) figure elaboration (divergent production of figure implications) and (b) semantic elaboration (divergent production of semantic implications). Apart from the stated factors, there are other factors not classified within divergent ones, but also significant for creativity:

5. Sensitivity to problems (cognition of semantic implications)—ability to notice shortcomings or need to change or improve existing things.

6. Redefinition (cognition of semantic transformations)—ability to abandon the old ways of explaining familiar objects in order to use them for new purposes.

of creative thinking (Đurišić-Bojanović 2011; Kvaščev 1981; Maksić 2006). In the creative production of an individual's abilities, interests and learning styles have been found to be most important (Renzulli 1992; Mouchiroud and Lubart 2001).

In recent work, creativity is mostly observed and described as creative talent, creative production, creative activity, and creative contribution (Csiksentmihalyi and Wolfe 2014; Snyder et al. 2004; Zahra, Yusoll, and Hasim 2013). Analyzing the theories and models of creativity leads to the conclusion that the phenomenon of creativity is rather described than explained, so that there is room for further research on this subject (Mouchiroud and Lubart 2001). Some authors insist on a holistic approach to the phenomenon of creativity and giftedness, which enables them to be explained in a comprehensive, scientific way and the development of gifted individuals to be simulated effectively in terms of education (Feldman 1999; Matijević 2012). There are many theories that attempt to explain the process of creation and creativity in general, but none of them provide a single and comprehensive interpretation of creative behavior (Runco 2007). The trait-based theoretical approach to creativity is believed to be the most comprehensive, because it includes personality variables, in a narrow sense, as well as abilities (Zeigler and Phillipson 2012).

Research on the creative potential of children at an early age can be successfully examined according to the Torrance Tests of Creative Thinking (measuring fluency, flexibility, originality, and elaboration) and/or Valac-Koganov's battery for measuring creativity. Besides, the application of creative thinking by Guilford et al. have also proven successful, for example, the "Unusual Uses" or "Alternative uses task," the "Listing words" test, or the test "Story" (Maksić 2006; Paletz and Peng 2008), as well as Torrance's techniques of evaluating and encouraging creativity in "Think creatively in action and movement" (Andiliou and Murphy 2010; Sturza Milić 2014). The very names of the tasks and tests fairly clearly imply their essence.

The analysis of previous research on this subject points, however, to a deficiency of data on the efficacy of existing, theoretically sustained, strategies and procedures that have been applied to older ages, i.e., school (elementary, secondary) rather than preschool children (Alfonso-Benlliure and Santos 2016). Data on the efficacy of didactic strategies that stimulate creativity in early age are scarce (Gralewski et al. 2016). Studies indicate that the creative production of preschool-age children is highly pronounced and occurs in various areas, but later, at different the ages, declining tendencies were observed (Alfonso-Benlliure and Santos 2016; Gojkov 1995).

Results of various research have offered argumentation on the non-linear development of creative abilities (Barbot, Lubart, and Besancon 2016; Besancon and Lubart 2008; Kleibeuker et al. 2013). Their findings have shown an average development of creativity between 4–9 years old, according to all the observed criteria, followed by stagnation, along with a modest decrease between 16–19 years old, with a subsequent, noticeable increase in creativity. In other words, there is a consistent growth of creative abilities, lasting until early maturity, or the so-called adolescent crisis in creativity development. Additionally, according to the findings of the above-mentioned authors, the growth is equal according to all the observed criteria, while the decline during the so-called adolescent crisis has been confirmed

in 3 out of 14 criteria. Experts consider that these differences in creative ability between age groups can result from other causes, not only from developmental changes. Up to now, there is no data regarding preschool-age children, nor lower or higher school-age children (Barbot, Lubart, and Besancon 2016). It is significant for the present paper that the findings of the mentioned studies are in favour of a linear development of creativity at the observed age (4–7 years). On the other hand, the finding referring to the older age found in another study (Gralewski and Karwowski 2013, 2016) is also interesting, since it indicates the importance of encouraging creativity development. In the discussion of their findings, these authors (ibid.) point out that underestimating student creativity, due to the inability to identify creativity by secondary school teachers in Poland, where the research was carried out, can cause a crisis of creativity development at early adult age (adolescent crisis), which has been noticed in the mentioned study (ibid.). This underscores the importance of research on the effects of didactic strategies focusing on creativity development. The weak point of this (ibid.) and other studies, as concluded by the authors themselves, is their methodological nature, since this is a cross-sectional study, and similar ones have been carried out in Germany (Jaarsveld et al. 2012; Krampen 2012; Urban 2005). There are currently no reports on the subject in longitudinal studies.

