GeoGebra the real challenge for young students

PhD **Valerian ANTOHE**
GeoGebra Institute of Timisoara Romania
Elena CREVARUCENCO
Secondary School "Mihai Viteazul" Galati Romania

Abstract: The Euclidean space, its understanding, and the correct cognitive formation of this concept for young pupils, is a challenge and a distribution of the teacher's effort in teaching the geometry elements. This paper presents some steps necessary to achieve an effective didactic approach within the geometry lessons for young pupils. In this respect, there will be presented some examples of good practice in the field. The experience developed and analyzed in time, could approach and structure the students' orientation in plan and space.

Keywords: points, straight, graphs

1.Introduction: We shall try to examine the interaction between the young students and the computer, the comportment of a young student in front of any computer which run an educational and dedicated software for a specific math problem to be solved or the real experience of any kind of young students into the computational socialization environments. Many specialists in the mathematical pedagogy have accepted that the algorithmically thinking it one of the most important way to solve problems and mathematical situations. The question if the algorithmically thinking and the connection of it with the computational methods which has gained a lot of "yes" in the past, today seems to be not so important. We could agree that the question must be replaced today with a new one, more explicit, if the method of "touch the button of the computer and gain the result" have the same role in the development of a mathematical thinking. Yes or no, some of these problems will be find out in this paper.

2.Mathematical modelling competency: GeoGebra represents dynamic mathematical software for all levels of education that joins arithmetic, geometry, algebra and calculus [1]. Students can draw points, lines, segments, vectors, polygons and other interesting construction in a 2-D space. This could be a real preview without considering the age and the level of the mathematical instruction. Considering that the area of interest could be extended to the work with very young students, the teacher must prepare segments of sub-programs that can aid the students to be involved in the real dialogue between student and machine. The step by step construction can be considered as an empirical algorithmically thinking in math. "Draw a point A, after this draw the point B and in the end, unite them!" – a simple three steps algorithm. Draw, build, unite, and investigate properties, change shape and size. Properties remain the same? Why? Can you formulate the theorem from this investigation? Prove it rigorously! Experience should not only be lived, but shared. With this action, the paradigm of „The GeoGebra Language" will not only be a working method but also a step in opening a viable way to exchange old, present and future ideas, covering the phenomena [2]. The step by step construction and investigation of this kind will be assumed by students which belong to a high level of mathematical instruction. But, come back to the youngers!

For the young students (4-6 years old), a real math problem will be the orientation in the 2D space. The instruction like: in front of, behind of, upstairs of, to the left or to the right of, are very important to be understands and to be used in the space orientation. For this reason, all the construction must be structured in sequences of thinking, moving an object in the plane, construct a geometric figure step by step moving a mouse or any other object. The final scope could be to realize a complex construction composing other simple constructions and declare the role for all pieces considered in the construction.

3. GeoGebra the real challenge for young students: In 2015-th it is rather difficult to find the best definitions for a domain which has a history of more than 20 years: computers working for schools. It was almost overnight that blackboard has become 'active' and that textbooks or student books, manuals or guides have been transformed into 'interactive' tools. A huge industry of 'soft' and 'hard' has been trying for at least 10 years to cover each need of the educational market, [3].

Many teachers accept today that GeoGebra it is an active instrument for teaching-learning. Some of them expose real objectives to conduct this action using GeoGebra. Many of them are looking to expose actions in an algorithmically way, produce operational objectives for real didactic sceneries.

An old software for the construction of the geometric figures and with the possibility of using blocks of programs was Logo. GeoGebra tried to import some ideas from it and accepted the construction protocol the turtle. We will not discuss any links between Logo or GeoGebra but we will agree as an interesting future the development of some routines that could follow this idea of easy programming a machine that will respond to our instruction will be very attractive.

For example, we tried to use the GeoGebra Turtle to construct algorithmic a segment, a triangle or a square. With the version for Win 10, the command < Turtle [ ] > will show a turtle named" turtle1" in the origin of axes, imagine that will be moved anywhere in the 2D plane. The instruction Forward Turtle [turtle1,3] will move the turtle 3 units in the point of coordinates (0,3), (Fig.1).

