

## **Magic Illusion - A Tool For Encouraging Functional-Logical Thinking Presented To Students Of Preschool Teachers' College In Approaches To Teaching Mathematics**

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**Abstract:** *In order to meet the demands and perceptive abilities of the new generation (Generation "Z"), we the teachers as learning facilitators, must follow their interests. The offered content and the approaches to learning, had better be prepared visually for viewing rather than for listening, it had better be attractive and engaging and at the same time the content and the approaches have got to remain adjusted to the objectives of the lessons. In this vein, the newly introduced course (Approaches of developing mathematical concepts at the College of Vocational Studies in Subotica) included a recently conducted survey among students of the third year on the topic of spatial geometric shapes - cubes. The Students have been presented with a video clip that features a magic illusion whose decipherment one uses essential functional-logical mental schemata. The aim of the presentation of the survey is to report on the findings that indicate insufficient ability of students to fulfill the task.*

**Key words:** *Generation "Z", modern media, magic illusion, approaches to teaching mathematics, functional and logical thinking.*

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### **I. Introduction**

Today's Generation "Z" is due to the highly developed perceptive abilities (environmental effects of upbringing, modern media, large diagonal TVs, the Internet, mobile telephony, virtual reality, holograms ...) very demanding in terms of resources for acquiring knowledge. These sources must be designed in accordance with their needs, abilities and interests. These requirements are justified because they allow the acquisition of knowledge in a more efficient manner than traditional teaching (Black 2014). Teachers who are aware of these needs, their lectures comply with these requirements that are made for viewing, active participation, rather than only listening [URL 1]. Since the traditional rote learning (or reproductive lessons so much present in Serbia) has poorly performed on PISA competition and the educational system has distinguished itself against the competing education systems of the developed countries, it is necessary to change the educational technology, access to knowledge acquisition in the direction of stimulating thought capacity (of children and students) in the field of functional-logical, convergent-divergent, associative thinking (Petrović 2013, Hilčenko 2015b 2015c). According to the findings of MENSA, the optimal period for that is still in the preschool period (Rajović 2009).

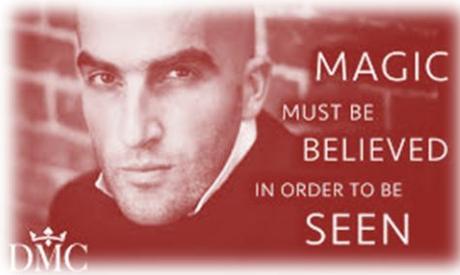
### **II. Magic Illusion**

In the seasons of "More than magic", a magician and a present by the name of Drummond Money-Coates, nicknamed DMC, puzzles the audience with stunning tricks on the streets of London, Paris, Barcelona, Mexico City and Singapore (picture 1). Inspired by Houdini's brilliant mind, a man known for his sensational escapes; Karl Zener, known for his work on heightened sensory perception (ESP); and master of bending spoons Uri Geller, DMC tried and succeeded in comprehending their stunning performances and therefore has even added some interesting details to his performances only for his audience. This exquisite art form does not cease to impress and leave people breathless [URL 2].

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Picture: 1

We have selected an example of the illusion that directly correlates to mathematics, geometric shapes, modern media, animation, and appeals to Generation "Z" as it encourages functional and logical thinking. The selected example is facilitated in Approaches to teaching initial mathematical concepts, a subject introduced at the College of vocational School in Subotica.

**Here's the magician's illusion:**

DMC confronts his audience as he demonstrates "the theft of the famous painter's canvas with easel and followed by an escape" from a large wooden crate. Namely, in the very video clip a huge wooden crate is seen in the shape of a cube containing the canvas on the easel. By entering the crate, the magician's associates close the front and back side of the crate, and then rotate the crate for two rounds. Then, again in front of his audience he opens the first front, then back side of the crate, where to the general delight of those present, is only an empty easel! After a few moments, the magician calls the amazed viewers as he stands at the top of the container standing away from them. Holding the canvas in his hands!

[URL 3] How was it done?

**III. Research Methodology**

The students have been asked to make their attempt at discovering or providing an acceptable (realistic and logical) solution to the illusion. Some possible solutions have immediately been eliminated ("double bottom" chests and possible "double" opening for the escape, which has in turn significantly narrowed, made it easier (?) (or made it harder) down the choice for harder for possible solutions.

The research methodology was based on their own practical research. During this procedure, we applied the research instruments of observation and analyzed the video reports and surveys (unpacking the magical process of illusion with elements of functional-logical tasks similar to those in mathematics). The measuring research instrument was an open questionnaire - in which the students could express their attitudes - unraveling or dismissing the presented solution of the magician's illusion and his infamous escape from the enclosure. The time frame for observations and solving tasks was one school hour (45 min.).

