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STEM EDUCATION: KEY TO MODERN SOCIETY

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ABSTRACT

Education is the only key to lead the civilized life in the world. From the beginning education is practiced through various methods and aids. In 21st century the education is totally modernized and there are several pedagogy are followed like learner center teaching, teacher center learning, Context-Based Learning, Learning by Doing, Adaptive Teaching etc. All the methods and their outcomes do not satisfies the global need. The primary focus of STEM (Science, Technology, Engineering, Mathematics) education is to prepare the student to be efficient in these multi-disciplines in order to meet the requirements of the 21st century workforce. STEM education faces an interesting conundrum because it is a collaboration of 4 major arenas. Countries across the world have tried to practice constructivist inspired student centered practices which are argued to be more engaging and relevant to effective learning of students than the traditional, didactic approaches. This paper argues the needs and importance of STEM education and its scope of implementation in educational scenario to the modern world.

Keywords - STEM, Pedagogy, Modern Learning, Teaching Method.

I. INTRODUCTION

Many global challenges including "climate change, over-population, resource management, agricultural production, health, biodiversity, and declining energy and water sources" need an international approach supported by further development in science and technology to adequately address these challenges [1].

STEM is a new curriculum based on the four specific disciplines which is science, technology, engineering and mathematics — in an interdisciplinary and applied approach. Rather than teach the four disciplines as separate and discrete subjects, STEM integrates them into a cohesive learning paradigm based on real-world applications. According to Tsupros, "STEM education is an interdisciplinary approach to learning where rigorous academic concepts are coupled with real-world lessons as students apply science, technology, engineering, and mathematics in contexts that make connections between school, community, work, and the global enterprise enabling the development of STEM literacy and with it the ability to compete in the new economy" [2].

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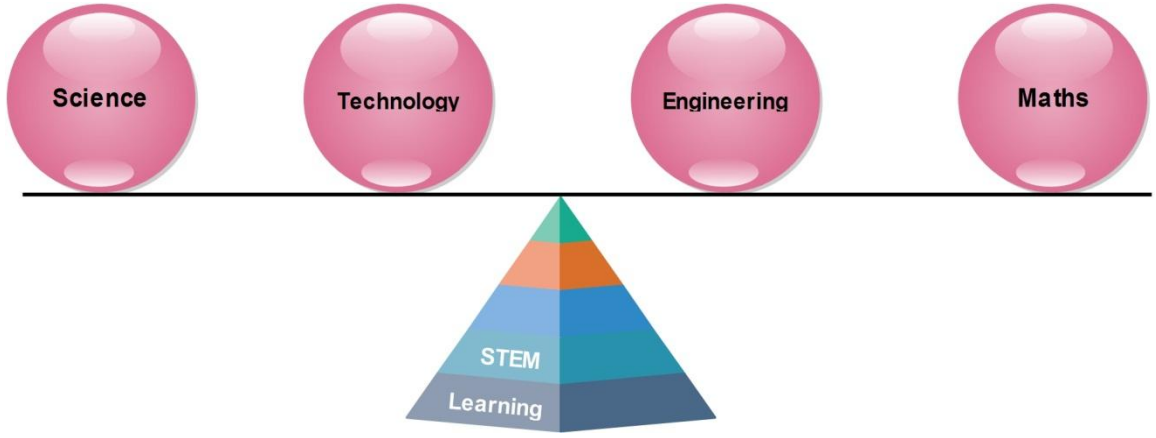

Figure1: Conceptual Structure of STEM

II. BACKGROUND STUDY

The idea of STEM education has been contemplated since the 1990s in the USA, few teachers seemed to know how to operationalize STEM education several decades later. Americans realized the country may fall behind in the global economy and began to heavily focus on STEM education and careers [3]. STEM funding for research and education then increased significantly in the USA [4]. The urgency to improve achievement in American Science, Technology, Engineering and Mathematics education is evident by the massive educational reforms that have occurred in the last two decades within these STEM education disciplines.