The part of the paper dealing with previous research on the phenomenon offers a discussion on understanding creativity, criteria, and ways to identify creativity.

There is a need for pedagogical work to be more seriously focused on fostering the creative manifestation of children by structuring suitable didactic-methodical strategies at an early age (Gralewski and Karwowski 2013). Structuring instructions adequately starts the process of distancing children from the accustomed testing directions (Mouchiroud and Lubart 2001).

Edward de Bono found that people think in two ways—linear thinking and lateral thinking (in Gojkov and Stojanović 2011). Linear thinking is developed during maturation and it enables logical thinking, problem solving, task solving, etc. Lateral thinking ("sideways thinking"), i.e., thinking in images or representations, is the foundation of creativity (Forthmann et al. 2016). It opens up possibilities for the creation of something new (Runco, Plucker, and Lim 2000). Children's inherent ability to think laterally is, to great extent, suppressed by parents and school, teaching children to think rationally, i.e., in a linear way, unconsciously suffocating creativity (Alfonso-Benlliure and Santos 2016). Children should be provided with the opportunity to develop both linear and lateral thinking, according to suitable strategies.

There is an obvious need to research strategies of creativity encouragement at an early age, and to inform the relevant actors in education (preschool teachers, teachers, parents) about them so that they can be effectively applied (Wang and Hong 2002).

Creativity encouragement strategies

Current research on didactic and teaching methodology strategies for the encouragement of creativity has led to the conclusion that there are possibilities for application at an early age (Feldman and Benjamin 2006; Forthmann et al. 2016). The research focusing on preschool-age children in cross-sectional studies have observed an acceleration of creative abilities and concluded that this accelerated development starts as early as kindergarten (Gralewski 2016). So, encouragement of the development of creative thinking elements should occur as early as preschool age.

One of the possibilities to encourage creative thinking elements development is the implementation of the Osborn's (1963) strategy - "brainstorming". It deserves a significant place within the well-known systems of creativity development and can be applied in different variants and at younger school age. Osborn's (ibid.) system of creativity development is based on the following psychological mechanisms: research and test other possibilities of implementation of ideas; adapt, modify, enlarge, reduce, condense, substitute, change the sequence of elements, turn everything over, then combine two or more ideas (Kvaščev 1981).

Torrance was another researcher whose creativity theory has turned out to be significant and efficient. His system of creativity development (Torrance 1981) is theoretically grounded in the following: in revealing ambiguity, i.e., various layers of meanings of the given facts and an increase of value of the given information; developing strategies of creative learning through discovery; developing motivational components of creativity; synthesis of empirical research and theoretical generalization; associative basis of discovery; and finding something new according to incomplete facts and insufficiently structured material. The function of didactic instructions in Torrance's system of creative abilities development is to synthetize material and functional aspects of education; to overcome the imbalance between the cumulation of knowledge and the demand for forming of creative personality through development of tolerance towards new ideas, encouragement of self-initiated learning, raising provocative questions so that the learners have to interpret, apply, analyse, systematize and evaluate information.

The Nikola Tesla Center's was established in 2000 within the Department of Mensa, Serbia. The purpose of the NTC program is to encourage creative thinking, or divergent production, based on didactic strategies, using knowledge gained from neurophysiology and cognitive psychology. Exercises in the NTC program offer practical procedures that address the issues of integrating intellectual activities in more coherent and interconnected acts, demonstrating practically, through exercises, how basic binding operations can be embedded in representations of the depiction and perception of an organization. The NTC's program for encouraging creativity is applied in Italy, the Czech Republic, Slovenia, Romania, Montenegro, Croatia, Slovakia, and Bosnia and Herzegovina. In Serbia, it was accredited by the Ministry of Education of the Republic of Serbia for the professional development of educators and teachers (Rajović 2012a). It is based on understanding the importance of a child's intrinsic capacities (for symbolization and representation),

and also on Bruner's insistence on the possibilities of intellectual development of a child according to techniques encouraging child's intellectual development (Gojkov, Rajović, and Stojanović 2015; Rajović 2009). Based on the above, which represents the theoretical basis for this evaluation study, as well as Osborn and Torrance's strategies of creativity development, didactic instructions were selected in the program, the effects of which are presented in the current paper (Rajović 2009, 2012).

The subject of the evaluation study refers to observing the effects of the international project called "Smart Children Network," (SMART) which is based on the NTC learning system.

The *research problem*, *or research question* is: what are the didactic reaches of the NTC program in the sense of divergent production development, meaning to what an extent have the tasks saturated by the processes of creative thinking, creative imagination, inventiveness, and divergent production influenced liberation from conformist thinking, and what have their effects been in divergent production?