In analyzing the results, we applied the descriptive statistical approach to analysis and the visual chart was selected for data presentation of results, and the more successful results (which translated into pronounced functional-logical abilities), are of those students who achieved to respond in half the estimated time.

The survey included 80 subjects aged 20 years who are vocational students of the third year from the College of Vocational Studies from Subotica. They were arranged and grouped according to age and success in two groups of 40 students.

**IV. Analysis of Results**

The research results indicate a very bad effect by the surveyed students in solving the given task (table 1). In fact, only one student (or 1.25%) has managed to solve this problem for a shorter time than the maximum predicted, while for the total estimated time (40 min) only 5 more students (or 6.25%), of which, 4 girls and two boys. Thus, a total of 6 students (or 7.4%). In general, although the summary results are poor, the girls have proved to be twice as good (4:2) in solving the task set for the girls.

The remaining students, 74 (or 92.5%) failed to come up with a precise or superior response.

Also notable is the fact that regardless of the sex of the respondents and the estimated time for the task, both groups achieved almost identical results in solving the task:

young ladies (♀): T(4), ⊥(36);  
young men (♂): T(2), ⊥(38);  
ΣT(6), ⊥(74);

AGGREGATE SURVEY							
	Exact solution			False solution			Σ
	20 min.	40 min.	Σ	20 min.	40 min.	Σ	
♀(40)	1	3	4	14	22	36	40
♂(40)	0	2	2	13	25	38	40
Σ	1	5	6	27	47	74	80

Table 1:summary of results of the survey

Here are some typical, "Rashomon-esque" attitudes perceived in the students:

- "I have seen the video featuring the illusionist but to be honest, I have no idea how has he managed to perform it..."
- "Actually, the wooden crate is constructed of two "carved" squares into each other at an angle of 90 degrees and so do not represent closed, but rather an open space, which probably allows DMC to "come out from the crate because he had never been imprisoned in it in the first place."
- "White lies" The video show associates first close the front part of the cubical crate, which camera immediately zooms. During that time, DMC could have had a lot of time to escape from the crate from the back side. Then, associates turn upside down the empty crate (turning one's attention to irrelevant details). I am of the opinion that the three present associates cooperate with the illusionist and that the video is made exclusively for viewers, so their attention is focused only to the crate (see the picture), and not to anything outside of it- the video is made up for deceiving purposes."

This term was coined by the cult film "Rashomon" by a famous Japanese director Akira Kurosawa (1910-1998), recorded in 1950 based on the Akutagawa's novel. In this novel as well as the film more characters narrate the same event in their own way. The term rashomon-esque was used in conditions when they can not find out the truth, or could not choose the right version from false versions, or more interpretations of the same events and situations. Film theorists emphasize that Kurosawa with his film language is considering the question of reality and illusion, and puzzles the perception of truth on the basis of which appears to be true if absurdly simplified [URL 4].

## V. Conclusion

To paraphrase the famous inspector Sherlock Holmes, a major figure in the literary works of British writer and physician Sir Arthur Ignatius Conan Doyle (1859-1930), known for solving cases with careful observation and logical reasoning, and who dealt with problems deemed too difficult for other inspectors. The Holmes' replica is a well-known one before solving a complicated case, "We have to rely on the old fact that when all the possibilities fail, what remains, no matter how incredible it seems - must be true!" [URL 5]. In this sense, even though we rejected: a) the possibility of a secret opening in a wooden crate, below which is a subterranean passage through which the escape was the simplest and most obvious possible and b) the existence of "duplicate person who hides under the double bottom", it must certainly not be applied though at first rejected! Of course, these are our assumptions, primarily because of the reputation of the DMC - because these are the solutions that occurred to the largest number of observers. However, the largest number of students were aligned with those observers as well, the 35 + 15 = 50 (50%).

