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VISUALIZATION IN THE FUNCTION OF ASSESMENT

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Abstract

Alongside the focus oriented in finding and developing effective approaches in teaching and learning, the contemporary theory of pedagogy is facing the biggest challenge that has to do with the assessment of students. The preoccupation of the methodologists and pedagogues is not only related to the "judgment" of evaluating students' achievements, but it also raises the question of how assessment can affect student motivation, so that it may have a positive impact on increasing their achievements.

Contemporary practice refers to innovative teaching strategies; whose benefits extend to the evaluation process. The effects of visualization in the teaching process are evident, withough neglecting the benefits of providing assessments with a motivating function and objective evaluation.

The tasks and the purpose of this research study are related to the description of key aspects of visualization, respectively its function in the process of evaluation. The study elaborates the degree of putting into function the contemporary approaches of evaluation, respectively the application of visualization in the evaluation process.

In order to solve this problem, this empirical study, will examine the analysis oriented in visual interpretations, that in this case will be used as an overview of the achievements. In order to answer the research questions at hand, the students will undergo evaluation with application of visualization strategy and opposite practice evaluation. In order to avoid unwanted effects that may arise as a result of (not) mastering this strategy, the research will be conducted by evaluating the same group of pupils according to the two forms of assessment.

The current study will use tests, teacher interviews, and retrieved data from participation, to verify the hypothesis that visualization has a positive effect on the process of evaluation. For this purpose, the research will answer the following questions: Are students willingly involved in the evaluation process through visualization? Is this assessment objective? Is this kind of assessment motivating? Does it provide a great insight into the student's achievements? Can it be applied to assess children with special needs? Does the evaluation through applying visualization provide additional data?

Participants in the research included about 90 pupils from the first cycle of primary school, who have been actively tested and monitored. Collected data were analyzed through statistical methods, and results indicated that visualization has a positive effect on the process of evaluation.

Keywords: assessment, strategy, visualization, achievements

Introduction

As soon as you learn how to look, the world will be yours!
Zenki-Dalipi, A.

"A picture is worth a thousand words "is a language idiom that emphasizes the role and the impact of visualization in our life. The use of visualization, as a form of expression or communication, has been identified since the second century B.C. in the form of drawings or maps. Since we are increasingly attacked by the world of visual technology, we can say that this phenomenon is growing, gaining enormous proportions. This expansion has a great impact on the education system and makes the latter evolve and reform.

The inevitable presence of visual expression causes it to be integrated as an inevitable part in various fields, excluding the myth that visual expression can only be found in figurative art. According to Tanton's statement, the presence of visual expression in mathematics highlights that "If the image is worth a thousand words, in mathematics it can create a thousand ideas. It can provide an in-depth understanding, encourage ideas, or it is a process through which in a moment everything will make sense, and will guide one on the way to the ultimate understanding of any complicated part" (Tanton, J., 2016). Visualization is also implemented in the field of languages, in fact in the field of reading, as a complex act present in every angle. Given the fact that reading is an intentional mental process, it is known that "Reading requires a two-way attack. It involves attacking the alphabetic code for word definition and thinking about those words to build meaning"(Harvey, S. & Goudvis. A., 2007). Decoding and understanding symbols represent visualization.

With the rise of constructivism in the 1980s, the need for applying different qualitative education methodologies was emphasized, which would respond to different challenges not only to reading comprehension, but also in the process of student assessment. Various docimological researches responded that one of the possible approaches in the assessment is the application of the same strategy.

Literature review

The term "Visualization"

The visualization structure itself represents "mental technology". The mechanism of the same puts into operation the ability to pass concrete boundaries and confront the abstract world. The systems of this imaginary strategy are designed to sketch cognitive skills. They are supportive of understanding the most complicated phenomena and problems, giving an overview of the complex problem. "Einstein often expressed that his thinking was visual, due to which, he later struggled to turn his ideas into words and symbols"(West, Th., 2014).

