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“STORYLINE” OR “ASSOCIATIONS PYRAMID”?  
A RELATIONSHIP BETWEEN THE DIFFICULTY OF EDUCATIONAL  
METHODS AND THEIR EFFECTIVENESS IN DEVELOPING  
LANGUAGE CREATIVITY AMONG PRE-SCHOOL CHILDREN

This article presents the results of a comparison of two educational methods – the “Storyline” and the “Associations Pyramid” – in developing language creativity among children. The methods were compared in terms of effectiveness with two post-tests, directly after the end of the experiment and after the next three months. Moreover, the initial level of operational thinking (from the pre-test) was used in a regression model as an independent variable to observe whether it predicts results in the language creativity of children in both groups, in post-test 1. Eighty-three preschoolers took part in the experimental study. The two methods do not differ significantly from each other in effectiveness. Also, the level of operational thinking does not predict an overall level of language creativity either in the “Storyline” group or in the “Associations Pyramid” group. The results are discussed in the light of pedagogical practice.

*Key words:* educational methods, five-year-old children, operational thinking, language creativity, effectiveness

## Introduction

Children are commonly considered as creative (e.g., Glaveanu, 2011). Early childhood is regarded as the best time to boost as well as to keep creative potential. Children not only know how to present happiness and pride while creating, but also benefit developmentally from creating (e.g., Barrett, 2006; Saracho, 2002). Creativity is not only a natural attribute of children, but can also be developed during the learning process, spontaneous experience, problem

solving and taking part in trainings that widen children's competence (e.g., Howard-Jones, Taylor, & Sutton, 2002; Mellou, 1995; Russ, 2003).

The current study focuses on language creativity, and shows possible ways of developing it effectively. Language creativity is defined here on one hand as a creative process directed to create a product (e.g., Bates, Dale, & Thal, 1996) – in this case a story – and on the other as creating a new and valuable product (Stein, 1953) – in this case an original and interesting story.

In psychology and in pedagogy there are a great many studies focused on assessment of effectiveness of various educational methods (e.g., Burke & Williams, 2008; Dziedziewicz, Oledzka, & Karwowski, 2013; Lillard, 2012; Maker, Jo, & Muammar, 2008). In such studies, factors that influence effectiveness are tested. They show that it is important to use methods with “evidence-based” efficacy because such methods produce better results in the development and education of young children (e.g., Kazdin & Weisz, 2003).

Despite the huge diversity of studies on creativity and thinking skills, there are not many studies which focus on two issues that are very important and are the basis of the studies presented here: the effectiveness of the methods and the role of the child's level of cognitive development in its effectiveness.

### **Evidence-based methods**

First of all, there is a lack of investigation of the effectiveness of methods that potentially differ in their level of difficulty. On one hand, it is often assumed that if the method is to be considered as effective it should be intelligible and easy for the participants. Difficulty in comprehension and the misunderstanding of the instructions can make problem solving exercises indecipherable to children until they reach a certain age. However, after the instructions are simplified, the number of correct answers rapidly increases, even among young children. It is important to adjust the methods used in education to children's general developmental abilities – primarily thinking skills (e.g., Donaldson, 1987; Flavell, 1978). On the other hand, Vygotsky suggested that with the active and flexible support of an adult, children can successfully perform tasks that slightly exceed their actual cognitive abilities (e.g., Vygotsky, 1966). This suggestion was confirmed in later studies, which verified and modified Vygotsky's theory and took into consideration a child's individuality and developmental abilities (e.g., Howe, 2010; Rogoff, Mistry, Goncu, & Mosier, 1993; Wood, Bruner, & Ross, 1976). Succeeding at solving problems that are slightly above the actual abilities of children can, though, help them reach a higher level of abilities faster than succeeding at easier ones. Thus, the first research question in the current study is whether differences in the difficulty of methods influence their effectiveness in developing language creativity.