The *general research aim* is therefore to contribute to discovering more effective creativity encouragement strategies at an early age. Apart from theoretical clarifications, the intention is to get to the arguments empirically, validating creativity encouragement strategies according to findings arising from of the results of a broader international research conducted by authors in Serbia and Romania (Rajović et al. 2017) in order to get insights into the didactic reaches of the NTC program in creativity development (independent or intervening, predictive variable).

The direct aim is to establish the extent to which the tasks saturated with the processes of creative thinking—fluency, flexibility, creative imagination, inventiveness, and originality (which are dependent variables)—all affect the development of elements of creative thinking or divergent production (which are criteria variables) in preschool children, in order to find suitable elements for assessing the efficacy of the NTC program.

General hypothesis: As a result of this exercise, the group of preschool age children will increase the number of creative solutions to problems in functional tasks, i.e., didactic instructions in the NTC system. Demands for divergent thinking will induce divergent production in respondents, that is, it will liberate them from conformist thinking and provide notable efficacy in divergent production.

Working hypotheses:

The research is a kind of explorative evaluation and operational, applied study, making several first steps in more fully articulating the poorly-examined phenomena of the effects of the NTC program's didactic instructions, as well as one of the commonly-applied strategies of developing creative thinking in older children, all in order to encourage creativity in children of younger ages.

Method

Sample and organization: A purposive sample included 562 children, 290 boys and 272 girls. Of the 562 children who participated in the initial test, 371 took part in the final test (192 boys and 179 girls). They included 368 children from Serbia, 194 from Romania, and ranged in age from 6–7. They were taught according to national curricula in institutional education and upbringing work. The decrease in the sample in the final test was caused by an outbreak of chickenpox.

Descriptive method and the method of a one-group experiment were used in this research. Descriptive method was applied in data collection, processing, and interpretation. The one-group experiment method was used in that work concerning the establishment of the effects the NTC system on the development of divergent production in preschool children.

According to Osborn's standpoint, the didactic program was related to the method of introducing creation to associative links, creative generalizations, and other forms of mediations, as well as developing flexible, creative thinking elements, i.e., the method of exercise, combining the nominal method of group discussion and instructions (Gojkov, Gojkov-Rajić, and Stojanović 2014). This is all contained in Osborn's checklist: Explore and try out some other possibilities of using ideas. Adapt (is there anything like this, what are the other ideas?), Modify (change the meaning, color, motion, sound, shape). Reduce (diminish—what to take away, make smaller, condense). Substitute (what can be added instead of this—other material, other processes, other methods of solving). Rearrange the layout of elements. Combine two or more ideas, etc. (Hellriegel and Slocum 1989).

Attention was also paid to the use of stimulus words and orientation towards finding remote associations, as well as on the encouragement of remote relations as intermediaries between the stimuli and response, as mediators in promoting fluency, flexibility, and other elements of creative thinking. This forms the structural basis of the program that's efficacy is analyzed in this research.

Characteristics of didactic instructions within the program also included stimuli for finding ways to solve problems without strict guidance, but with total freedom allowed, stimulating production to the maximum extent, encouraging unusual ideas for solving problems, and considering the most suitable ideas through discussion (which has its own rules specific to Osborn's strategy) (Osborn in Stojaković 2008).

The responses were differentiated according to the structure of associations, i.e., the level of divergencies: 1. *associations according to similarity*; 2. *direct associations*; 3. *accidental associations—practical*; 4, *distant relations*, referring to different creative uses of an objects, establishment and strength of associations.[8]

The key characteristics of didactic instructions in the analyzed program are related to the teaching style in which the development of tolerance towards new ideas is recognized; asking challenging questions that should be interpreted, analyzed, and systematized by children.

Research instruments refer to tests for children: pre-test and post-test, i.e., initial and final tests of functional knowledge (FZ-1 and 2)[3] and divergent production tasks (ZDP-1 and 2)[4]. Functional tasks are selected so that it is possible to check the effects of creative reactions in solving the problems referring to functional knowledge. The same tasks were applied in both initial and final testing. The same tasks were used in the final testing in order to determine the effects of the

[2] Example:

