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Giotto's Circle – Example of Methodical Procedure for Early Detection/Encouragement of Preschools' Giftedness for Solvinglogically-Functional Mathematical Problems

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Abstract

The aim of this paper is introduction of didactically-methodical procedure for early detection/encouragement of gifted children in solving problematically-logical and functional problems in math/geometry. We will display this procedure on the example of activities with preschool age group of children (6 years old), on which a new term is acquired – a CIRCLE. Problematical manipulative task called *“Draw as correct circle as possible without using a divider”*, which was conceptualized by the principles of “Nikola Tesla Center” (NTC) – MENSA of Serbia, was offered in three variants with different level of difficulty and number of didactical material for solving: 1) THE EASIEST PROCEDURE: with a logical block which has circle base + felt pen and paper, 2) MEDIUM-DIFFICULT PROCEDURE: pencil attached to the thread + paper and 3) THE MOST DIFFICULT PROCEDURE: color with brush + paper; Every child should make an individual attempt to solve all offered procedures – successively, one after the other, and their attempts, SUCCESS/FAILURES should be recorded by educator.

Besides that, the paper indicates UNWILLINGNESS OF SERBIAN EDUCATION SYSTEM FOR THE GIFTED ONES = the necessary condition of the progress of every society, in which, they are LEFT ON THEIR OWN!.

Keywords: traditional education system ≠ early (UN) discovery of giftedness, an example of a workflow, didactics, methods, NTC + Mensa

Introduction. Gifted child in Serbia, what about him?

“Cruel place for genius ideas”

“In our country, those who cram are the most successful”

“Foreign talent hunters lurk the best ones”

“The country is still expelling young talents!”

“Serbia is in the fourth place in the brain drain”

“Serbia is the latter in the number of computers in Europe, only the Vatican is behind”

“Scientific potential of Serbia is only in America (2000 PhDs) higher than in the country”

These are just some of the transparent titles in the newspapers, which illustrate how the country is treating a young talented people in Serbia and not since yesterday. Young talented people can say the most about their difficult status in society, and the country is in the infamous role of Antonio Salieri (1750–1825) (Hilčenko, 2011, p. 7). Education system of Serbia is not prepared for gifted ones. The exception¹ does NOT confirm the rule, but the number of adequate institutions is negligible! Negligence which lasts for many decades and inadequate approach in working with gifted individuals, within traditional educational system, made an irreparable damage to its development. How the precondition of progress in every society is – creative cadre and intellectual ability of an individual, Serbia is more and more deficient in terms of the most valuable social capital – by its own fault!

High coefficient of intelligence is condition of giftedness, but not the whole giftedness. According to Đorđević (1995), in the present time differences between areas of giftedness are being made: **ingenerally intellectual abilities**, in **creative abilities**, in **academical abilities** (for exact sciences, natural sciences, language), in **social abilities** (ability of leadership), in **psychomotor and manipulative abilities**, etc. However, it is not static phenomenon which stays forever, giftedness will not develop unless the child receives adequate conditions and support. Likewise, there is possibility that giftedness remains undiscovered, that it stays unrecognized and unidentified at all. In order to avoid these problems, it is essential to know the traits of gifted children, first of all by parents, teachers, professors, trainers etc. (Đorđević, 2005).

In the book that was written by Doman and Doman called “*How to multiply your baby’s intelligence: The Gentle Revolution*” (American bestseller about parenthood, sold in millions of copies), they have researched for over 50 years why children from birth until they reach age of 6 learn better and faster than older children. The research has showed that very young children are much more capable of learning than it was previously thought, and it was empirically confirmed (Doman, Doman, 2016).

Likewise, belief that gifted individuals always stand out and realize their potential regardless of external influences from their environment has been overcome. The results of the research speak in favor of it, which means that the giftedness has to be nurtured and encouraged, and in this way the optimal level of development of gifted individuals will be reached. The question that arises is: who is in charge of this task and who has the influence to encourage the giftedness? Scientists, who researched this issue, separated three key factors which can have impact on encouragement and development of giftedness, and those are the following: **family**, **school/kindergarten** (all levels) and **society** (Prtljaga, 2009, p. 502).