### **Cognitive development and effectiveness of methods**

The second issue in the current study is directly connected to the first. It concerns whether the initial level of thinking skills of children taking part in the current study predicts the methods' effectiveness. One of the most important factors, which has a crucial influence on the results of the educational process, is the environment in which the child grows up. The more diverse and rich the environment in which the child develops and learns, the more advantageous it is for them (e.g., Bronfenbrenner, 1986; Flynn, 2000; Murray, 2002; Nisbett, 2009). At the same time, the importance of early intervention in a young child's education is highlighted. The studies indicate that participation in preschool education significantly influences a child's future performance (e.g., Burger, 2010; Camilli, Vargas, Ryan, & Barnett, 2010). Additionally, it has been shown that the brain of a young child is exceptionally malleable and susceptible to different influences (e.g., Belsky & de Haan, 2011). This is why it is important for children to be engaged in different educational activities at a young age (e.g., Barnett et al., 2008; Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; Love et al., 2005; Schweinhart et al., 2005). The benefits of these lessons in early childhood are far more evident and long lasting than if they are learned in later childhood or adolescence. Quite often, studies on the effectiveness of different educational methods show positive effects of working with children (e.g., Gormley, Gayer, Philips, & Dawson, 2005; Hamre & Pianta, 2005; Hill, Brooks-Gunn, & Waldfogel, 2003; Slavin, 2005). Certainly, the effectiveness indications differ from each other depending on the program and the type of difficulties observed in specific children. In general, however, the programs that work best are those whose activities are as intensive and as diverse as possible and directed at smaller groups of receivers at once, rather than those that last longer and are directed towards larger groups of people (e.g., Besharov, 2005; Borman et al., 2007). Studies that admittedly concern effectiveness find that the higher the initial thinking skills of children are, the better are the effects of the interventions (Bayliss, Jarrold, Gunn, & Baddeley, 2003; Bayliss, Jarrold, Baddeley, & Leigh, 2005; Lepola, Niemi, Kuikka, & Hannula, 2005; Sweller, 2008). Additionally, the studies show that children's previous higher thinking skills determine their later educational success (Duncan et al., 2007; Hattie, 2010; La Paro & Pianta, 2000; Rhoades, Warren, Domitrovich, & Greenberg, 2011). Thus, the second research question is whether the initial level of operational thinking is significant for the effectiveness of the methods used in the current study.

### **Educational methods**

In the current study, two methods were used to work with preschoolers. The methods were used to develop preschoolers' language creativity. Previous

studies have shown that there is a strong relationship between the level of operational thinking and language abilities (e.g., Bivens & Berk, 1990; Gentner & Boroditsky, 2001; Gopnik & Meltzoff, 1997; Papafragou, Li, Choi, & Han, 2007; Pederson et al., 1998; Piaget, 2001; Schaffer, 2006; Wood, 1998; Vygotsky, 1986). This relationship is meaningful for children's functioning in preschool, and later at school. The ability to use language effectively significantly increases a child's success in education. A low level of ability to verbally describe knowledge can be considered an indication of intellectual incompetence. In reality, though, it is a problem which starts at the level of creating consistent and clear statements. It can be assumed that to express his or her thoughts in a way that is comprehensible to an interlocutor, a peer and an adult, a child's level of language development should be as advanced as possible. The importance of the child's consciousness of how and what s/he is communicating is also important. This consciousness develops during childhood – from spontaneous improvement of statements to reflection on the result of the statement (Donaldson, 1987). There is a need for additional development of a child's language abilities to facilitate accurate expression of their opinions and communication with other people generally, and to increase their language consciousness. In the current study, two methods for developing children's language abilities were chosen: "Storyline" and the "Associations Pyramid." After analysing their theoretical bases, we assumed that they are well suited for this purpose. The methods used in this study were described in detail in other publications (e.g., Smogorzewska, 2014).