A PEN
Examples of responses
I
Drawing/writing/coloring...
Putting make-up/drawing on one's face
II
To sharpen it
If you have an eraser, to erase it
To tap with it
To make a hole with it
To poke something with it
III
To be a meat skewer
To model dough/plasticine with it
To play music with it, to be a drumstick...
To put it in one's hair, to curl hair with it
To be a stick holding a flower
To measure something with it/ to be a ruler
To hit something with it
To hammer it on the wall
To reach something with it
To ornament it
To mark a place in a book we are reading
IV
To construe something with it
To be a rabbit's ear
To be a fence
To be a mic
To be a magic stick
To be a conductor stick
To be a weapon in a play (a sword, arrow, gun…)

[3] An example of a functional task: A man was walking through the woods with his eyes closed, but he nevertheless knew it was autmn. How? (Solution: leaves rustling sound effect…)

[4] The tasks required children to come to as many original and unusual responses as possible. In the offered examples, the children were motivated to find/think of as many helpful uses of a ball, a coffee cup, a pencil, a piece of paper, and a fork as possible.

program, and the grounds for this was found at the level of results of the initial testing.

The paper will offer only the findings related to the tasks requiring children to think of as many original and unusual responses as possible. Each of the stated objects has its own common use, and children were supposed to list several other (different) possibilities (Snyder et al. 2004).

Data analysis: for the purpose of this research, the children's responses were classified by competent reviewers—researchers of creativity—in six categories that reflect the structure of associations in divergence: associations by similarity, direct associations, random associations, remote relations, no answer, and senseless answers.

In presenting the research data, the focus was on responses related to a more creative use of items, i.e., those in which divergent elements of thinking are manifested. It was necessary to determine the extent to which respondents, in solving problems, predominantly use mediators and establish associations, as well as the consistency of association (Mednik in Gojkov 1995).

It was established, according to the calculation of the Cronbach's alpha (0.73), that the scale used to measure the success in problem solving of divergent production in the initial and final research showed sound reliability and internal consistency for the chosen research sample. Cronbach's alpha for the test of functional knowledge was 0.78.

In order to establish the validity of the instrument, i.e., in order to examine what the instrument measures, it was necessary to analyze the data collected according the instrument, which was a modified version of Guilford's (1968) creativity test, directing a subject to state as many possible uses of an object (e.g., a brick) as possible for a limited period of time. This was done for a representative subsample of subjects. Subsequently, the collected data were analyzed according to logical validation of an expert team; content analysis was conducted, as it is a common initial procedure for validity check. Condensation of test particles led to three latent variables, referring to divergent production, whose construct consists of fluency, flexibility, and originality, which is in accordance with the theoretical grounds this research is based on.

The initial research was organized in the beginning of 2016 and finalized at the end of the same year. Data statistical analysis was conducted in the Statistical Package for the Social Science (SPSS program – descriptive statistics, Chi-square test of independence for determining the statistical significance of differences).

The *predictive variable* is the NTC program, that is, didactic instructions that encourage creative responses in children, while the *criterion variable* refers to the elements of divergent thinking. Aware of the possibility that numerous factors can influence the changes in the quality of creativity in general, and thus in the case of the observed children, we adopted the one group experiment due to the fact that the project made available a purposive sample, implying more contents. As a consequence, there were no possibilities for other approaches. Keeping in mind that this is an explorative approach, i.e., the first step in the search for finding broader frameworks and more certain hypotheses, an experiment with one group was considered acceptable for the present evaluation study.

The respondents' countries, familiarity with the items, knowledge, and experience as a factor of creativity were the *control variables*.

Results and discussion

Effects of didactic instructions contained in Osborn's strategy of creativity development on divergent production

The presentation of data relating to the first hypothesis shows the number of changes developing in respondents under the influence of didactic instructions contained in Osborn's strategy of creativity development, i.e., using the NTC program. Relations between the initial and final test are shown in Table 1.

0		**The number of acceptable responses**					**Total**
1		**2**	**3**	**4**			
Repeated		46	59	82	89	90	366
		12.6%	16.1%	22.4%	24.3%	24.6%	100.0%
Initial		128	88	78	46	23	363
	35.3%	24.2%	21.5%	12.7%	6.3%	100.0%	

Table 1: Differences in initial and final measuring of divergent thinking

There is an obvious difference in favour of final measurement in which respondents were providing more creative answers than in the initial measurement, meaning their responses contained more elements of creative production, or more fluency of ideas about the usability of items that were examined, more flexibility, originality, redefinitions, and creative generalizations were given, and there were less senseless answers or situations in which the child did not give any answer.

