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STEM EDUCATION AT A GLANCE

Abstract. This article reports the determination of general definition of science, technology, engineering, and mathematics (STEM) education. During literature research, it was found that the concept of STEM education is being discussed differently by scientists. Some consider STEM education to be improved teaching of separate subjects of STEM. Others believe STEM should be taught using an integrative subjects approach. Many believe it is a combination of both of these approaches. The development of a STEM agenda is mixed. Through this article, effectiveness and importance of STEM education, the age at which students should start attending STEM lessons were outlined, in order to give a brief overview of STEM education.

Key words: Science, technology, engineering, and mathematics (STEM), approaches of education, integrative education.

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Аңдатпа. Мақала білім беру жүйесіндегі ғылым, технология, техника және математика салаларын қамтитын жаңа бағыт – STEM – туралы жалпы түсініктеме береді.Тақырып бойынша ғылыми әдебиеттерді зерттеу барысында, STEM тұжырымдамасының түрлі елдердің ғалымдары арасында әр түрлі талқыланатыны анықталды. Кейбір елдер STEM білім беру жүйесіндегі жеке пәндердің ұсынылуын жетілдіру керек деп жатса, кейбір елдер STEMпәндерін өзара бірлестіру арқылы кешенді бір сабақ ретінде өткізген жөн деп санайды.Көптеген елдерде жоғарыда аталған тәсілдердің комбинациясы қолданылуда. STEM білім беру жүйесінің негізгі мақсаттарын анықтау әлі де тұрақталмаған. Мақалада, STEM білім беру жүйесінің маңыздылығы және оқушылардың әр жаста STEM сабақтарына қатысуының тиімділігі жайлы деректер берілу арқылы, STEM жүйесінің қазіргі уақыттағы деңгейіне және қолданыс үрдісіне шолу жасалады.

Кілт сөздер: Ғылым, технология, инженерлік және математика (STEM), қалыптастырудағы тұрғылар, қалыптастыру интегративтік.

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Аннотация. В статье описано общее значение нового направления — образовательной системы STEM, охватывающей, как это следует из аббревиатуры, проблемы науки, технологии, техники и математики. В

ходе исследований литературы на данную тему, было установлено, что концепция образования STEM обсуждается по-разному среди академического круга разных стран. Некоторые считают, что в рамках STEM-образования необходимо совершенствовать преподавание отдельных предметов STEM. Другие считают, что STEM следует преподавать с использованием комплексного подхода, что в свою очередь означает слияние и преподавание предметов STEM как одно целое. Многие считают, что это сочетание обоих вышеупомянутых методов. Разработка главных целей образовательной системы STEM носит смешанный характер. В данной статье представлены сведения об эффективности и важности обучения STEM, о возрасте, в котором учащиеся должны начать посещать уроки STEM.

Ключевые слова: Наука, технология, инженерия и математика (STEM), подходы к образованию, интегративное образование.

One of the most significant responsibilities of teachers is involving students in beneficial learning activities through standards-based education. Science, technology, engineering, and mathematics (STEM) education is a developing trend that many believe may help teachers to accomplish their task. This article is composed to determine a general overview of STEM education, outline the urgency of its growth, in order to motivate teachers to consider the case that their professional development might consist of STEM strategies for the purpose of improving their curriculum and instruction. With this knowledge, perhaps teachers will be able to incorporate a new way to reach students.

The concept of STEM was first introduced in 1990s by Judith A. Ramaley, the former director of National Science Foundation of the United States of America, as an acronym for science, technology, engineering and mathematics. Frequently, this acronym is used as the interpretation of STEM education, determining STEM by separate subjects of which it is composed. However, this explanation is incompetent [1]. Rather, STEM education is an associative approach to learning, which removes traditional barriers separating the four disciplines. STEM purposes on developing higher level of thinking skills by connecting classroom learning to the real world. According to a report at CurrTech Innovations, STEM can be defined as the "creation of a discipline based on integration of other disciplinary knowledge into a new 'whole'. This interdisciplinary bridging among discrete disciplines is now treated as an entity, known as 'STEM'." On the other hand, a recent survey on the "perception of STEM" found that most professionals in STEM-related fields lacked an understanding of the acronym STEM. Most respondents linked the acronym to "stem cell research" or to plants [2]. Once again, the education community has embraced a slogan without really taking the time to clarify

what the term might mean when applied beyond a general label. When most individuals use the term STEM, they mean whatever they meant in the past. So STEM is usually interpreted to mean science or math. Seldom does it refer to technology or engineering, and this is an issue that must be remedied [3].

If STEM education is going to advance beyond a slogan, educators in the STEM community will have to clarify what the acronym actually means for educational policies, programs, and practices. The following discussion presents several things that STEM might mean for contemporary education. First, based on the observation that STEM is often a term for science or mathematics, STEM should mean increased emphasis of technology in school programs. With reference to technology, there are very few other things that influence our everyday existence more and about which citizens know less. It is time to change this situation. Second, STEM could mean increasing the recognition of engineering in K-12 education. Engineering is directly involved in problem solving and innovation, two popular themes [4]. Engineering has some presence in our schools, but certainly not the amount consistent with its careers and contributions to society. If the nation is truly interested in innovation, recognizing T and E in STEMshould be the first things to be learnt.