"Visualization provides a method to see the invisible"" (McCormick, H., DeFanti, A. & Brown, D., 1987). The imaginary confrontation with the abstract world enables issues and understanding to appear in a three dimensional form (Zenki-Dalipi, A., 2018)."Successful readers spontaneously and intentionally create mental images during and after reading. The images that result from the five senses and the emotions, rely on the reader's preliminary knowledge"(Keene and Zimmerman). Hence, it is not difficult to identify the importance of visualization in supporting the critical and creative thinking by "overcoming mental limitations"(Pea, R., 1987), in order to clarify and "sharpen your eyesight".

"Visualization is an ability; a process and a product of creation; interpretation; thinking through images; images and diagrams in our minds, on paper or through technological equipment, so that information is displayed and transmitted; thought about it in order to develop understanding." (Zimmermann, W. & Cunningham S., 1991).

The overarching definition of Zimmerman and Cunningham highlights the visualization function. The nature of this mental and cognitive act, to look beyond the invisible, as well as the function of the strategy in question, allows the understanding of the causal connection to the elements of the problem, identifying another problem, and providing a link to the solutions from previous experiences.

The term "Assessment"

Assessment is one of the most sensitive acts in the education process. As a rather complex issue, within the pedagogical-didactic science, the evaluation dissociates itself as a particular scientific discipline, called docimology.

It is agreed by everyone's definition that this integral element of education, though causing many debates, discussions, and objections, is about tracking, controlling, and evaluating student achievements and skills. The tendency of today affects the redefinition of the traditional notion that assessment is "judgment" and that the latter should be directed only to the final result. In the contemporary approach to the process itself, assessment is perceived as a way to determine not only the degree, but also the process, the efficiency of application of skills, habits, and knowledge. The assessment process has undergone an evolution by turning its attention away from the appreciation of particular successes, from essential personality changes. According to Osmani, assessment involves integrating different applications into a comprehensive portrait of individuals in the teaching situation (Osmani, F., 2010).

"Evaluation refers to: building an image of progress and/or achievement in learning the curriculum in a given period of time. Information on how the child learns (the learning process) and what the child learns shapes the image. The teacher uses this information to identify and evaluate the current progress in the child's learning and to provide him with adequate support in further learning." (Мискоска, Г., 2008).

New trends in this science include influential actors, parents, and inevitably the importance of applying new methods and assessment techniques. Such tendencies emphasize learning appreciation, that is, an alternative assessment. "The alternative assessment itself includes authentic assessment, performance appraisal, portfolio, exposure, demonstration and other forms of assessment. These forms of assessment engage students in learning and require the development of reflective skills, and thus match with the theories of cognitive learning and motivation" (James, M., 2011).

The role of visualization in the process of assesment

Although not many studies have been done about assessing knowledge and skills that include graphic presentation, this research has been conducted by measuring perceptive skills in order to extract information from graphical images.

Initiated by the tendency to give another sense of assessment, as a process that would unfold pupils' knowledge and skills in an entertaining way, we emphasize the visualization as an effective form as well. Visualization is a cognitive ability that creates conditions to understand the problem and its elements, while identifying and evaluating the causal connection. This mental ability allows us to have a clear insight and to create mental images about a subject and modeling of the same. This strategy represents a bridge between knowledge and understanding.

Creating mental images about the structure of the problem, broken down into content elements, reflects on the understanding of the constituent elements' reports. The control function of the same allows verification of the accuracy of the selections. In this case, it comes to the expression that through figurative language, we can increase the level of understanding, but at the same time the appearance of understanding through visual images allows verification of comprehension.

Although it was emphasized that visualization involves a two-way attack, we will elaborate how the visualization strategy allows the assessment of students' knowledge and skills. Applying this method, it is thought to motivate students to participate in the act, avoid anxiety during the assessment, and at the same time make it fun.

Research questions

The primary purpose of this research is to examine the essential issue, which concerns the application of visualization in our school practice.