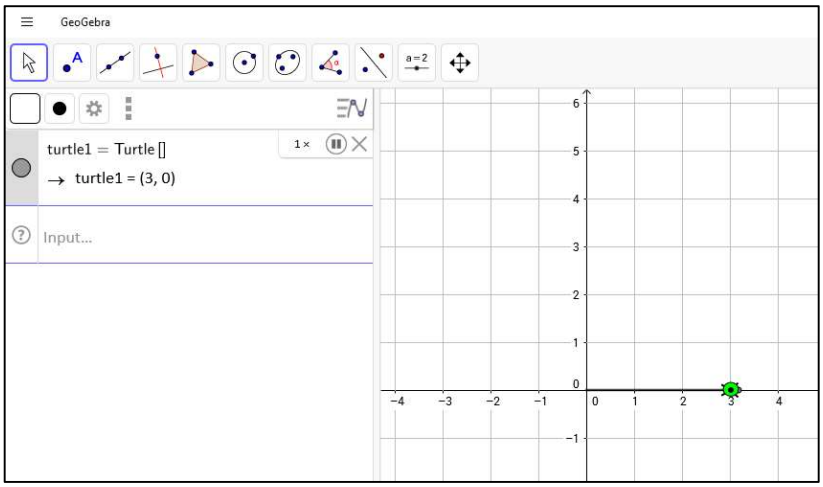

Figure1. The sequence of using the turtle to construct a segment

The first problem is that the action will be realized after another action of the touching some buttons, and the instruction disappears, it can be not visualized in the construction protocol.

Even if the project will be saved in the personal page of GeoGebra, the complete action cannot be opened easy and the opened page will show only the last position of the animated turtle, without the construction protocol and the drawing. So, we must to start the construction protocol once again!

In this case any of us will try other interesting construction protocol, writing commands and wait a more complex imagine, (Fig.2).

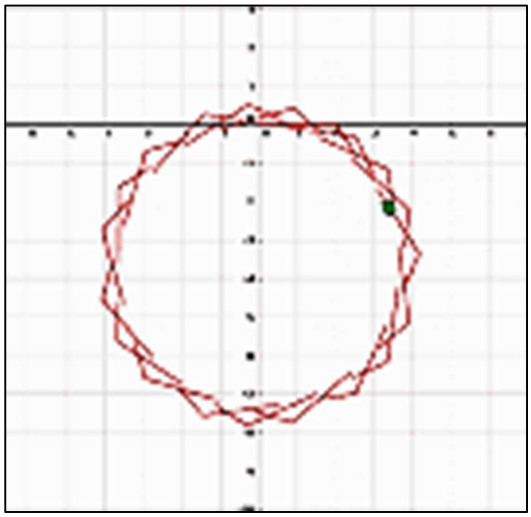

Figure 2. An interesting imagine obtained after learning the turtle to draw

The next project will show a turtle drawing which used in the commands protocol some FT, LT or Repeat, (Fig.4,5).