The above finding confirms the first hypothesis that a statistically significant difference is expected in favour of the final measurement regarding the elements of creative production. This essentially confirms the general assumption that didactic instructions in the NTC system affect the development of divergent production in preschool children. The application of the above described didactic instructions within the NTC program, grounded on the elements of Osborn's strategy of creativity development, lasted from the middle of March 2016 to October 2016 with a break during summer holidays (July–August). All in all, children were exposed to these didactic instructions for about four months, and if the summer holiday is taken into consideration, it is a period of six months. From the angle of maturation, it is not to be expected that the factor of time would have been the sole cause of statistically significant indicators, having in mind that the observation period was not long.

Didactic instructions saturated with demands for creative thinking, creative imagination, and inventiveness induced divergent production, that is, affected the liberation from conformist thinking and led to notable efficacy in divergent

production. This is a confirmation of the first hypothesis, in which the elements of creative thinking are criteria variable and the NTC program is a predictive variable. It verifies the possibilities of encouraging creativity at a younger age, that is in children 6–7 years old (Gralewski et al. 2016). The data are given in Table 1.

The second hypothesis, that statistically significant differences in the understanding of creative use of objects in the course of solving functional tasks was expected, indicating divergent production, was tested using the Chi-square test of independence. It was found that there was a statistically significant difference (0.01) between efficacy in solving functional tasks and giving creative answers to the question about the use of items (pencil, sheet of paper, ball, cup) ($\chi^2 = 66.309$, $p < 0.001$) in favor of the final test. A small but statistically significant influence was found regarding the efficacy of solving functional tasks with the help of divergent functionality of items ($V = 0.17$). Based on the divergent use of items, respondents created new ideas about the possibilities to solve tasks in a new and original way and, thus, they were more efficient in solving functional tasks. This relation can be seen in Figure 1.

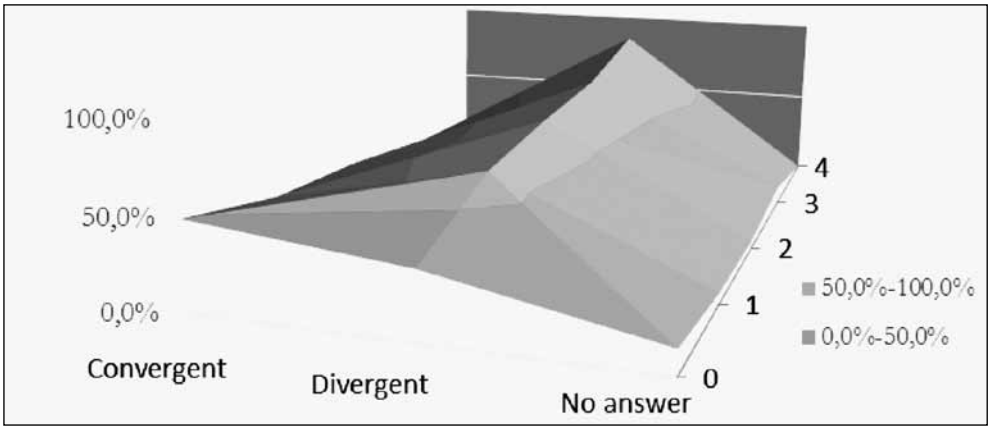

Figure 1: Relation between the efficacy in solving functional tasks and divergent production

The confirmed relation between the elements of divergent thinking and the success in solving functional tasks also indicates the possibility of encouraging divergent thinking at this age using certain didactic instructions and strategies. Based on divergent abilities, respondents demonstrated creative responses and came up with new ideas that represented original ways in solving functional tasks, which is an essential feature of divergent production (Diakidoy and Phitaka 2002). Similar findings were reported by other researchers (Runco and Acar 2010) who studied the advantage of using the instruction and evaluation of ideas in problem solving. Instructors who led the training facilitated an increase in the number of accurate solutions for the given tasks.

It can be noticed that the tasks saturated by the processes of creative thinking (fluency, flexibility, creative imagination, inventiveness, and originality) have influenced the development of elements of creative thinking, i.e., divergent production

in preschool children, leading to greater production in solving functional tasks and providing proof of the efficacy of the NTC program, which is also indicated by the statistic indicators discussed below.

Functional tasks and hierarchical organization of associations

The second hypothesis, that statistically significant differences in the perception of functionality of items used in the test and their creative use in solving functional tasks, is also confirmed by the above findings. It is a confirmation of the scope of the NTC program, which was aimed at encouraging creative responses in children at an early age.

Using the Chi-square test of independence, a statistically significant difference was found (0.01) between the efficacy in solving functional tasks and the hierarchical organization of associations in answering the question about the use of items ($\chi^2 = 54.348$, $p < 0.001$). A medium, statistically significant influence was found between the efficacy in solving functional tasks and the ways of structuring associations ($V = 0.28$). The obtained data indicate that children who are more efficient in solving functional tasks (i.e., provide more correct answers) have more associations and remote relations as indicators of divergent production (Figure 2).