For this purpose, the research will answer the following questions:

- Are the students willing to join the assesment process through visualization?
- Do the tasks with visual support increase the student's achievements, as opposed to those of the verbal ones?
- Is this kind of assessment motivating the students?
- Does it provide sufficient data about the student's achievements with visualization application?
- Does the evaluation through visualization provide additional data?
- Can it be applied to assess children with special needs?

Methodology

In order to clarify this problem, the questions will be explored through qualitative and quantitative methods. The elaboration of the issues will be oriented to visual interpretations of the pupils, where the pupils will participate in evaluations with visualization application and the reverse practice. In order to avoid unwanted effects that may arise as a result of (not) mastering the strategy, the research will be carried out by assessing the same group of pupils through the two forms of assessment.

The research includes 90 pupils of the first cycle of the educational development, who have been actively tested and monitored. In order to verify the assumptions, the collected data are approached with statistical methods. At the same time, we present and use relevant data from participatory observation.

Results

By learning the impact of visualization, the strategy is extentend in the domain of pupil assessment. As an unusual approach to school life practice, visualization remains an active question in the contemporary interactive sphere of education.

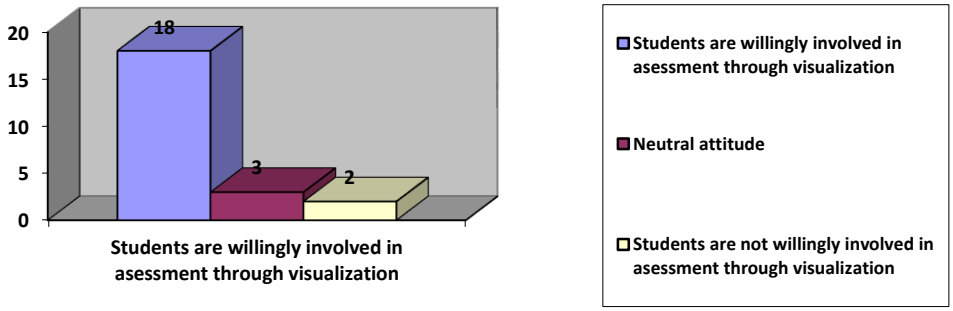
We approached the research from two perspectives: by collecting and analyzing the data gathered by teachers, and the data that was reflected from the student's testing. We will also discuss the evidence gathered from participatory observation during classroom monitoring.

Regarding the question: *Are the students willing to join the assesment process through visualization?,* according to the data gathered from participatory observation, we can conclude that students have a great freedom of expression of knowledge and skills. It is very important to emphasize the fact that many of the students, do not experience asessment through visualization as an evaluation, but merely as a frequent connection to routine activities. To proof this data, we disclose the fact that 100% of students, participating in the evaluation through visualization, submitted a paper (drawing). Reading and interpreting drawings enables teachers to get information about the students' understanding of what is being read i.e. how many students have acquired the numbers and basic math operations.[2]

[2] Student assessment was conducted in the subject of language where the students after reading the text had to illustrate it. From the visual appearances, we conclude that the students have or havent understood the text. In the subject of mathematics, students were required to color in different colors in order to distinguish odd and even numbers. With the tendency to level up the requirements, respectively to assest the students with higher level requirements, the task was submitted to the requirements that according to the colors to find the reports during the mathematical operations.

The same question, from the perspective of 23 interviewed teachers, reflects that it complies with the elaboration based on observations from the survey. 18 teachers, or 78.26%, stated the willingness of students to participate in evaluations through visualization, 3 teachers, respectively 13.04%, have a neutral attitude. Despite the aforementioned teachers, we encountered 2 teachers, or 8.7% of them who deny the ability to evaluate students through this strategy. They justify their attitudes by making statements such as "mathematics is mathematics and can not be art" or declarations such as "Students should know when they are tested. That is an assessment and not a game."