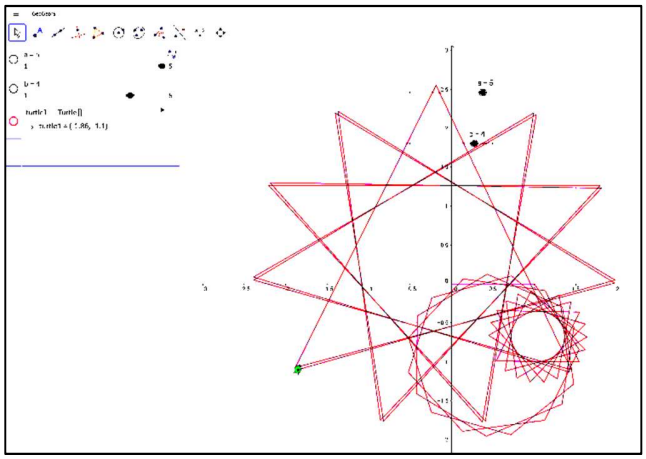

Figure 3. Imagine obtained after learning the turtle to draw

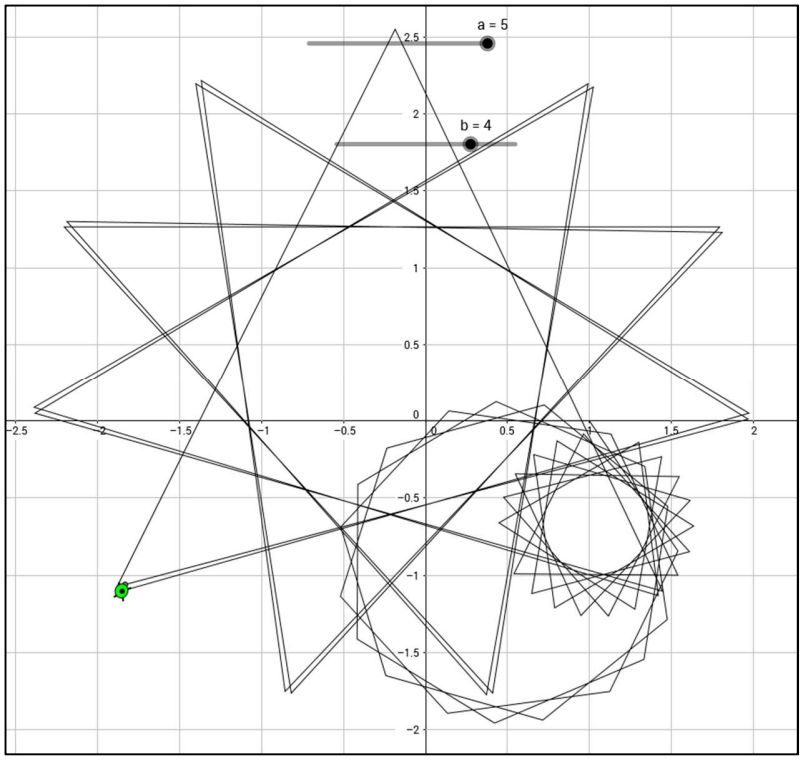

Figure 4. Imagine exported as "."png with turtle draw

4.Project-Turtle drawing a geometric figure. For young students, a real adventure, will be the objective to draw a square, to color it and to move its elements changing the length of its side. For this reason, a such activity must be conduct step by step by the teacher, using first a piece of paper and a pencil, after this an important objective to be gained will be to understand the rules and the principles of drawing. These could relate to the real moving of a students in front of the team, moving his body forward, fixing the stop place, moving around to the left or to the right and moving to arrive in the first start point. The turtle will show on the interactive table using eventually a camera, the connection between the real construction and the modeled construction with geogebra software. The scopes of this activity could be the understanding the notion of the length of any segment and the ratio between constructed model and the modeled action, the understanding of the notion of moving around with any angle, without considering the measure and only considering the equivalent angles. We shall use angles with any orientation, to the right or to the left and we shall see and understanding the 2D geometry figures.

5.Conclusions: After 8 years of GeoGebra software we accept that the grow up of possibility to using the educational platform has moved up exponentially. Today, more than 5 million people use it. Teachers involved try to discover methods for high mathematical problems and students follow them. We assume that more teachers must to return to the instruction of young level students and this as a contra-play with some platforms of socialization which have not enough educational structure to instruct young students. The automatism of "touch the button of the computer and gain" seems to be everywhere! Teachers, developers, people engaged in education politics must collaborate and transfer the computer more and more to a real education instruction. For this

reason, we shall propose a new group of discussion where the teachers to ask developers to project algorithm of teaching, conducting students to a new mathematical thinking. Proposed and developed structure must retain the structure of thinking and action in easy algorithms for problems solve. Some of the most interesting projects in these sense, must be posted in a work list direct on the wall of menu of geogebra software, downloaded all once the software will be accessed and used easier, without the procedure of find using a keyword. Not in the end, we shall propose as a future work, a new software named "GeoGebra for kids" and waiting for this it we shall wish big success to all geogebra developers.

References:

[1] Valerian Antohe, "Limits of Educational Soft "GeoGebra" in a Critical Constructive Review", Vol. VII fasc. 1 – 2009 Annals. Computer Science Series. 7th Tome 1st Fasc., Timisoara, Romania, 2009.

[2] Valerian Antohe, "GeoGebra the rainbow over past, present and future", GeoGebra the New Language for the Third Millennium-Journal, Vol.1 No.1, Zigotto Publishing House, Braila, Romania, 2014.

[3] Angela Elena Sooare, "Computer-Mediated Learning", GeoGebra the New Language for the Third Millennium-Journal, Vol.4 No.2, Zigotto Publishing House, Braila, Romania, 2014.