Many factors affect to integration degree of STEM education. A complete integrated STEM curriculum is most easily reached at the elementary level, where students endure with a single teacher for a large period of the day. An embedded STEM curriculum is perhaps more achievable at the secondary level. Within a brief context, embedded instruction may be determined as "situated approaches that emphasize the learning of domain knowledge through ongoing activities and accurate problem-solving in rich social, cultural and functional contexts" [5]. It is the persistent, intentional process of embedding STEM content in a secondary classroom that improves student understanding and application of the material.

STEM's recognized potential is to conclude a student's learning experience by assisting him or her in the ability to turn over learning [6]. Students can deal with new problems and draw conclusions based upon previously learned fundamentals applied through science, technology, engineering, and mathematics.In the United States, The National Research Council's Framework for K-12 Science Education makes students' engagement the highest priority. Educators more and more acknowledge the challenge of guaranteeing that instruction not only covers the foremost necessary mathematics and science content but does so in an exceedingly way which will stimulate even bored or distracted students.

Research in STEM learning over the past ten years encompasses a lot to mention about what makes for effective, engaging STEM education. Among the key factors: it takes advantage of students' early interests and experiences, determines and builds on what they know, and provides opportunities to interact within practices of science and mathematics to preserve their interest.

In other words, during their schooling, students should learn to analyze questions on the globe that they come across in everyday life, in much the same way that scientists and mathematicians do.

Interactive engagement is now showing great promise in STEM learning at the college level, especially group problem solving. As an example, teachers can suggest a question and motivate students to work together in groups to come up with a consent feedback. This provides immediate reasoning and consideration, and, moreover, allows students to assess their own understanding [7]. Peer instruction, that expects students to apply notions learned in class and to teach other students, has also shown promise for the same advantages mentioned above, and because it involves every student in the class. Researches on peer instruction have found that it raise student learning, especially in concept mastery [8].

There are endless ways to involve students in interesting STEM experiences that can be adopted according to different levels of difficulty of different grades. As an example, heights of young students with and without shoes may be compared to learn ins and outs of measurement; plant and animal species on the school's grounds may be explored and categorized to learn about biodiversity. Each of these actions has the capability to be an important STEM learning background if the teacher constructs and aids the lesson, providing students to come up with their own questions, data, and conclusions.

Successful teachers arrange numerous opportunities for students to involve in logical arguments as they learn to compose and distil explanations for their observations, providing students to design and construct practical analysis, connect the analysis to basic knowledge, and work from a curriculum to essential problems [9].

Opposite to traditional wisdom, it is never too early to develop student interest in STEM. Recent study has recommended that each attempt should be made to start as soon as children enter elementary school. Research have identified the elementary year as the period when students build up their interests in STEM identities and careers [10].

There are many ideas about the most effective entry point in the education system for making an impact on student interest and achievement in STEM. Some say high school. Some say that is too late. Some say middle school. The Raytheon Co., one of the Massachusetts' leading employers of STEM professionals, conducted a survey of 1000 middle school students across the country and asked them if the preferred doing math homework or eating broccoli. The winner, with 56 percent of the vote was broccoli. From this fact we should say that you can't start early enough: young children are natural-born scientists and engineers. Like STEM, investment in early-childhood education is a workforce-pipeline issue. Research has shown that, high-quality pre-K cuts the rate of children being held back a grade in half; decreases juvenile arrests by a third; and increases high school attendance by a

third, college attendance by 80 percent, and employment by 23 percent. High-quality early learning environments provide children with a structure in which to build upon their natural inclination to explore, to build, and to question.

There is an exciting and powerful link between STEM and early childhood. Research from the University of California, Irvine, confirms that, the brain is particularly receptive to learning math and logic between ages of 1 and 4, and that early math skills are the most powerful predictors of later learning and later academic success than early reading is. The study found that, in a comparison of math, literacy, and social-emotional skills at kindergarten entry, "early math concepts, such as knowledge of numbers and ordinality, were the most powerful predictors of later learning".

STEM education is aunified approach to education for the purpose of instilling creative problem-solving techniques in students and the development of future innovators. STEM education improves a student's learning experience through application of general principles and practices. When organized properly, it should inspire creativity, analytical thinking, and teamwork. Furthermore, STEM education offers an applicable solution to a potential warning due to a lack of fully qualified workers who can contribute to the global economy.

As teachers, it is important that we are knowledgeable about the demands on our students. Learners in the 21st century will be required to present understanding and skills that were incomprehensible to us just ten years ago. Technology teachers have the responsibility of preparing students to be actively involved in future efforts. We cannot adequately meet that demand apart from an application of STEM education principles. So, it will be more in line with our endlessly developing world and economy to use STEM principles in construction of the curriculum.It will be difficult to use all STEM guidelines at once, as there is no definite framework or instruction on how effective STEM lesson should look like. More research and study is needed on STEM education so that suitable methodologies can be implemented by teachers in the classroom.

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