Figure 1. Student's willingly engagement in the evaluation process through visualization



To verify the hypothesis, we will refer to data and statistical analysis. With the impression that all students are "moving" without exception to choosing the tasks, it is noted that the level of active engagement of all students is incresed, and at the same time, their dependency on copying from a friend is reduced. Each of the student's attempts to answer questions through figurative expression, independently and uniquely. The engagement of the students influenced the presentation of the results as follows. The test in which the students had the opportunity to answer through the language of art reflected that 90% of them managed to answer the questions correctly. By contrast, the students who answered the test verbally managed to answer correctly about 58% of the questions

Table 1. Tasks with visual support compared to verbal ones

Concluding correlation and t-test statistics
Spirman's correlation coefficient of evaluation through visualization and verbal evaluation

			Visual	Verbal
Spearman's rho	Visual assessment	Correlation Coefficient	1,000	**,406****
		Sig. (2-tailed)	.	**,000**
		N	81	81
	Verbal assessment	Correlation Coefficient	,406**	1,000
		Sig. (2-tailed)	,000	.
		N	81	81

**. Correlation is significant at the 0.01 level (2-tailed).

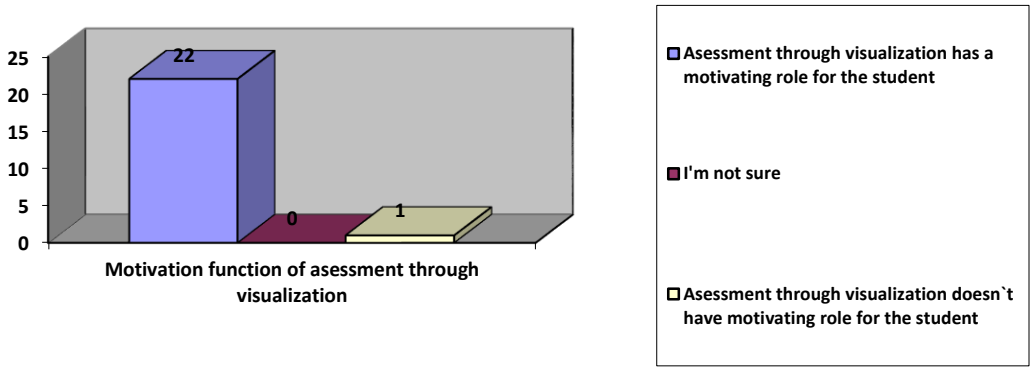
Regarding the question: *Do the tasks with visual support increase the student's achievements, as opposed to the verbal ones?* there are statistical analyzes showing the following results:

The analysis derived through the statistical method of the Spirman's coefficient, ascertain that there is a positive correlation between visual and verbal forms r = 0.406 sig = 0.000 (0.000 <0.01) significant for the first probability limit of 0.01. All this evidence allows us to conclude that although in both types of assessments the student reaches 40% of correct answers, there is an increase in the results, i.e. positive correlation.

Regarding the question *Is this kind of assessment motivating students?* according to the data which derived from the observation of the classroom while this practice was applied, the most important one to note is the disinterest of the pupils to integrate in the process. Once the students read the assignment or received instructions, they immediately reacted about the need to become supplied with the materials needed for the task. Most importantly, we should emphasize that all students are exceptionally engaged in some way in the assessment.

The question raised by teachers reflects considerable consistency according to teachers' attitudes. 22 of teachers, or up to 95.65% of them, claim that there is a motivational function to this approach in the evaluation. While a considerable number of teachers have a plausible attitude, there is one teacher, or 4.35%, who denies it by arguing that "Students do not even know that they are evaluated, so how can we ascertain that they are motivated?"

Figure 2. Motivation function of asessment through visualization



To resolve the dilemma of *Whether we can receive sufficient data about the student's achievements with visualization application?* we will refer to teachers' answers. This time their attitude differs. Their skepticism reaches 39.13%, respectively 9 of the teachers think visual presentation does not provide enough data, 6 of them, or 26.1%, appear to be undecided, while 8 teachers, or 34.78%, point out that this approach provides sufficient data.

