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ARTICLE

STEM- A Bold Vision for Reforming Education

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Abstract

Interdisciplinary STEM (Science, Technology, Engineering, and Mathematics) education motivates students to learn the content through experience, exploration, and problem-solving technique. Students can learn things by collaborating different subject knowledge and develop their own sense of innovative views for research. This also develops the teachers' ability and competence by using this STEM approach. In this, how STEM is important has been described. STEM is closely relevant to problem based learning. Government has also started some innovation foundations based to promote STEM education to strengthen the grassroots technological innovations in India. STEM also develops the problem solving ability in students. Advantages and challenges of STEM are also discussed in this paper.

INRODUCTION:-

"STEM is an interdisciplinary approach to learning were rigorous academic concepts are coupled with real natural world lessons as students apply science, technology, engineering and mathematics in contexts that make connections between schools, communities, works and global enterprise enabling the development of STEM literacy and with it the ability to complete in the new economy"- **Tsupros, Kohler, & Hallinen (2009).**

The concept of STEM Education (Science, Technology, Engineering, and Mathematics) is old, but the emphasis is new. And it comes at the same time when we assess fundamental knowledge and skills through objective tests and sometimes through online mode. Fundamentals and STEM are not necessarily at odds with

each other. Fundamental skills in reading, writing, mathematics, and science form the foundation for logic, scientific creativity, critical thinking and problem solving activities. In some cases there have been additions to the STEM acronym, most recently the addition of an 'A' for 'Arts', forming the term 'STEAM Education'. This further emphasizes creativity and skill in the problem solving process.

Outside India, over the past several decades, there has been increasing interest in STEM education, particularly in effective strategies to prepare students for advanced study in STEM-related fields (Innovation America, 2008). Consequently, several approaches for STEM education have been proposed **(Atkinson, Hugo, Lundgren, Shapiro & Thomas, 2007)**, school-based STEM programs **(Toulmin & Groome, 2007), distance learning initiatives (Demski, 2009)**, mentoring programs **(Atkinson et al., 2007)** and special STEM schools **(Cavanagh, 2006)**. However, these approaches have often unsuccessful to reflect the nature of true world STEM, and therefore have limited potential to prepare students for emerging STEM careers. The practice of STEM, by its very nature, is interdisciplinary and focuses on authentic problem solving approach. Hence, organizations and educators should develop STEM education programmes supporting STEM Education in particular class contexts. Schools should design curriculum materials and engage in pedagogical practices that reflect the interdisciplinary, problem-based work in which scientists are engaged **(Anderson, 2007; Clark & Ernst, 2007; Marshall, Horton, & Austin-Wade, 2007; Paige, Lloyd, & Chartres, 2008; Park-Rogers, Volkmann, & Abell, 2007).**

STEM AND PBL:-

STEM education can provide through PBL method. Through PBL, schools should encourage students to invoke concepts and ideas drawn from multiple disciplines. PBL is relevant for it. Students should feel the problem, understand it in proper way and then think about solutions of the problem and ten pick the best solution from them. In short, should try to mirror the processes used by scientists to solve real-life problems. **(Crawford, 2000; Colliver, 2000)**. This can happen through active construction of knowledge and development of social and communication skills.

This will help to increase the understanding among theories, principles, rules, concepts and skills of different subjects. It will develop ability to apply their knowledge in practical way. It will help to develop students' creativity, critical as well as scientific thinking, imagination power and interest within the subjects. Learning by thinking and doing can be truly implement here. Students'

participating in STEM-PBL activities shows the better performance and positive attitudes towards STEM **subjects (Chen, 2007; Lou, Shih, Diez & Tseng, 2011; Tsai, 2007)**. Studies in international contexts suggest that students' participation in engineering based STEM contents improves their problem solving ability. Problem based learning concept also increase in-depth understanding of mathematics and science principles and their application to real life contexts.

IMPORTANCE OF STEM:-

In this globalization, global citizens require a greater level of STEM literacy and fluency to utilize the benefits of science and technology as well as to better understanding of complex issues that affect them and their communities. Moreover, more jobs require proficiency in STEM. A study by a leading job site indicates that the average level of shortage of skill talent in India in STEM has risen from 6% in January, 2014 to 12% in January, 2018, despite producing maximum number of graduates globally. A survey in America that STEM jobs are expected to increase almost twice faster than non-STEM jobs. The unemployment rate of STEM workers is 5.3%, is close to half of non-STEM workers as 10%. Moreover, 80% of jobs will require technical skills within the next decade. Thus, we can say that that interconnected content of discipline of science, technology, engineering and mathematics (STEM) support to modern society. In the advancement of technological era, learners should get opportunity to access quality STEM learning environment. Quality STEM education makes sharp real life observations and data analysis skills of students. It develops the experience and skill of research, which can help person to be a good problem solver in daily life.

