

THE INTEGRAL DEVELOPMENT FOCUSED ON SCIENCES OF THE CHILDREN'S INTELLECTUAL FORMATION AT EARLY AGES: AN EXPERIENCE WITH GIFTED MEXICAN CHILDREN

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INTRODUCTION

During last decades the educational system in Mexico has achieved significant success as a result of a challenge of providing public education en different levels as well as the higher results of evaluation.

Nevertheless there exist some circumstances due to which some groups of children have not possibility to access to an education level which they require. Among these groups there encountered the so called *gifted children*.



Politics express of Mexican Constitution, Art. 3, declare that all the individuals have right to receive a general education.

Furthermore, the Article 41 of the General Law Education declare that there should be provided an attention to children with special necessities due to some kind of physical deficiencies as well as to gifted children, as two extreme points.



- Our group is engaged to provide an adequate intellectual development to the latter group of children by means of a variety of activities which could satisfy their ***educational necessities***.



- The school groups of basic education present a grand diversity in ethnic culture, languages, religion, economics, ethics, which is rather favorable in some respect, because provides reach opportunity to built a society with respect, tolerance, community between individuals, which is fundamental for a development country.



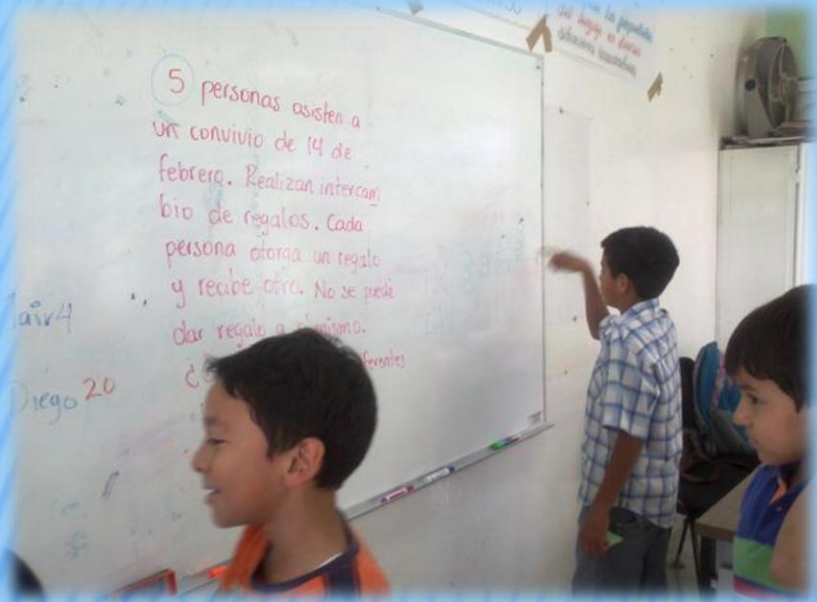
- Diversity does not refer only to inclusion of the people with physical deficiencies rather to a heterogeneity of the characteristics of human being one of them might be to possess a gift (children with super aptitudes) [1].
- This is in accordance to fundamental principle of UNESCO that education should contribute to every person complete development - mind and body, intelligence, sensitivity, aesthetic appreciation and spirituality [2].

PRELIMINARY EXPERIENCE

- The school period 2011-2012 offered a program of logic mathematics thinking for 160 children selected from different public schools and our program has been focused on the development of the mathematical logic thinking in order to prepare them for the *mathematical competitions* organized for these levels, by the Mexican Academy of Sciences.

- The program for the second year has been changed with the focus on the *integral development of intellectual formation* of children with interest to natural sciences, because it was detected that the children are not so much interested in the competitions, rather they prefer some kind of *explorative activities* in collaboration with others.





- In general the activities where there required the motor skills and ability, are not well accepted by the majority of the group, rather they prefer activities which require the mental ability.

- In the case when a student with the experience of the previous year presents the solution on the blackboard, there is much more acceptance and curiosity compared with the explanation given by a tutor. Nevertheless the level of curiosity fall down and further the children prefer some sort of collective activities.

