



A REVIEW OF AWARENESS OF STEM AMONG EDUCATORS

Marketing

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ABSTRACT

This review examines the level of awareness of STEM (Science, Technology, Engineering, and Mathematics) education among educators and highlights the current challenges and opportunities within this educational paradigm. STEM education aims to unify these disciplines into a cohesive, interdisciplinary approach, fostering the development of critical 21st-century skills. However, many educators express feelings of unpreparedness and lack comprehensive STEM knowledge, impacting the effective implementation of these programs. The study underscores the importance of continuous professional development and the creation of STEM-focused instructional modules to support educators in overcoming these obstacles. It advocates for collaborative learning communities and governmental support to advance these initiatives. Enhanced awareness and the integration of STEM methodologies are essential for preparing students to meet the demands of an evolving global economy and to contribute to future technological advancements. The findings suggest a promising trend towards improved teacher perceptions and engagement with STEM, promoting a more innovative and skilled future workforce.

KEYWORDS

STEM, NEP, Skills

INTRODUCTION

Science and technology have exerted a profound and transformative influence on various aspects of human life, with education being one of the most significantly impacted areas. In this context, the competencies required for the 21st century, which include skills such as critical thinking, effective problem-solving, creative innovation, collaborative teamwork, and clear communication, have become indispensable for the progress and development of any nation. Consequently, updating and revising educational curricula have emerged as fundamental necessities for countries worldwide to adequately address and navigate the complex challenges of the contemporary era. The perspectives and attitudes held by teachers play a pivotal role in shaping pedagogical decisions and the overall educational experience (Timur, 2012). To effectively equip both educators and students with the requisite knowledge and skills, the adoption and implementation of innovative teaching methods and strategies have become crucial (Yaki, Saat, Sathasivam, & Zulnaidi, 2019). STEM (Science, Technology, Engineering, and Mathematics) education represents one of the most advanced and forward-thinking approaches to teaching and learning, with teachers serving as the key facilitators and guides in the delivery of STEM education (McDonald, 2016). Furthermore, there is a growing need for continuous professional development for educators to remain updated with emerging trends and technologies, thereby ensuring that their teaching methodologies remain relevant and effective in fostering an environment conducive to learning. As educational environments continue to evolve, it is essential that both teachers and students are provided with resources that support adaptability and innovation, ensuring they can thrive in an ever-changing global landscape.

STEM Education

The National Science Foundation (NSF) introduced the term "STEM Education" to denote an innovative pedagogical framework aimed at revolutionizing the way students engage with and understand key academic disciplines (Watson & Watson, 2013). STEM education, which is an acronym for science, technology, engineering, and mathematics, represents a contemporary approach within the educational landscape, seeking to break down traditional barriers between these fields and integrate them into a cohesive and interconnected curriculum (Gonzalez & Kuzenzi, 2012). This comprehensive educational strategy endeavors to amalgamate science, technology, engineering, and mathematics with essential 21st-century skills, all of which are collectively recognized under the umbrella of STEM education. Its importance lies in its potential to cultivate the development of critical thinking, problem-solving capabilities, creativity, and collaboration skills, while also encouraging experiential and practical learning environments that are vital to student engagement and understanding. Furthermore, STEM education plays an indispensable role in propelling the nation's economic growth and fostering a culture of innovation and technological advancement. By equipping learners with the skills necessary to succeed in a rapidly evolving global economy, STEM

education addresses the growing demand for a skilled workforce capable of tackling complex challenges and driving future progress.

Educators' Awareness of STEM Education

Numerous scholarly studies focusing on the awareness and understanding that teachers have regarding STEM (Science, Technology, Engineering, and Mathematics) education have consistently revealed that many educators often feel insufficiently informed and prepared about the comprehensive requirements of STEM education (Yildirim, 2016). The array of challenges that impede the effective implementation of STEM education is broad and multifaceted, including the inherently multidisciplinary nature of the concept, the lack of adequate instructional materials and resources, improper timing and allocation within the curriculum, suboptimal and sometimes restrictive classroom environments, as well as varying levels of student interest, engagement, and motivation. Instructors must not only possess robust pedagogical skills, comprehensive integrative abilities, and an expertise in 21st-century skills but also demonstrate a profound understanding of STEM knowledge domains. Despite these hurdles, research indicates that teachers' perceptions of STEM education are gradually improving and their interest in adopting such educational frameworks is incrementally increasing (Elam, Donham, & Solomon, 2012). The integration of STEM education into existing curricula has been successfully facilitated and enhanced, to a significant extent, by recognizing and leveraging students' capabilities and potential (Wang, 2012). According to Honey et al. (2014), the organizational structure in most educational institutions, where schools and courses for STEM subjects are sectioned into separate departments and class schedules, means that teachers are generally equipped and prepared to instruct primarily within a single disciplinary focus. Further research conducted by McMillan, McConnell, & O'Sullivan (2016) suggests that educators' skills, perceived efficacy, satisfaction of basic professional needs, accessibility of career development opportunities, and the quality of interpersonal relationships significantly impact their willingness to learn and engage in continuous professional growth.