The efficacy of STEM education has been addressed in the literature over the last decades. Only within four years, from 2007 to 2010, over 1,100 articles discussed this integration in education [5]. It helps students not only develop their skills but also construct their awareness of science and engineering concepts through experiential learning methods [6-8]. The interdisciplinary promotes the middle and early secondary school student learning and STEM activities [9]. Although the literature focusing on the methods of STEM integration, efficacy of this process, for example, has been studying and up-to-date [5], the caution about curriculum, clarity, vocational and general education, alignment, epistemology, and goals still need to be explored in a variety of educational contexts [10].

III. NEED OF STEM EDUCATION

All of this effort is to meet a need. According to a report by the website STEMconnector.org, by 2018, projections estimate the need for 8.65 million workers in STEM-related jobs. The manufacturing sector faces an alarmingly large shortage of employees with the necessary skills — nearly 600,000. The field of cloud computing alone will have created 1.7 million jobs between 2011 and 2015, according to the report. The U.S. Bureau of Labor Statistics projects that by 2018, the bulk of STEM careers will be:

- Computing – 71 percent
- Traditional Engineering – 16 percent
- Physical sciences – 7 percent
- Life sciences – 4 percent
- Mathematics – 2 percent

According to the research the computing domain secure maximum share of the career opportunities than the other domains. Its shows all the fields will be coupled with computer and technologies.

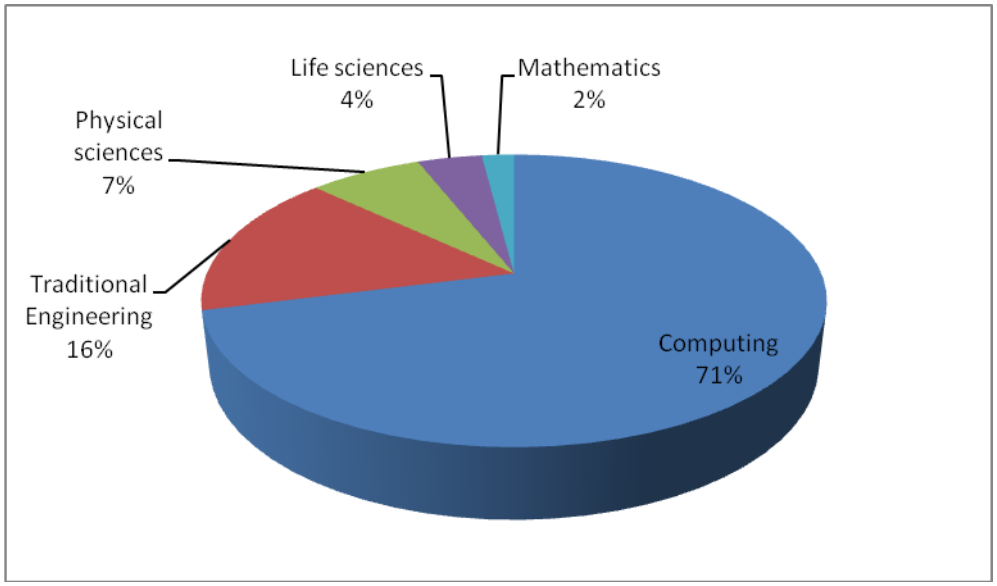

Figure 2. STEM Career Opportunities

IV. BLENDED LEARNING

What separates STEM from the traditional science and math education is the blended learning environment and showing students how the scientific method can be applied to everyday life. It teaches students computational thinking and focuses on the real world applications of problem solving. As mentioned before, STEM education begins while students are very young:

Elementary school — STEM education focuses on the introductory level STEM courses, as well as awareness of the STEM fields and occupations. This initial step provides standards-based structured inquiry-based and real world problem-based learning, connecting all four of the STEM subjects. The goal is to pique students' interest into them wanting to pursue the courses, not because they have to.

Middle school - Middle school is a particularly important time in general, with many students beginning to consider possible career options. The opinions they have about STEM subjects at this age will be taken through to further years, with previous experiences or perceptions dramatically impacting their future choices [11]. Despite being such a key time, middle school teachers often have limited resources, with school protocol invariably dictating that other subjects take precedence over STEM.

You are more likely to ignite enthusiasm by making STEM learning interactive and fun. Help set up experiments, asking your child to predict what will happen, and why. Buy a telescope and explore the skies. Even building Lego or playing Minecraft can help with their logical and engineering skills. If you need a little inspiration, Science Buddies makes science fun, with a multitude of activities and explorations to help kindle their interest.