In this paper, we emphasized **preschool institution and society** as important factors which has significant contribution to **detection**, and also **encour-**

¹ Mathematical Grammar School in Belgrade.

agement of giftedness, and thus helping in creation of social and intellectual elite. Education system of Serbia “does NOT see” the gifted ones, and even less works with them, with the exception of few RARE educational institutions, from where, IN MOST CASES they continue their progress beyond the borders of the country. Our talented boys and girls are not falling behind with the world. Thus, for instance, mathematician Burg² (a couple of years ago he was the most talented mathematician in the world) won 13 medals in big international competitions before his 17th birthday. Once, Fund for young talents did not give him the prize because “he was not 13 years old”, even though he was competing with seniors from high school. He received half million dinars as a prize afterwards, however, even though the amount seemed decent, it was enough only to cover fees of private lessons in math, because he could not develop his mathematical skills in regular school system! “The inelastic school system of Serbia is the biggest issue in education, and the reason for the departure of young people abroad” (Hilčenko, 2011, p. 16).

Giotto’s Circle

We will display didactically-methodical procedure for early detection/encouragement of talented children for solving logically-functional problems in math/geometry on example of topic which is titled **Development of the CIRCLE concept** at 6-year-old preschoolers. Such examples of work procedures in the plans of our preschool institutions do NOT exist, therefore, it is necessary to do their complete review in accordance with this principle, as well as individual approach (interests and needs of young people) with the application of appropriate didactic and ICT tools in accordance with time. This would ensure that every child in the educational process has the preconditions for early detection/encouragement and development of their potentials, and therefore society as a whole!

Topic of activities: wide – Children and traffic; narrow

– **Development of the CIRCLE concept**

Age group of children: preschool – 6 years old

Working space: workroom

FREE ACTIVITIES

Educational goals:

Working methods: Solving e-problems

Working shape: Frontal and individual work

Didactical tools: Tablet computers

² What does von Burg do now? He’s studying mathematics at Oxford (Exeter College) in his third year now.

Children should be animated with appropriate e-tasks on the topic of **CIRCLE** (in corners/centers of interest). For instance, in **the internet corner** children are solving interactive tasks based on Maria Montessori (1870–1952) (example of application, “**From Game to Computer**”, area: “**Calculating & counting**”, tasks number 5: “**Assemble a circle**” and “**Fill empty fields of square with geometrical shapes**”, and in the end, task number 13: “**Fill the piggy bank**”, from area “**Orientation & surroundings**”. All tasks are time limited. (Author PhD Slavoljub Hilcenko, pictures 1–4) (Hilcenko, 2014, p. 179, 303).



Pictures 1–4. E-tasks from application “From Game to Computer”

Examples of similar tasks can be found on many websites:
<https://www.youtube.com/watch?v=E6qWBhEiP6g>,
<https://www.ixl.com/math/kindergarten>.

AIMED ACTIVITY (AA) – duration 10 minutes

Educational tasks:

- Care of communion, cooperation and behavior in traffic.

Educational tasks:

- Recognition and designation of objects which have shape of circle, development of analytical opinion and conclusion.

Functionally-logical tasks:

- Ability to use data, to apply and connect two or more and conclude = to derive third;

The method which (future) educators and children should learn and practice.

Motorically-manipulative tasks:

- Always works with functionally-logic tasks as a stimulation of these development capacities in children (manipulation with didactical material, encouraging fine hand movements, etc.).

Correlation:

- With all educational areas.

INTRODUCTION (preparatory phase)

1. PREPARATORY PHASE – duration 5–10 min.

Working methods: Dramatization, stage view

Working shape: Frontal work, individual and group work

Didactical tools: Costumes, CD players, improvised scene, door, chalk

- **Giotto di Bondone** (1266/7-1337), also known as Giotto, was famous Italian painter, sculptor and architect. He is the most influential and the most important painter of the Gothic period. He is considered to be one of the main predecessors of the Italian Renaissance.