Figure. 3 Providing sufficient data about student achievement with visualization application

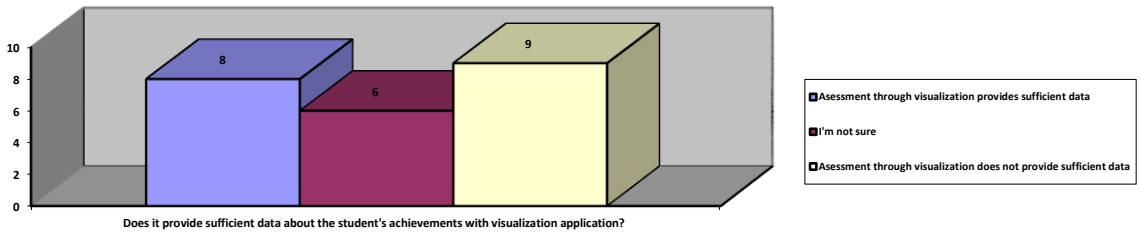
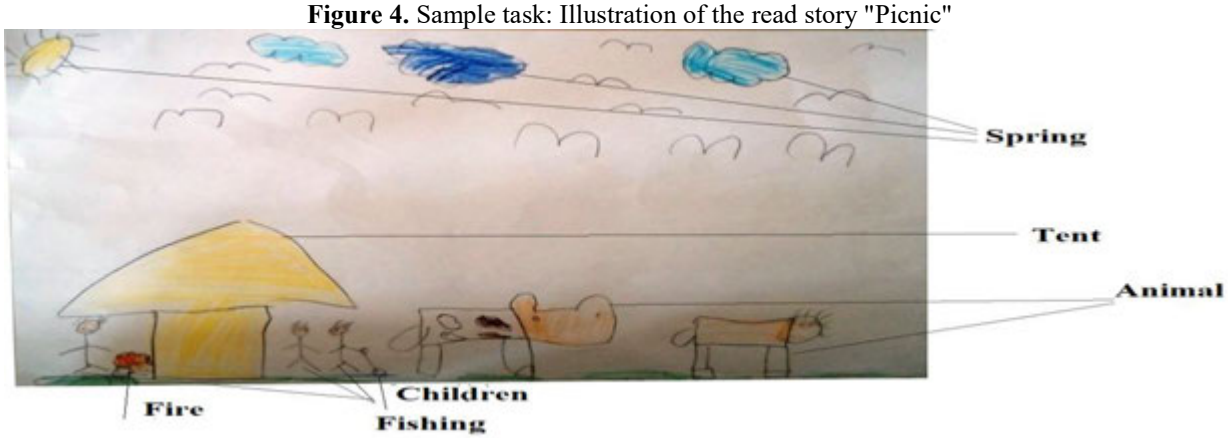


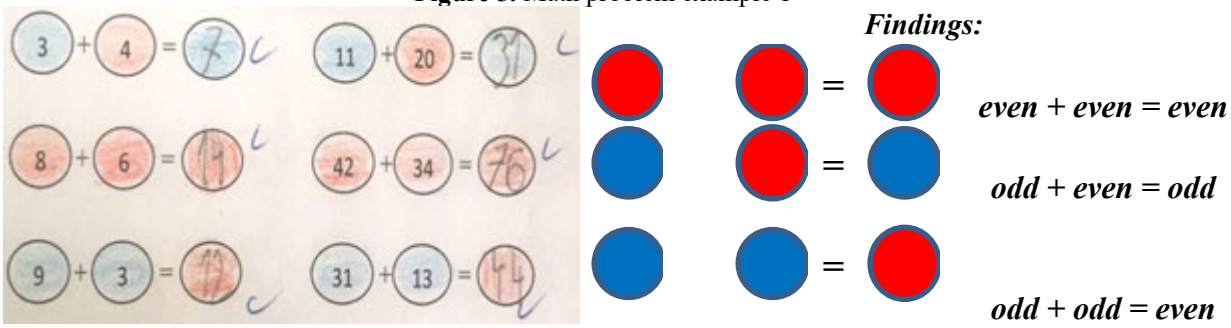
Figure 4. Sample task: Illustration of the read story "Picnic"



To analyze the question, we presented the students with a task, where it is clearly indicated how a student has managed to illustrate the read story. In it, the student presented, and then through the technique "Conference with the writer", he/she discussed the visual presentation. According to the student, he/she has drawn clouds and the sun because the story "Picnic" occurs in the spring season. At picnic, there were children who set up a tent and saw animals grazing. The kids fished in the lake and then lit up a fire to eat. The explanation of the student gives us detailed information contained in the text, and the latter are presented through the language of art.