At this stage, the courses become more rigorous and challenging. Student awareness of STEM fields and occupations is still pursued, as well as the academic requirements of such fields. Student exploration of STEM

related careers begins at this level, particularly for underrepresented populations. While the creation of a school culture for science and learning is important, the creation of this attitude must also be cultivated amongst the students. Ejiwale stated the lack of inspiration of students as a barrier to successful implementation of STEM education [12].

High school — The program of study focuses on the application of the subjects in a challenging and rigorous manner. Courses and pathways are now available in STEM fields and occupations, as well as preparation for post-secondary education and employment. More emphasis is placed on bridging in-school and out-of-school STEM opportunities.

Much of the STEM curriculum is aimed toward attracting underrepresented populations. Female students, for example, are significantly less likely to pursue a college major or career. Though this is nothing new, the gap is increasing at a significant rate. Male students are also more likely to pursue engineering and technology fields, while female students prefer science fields, like biology, chemistry, and marine biology. Overall, male students are three times more likely to be interested in pursuing a STEM career, the STEMconnect report said.

Ethnically, Asian students have historically displayed the highest level of interest in the STEM fields. Prior to 2001, students of an African-American background also showed high levels of interest in STEM fields, second only to the Asian demographic. However, since then, African-American interest in STEM has dropped dramatically to lower than any other ethnicity. Other ethnicities with high STEM interest include American Indian students.

V. IMPEDIMENT TO IMPLEMENTATION OF STEM EDUCATION

There is growing concern that the world countries are not preparing a sufficient number of students, teachers, and professionals in the areas of science, technology, engineering, and mathematics (STEM). Although the most recent National Assessment of Educational Progress (NAEP) results show improvement in knowledge of math and science, the large majority of students still fail to reach adequate levels of proficiency. For STEM education initiative to be adopted by any society must be understood to avoid the risk of compounding its societal problems. In addition, STEM educator should assume the new role of a facilitator in the classroom or laboratory. As such, it is necessary to address and reduce the barriers to successful implementation of STEM education. The following are some of the identified barriers to STEM education that are attributable to the loss of interest in STEM disciplines by students who would have become future scientists, engineers, and technologists: Poor preparation and shortage in supply of qualified STEM teachers, lack of investment in teachers professional development, and lack of research collaboration across STEM fields [12]. The barriers are

- Poor preparation and shortage in supply of qualified STEM teachers
- Lack of investment in teachers professional development
- Poor preparation and inspiration of students
- Lack of connection with individual learners in a wide variety of ways
- Lack of support from the school system
- Lack of research collaboration across STEM fields
- Poor Content preparation

- Poor Content delivery and method of assessment
- Poor Condition of laboratory facilities and instructional media
- Lack of hands-on training for students

The barriers are should be consider and rectify in the educational institutional environment will be improve the learners percentage.

VI. STEM PARTNERS

Teaching and learning do not happen only within the walls of a school. Successful STEM programs have partnerships within the community, industry, businesses, and with different individuals. These partnerships have not only been identified as important to successful STEM schools, but also for promoting STEM and STEM careers and making connections between classroom work and real-world problems.

Partnerships with institutions such as museums, science centers, and businesses can provide schools with both in-school and extra-curricular opportunities to facilitate teachers' implementation of a STEM curriculum [13]. Also, partnerships with families and the community helps to build an understanding of the rigor of science education and helps parents develop an appreciation of the beauty and wonder of science [14].

Partnerships that schools form outside of their walls provide many opportunities for students and teachers alike. Universities, industry, and different informal institutions and organizations support STEM learning in different ways, and provide students with different enrichment opportunities, teachers with different learning opportunities, and schools with grants and other monetary support, among many other examples. Partnerships enhance the capabilities of the school, and the literature reflects this in the many examples of partnerships that schools can form to support STEM learning.

VII. CONCLUSION

STEM education—are vital to our future—the future of our country, the future of our region and the future of our children. Besides, STEM is everywhere; it shapes our everyday experiences. In this paper STEM education is analyzed from various angles and point and highlights the limitations. The paper further suggests implementing the STEM through various partnerships.

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