**"Storyline".** "Storyline" was proposed by Scottish educators from University of Strathclyde in Glasgow – Steve Bell, Sally Harkness and Fred Rendall – in the 1960s. "Storyline" is an educational method that facilitates children's activity. They learn by doing. Children are the main creators of and participants in the story, which is developed during classes. The method also requires a teacher's involvement. The teacher gives the children new threads of the story. The children's task is to develop and enrich the story as well as to solve problems contained within the threads. To solve the problems and to develop the story children can choose from different tools, i.e., drama, art, discussion, examining the surroundings, writing and creative thinking. On the basis of the children's ideas, the teacher gives them the next piece of the story, on which the children work again. A story is used to teach children how to link knowledge from different subjects. It is believed that if children are the main creators, then they are better motivated and they are more emotionally and intellectually engaged in their learning process (Bell & Harkness, 2006). It was assumed that this method was easy for children to use because it was close to the children's own experiences and was proposed specifically for working with children. It can be easily adapted to work with children in different age groups as well, as it does not require using advanced cognitive abilities.

**“Associations Pyramid”.** The “Associations Pyramid” method is heuristic; that is, it is basically used as a support in finding the most appropriate solution to complex problems. It is based on creating associations between words. Its author is the Polish educator Janusz Kujawski (2000). The method was created at the beginning of the 1990s.

The usage of the “Associations Pyramid” method is based on linking data (e.g., words, ideas) in pairs as long as there is only one synthesized concept, peak, key and summary of all previous deliberations. Words are linked to each other in further steps, from the bottom of the pyramid to the top. At the bottom there are always notions that were created as associations for a previously chosen word – the more associations the better, e.g., different view points, important ideas, or freely chosen words. From these words the participants choose a few which in their opinion are the most important, and those words build the pyramid. The elements are linked to each other in pairs, until there is only one notion on the top, which is a summary of all the previously used words (Kujawski, 2000). The method has many applications. It can be used for problem solving, but also for creating stories, as in the current study. The peak of the pyramid was used as a theme, or a key idea for the story, and words from other levels of the pyramid could be used for developing the story. It was assumed that this method is more difficult for children than “Storyline,” because it is based on using higher cognitive abilities, such as abstract thinking and creating further associations. Despite the fact that studies indicate that children can use abstract thinking, development of abstract thinking in young children is still discussed among cognitive development researchers (e.g., Lieven & Tomasello, 2008; Saxton, 2010; Tomasello, 2009). The method was not initially created to work with young children – it was, first of all, created to use for solving more complicated problems. Children need to make more of an effort to understand the rules of the method and to use the method in practice. For those whose developmental level is not advanced, it can be difficult. It was assumed, though, that the effectiveness of the methods used in developing language creativity in children can be different. Also, it was assumed that the initial level of operational thinking in the case of the “Associations Pyramid” method would predict results in language creativity gain.

There are a few basic reasons why the methods in question were chosen for this study. The “Storyline” method is practically unknown in Poland, and the “Associations Pyramid” method is rarely used when working with children. Neither method has been tested as to its effectiveness in a longitudinal design. However, both methods can be used for developing children’s language creativity. There are features which link the methods as well as those which differentiate them. It will be interesting to see whether those similarities and/or differences have an influence on the methods’ effectiveness.

## Method

### Participants

Eighty-three typically developing five-year-old children from four preschool groups, who attended three kindergartens in Warsaw, took part in the study over the 2011/2012 school year. Preschool groups were randomly assigned to one of two experimental groups: the “Storyline” method or the “Associations Pyramid” method. Altogether there were 49 participants in the “Storyline” group and 34 children in the “Associations Pyramid” group.

### Measures

All the children who took part in the study had their language creativity assessed in the same way. Each child met with the experimenter individually. Every child was asked to tell a story. Instructions were prepared for this study and read as follows:

“I know that in your kindergarten children can tell fantastic stories. Until now I told stories to children, but now I have run out of ideas. That is why I came here, especially to meet you and to hear what story you can create and tell. I am sure that your story will be very interesting and I would be able to tell your story to children in another kindergarten, if you give me your approval. But you must remember that those children know a lot of stories, so your task is to tell a story which those children have never heard before. It would be best if you made up a new story! Then children will be really glad. If you allow me, I will record what you are saying to give the other children a chance to hear how you tell the story. Will you agree to help me? Tell me, please, when you would be ready to start telling your story?”