The aim of dramatizing the anecdote called “GIOTTO’S CIRCLE” – to create an interest in children for the concept that they are developing (with costumed characters: narrators, painters, appropriate scenes with doors and silent music of that time):

“One day, famous painter went to visit his friend. After he did not find him at home, nor he had a paper and pencil to leave him a message, he came up with an idea how to notify his friend that he visited him. In his pocket he always had a piece of chalk, so he drew a CIRCLE on the door with his hand. When his friend came home, he immediately knew who was looking for him!” What do you think WHY?

Answer: Giotto was very skilled because he knew how to draw a regular circle freehand, which is very difficult. Educator (actor), “describes” with hand the circle that was drawn earlier on the door, and then he turns to the “audience”.

2. WORKING (operative) **PHASE** – duration 20–25 min.

Working methods: Verbally-illustrative, method of practical works, work on computers

Working shape: Frontal and individual work

Didactical tools: Paper, pencils, thread, watercolor, divider, logical blocks, tablet computers

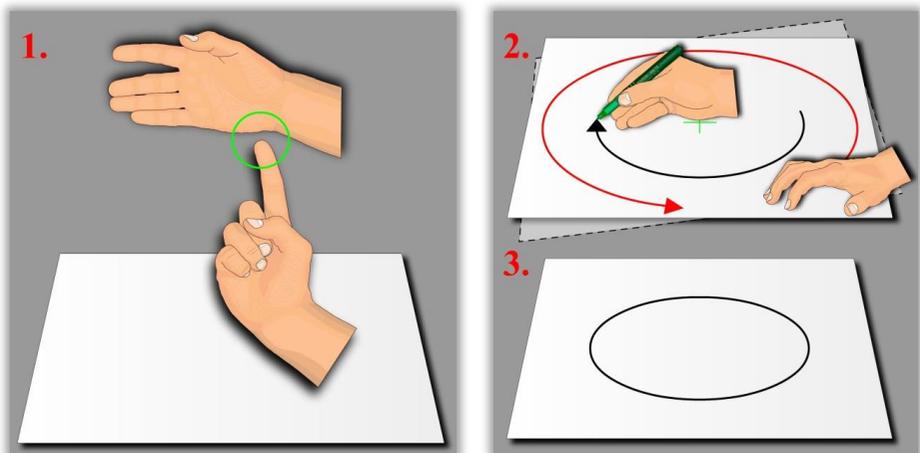
Conversation about the story, with encouraging the children to make their own conclusion about what is the goal of activities. Educator induces children to use their own experience, imagination.

Further conversation should be aimed towards the designation of the shape of the circle from nearby surroundings (room), kindergarten, environment. Children should be induced to highlight characteristics of the circle: circle shape, it is rolling (for example, button...), it can be of different sizes. Drawn circle can NOT be taken by hand until we cut it out with scissors! (All mentioned is illustrated with appropriate didactical material).

Dialogue should be focused on presentation of shapes which are different from the circle, with encouraging the children to verbally express the differences that they perceive. Particularly, educators should point out to them the difference between the circle and **the ellipse** (which is not named!). **“That shape LOOKS LIKE a circle, but a little stretched, it is not the same on all sides!”**

1. TASK

The prize question is: “Can we draw a completely regular circle without using a divider?” “YES?” “NO?” (every child has a piece of paper in front of themselves and tries to draw a circle from a few attempts. Afterwards, “the trick”, with whom the circle can be drawn more precisely, is demonstrated, pictures 5 and 6) https://www.youtube.com/watch?v=imkCkT_13RM.