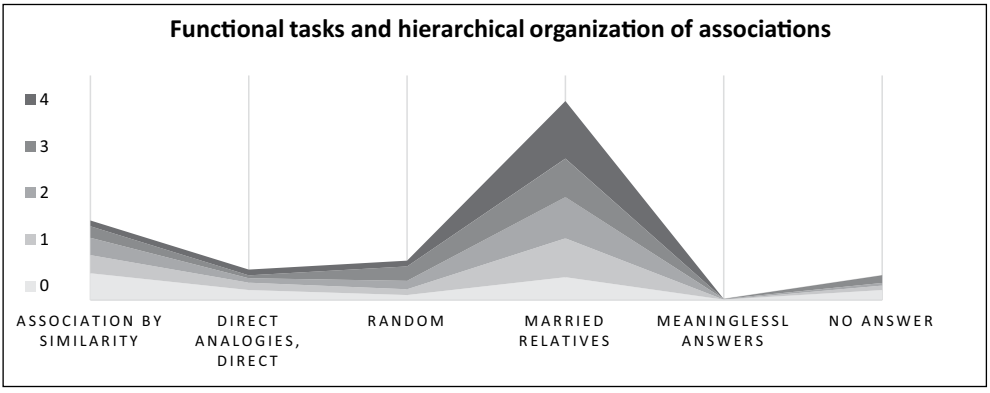

Figure 2: Functional tasks and hierarchical organization of associations

In Figure 2, the absence of the correct solution of the task is indicated by 0, while the number of correct answers is indicated by 1–4 (1 being the least correct and 4 being the most correct). It can be seen that the number of successfully solved functional tasks increases as the number of creative elements in conceiving the usability of items in the divergence test rises. This is in line with findings of other researchers (Runco and Charles 1993) who reported on the significance of the conceptual style of creative production. Style is dependent on originality as an essential element of creativity. Analyses of conceptual style (ibid.) found that originality is essential for creativity, and divergent production is the effect of remote relations and the creation of wider, flexible, original structures, which form hierarchies of

association and specific cognitive structures. The hierarchical structure of associations makes the basis for the creation of wider cognitive structures (mediators) and proved to be a significant factor in solving functional tasks, which in this research also confirms the effects of exercising.

Considering the hierarchical organization of associations (Figure 3), a link can be observed between divergent production (remote associations, new, unusual and useful combinations, remote relations, etc.) and efficacy in solving functional tasks, meaning respondents who base their general mediation responses on relations find it easier to break the "flow of thoughts" while solving the problem at hand; they search for remote relations in the given task and they are more efficient in finding answers and solutions in remote relation to the given task, so that their behavior is more flexible and less automatic. It emphasizes of the importance of *creative generalization* as the basic condition for discovering new ways of thinking. This finding confirms the importance of flexible control in mediation (Mednik et al. in Kvaščev 1981; Gojkov 1995), because respondents who manifested "flexible control" in the hierarchical structure of associations were more focused on finding remote answers, remote associations, new combinations of different elements of materials, and different information, which is related to the efficacy of solving functional tasks.

This finding is important for didactics, as it can be concluded that it is possible for children of preschool age to be trained through consistent exercise to develop a wider mental structure as a mediator between stimuli and responses, i.e. a creative generalization in the sense of discovering unusual and remote relations between stimuli and responses. This emphasizes the importance of developing an individual learning style and integrating the principles of developing creativity through the hierarchy of associations (combining, researching, relating information with different meanings, and remote relations) in early childhood.

Differences in creative production relative to the country from which respondents originate

According to the third hypothesis, a statistically significant influence of the respondents' home country was expected as a variable on the way in which children solve the tasks. When considering creativity, the influence of the environment was also assumed to be important in addition to personality traits, processes, and products of children creativity. Other researchers also suggested that the environment can facilitate or hinder the manifestation of the individual's creative potential (Bodroža et al. 2013; Mooney 1963). Educators in Serbia receive substantial support from a well-organized pedagogical and psychological service. This was envisaged by the SMART project to help educators in structuring exercises that encourage creative responses in children. Educators working with children included in the research sample were led by intrinsic motivation, because one of the conditions for inclusion in the project was to participate in instruction for the implementation of the NTC program. The applicants already participated the seminars in the field of implementing strategies for encouraging creativity in younger children, and their

expectations were focused on the possibilities for transferring what had already been learned. In Romania, educators lack this type of professional assistance in their preschool institutions and overall education systems. In addition, the initial preparation of educators in preschool institutions is also different, taking into consideration the specific circumstances in each country.