During the post-test examination, the instructions were changed a little, because the children already knew the researcher and knew what the meeting would be like.

Every child had as much time as s/he needed to make up the story. If a child had said that s/he would not tell the story, or had not said anything, s/he was asked why s/he did not want to tell the story. If the child had said that s/he did not have any ideas, they were asked what stories they liked most and were encouraged to tell such a story. After this kind of encouragement, some children decided to start talking, but if this did not work the child was not encouraged again.

After finishing the story, each child was asked to solve the Operational Thinking Test (version for younger children: Matczak, 2001). The test consisted of three kinds of tasks, which are based on pictures:

- a) Completion – the completion of the basic order of four elements (order, in which three elements are given, and the fourth must be chosen from five possible answers) (5 picture examples);

- b) Analogies – the completion of an order, consisting of two analogical pairs (the second pair must be complemented analogically to the first pair; the child has to choose one answer from five options) (4 picture examples);
- c) Multiplication – the completion of an order, consisting of two smaller orders, based on different rules, in which each order has three elements (each pair of orders has two elements, and the child needs to choose the picture which links both orders) (3 picture examples) (Matczak, 2001, p. 11).

The total points received from all three scales constitute the final result. The instructions used in this task were taken from the test manual. Reliability of the scale is acceptable, but not high ( $\alpha = 0.70$ ).

The stories that children told individually were assessed along seven dimensions: the semantic structure, cohesion, complexity, length, syntactic structure, originality of the statement, and the number of neologisms created. A sum of points from all dimensions constituted a final level of language ability. The way of understanding the notion of “language creativity” has its roots in other studies connected to the development of children’s language (e.g., Ely & McCabe, 1994; Geist & Aldridge, 2002; Glenn-Applegate, Breit-Smith, & Justice, 2010; Leaper & Smith, 2004; Nicolopoulou & Richner, 2004; Peterson & McCabe, 1983; Wenner, Burch, Lynch, & Bauer, 2008). It is understood as an ability to create a statement that is consistent and clear to the interlocutor. The dimensions along which children’s language abilities were assessed take into account their general level of knowledge of the structure of language and their knowledge of how to create a clear statement (the semantic structure, cohesion, complexity, length, and syntactic structure of the statement), as well as so called “creative language abilities” connected to the features of creative thinking (the originality of the statement and the number of neologisms created).

The semantic structure is connected to reference situations (Lyons, 1977). Reference situations are elements of a discourse and can be understood as more or less complex structures. Reference situations are states of changing reality. They can be transformed from one into another, forming events and episodes. Events are situations linked chronologically, or both chronologically and causally. Episodes are situations that are linked teleologically (in an episode a goal-directed activity is shown) (Bokus, 1992, pp. 255/256).

The reference situations were analyzed using a modified version (Bokus, 1992, 1996) of the method proposed by Stein and Glenn (1979) and developed by Peterson and McCabe (1983). A more semantically complex narrative means a more developed story (points 1-7).

The cohesion of the narration line, defined by Bokus (1992), depends on the relation of a time sequence, the relation of cause and effect, or on the existence



of intentional representation of a character's actions in the story. The more cause-effect and intentional actions of the character in the child's text, the more consistent the story is (points 1-3).

The complexity of the narration field is the number and quality of the connections (i.e. co-action, observer-observed behavioural relation) between the characters in the text (Bokus, 1992) (points 0-3).

The length of the story is specified as the number of words the child used to create the story (points 1 (less than 30 words) to 3 (more than 100 words)).

The originality of the story is understood as not only the rare appearance of an element or a story in the whole group, but also as a single surprising, novel idea (points 1-5).

The syntactic structure of the story is defined as the ratio of the number of simple and complex sentences in the child's statement. The more complex the sentences, the more complex the syntactic structure is (points 1-3).