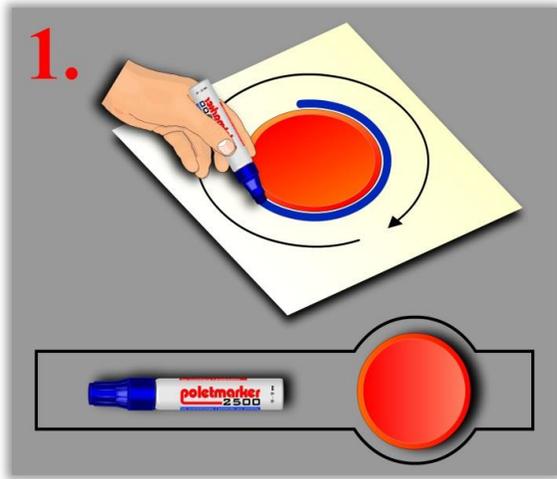


Pictures 5 and 6. Process of drawing the circle with help of “the trick”

2. TASK

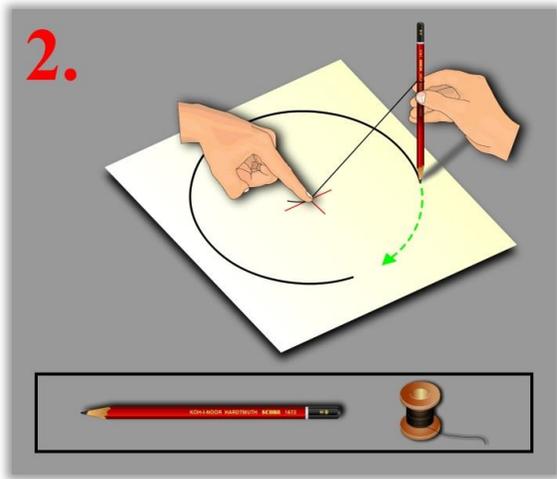
“If you are skilled and clever, everyone can draw the circle!” In that sense, we offer to children a didactic material, which they can try to do. We offer the following to them:

1) THE EASIEST PROCEDURE: with logical blocks that have circular base + felt pen and paper (picture 7).



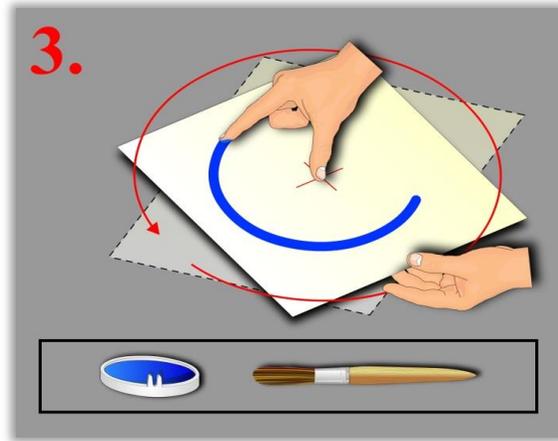
Picture 7. Solving procedure

2) MEDIUM-DIFFICULT PROCEDURE: pencil attached to the rope + paper (picture 8).



Picture 8. Solving procedure

3) THE MOST DIFFICULT PROCEDURE: color with brush + paper; Every child individually tries to solve all offered procedures – successively, one by another, and their attempts, **SUCCESSSES AND FAILURES** are recorded by educator (picture 9).



Picture 9. Solving procedure

Giftedness discovery is pretty complicated activity which is based on a wider knowledge of giftedness. It is inherently complex in its structure, which is the reason why it is difficult to discover it. Besides that, range of gifted ones is very wide, so some are easier, and some are more difficult to detect. Giftedness can be multiple, but gifted children are not talented in all aspects, nor the all children are equally talented (Nikoloć, 1998). Therefore, initial incentives will not be visible immediately, they have to be continuous, (planned and systematic) and on all activities...

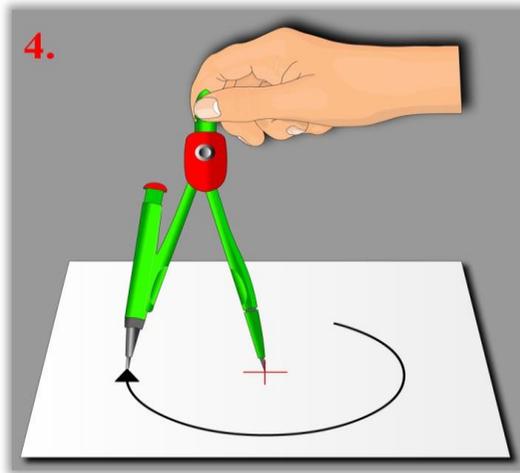
These incentives must be diverse, they must encourage children, provide adequate materials for playing and learning, and offer as many experiences and exercises, because quality early experience is crucial for later development of high abilities (Čudina-Obradović, 1991).