TEACHING GOALS



- We have implemented some learning techniques which provide an inclusion. Each pupil receives a personal attention in order to detect their individual education necessities.

- The educational integration, which is directed especially to pupils with specific educational necessities, is an important element in favor of a process of inclusion, since it points toward projects and organization of a school matters in order to provide instructions and actualization of the school staff, to enhance the teachers practice as well as values.

- This is a procedure that permits to every pupil with super aptitudes participate in all the activities and to construct their knowledge in accordance with their own rate, styles and interest and to develop abilities and competition that will allow them to solve problems in everyday life [3].



INNOVATION STRATEGIES

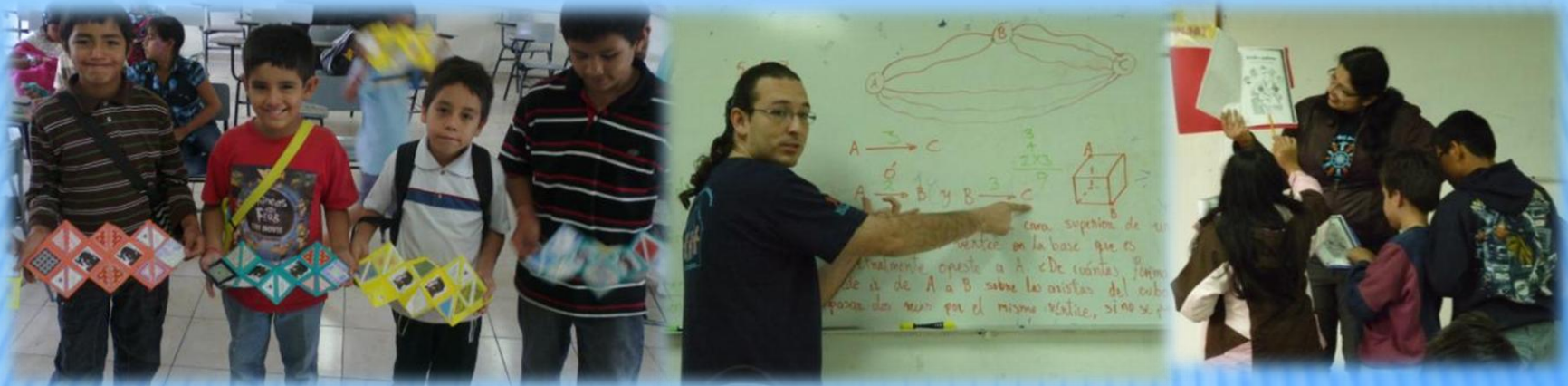
- We have proposed a series of experimental activities with game elements to some respect. We have considered suggestions that children achieve gradually the development of different capacities, as well as this activities contribute to activation of cognitive recourses necessary for problems solutions.



- An impressive body of research shows the potential benefit of early access by students to important conceptual ideas. In classrooms using a form of “cognitively guided” instruction in geometry, second-grade children’s skills for representing and visualizing three-dimensional forms exceeded those of comparison groups of undergraduate students at a leading university [4].



ACTIVITIES OF MENTAL AND MOTOR SKILLS



- The implementation of handwork activities and game-type teaching environment are in congruence with new approaches to support learning with understanding and encourage sense making. One is “*progressive formalization*”, which begins with the informal ideas and gradually helps pupils see how these ideas can be transformed and formalized [4].



PUZZLE OF ARBITRARY CUTTING



One activity was dedicated to elaboration of a paper format of a Puzzle of their own design so that each piece would not be like those known from previous practice. Thus pupils traced a geometric square and enthusiastically produced cuttings as they liked to form the picture. Afterwards they interchange their paper figures in order to reconstruct the picture of their partners.