Color even numbers in red, while odd numbers in blue! After you have colored, carefully look at the task presented and try to draw mathematical findings! The problem is illustrated in figure 5.

Figure 5. Math problem example 1



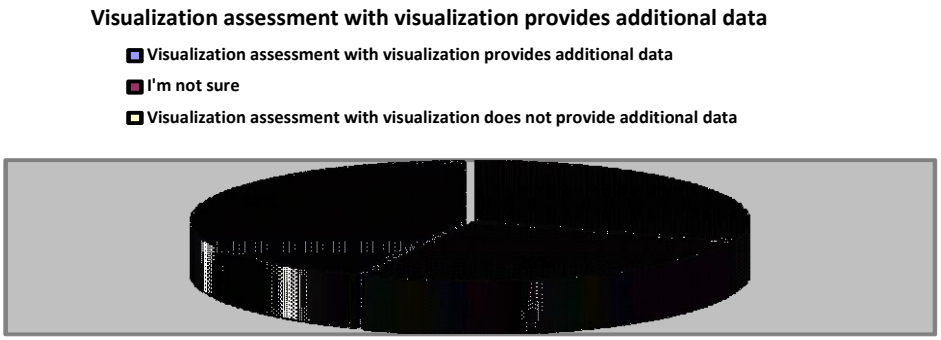
The task outlined above provides us with information that students have learned the subject matter. It is important to note that the mathematical assignment involves levels of Blum's taxonomy. While identifying odd and even numbers and coloring them with the corresponding colors belongs to the lowest taxonomy or recognition level, determining the sum of the numbers includes the level of knowledge application. To reach the highest level of the same taxonomy, students are required to manipulate the information and the knowledge they possess, to draw possible findings about arithmetic laws.

According to the data elaborated by student drawings, we can conclude that this approach provides sufficient data to asess students through visualization.

Regarding the question *Does the evaluation through visualization provide additional data?* we will analyze it from the aspect of the teachers and the data collected from the observation. According to teachers' interview data, 10 or 43.48% think visualization does not give us such

opportunities. While 6 of them prefer to stay neutral, 7 teachers or 30.43% admit that the visual strategy allows us to extract additional information.

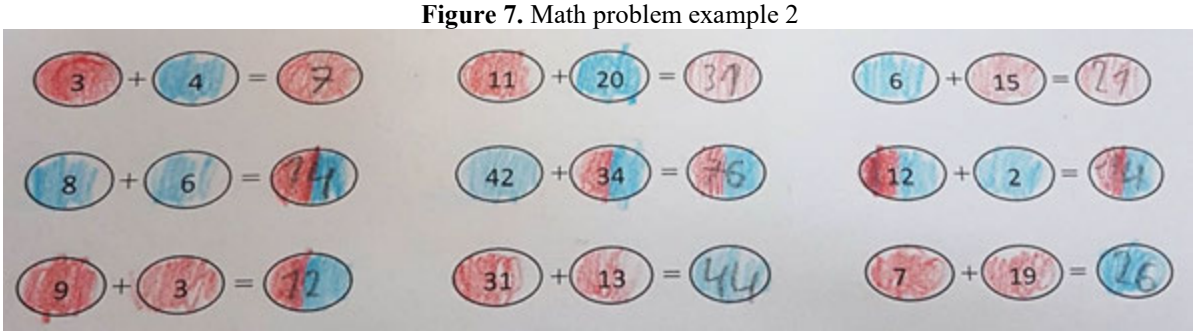
Figure 6. Providing additional asessment data with visualization application



Although, at first sight, the data from school practice do not reflect data that will help us test this hypothesis, a more detailed analysis of visual representations proves the same fact. To clarify this, we will use student's accomplished math problem during the observation.