Neologisms are all the new words which the child made up while telling the story (points 1-0, if there were any neologisms in the text, one point was given).

The above elements were assessed with the help of four competent, independent judges. Each story was assessed by four judges, and judges assessed stories individually. The judges had a high level of agreement: ICC = 0.882. The scale has an acceptable level of reliability: in pretest  $\alpha = 0.76$ , post-test\_1  $\alpha = 0.82$ , and post-test\_2  $\alpha = 0.79$ .

## Procedure

The study consisted of four stages. The first stage was a pretest examination in which each child took part individually. The second stage consisted of classes in the kindergarten groups, conducted according to one of the two methods. The third and fourth stages of the study were again individual meetings with each child (the post-tests). The first post-test was conducted shortly after the classes finished, and the second one was conducted after three months to check whether the (potentially) gained effect was stable. Pretest and posttest examinations were conducted by the author of the study. Children were examined individually in a quiet room in their preschool.

All children had parental written consent for taking part in the study. For each group – working with the “Storyline” method and the “Associations Pyramid” method – 18 scenarios were prepared for the classes. Preschools and individual groups voluntarily answered an invitation to take part in the experiment. Classes were led by four preschool teachers who worked with the children every day. Teachers took part in training focused on one of the methods, and learned how to work with it. The training contained information about the method, and its assumptions. During the meeting, each scenario was described and discussed. Teachers were in regular contact with the author of the study and could ask questions at any time if they had doubts. Teachers



received all materials needed for conducting the classes. The children took part in the classes twice a week for half an hour in three cycles, each consisting of three weeks followed by a one week break. Children worked in small groups (5 children per group). The main task of each meeting was to create a group story; children were creating stories on the suggested topic according to the method's rules and with the teacher's help. The main goal of the classes was developing the language abilities of the participants, and that is why children were encouraged to speak and to exchange ideas as often as possible. The children had never worked with the methods before.

## Results

Descriptive statistics are presented in Table 1.

*Table 1. Descriptive statistics of the results.*

		Storyline				Associations Pyramid			
		MIN	MAX	<i>M</i>	<i>SD</i>	MIN	MAX	<i>M</i>	<i>SD</i>
Semantic structure	pretest	1	6	1.93	1.41	1	6	2.21	1.55
	posttest_1	1	7	3.85	1.66	1	6	4.00	1.78
	posttest_2	1	6	3.27	1.72	1	6	3.97	1.49
Cohesion	pretest	1	3	1.49	0.71	1	3	1.62	0.78
	posttest_1	1	3	2.22	0.80	1	3	2.21	0.73
	posttest_2	1	3	2.18	0.75	1	3	2.32	0.64
Complexity	pretest	0	3	1.04	0.89	1	3	1.09	0.93
	posttest_1	0	3	1.67	0.99	0	3	1.59	0.86
	posttest_2	0	3	1.88	0.95	0	3	1.68	0.77
Length	pretest	1	3	2.10	0.62	1	3	2.12	0.64
	posttest_1	1	3	2.33	0.59	1	3	2.26	0.62
	posttest_2	1	3	2.29	0.61	1	3	2.15	0.61
Originality	pretest	1	4.75	2.18	0.99	1	5	2.38	1.03
	posttest_1	1	4.5	2.52	0.85	1	5	2.93	1.09
	posttest_2	1	4	2.20	0.88	1.25	4.75	2.33	0.82
Syntactic structure	pretest	1	3	1.49	0.54	1	3	1.68	0.58
	posttest_1	1	3	2.35	0.60	1	3	2.26	0.71
	posttest_2	1	3	2.12	0.63	1	3	2.09	0.71
Neologisms	pretest	0	1	0.04	0.20	0	1	0.03	0.17
	posttest_1	0	1	0.16	0.37	0	1	0.12	0.33
	posttest_2	0	1	0.08	0.28	0	1	0.06	0.24
Overall	pretest	5	19.25	10.28	3.83	5	23.5	11.12	4.54
	posttest_1	5.25	22	15.11	4.32	5	24	15.38	4.85
	posttest_2	6	22	14.02	4.55	6.5	21.75	14.60	3.75