Nevertheless it became clear that although all of them started with the same simple figure as a square there was no pattern of order among the intermediate peaces which would allow them to achieved to the goal

PUZZLE OF ARBITRARY CUTTING

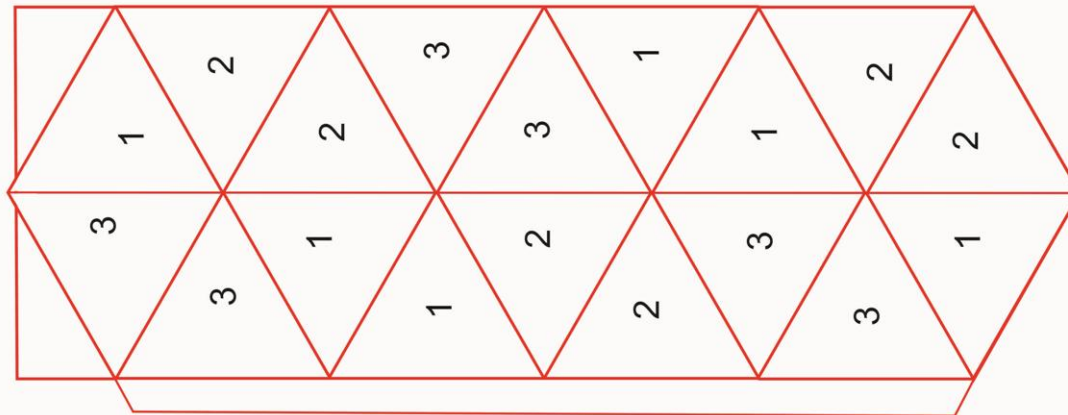
The comments of pupils at the very beginning of this activity demonstrated that they were sure that this task was quite easy, since starting with the square format there would be not so complicated to put together the pieces produced by their partner and reconstruct their pictures. In reality only one each three pupils could arm the original picture.



Through this activity pupils have learned that one should not overestimate their ability to afford a problem whatever simple it would appear to be at first glance, as well as in everyday life no always there are patterns to follow. One could make a comparison with the situation when the crystal vase is broken: it is not so simple to reconstruct the original object

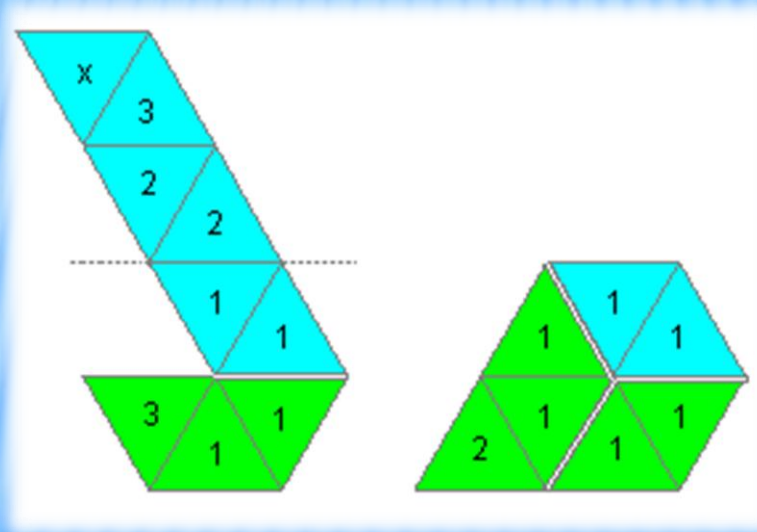
ELABORATION OF FLEXIBLE HEXAGON

For this task each pupil was given an impressed pattern which contained number to guide their actions. First observation was that the pattern was formed by several equal triangles, and all of them were regular ones. As well let visualize hexagonal contours en certain zones of the picture.



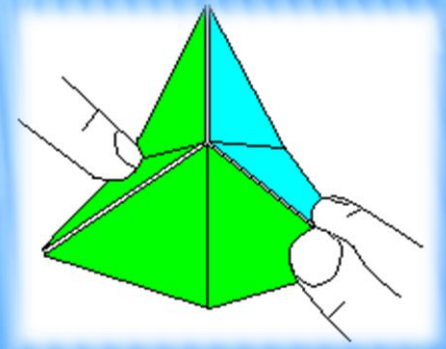
ELABORATION OF FLEXIBLE HEXAGON

They were advised to put different colors to the triangles numbered with the same digit. Afterwards they receive the instruction of how to fold the strip and to glue in order to obtain a plan hexagon, which resulted to be painted by the same color when viewed from one side y the distinct color when vied from another side.

