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## **THE ROLE OF ARTS IN STEM EDUCATION (РОЛЬ МИСТЕЦТВА В STEM-ОСВІТІ)**

The question of the role of arts in STEM education is of utmost importance nowadays due to the fact that the elements of STEM education are bound to be implemented in the Ukrainian system of education.

There are many scientists that dedicate their work to this question including Sousa D., Bequette J., Daugherty M., Sanders M. and others.

The aim of this paper is to define when and why STEM education appeared and why the arts should be implemented into it.

When and why did STEM education appear? This idea is not new, it has been around for a long time, but in a way it is used today it started in the USA at the end of the 20th century. In the 1990s, the National Science Foundation (NSF) began using “SMET” as shorthand for “science, mathematics, engineering, and technology.” Later the “STEM” acronym was born. [3, 20]

There are many reasons why the government of this country started to invest so much time, money and effort into it. One of the reasons is the fact that the USA didn't want to lag behind the Soviet Union during the time of cold war. Another reason is more recent. It is the fact that American students have been showing quite low results in mathematics according to some educational rankings like PISA during the last few decades. In my opinion, STEM education is an attempt to improve those scores.

The whole idea of the education which main purpose is high test scores causes a lot of debate. There are some examples that show that it is not effective and there are examples of some countries that do not have test throughout the school years, but still manage to perform on a very high level during some international testing.

If education is focused only on some subjects that are considered by some to be the most important there is a possibility that many students will not find their place in

school environment. In the USA almost 25 percent of students enrolled in high schools drop out before graduating. [5, 12] The academic achievement of the American students also hasn't improved much in the last few decades.

There is an established misconception that arts and science are two conflicting ideas that cannot interact. However, if we take a look at any world community we see that arts are an important part of their life. Moreover, if we consider many scientific discoveries we can see that many were made with the help of some kind of art and that many scientists considered themselves artists. Michael K. Daugherty in his article "The Prospect of an "A" in STEM Education" gives some examples of this.

- Modern cell phones and PDA's use a form of encryption called frequency hopping to ensure your messages cannot easily be intercepted. Frequency hopping was invented by the composer George Antheil in collaboration with the actress Hedy Lamarr.
- Electronic display screens employ a combination of red, green and blue dots from which all the different colors can be generated. That innovation was the collaboration of a series of painter-scientists and post-impressionist artists like Seurat.
- Computer chips are made using a combination of three classic artistic inventions: etching, silk screen printing and photolithography. [2, 11]

Root-Bernstein in his research gives this information related to arts and science. Nobel laureates in science are:

- ☐ 25 times more likely to sing, dance, or act than average scientist
- ☐ 17 times more likely to be an artist
- ☐ 12 times more likely to write poetry and literature
- ☐ 8 times more likely to practice woodworking or craft
- ☐ 4 time more likely to be a musician
- ☐ Twice as likely to be a photographer
- ☐ Many connect their art with their scientific creativity

In modern cultures, the arts are thought of rarely as survival skills, but rather as frills—the aesthetic product of a wealthy society with lots of time to spare. [5, 14] So the question arises whether arts should be implemented into STEM education and why. It is believed by many scientists that it is incorrect to talk about the value of arts through the idea that arts help improve academic achievement, because if it fails to do so, the

value of it will be diminished. The arts have value in themselves, they teach how to be innovative and creative, how not to be afraid of the mistakes, how to collaborate and observe, how to focus and dedicate your time and effort to some activity. Many scientists, mathematicians, and engineers know that the arts are vital to their success, and they use skills borrowed from the arts as scientific tools. These include the ability to do the following: draw on curiosity, observe accurately, perceive an object in a different form, construct meaning and express one's observations accurately, work effectively with others, think spatially and perceive kinesthetically. These skills are often not expressly taught as part of STEM courses, but they are at home in writing, drama, dance, painting, and music. [5, 11]

Moreover, arts give that necessary break from more academic subjects where students may have the chance to relax and work in more friendly and less competitive atmosphere. They can also help to involve more students into the school life so they may find their place more easily within the school community.

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