The first research question was whether differences in the difficulty of these methods influences their effectiveness. The result of comparing the effectiveness of both methods are shown in the Table 2. The comparisons were conducted with MANOVA. The strength of the effect was assessed with  $\text{Eta}^2$ . The first comparison was between pretest and posttest\_1 (when the experiment has finished) results. The second comparison concerns differences between posttest\_1 and posttest\_2. In the case of significant differences between posttest\_1 and 2, differences between pretest and posttest\_2 were checked for statistical significance and whether the changes further increase or decrease.

Table 2. Effectiveness of the “Storyline” and the “Associations Pyramid” methods in developing language creativity.

	Semantic structure	Cohesion	Complexity	Length	Originality	Syntactic structure	Neologisms	Overall
$\text{Eta}^2$								
Pretest-posttest_1	.52***	.43***	.29***	.07*	.12***	.40***	.05*	.55***
$\text{Eta}^2$								
Posttest_1-Posttest_2	.03	.003	.03	.01	.17*** <sup>1</sup>	.05* <sup>2</sup>	.05* <sup>1</sup>	.43***

Key: \*  $p < 0.05$ , \*\*\*  $p < 0.0001$ , <sup>1</sup> – no differences between pretest and posttest\_2,

<sup>2</sup> – significant positive difference ( $p < 0.0001$ ,  $\text{Eta}^2 = 0.27$ ) between pretest and posttest\_2.

There were no differences in the effectiveness of the two methods ( $p > 0.05$ ). All effects of time between pretest and posttest\_1 are significant ( $p < 0.05$ ), but there is, unsurprisingly, no interaction between time and method. An analysis of differences between results in posttest\_1 and posttest\_2 shows that there are significant differences in originality, syntactic structure, and number of neologisms: for all three variables, results in posttest\_2 are significantly lower than in posttest\_1. The comparison between results in pretest and posttest\_2 shows that the level of originality and the number of neologisms is similar at both measurement times. Syntactic structure at posttest\_2 remains significantly better ( $p < 0.0001$ ) than at the pretest. The overall result in posttest\_1 as well as in posttest\_2 is significantly better than in the pretest ( $p < 0.0001$ ), comparably in both groups.

The second research question was whether the initial level of operational thinking is significantly related to the effectiveness of the assessed methods. To answer this question, a regression with level of operational thinking at pretest as a predictor was conducted. Children from the “Associations Pyramid” group initially had a significantly higher level of operational thinking ( $M = 28.15$ ,  $SD = 4.46$ ) than children from the “Storyline” group ( $M = 25.65$ ,  $SD = 4.69$ ). However, during the next measurement times the results were almost identical; thus, the differences were not significant.

*Table 3. Regression with operational thinking (pretest) as predictor of language creativity results in posttest\_1.*

	Semantic structure	Cohesion	Complexity	Length	Originality	Syntactic structure	Neologisms	Overall
Story-line	$R^2 = 0.061$	$R^2 = 0.01$	$R^2 = 0.04$	$R^2 = 0$	$R^2 = 0.07^1$	$R^2 = 0.002$	$R^2 = 0.004$	$R^2 = 0.03$
Associations Pyramid	$R^2 = 0.06$	$R^2 = 0.10^*$	$R^2 = 0.13^*$	$R^2 = 0.18^{**}$	$R^2 = 0.03$	$R^2 = 0.03$	$R^2 = 0.004$	$R^2 = 0.06^1$

Key: \*  $p < 0.05$ , \*\*  $p < 0.01$ , <sup>1</sup>  $p < 0.1$

The results show that the initial level of operational thinking did not predict the results of language creativity in the “Storyline” method group. In the case of the “Associations Pyramid” method group, the initial level of operational thinking was a predictor for results at posttest\_1 in the categories of the cohesion of the narration line, the complexity of the narration field, and the length of the story. However, the initial level of operational thinking is not predictive of an overall result in the “Associations Pyramid” group.