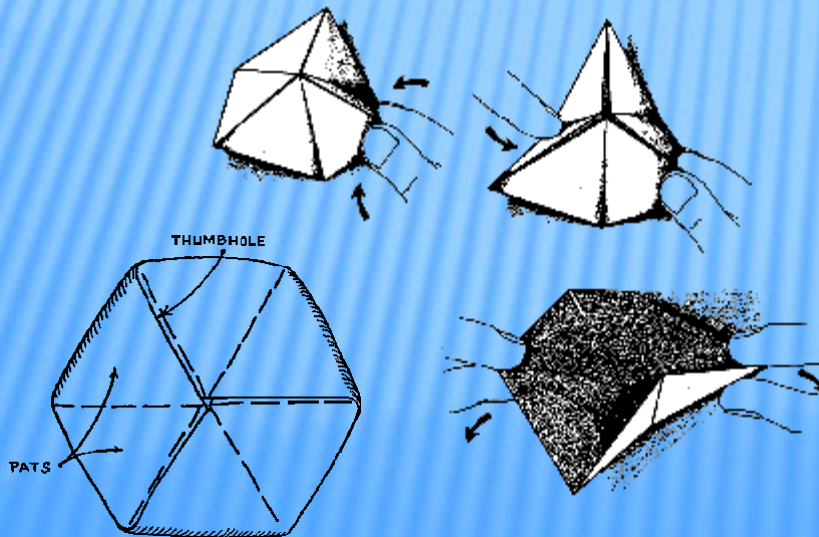


ELABORATION OF FLEXIBLE HEXAGON

Apparently this activity does not produce any interest but when it was revealed that by “folding” their plane hexagon according some special way, namely put together three alternating vertices, it was possible to open a peculiar figure similar to a flower, and at the same time demonstrating a new face of hexagon which was not seen in place of the initial one [5].



Finally they seem became curious with their experience because having started with a plane figure, there was possible to arrive to a variation of figures while rotating the piece. Even one pupil described this activity as “*addictive process*”.



THREE DIMENSIONAL PUZZLES.

Pupils have been suggested to reconstruct a three dimensional spherical figure, and three figures of the cubic form, one being empty and others solids



In every one of three tasks the majority of pupils achieved the goal in *30 minutes*, as a average time. It is worth to mention that normally in *20 minutes* children become impatient and are tempt to give up. Nevertheless in this task, when the first pupil who accomplished the task and demonstrated his figure well armed, there resurrect once more a motivation among other children to have their own figure well constructed.

THREE DIMENSIONAL PUZZLES.

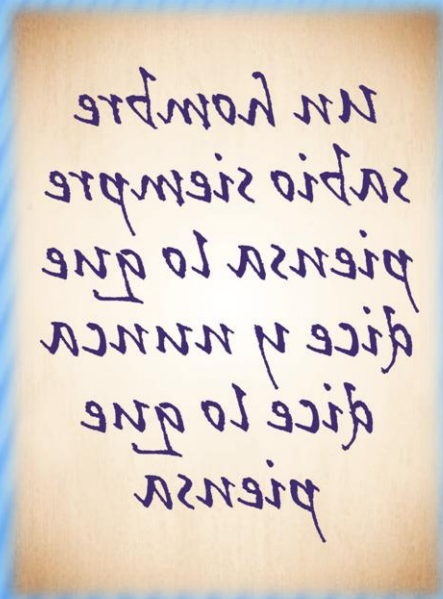


There appears naturally an environment of collaborative work presented because some children expressed the need of help from the more successful partners. Some children did not want to believe that with the given irregular pieces of plastic there will be obtained a little nice sphere.