“Nikola Tesla Center” (NTC) and Serbian MENSAS³ have the program for early detection/encouragement of logically-functional and motorically-manipulative abilities, however, in contrast to EU, there is not enough hearing (!) for them in Serbia.

³ Program is based on knowledge that brain establishes 75% of all neural connections till age of 7 (the biggest potential for development is between ages 2 and 4), of which 50% of synapses appear till the age of 5. This argument is convincing enough to pay great attention to pre(school) age, learning system and encouraging the creatively-functional and logical potentials of children. NTC learning system studies the question HOW to stimulate development of synapsis, and therefore a great children’s potentials before they go to school. NTC learning system implies study based on theoretical bases of neurology, neuropsychiatry, family pedagogy, didactics and methodology for preschool.

This is followed by a procedure for demonstrating how to properly draw a circle with a large divider. It is followed by an explanation that for a circle drawn only by hand, we say “it just look like a circle, but it's not a circle!”.

Every child should try to draw a circle with divider on a big paper that was prepared by educator! (picture 10).



Picture 10. Drawing a circle with divider

3. TASK

Children use tablet computers to solve interactive task (“Traffic signs”), picture 11 (Hilčenko, 2017, p. 306). It is required to put appropriate symbols only on signs that have circular shape. Conversation about wider topic of activities: *Children and traffic!* (picture 11).



Picture 11. E-task

3. VERIFICATION (final) PHASE – duration: 5–10 min.

Working methods: Illustratively-demonstrative, solving problematic e-tasks method

Working shape: Frontal and individual work

Didactical tools: Tablet computers

4. TASK



Pictures 12 and 13. E-task

Children watch a part of animated movie (circle) “**Dot, line...**”, and then they solve interactive task – “**What is not a circle?**”, pictures 12 and 13 (Hilcenko, 2017, p. 62, 307)⁴.

Conclusion

In professional literature, there is emphasized opinion that giftedness is a result of special combination of hereditary traits and their interaction with incentive environment. High results regarding the development of giftedness (of any kind) can be expected only if people start to take care of it as soon as possible (Milošević, Vujačić, 2006).

In other words, appropriate conditions and activities should “wake up” sleepy creative abilities in children, which will not appear at the same time in every child. It means that the nature of giftedness itself necessarily imposes the need for encouragement through the creation of favorable conditions and circumstances (Nikolic, 1998).

At preschool age, it is necessary to stimulate general development (through all activities), in other words, it must have a global character. Thereby, it is necessary to have in mind the importance of early experience of children, their activities and the importance of incentive, stimulating environment in which good emotional atmosphere should prevail, and that will “unlock” the gifted potentials (Cvetković-Lay, 1995).

⁴ All drawings in the paper were created by author himself.

Introduced didactically-methodical procedure for early detection/encouragement of children's talent in solving logically-functional and motorically-manipulative problems in math/geometry at young preschool children is only one of countless number of examples which can be used in every topic and all other activities (language, nature, physical education, music, art). In practice, there can be found few pedagogical enthusiasts motivated to offer to their educational groups something different from traditional approach. Even though it is commendable, these activities cannot be considered as a systematical, expert, and programmed approach to the problem – early detection and encouragement of giftedness, which would cover entire children's population, through all educational levels and in accordance with all specific needs. It requires systemic reform of educational system in Serbia, (education of tutors, development of application of IKT, didactical material, educational technology...) based on this paradigm. It seems to us that Serbia will not have the right solution for this problem in the coming years. As usual, everything will be reduced on few individuals who cannot stand by side and watch!

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