## Discussion

The two tested methods were comparably effective in developing children’s language creativity. They were associated with positive, significant, and similar changes in children’s language creativity despite the fact that the methods differ in difficulty. In the case of originality and number of neologisms, the results in posttest\_1 were better than in the pretest, but the final results on these measures in posttest\_2 were similar to those in pretest. All other measures of performance, as well as overall performance, were significantly better for posttest\_1 and 2 than for the pretest in both groups. Moreover, the initial level of operational thinking did not predict the results for language creativity among children from the “Storyline” group. In the case of the “Associations Pyramid” method, the initial level of operational thinking predicted results in only in a few dimensions, in the case of the cohesion of the narration line, the complexity of the narration field, the length of the story. However, the initial level of operational thinking does not predict an overall result in this group. Because the various results are related to each other, discussion of their hypothetical causes will be presented together.

The first comment relates to the comparison of the methods. Their detailed analysis leads to the conclusion that the methods have many common features, which can be the reason for similar results. Some differences were a basis for the hypothesis about the differences in the methods’ effectiveness. The theoretical bases of both methods allow outlining five main features that link the methods:

- 1) Both methods develop children's creative thinking – during classes children use abilities that are traditionally considered as a basis for creative thinking, such as synthesis, association, elaboration, transformation, imagination and divergent thinking;
- 2) Both methods develop children's language skills – through creating stories in groups and discussing and expressing their own ideas, children use language all the time to communicate with each other. Lively interaction between children influences the development of language skills. Additionally, because the main goal of the classes is to create a story towards which children have a positive attitude (e.g., Bettelheim, 2010), the preschoolers are extraordinarily talkative;
- 3) Both methods stimulate the interaction between children and an adult – the adult controls the children's activity. Many researchers have found that children are naturally prepared to construct knowledge with other people. Such cooperation, even just through children's observation or imitation of an adult, is very effective for teaching children new skills (e.g., Bandura, 1986; Bruner, 1995, 2010; Gauvain, 2001; Panselina, & Komis, 2009; Tomasello, 2001; Turiel, 2010; Veneziano, & Hudelot, 2009; Wertsch, & Tulviste, 1992). Cooperation is even more effective when the teacher uses strategies which help children to develop knowledge;
- 4) Both methods use interaction between children – they work with methods that are based on contact between children of the same age, but at the same time, often with different levels of knowledge and skill. Many studies on children's interactions have shown that children can not only take part in such interactions from a very young age, but also that progress in cognitive development is much faster and more stable when children work together, rather than individually (e.g., Howe, 2010),
- 5) Both methods complement children's natural activity – the methods are attractive to children because they are based on play. They give children an opportunity to ask questions, the opportunity for creative expression, and, most of all, the opportunity for self-creation. Children, as class participants, are responsible for what is happening during the classes. This attitude towards children has its sources in Dewey's progressive education (Dewey, 1997), or in Loris Mallaguzzi's approach (Edwards, Gandini, & Forman, 1998).

Theoretical differences between the methods can also be observed, concerning, for example, the different structures of each method, different cognitive skills as a basis for the use of the methods, the differing contributions in interactions with children made by the adults involved, were probably not so important an influence on the results. At the same time, it was observed that if the more cognitively demanding method ("Associations

Pyramid”) was presented to children in accordance with given clues, it was similarly intelligible and as easy to use as the easier “Storyline” method. This result confirms the conclusions of Margaret Donaldson’s study (1987). She noticed that adapting the instructions to a child’s perception level results in rapid, positive changes in the child’s results. Her results supported previous theses that it is possible to effectively develop abilities among preschoolers, such as making further associations and using abstract thinking, even if their age signifies that developmentally they could not be ready for such tasks (e.g., Hickmann, 2001; Lieven & Tomasello, 2008; Tomasello, 2009; Wood, 1998).