As signs of desperate there were exclamation “these pieces don't work” or “my set of pieces is not complete” of some children who were not able to achieved the goal from the very beginning.



DECODING “MIRROR WRITING”



Mirror Reading: In Spanish “*un hombre sabio siempre piensa lo que dice y nunca dice lo que piensa*”

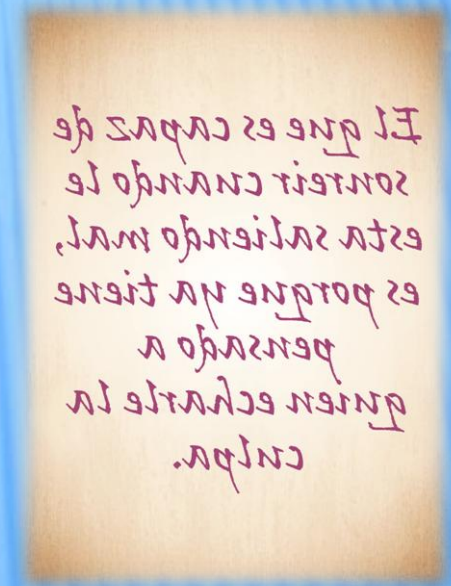
An activity, called “*Letricias*” (derived from “letters”) in Spanish produced much creativity and excitement, because the result was excellent.

As the picture presented, there is a message written as the mirror image of a text in Spanish. The task was to decode the text without using a mirror. The background of this task is due to publication [6], which asserts that neurophysiologic mechanisms of movements viewed in a mirror seem to have significant participation in a cortical region called supplement motor area.

DECODING “MIRROR WRITING”

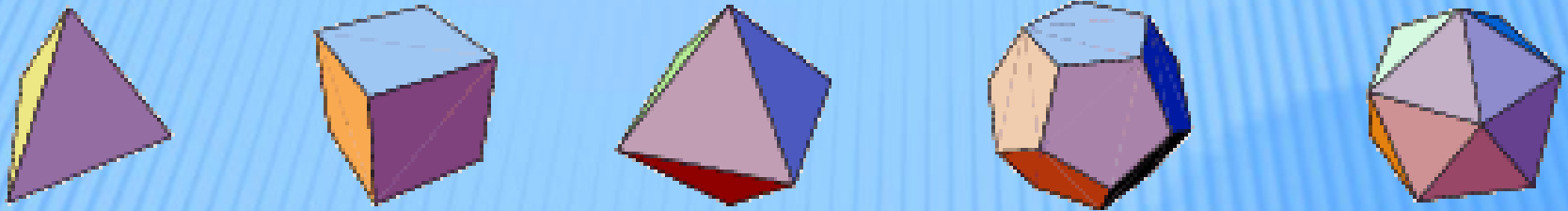
Therefore the idea was to stimulate these cerebral regions by means of a series of specially designed exercises for some groups of pupils.

Their solution was that which was expected. They just put a piece of paper with the text against the window and read the message. Thus they did neither use a mirror nor decode the text letter by letter.



Mirror Reading: In Spanish “*El que es capaz de sonreír cuando le esta saliendo mal, es porque ya tiene pensado a quien echarle la culpa*”

PLATONIC SOLIDS: ICOSAHEDRA.



To start with another activity related to three dimensional figures, We gave a discourse about Plato and his contributions. The pupils familiarized with figures called *Platonic solids*, examined their forms and appreciated their names given. Even the demonstrated some elements of negotiation of mathematical terminology [7] with respect of Icosahedra: they make fun of saying “*Cosa Hedra*” because in Spanish “Cosa” means “Thing”.

PLATONIC SOLIDS: ICOSAHEDRA.

Afterwards, they had built a decorative Icosahedra by putting together 20 circular pieces with a regular triangle inscribed, thus decorating the central part of a circle



PLATONIC SOLIDS: ICOSAHEDRA.