The question regarding the role of the respondents' home country was answered by considering the children's responses, grouped into six categories relative to the hierarchical structure of associations (from similarity-based associations—stereotypical constructions—through associations related to direct associations—direct analogies, random associations—and remote relations—creative generalizations) (Figure 3). The following data were obtained: the Chi-square test of independence found that there was a statistically significant difference (0.01) in the creative use of items among children from Romania ($\chi^2 = 37.549$, $p < 0.001$). Children's home country as a variable was found to have a medium influence on the divergent organization of cognition in children ($V = 0.26$).

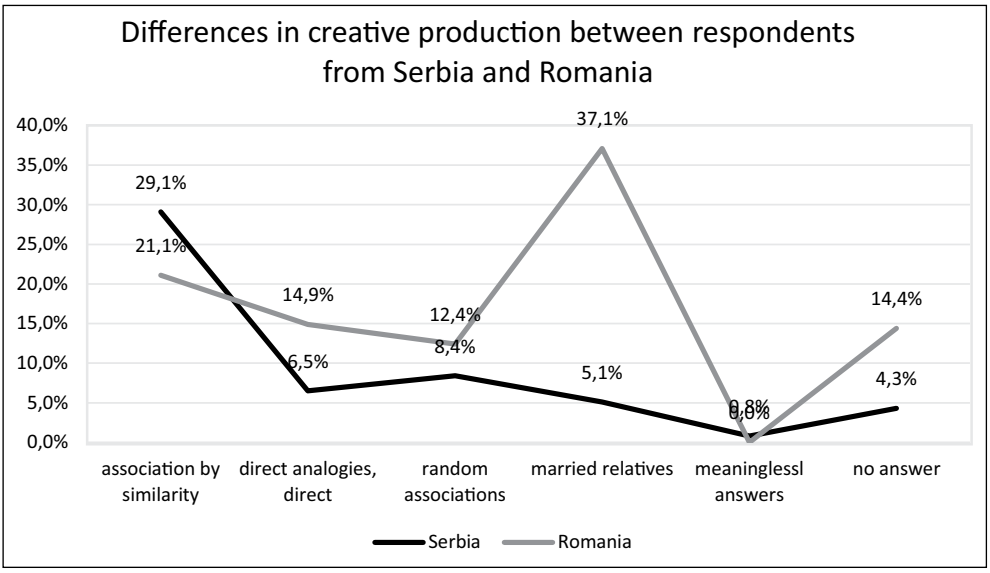

Figure 3: Differences in creative production between respondents from Serbia and Romania

This confirms the assumption that there are differences when it comes to the children's home country as a variable.

One of the determining factors relates to differences between the countries in terms of the style of parental upbringing, which was confirmed in some studies (Gojkov 1993). Romania and Serbia are neighbouring countries. Respondents who came from geographically close regions, situated along the border might have been exposed to different social contexts and educational systems. That seems to be the reason why different styles of parental upbringing have been formed, which significantly affects the perception of creativity and the ways of supporting it (Đurišić-Bojanović 2008; Rajović 2012).

This is in line with the findings of other studies (Arar and Rački 2003), which concluded that the environment in which the individual lives plays a significant role in either developing or hindering creativity. Creativity also significantly depends on the social context in two aspects: ontological (in which the critical segment of society decides what is creative and what is not) and empirical (in which the realization of creative ideas depends on the support provided by the social milieu) (ibid.). A creative act requires the individual to invest its abilities, skills, and efforts, but this act should be noted in the society. Societies differ from each other by the amount of attention and time they invest in identifying and recognizing new ideas, as well as realizing creativity. Identifying differences in various social environments can be considered a confirmation of other research findings on the importance of the core factor of realizing creative ideas and evaluating creative products (Andiliou and Murphy 2010). In Amabile and Pillamer's componential theory of creativity, they (Amabile and Pillemer 2012) suggested that creativity is affected by four elements; the first three relate to the individual (relevant skills domain, processes relevant for creativity and intrinsic motivation), and the fourth (organizational creativity and innovation) to the individual's social environment (ibid.). Creating an open, flexible, unconventional environment in which the individual can advance the development of personality traits, styles of thinking, knowledge, and skills necessary for creative thinking is one of the most important factors for stimulating creative potentials.

Conclusions and recommendations

The findings of this study indicate the possibilities for making advancements in the divergent thinking of children at an early age using didactic strategies. Notions of *creativity as a factum*, which include exceptional cognitive characteristics but also a combination of certain personality traits and motives (Urban 1995), and also implies a special model for identification (Sternberg 2006), have found a confirmation in the results of this research.