The results show that the initial level of operational thinking is important for some detail effects in the “Associations Pyramid” method. It is not surprising, because this method engages more cognitive functions, such as abstractive thinking and making associations, than the “Storyline” method. However, searching for sources of these differences would be very speculative. Especially, the operational thinking level is not predictive for the overall result.

There are several possible explanations for the similar effectiveness of the “Storyline” and the more cognitively demanding “Associations Pyramid” method. They may impact students’ achievement through different mechanisms. The “Storyline” method is very engaging – children engage in doing, speaking, listening, and cooperating, but also express their emotions and ideas. Children can actively participate in creating a story, playing the role of a character, giving new ideas or developing existing ones. Cooperating with other children during activities requires constant verbal communication. Children can learn new words and proper grammatical forms from each other, but also listen to different ideas, which they can later modify, add some new elements, and in this way, create a new, surprising story. The “Associations Pyramid” method, by contrast, could have a great impact on participants because it develops abilities that are not very often present in preschoolers (Scott et al., 2004). The effects achieved are linked with the intellectual effort that children need to put into the classes to understand the mechanism of working with the method. The bigger the effort made to understand how the method works, the more it influenced children’s cognitive and language development. Children who worked with the “Storyline” method did not need to put a great deal of effort into understanding the idea of the method, because the method does not contain especially difficult elements. However, proposed activities are very diverse. This means that they are very attractive to children. In the “Associations Pyramid” method, by contrast, all classes are based on the same scheme. The children’s role is the same every time, even if the final product is different. Among children from the “Associations Pyramid” group, however, there may be a significant “reorganisation” of cognitive structures (a mental reorganization), and that may be responsible their movement to a higher developmental stage. Furthermore, these children

may experience a deeper socio-cognitive conflict (e.g., Cannella, 1993; Doise, 1990; Druyan, 2001; Olson & Spelke, 2008; Sheridan & Williams, 2006; Tolmie, Howe, Mackenzie, & Greer, 2010). The child experiences this conflict when he or she observes at the same time others' and their own way of understanding the problem. That is when mental reorganization occurs; the child needs to link external opinions with their own point of view. The differences between other people's ideas and the child's own can cause anxiety, so the child actively aspires to reduce this unpleasant feeling. Additionally, the fact is that the "Associations Pyramid" is a heuristic method, which teaches children strategies of solving problems. Some studies of heuristics show that teaching thinking strategies more significantly influences cognitive development than using different methods together at the same time (Nisbett, 2009; Scott et al., 2004). Development of thinking skills influences language development, because language and cognition strongly relate to each other (e.g., Gentner & Boroditsky, 2001; Gopnik & Meltzoff, 1997; Papafragou, Li, Choi, & Han, 2007).

### **Limitations**

As with other, similar studies, this one also has its limitations. Certainly, these limitations significantly influence the results and conclusions. One is the relatively small size of the research group. Because there were not many participants, the results must be treated cautiously and they cannot be generalised. However, the results suggest that difficult tasks may stimulate the cognitive development of children.

Another limitation of the study was the tool used to measure operational thinking. It is not an ideally reliable tool. In spite of this limitation, this test has some important merits, e.g., the tasks are presented in picture form, making them easily intelligible to children.

Another limitation was the method used to examine an individual child's language skills. The preschoolers were asked to do the same thing three times: to tell a story. Admittedly, the conversations were conducted with three month breaks in between, but children could become bored with the monotony of the task. On the other hand, if this were so, the results probably would not differ greatly. They would stay the same, or they would even drop. The analysis revealed, though, that in the case of the majority of the variables, the scores increased and stayed at the same level after three months.

### **Conclusions**

Even if the results shown in this paper cannot be generalised, they can be a starting point for future studies on the effectiveness of educational methods proposed for young children. They can induce reflection that it is worth using methods that are engaging and just above children's current abilities, as

Vygotsky proposed in his theoretical deliberations on the Zone of Proximal Development (Vygotsky, 1966), to help children accelerate their cognitive development, as well as to reduce further potential problems at school.

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