India is a developing country. Many intellectual persons were in India; and present India also is a knowledge country. Many scientists and intellectuals hold good positions in the world. They have born in India; but works and get fame in and for other countries. This brain drain process damage Indian economy. Since few years, India tries to correct this situation. And for it, India wants innovation in different areas. STEM educated students can help it. These creative STEM students also are an important part of newly launched schemes like skill India and Start up India initiative by Hon. Prime minister of India. Indian Government is actively implementing new initiatives to support STEM in education. Some of these initiatives are 'Rashtriya Avishkar Abhiyan', 'Robo Shiksha Kendra', and 'Atal Innovation Mission'. India has also constituted National Council for Science and Technology Communication (NCSTC). So, STEM is of most importance for India;

which thrives on sectors such as manufacturing goods including auto component, space sciences, defense mechanism, life sciences, agriculture and food processing units and many more. Innovations in these areas fully depend on educational curriculum. If curriculum is based on STEM, it will be extreme important for innovations and research. That's why Indian government should promote STEM education strongly. **Department of Science and Technology (DSC),** Government of India has started **'The National Innovation Foundation (NIF)-India** to serve the knowledge-rich common people of the country. It is committed to making India innovative by documenting, adding value, protecting the intellectual property rights (IPR) of the contemporary unaided technological innovators as well as of outstanding traditional knowledge-holders and disseminating their innovations on commercial and non-commercial basis. It is India's national initiative to strengthen the grassroots technological innovations and outstanding traditional knowledge. Thus, govt. frames the policy according to STEM. Indian Govt. organized '**FINE' (Festival of Innovation and Entrepreneurship).** It is a signature event of the 'Rashtrapati Bhavan' calendar. It is a part of an effort for all Indians to making and continuing to inculcate a culture of innovation in every aspect of Indian society.

ADVANTAGES OF STEM:-

If we want to become our students as entrepreneurs, we should develop their mind as an innovator in STEM discipline. As critical thinkers, students will make meaningful and logical connections between school, society, work, and global major issues. When students start to see how their skills and experiences can be used to develop new ideas and innovations, they will begin to see themselves as researchers or innovators. When they leverage their STEM skills to produce new ways of doing business, they will believe in themselves as entrepreneurs. In STEM, students understand the concept in a very good manner and apply it in action. So, here students apply their knowledge, understanding and skill into application. When they learn how to apply their STEM knowledge and skills to real life situations, that's when they become empowered to be these problem solvers of future and the drivers behind country's future social and economic well being. In problem solving process, students use their creativity; it allows students to see problems in a different way; and that's why they think outside the box. To solve the problems, they discuss with others and it creates teamwork. In STEM, they do collaborative works or activities related to four disciplines. Through this, develop good communication skill, manners and good behavior to among. STEM teaching and

learning promotes sustain involvement of students; It should inspire students and their surrounding communities with a belief that they can create their own lives and others through STEM. Through STEM, students think about technological innovations. And most important, students start to love their work, they like to learn. STEM develops positive attitude or passion in students to do something innovative work. This curiosity and thirst of knowledge leads them to create new things. And this attitude transfers into commitment to the task. This mindset of students can lead our country on the top of innovations.

CHALLENGES TO IMPLEMENT STEM:-

- Teachers' should change their opinions and beliefs according to STEM.
- Teachers also develop their capacities; knowledge and skills for provide STEM education.
- Every teacher has not adequate knowledge and experience about engineering and technological skills; so they should try to develop it.
- Teachers should be clear in deciding goals and benchmarks for innovations in STEM education.
- Teachers should develop the internal and external relations or connections among these four scientific disciplines science, mathematics, and engineering and technology.
- Teachers should face some significant challenges regarding creation of interdisciplinary problems related to appropriateness of curriculum.
- Teachers should aware and sometimes connected with their students real lives.
- Teachers should learn new things and adopted new approaches in their teaching methods.
- Teachers should evaluate their techniques, methods mode of teaching, tools for evaluation and other resources to involve in integrated STEM education task.
- Instructional methods or activities and assessment should be effective and prompt.
- Curriculum and content formation should be difficult.
- Without support and encouragement of administration, implementation or adoption of STEM should be tough.
- Schools management should develop encouraging STEM environment; in which teachers can facilitates their learning in effective manner. For that management should arrange activities that develop teachers' professional development and

improve their STEM practices. Awards, rewards, incentives should also be useful for it.

- Team work should necessary for STEM education, so faculty meetings and faculty- administrative meetings should arrange to share experiences and issues related to STEM education. For it, should provide sufficient preparation time for it.
- Effective framework of evaluation for students and teachers should conduct.

CONCLUSSION:-

Russell Shilling (2015) remarked, "Every child is imbued with a sense of curiosity and wonder. They are born scientists, engineers, and creators ready to discover the world at every turn. The goal of education should be to sustain engagement through a lifetime". In this article, we have discussed about some STEM education concern matters. STEM has a quality to develop education in a very scientific way. It should implement in the early school life. **Moomaw & Dvis (2010)** says, For STEM education to have the desired effect of developing individuals' lifelong learning skills, as well as the potential for sustained interest in STEM topics and issues, children and youth should be exposed to positive and authentic STEM learning experiences as early as preschool and throughout their educational pathways. Schools should start to provide smooth accessibility of STEM and involve students in it. Once it starts, it becomes a learning process that transmits the knowledge and skill into action mode. It helps students to identify that what they know now and what needs have to be discovered. It help students to think about needs to be developed to get the ultimate goal. Certainly, challenges remains, but new things can be learned through it. New ideas and solutions make more qualitative STEM education in society. It will be a base of future innovations. This will generate future knowledge. It is a vision for an innovative future of country.

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