Findings on the advancements of children's creative production manifested in divergent thinking and functional knowledge have shown that the instructions contained in Osborn's strategy encourage children to solve tasks based on their general mediation responses on relations[5] and the wider flexible cognitive structure as a mediator between the stimuli and responses, which led to efficacy in task-solving. This confirmed the theoretical assumptions of *cognitive approach* (Csiksentmihalyi and Wolfe 2014), according to which creativity results from thinking processes (Banaji, Perrotta, and Cranmer 2010; Kim 2011; Runco 2007), since they are directed towards internal structures of cognitive processes that lead to creative results and interdependence with other aspects (personality traits, intelligence, etc.). This is

[5] For example, the word "paper" induced the most divergent responses, mainly providing answers based on associative elements that can be evoked by touching on the basis of mediation of common elements (to draw on it / write / apply color; to cut / split / burn; to sharpen a pencil on it; making airplanes / boats / caps / crowns / hats; making a trumpet with it / ball in the game / ice cream basket; make a mask from it; fold it as a pancake, etc.

in accordance with the standpoints of *confluent (integrative)* theory, according to which creativity is influenced by several elements, such as intelligence, knowledge, thinking styles, personality traits, motivation, and environment (Sternberg 2006). Sternberg's attitude towards three aspects of intelligence—analytical, creative, and practical—does not, however, contradict the notion of the importance of establishing wider mental structures as the basis of relations.

The social context is a factor that can affect differences in creative performance (Sternberg 2006). Marking the importance of social context in which respondents from Serbia and Romania are developing, the findings have also confirmed the second approach, where creativity is seen as a potential to be discovered and perfected. Sternberg's view that the utility and value of a creative idea largely depends on the individual's society and culture is well interpreted by the finding regarding differences between respondents from Romania and Serbia. This supports the *socio-psychological approach*, which also considers the influence of society, environment, motivation, and personality traits on creativity.

The main finding of this research is consistent with the well-established opinion in the scientific community that creativity can be developed (Csiksentmihalyi and Wolfe 2014; Sternberg 2006). These findings indicate that exercises and instructions in the NTC learning and teaching program enables children to develop a broader mental structure as a mediator between the stimuli and responses in terms of discovering unusual and remote relations between them.

There are, however, some interesting questions that largely escaped the researchers' attention: what are the causes of individual differences in creativity from the perspective of associative hierarchy? Which didactic factors encourage the creation of unusual associations and useful combinations that can indicate the mediation mechanism, considered to be the most important association mechanism for testing creativity? What didactical instructions provoke mediation, or the creation of an associative hierarchy? The findings of further research could answer these questions and would be important for preschool didactics, as well as the overall research on the nature and ways of encouraging divergent thinking at an early age.

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STRATEGIJE SPODUJANJA USTVARJALNOSTI V ZGODNJEM OBDOBJU

Povzetek: Analiza dosedanjih raziskav o ustvarjalnosti v zgodnjem obdobju nakazuje na pomanjkanje podatkov o tem, koliko so teoretsko uveljavljene strategije in postopki spodbujanja ustvarjalnosti, ki jih uporabljamo s starejšimi otroki, učinkovite tudi pri delu z mlajšimi, čeprav so ugotovitve nekaterih raziskav v tem pogledu sicer spodbudne. V prispevku najprej teoretično, nato pa tudi empirično obravnavamo strategije spodbujanja ustvarjalnosti; predstavljamo del ugotovitev mednarodne raziskave v Srbiji in Romuniji, v kateri smo proučevali didaktične možnosti programa NTC, namenjenega spodbujanju divergentnega mišljenja, zlasti miselne fluentnosti, fleksibilnosti in izvirnosti. Raziskovalno vprašanje je bilo, kako procesi ustvarjalne imaginacije in inventivnosti v okviru Ozbornove strategije razvoja ustvarjalnosti učinkujejo na ustavrjalnost predšolskih otrok. V raziskavo je bila vključena skupina otrok, pri katerih smo merili, kako rešujejo ustvarjalne naloge pred implementacijo metode NTC in po njej. Otroci iz Romuniije in Srbije so bili stari šest in sedem let; 562 jih je sodelovalo v začetnem, 371 pa v končnem testiranju. Rezultati kažejo, da je z uporabo metode NTC mogoče spodbuditi razvoj ustvarjalnosti.

Ključne besede: ustvarjalnost, metoda NTC, strategije spodbujanja ustvarjalnosti, predšolsko obdobje

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