This way children understood another perspective of mathematics: that geometric figures may serve as a decorative element. The use of colors in this task, as well as in the previous ones, play fundamental role to draw their attention to achieve the planned objectives.



PLATONIC SOLIDS: ICOSAHEDRA.

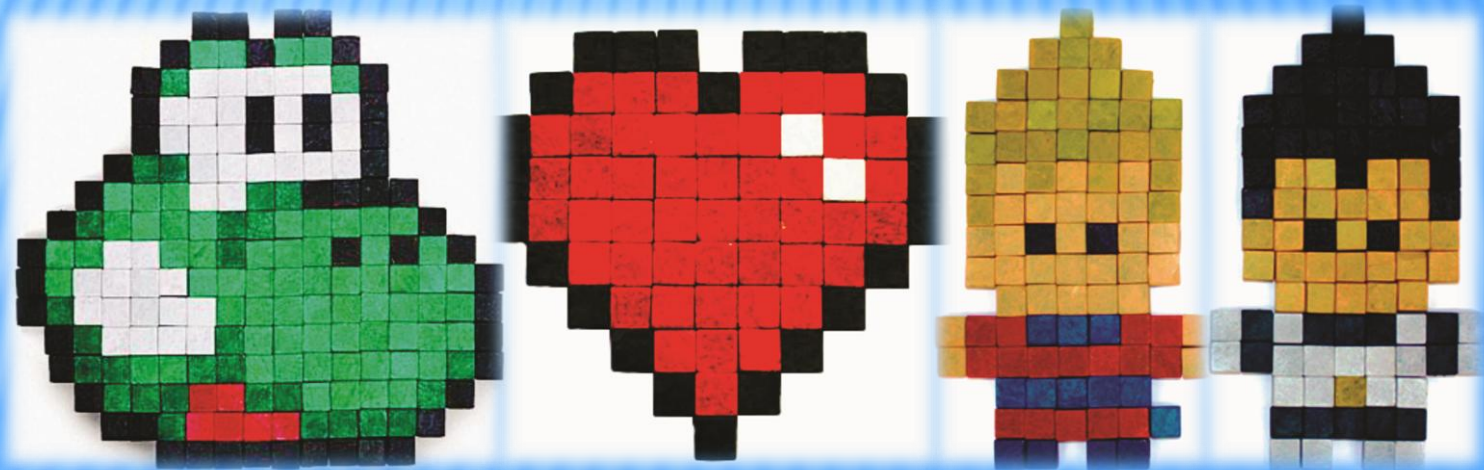
Children had a true satisfaction as they had constructed their proper sphere of colors, which also was a part of a three dimensional family of Platonic solids, invented centuries ago by a Greek Philosopher.



Their parents commented later on that children had repeated this very activity at home to produce a nice element of decoration as a present for their friends.

PIXELS.

We explained the word pixel as picture element; as well we explained that all digital images are produced as a result of using pixels of different colors. As an introduction to their task there were presented some pictures of small number of pixels. Since pictures represented the images of well known cartoons the children were able to identify them in spite of “low density”.



PIXELS.



Furthermore, with a help of a large piece of squared paper and a plenty of little colored square of 4x4 cm. paper pieces pupils produced an image of variety of 40x24 pixels by gluing their colored square-papers on the places coded according to special order: a zone numbered by the digit 1 should be covered by a little red square, a zone numbered with 2 should be covered by a little rose colored squares, etc.

PIXELS.

The result were amazing and the children appreciate very much when the little colored squares formed another well known image, being viewed from a distance, meanwhile being close to their “paper screen” it was impossible to reveal that very image .



The emotional impact was obvious when their faces expressed “awe” as they saw the result of their combined efforts.

FINAL REMARKS

We are working on the design of evaluations in accordance with Theory of Ontosemiotic Approach in order to be able to describe the competitive level of the children who participated in this program.

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[5] <http://delta.cs.cinvestav.mx/~mcintosh/comun/flexagon/node3.html>

[6] http://www.psicoweb.es/ARTICULOS/a_1_escritura_en_espejo.htm