Teachers are particularly driven to improve their instructional techniques by observing students' struggles and challenges, particularly with mathematics, which concurrently heightens their frustration with their current instructional approaches. Their unwavering commitment to ensuring comprehensive student learning propels teachers towards personal growth and development, ultimately aiming to become more effective educators (Appova & Arbaugh, 2018). Campbell & Jobling (2010) report that a substantial number of educators frequently lack the confidence, expertise, and in-depth knowledge necessary to advance STEM instruction effectively. This reflects a demand for comprehensive professional development and support systems to empower teachers in this critical field.

Need & Importance of STEM Awareness

UNESCO asserts that for scientific and technological experts to

effectively contribute to socially and environmentally sustainable development, it is imperative to have high-caliber education in science and technology (Fensham, 2008). Shernoff, Sinha, Bressler, and Ginsburg (2017) highlight the challenge of advancing STEM education. There is a requirement for educators who possess a deep understanding of STEM concepts and can implement innovative methods and approaches in the classroom, thereby motivating students to adopt these techniques for their personal development.

Recommendations For Enhancing Awareness Of STEM Education

The necessity of STEM education within society underscores the importance of raising awareness in this field. Consequently, the education system can employ several strategies to enhance the promotion of STEM education awareness.

1. Teachers' Professional Development

The rapid advancement and integration of STEM education into curricula necessitate a concerted effort to facilitate the continuous professional development and upskilling of teachers. Educators should be systematically and adequately equipped with the knowledge and tools necessary to significantly enhance their instructional skills and deepen their theoretical and practical understanding of STEM pedagogy through effective, comprehensive training programs and courses. Such initiatives should be diligently provided and supported by government entities like the Ministry of Education, as well as teacher education universities, professional development organizations, and educational consortia that specialize in transformative teaching practices. These carefully structured and thoughtfully designed training initiatives, alongside interactive short-term courses, play a crucial role in fostering a sense of enthusiasm and commitment among pre-service teachers. Moreover, they effectively alleviate their apprehension and anxiety regarding the complexities of the implementation process within contemporary educational environments. Furthermore, fostering a collaborative learning community among educators can lead to the sharing of best practices and innovative teaching strategies, ultimately enhancing the quality and efficacy of STEM education.

2. Development of STEM Education Based Modules And Instructional Strategies

STEM-focused educational modules and instructional strategies are fundamental tools that effectively address the multifaceted challenges faced by educators in their efforts to integrate STEM education meaningfully and successfully within their diverse classroom environments. These meticulously designed STEM-centric modules and strategies provide comprehensive and detailed descriptions of teaching-learning sequences, which can significantly assist educators in methodically structuring their classroom environments to enhance student engagement and learning outcomes. Additionally, they offer educators a set of appropriate and adaptable guidelines that can be tailored to different educational settings and learner needs, ensuring a flexible yet consistent approach. By employing these resources, teachers can achieve a more coherent integration of STEM subjects, fostering an environment where students can develop critical thinking, problem-solving skills, and a deep understanding of interdisciplinary connections. Moreover, these strategies equip teachers with the pedagogical tools necessary to inspire curiosity and innovation among students, thereby preparing them for the demands of the contemporary world and future career opportunities in STEM fields.

CONCLUSION

In summary, the awareness of STEM education among educators is crucial for fostering a skilled and innovative workforce capable of addressing the challenges of the 21st century. Despite the initial hurdles and lack of preparedness faced by many teachers, there is a notable improvement in their perceptions and interest in adopting STEM educational frameworks. This growing engagement underscores the need for comprehensive professional development programs, supported by governmental and educational institutions, to equip educators with the necessary skills and understanding. By implementing meticulously designed STEM-focused modules and instructional strategies, teachers can create dynamic learning environments that effectively integrate science, technology, engineering, and mathematics, thereby enhancing student engagement and outcomes. Furthermore, cultivating a collaborative community among educators can facilitate the exchange of innovative teaching practices, ultimately elevating the quality of STEM education.

Through these concerted efforts, educators can inspire students to become adept problem-solvers and innovators, ready to contribute to the global economy and technological advancements.

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