Calculate the sum of the numbers. Once you've calculated, color even numbers in red, while odd numbers in blue. After you have colored, carefully look at the task presented and try to draw mathematical findings! As illustrated in figure below.

Figure 7. Math problem example 2



Since the student did not respond to the last question, by wrongfuly coloring the opposite number; this allows us to trace whether it is a mistake made by negligence or a problem of failure. The main issue lays in the answers which the student has colored half in red and half in blue color. Such visual representation allows us to understand that the student has confusions regarding the two or multi-digit numbers, without knowing clearly that even and odd are determined by the last standing digit number. All this enables us to conclude that visualization really gives us additional information.

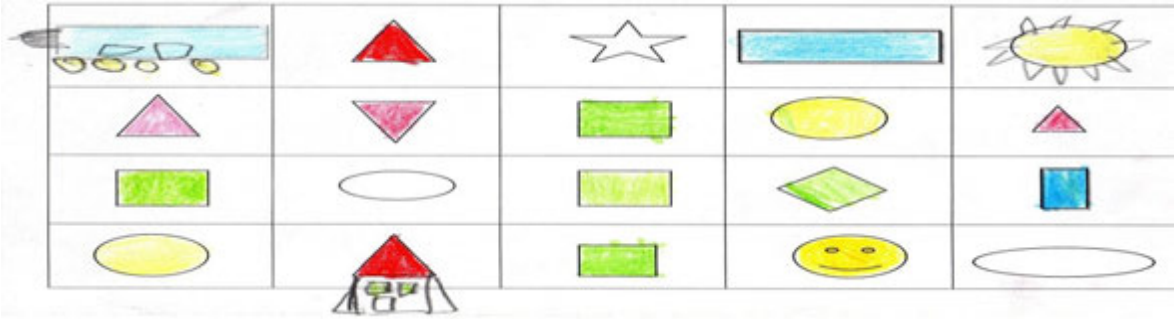
Although we traced the effects of visualization on students with regular physical-psychological development, we also posed the question *Can visualization be used to assess children with special needs?*

This question was not posed to the teachers who do not teach children with special needs, but to those who lecture in the special need classroom. These teachers emphasized that this form can be applied and is willingly accepted by the students, even though by a certain group of students. They emphasized that this assessment strategy could be widely applied especially to students who suffer from dyslexia and disgrafia.

To prove our position, below is provided a task, accomplished by a child with special needs.

Sample task: Color 2D forms according to the given request. Rectangles with blue color, triangles with red, squares with green and circles with yellow color.

Figure 8. Form coloring



According to the visual presentation of the given exercise, it is clearly seen that the student, besides being able to accomplish his duties, also shows contact with the outside world. This color-based presentation allows us to conclude that visualization as a strategy can help learners with special needs to perform assignments as well as to connect with the outside world.

Discussion

The carried-out research highlighted important aspects of visualization on the evaluation process. Although not completely, the data attracted by the most number of teachers' interviews allows us to conclude that visualization includes the students willingly in the evaluation process. According to them and to the data gathered from the observation, we notice that all motivated students are involved in this kind of assessment. Although the majority of teachers don't share the opinion that the strategy in question provides sufficient data, learning outcomes evidence that visualization provides sufficient and complementary data. It is very important that this research presents evidence that visual application in evaluation can also be applied to students with special needs.

According to the results that are reflected in the teaching practice, we conclude that visualization is a very important component. The strategy can be widely applied in the evaluation process. For this purpose, the outlined results motivate future research in the field of pedagogy. Verifying the accuracy of the questions of this research and future research should have a driving force for teachers' training in applying this strategy in classroom and for encouraging teachers to use contemporary teaching approaches.

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