Dear colleagues,

I am very glad that I have been granted this opportunity to present my thoughts and ideas. My name is Karolina Brleković, I have been a professor in a secondary technical school for almost 29 years.

Working in a school which teaches computer technicians and electrical technicians has shaped my work as a math professor. In the beginning it was obvious that, with the type of pupils I work with, I have to use ICT in my lectures and stay in touch with the times. I was also given the opportunity to teach but also learn from my pupils. Math, as a subject in this type of school, is crucial, yet it is not liked by many. Therefore, we must encourage pupils to see maths from a different perspective and come to the conclusion that maths can be loved and learnt.

I became a part of the Scientix ambassadors because of the aforementioned reasons so that I could share and expand my knowledge. After all these years of researching and promoting STEM, I must ask myself what the letter M in STEM is. Sometimes it seems we are purposefully hiding it.

STEM is a lot of things, science, technology, engineering and mathematics. But STEM is complex, and as a result it is difficult to list all the fields it encompasses.

Both in Europe and Croatia much is done to popularize STEM, from kindergartens to retirement homes. Through research I have noticed all but mathematics.

Some years ago, the Croatian school system underwent a transformation in the model of “School for life” – new curricula of general education subjects, maths included. Professors were educated; digital educational content was made; schools were equipped.

The development of STEM was pushed by EU projects and the equipping of schools. Equipment is important for the development of STEM in schools, but is it enough to change the way pupils think?

In my opinion STEM is not equipment, rather a mindset; students can be encouraged to become a part of STEM without expensive gear. We must encourage pupils to research, analyse in detail, think logically, discuss with

reason, learn through the “trial and error” method, learn independently and combine the knowledge which the child has mastered at a certain age.

Learning through trial and error is especially important for pupils; we must teach students that failure is not a bad thing. Analysing mistakes in our work helps us come to an answer.

A task done through a STEM approach does not have to be difficult, time-consuming nor financially demanding.

Let us look at a few questions about an ordinary graphite pen;

1. What material is the pen made of?
2. Where do we find this material in nature?
3. How much force does it take to break a pencil in half?
4. Can a graphite pencil absorb water?
5. What is the volume of the pen?
6. Assemble a geometric shape or a geometric body with the help of pencils!
7. Assemble a model of a useful object with ten pencils!
8. In what ways, apart from writing, can we use a pencil?
9. Sketch the design of a new pen that will have at least two other applications besides writing!
10. Why is the price of a graphite pencil 1 €?...

Let us focus back on mathematics in STEM. I believe we can agree that maths is the foundation of STEM. I will bravely declare that STEM cannot exist without mathematics.

To prepare a math lecture within the STEM approach we must use lots of imagination and different knowledge. Must we really come up with this approach?

As a Scientix ambassador I will of course mention the Scientix website and the resources that can be found on it.

While researching the Scientix website I have found some interesting topics and ready-made scenarios for math lectures where students can use the true STEM approach:

- impact of traffic noise on people “Build your own disruption function”
- DESIGN A GARDEN FOR YOUR COMMUNITY
- THE MATHEMATICS OF A HEALTHY LIFE
- more light, less lighting

You do not have to carry out these scenarios in full, but they can give You inspiration for Your future lectures.

Lastly, I will show you some projects that I have come up with during online school. The projects include closed-ended questions and open-ended tasks. In this way the pupils’ works have been diverse.

Project Aquarium:

The pupils take on the role of an entrepreneur who has to build an aquarium in the shape of a cylinder with the height of 5 meters which is also a scenic view for the purposes of an amusement park. The scenic view consists of 2 cylinders; one internal and one external with a staircase between the two. The dimensions of the aquarium, aside from the height, are not given, however the surface area for the foundation of the tower is 20 meters squared. The scenic view must hold 7 people at once with access to the outer fence.
The pupils must determine:

a) The surface area of the glass
b) The amount of water in litres
c) The number of fish

Project Pool

For this project I had the help of Stientix ambassadors Snježana Damjanović from Bosnia and Herzegovina and Sonja Šumonja from Serbia. This project can be found on the X-Change programme.

Project Reduce Plastic

The pupils are working on the packaging of small juices in pallets in a way that reduces the usage of thin plastics in which the juices are wrapped in.

Project Greenhouse

The pupils take on the role of an entrepreneur who is competing for the job of designing a greenhouse in a botanical garden. The greenhouse has some assigned dimensions, and it must fit a tree which, at the time of planning, is 10 metres tall. The greenhouse should be in the shape of a cube with a pyramid on top.

The competition requires a sketch of the greenhouse, metal constructions and the expenses of the glass…

How did my pupils handle this task?

Have a look at some of the works that are truly detailed and contain thorough research.