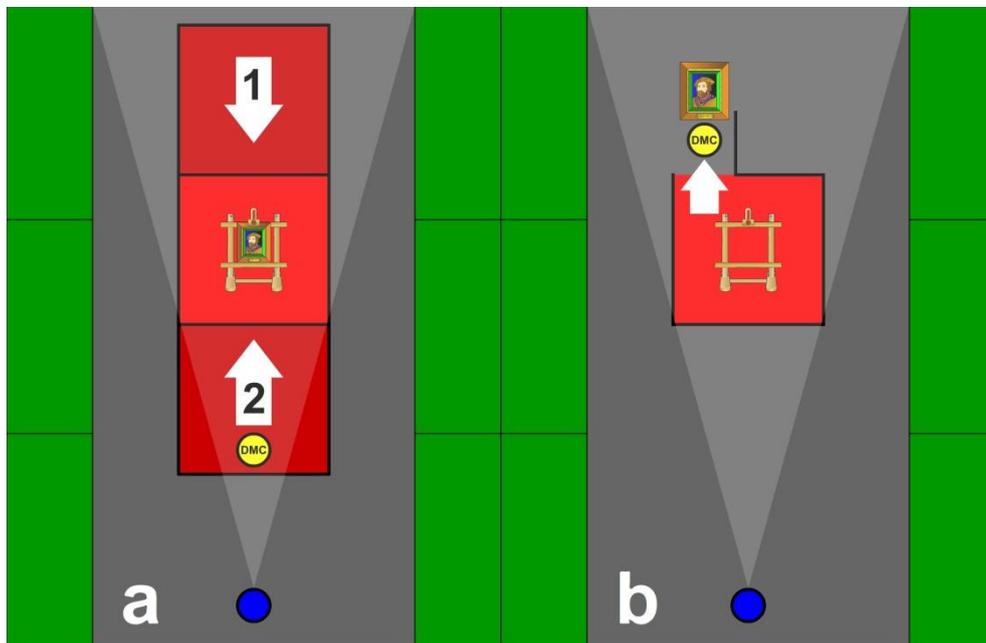
The fact that the crate is rotated, gives us the right to suppose (of course, not absolute right or to claim one) that the proposed solution is the closest to the truth.

**Possible solution of the magic trick:** a sizable wooden box in the shape of a cube, occupies the central space between two rows of metal containers, placed in the port dock. The size of the crate, its position, the position of the container and observers are accurately calculated. Observers have limited field of vision, especially at the time of rotation of the crate when it is on the diagonal "widest", which opens a space that at a given moment, allows the magician to step away from the crate, unnoticed with the image in his hand. The crate had been left before the start of its rotation through a "secret opening" (Graph. no. 2). Until the crate is not in its original position, with its two sides open, enough time is left for the magician to appear "elsewhere".

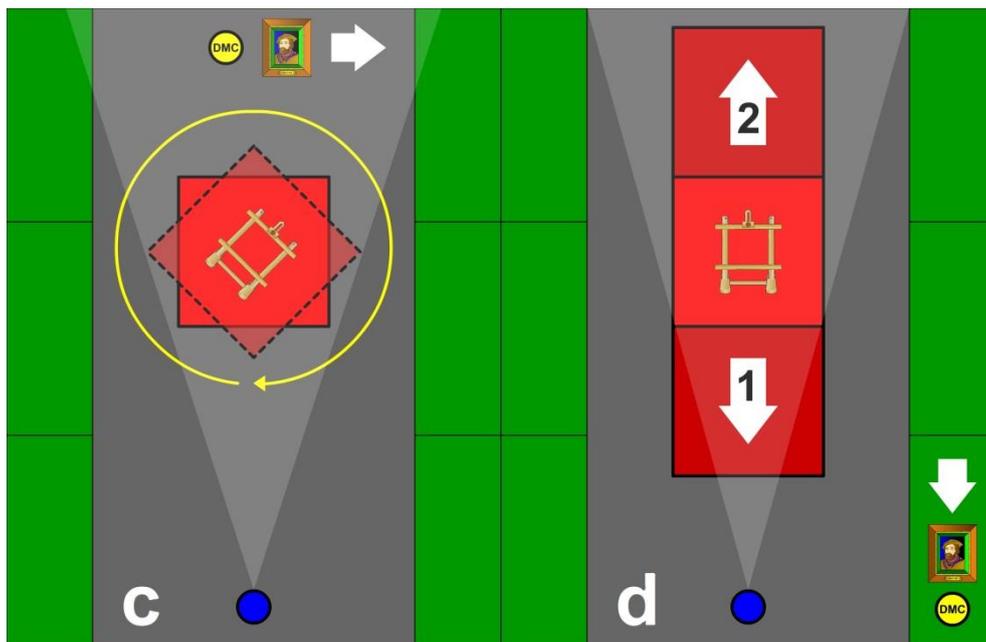
For this purpose, we have done an animated application (developed on the platform Adobe Flash CS4) that provides a visual representation of "step by step" guidance of the whole process (Graph. no. 4).

These and similar illusions are very suitable means to encourage the development of thought processes (functional logic, etc.) Which, however small, the conduct of this rather small research refutes it in a large percentage. Of course, the reasons for this should be sought in the traditional approach to working with students, or the fact that the student have no experience in solving these and similar problem tasks. With solving similar tasks appropriated for the target groups, one should start as early as possible even in preschool institutions.

It would be interesting to setup this or similar problems to a wider group of participants in order to get more objective information. What is certainly positive, is that the tasks create an incentive for the development of thinking capacity of students and that as such, if they are thematically linked to the curriculum may find its place in the educational process of the present generation.



**Graph. no. 1 and 2**



**Graph. no. 3 and 4: review of the possible solutions of the magic trick**

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