



Impact of Stem on The Academic Achievements of Students: A Case Study of High Schools in Tehsil Rahim Yar Khan

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Abstract

This study shows how it is critical that high schools prioritize STEM instruction and really implement it. This will ensure that STEM education is successful for a very long time. This paper aims to provide the impact of STEM on the academic achievements of students in High schools of Rahim Yar Khan. Numerous studies underscore the pivotal role of STEM in enabling students to excel across diverse fields. A meticulously crafted questionnaire serves as the research tool to gather pertinent data from a sample size of 500 students, which is then skillfully interpreted using SPSS. The results clearly show that STEM education has a really positive effect on high school students. To keep STEM education working well, this study strongly supports putting it into practice and giving it top priority in high schools in the city of Rahim Yar Khan. It's all about making sure STEM education continues to have a big impact. Additionally, consistent funding, unwavering support, and ongoing professional development for teachers are crucial to sustaining the success of STEM programs. High schools can help students get ready for success in our technologically sophisticated society by adopting STEM education. The success of inclusive STEM high schools serves as a beacon of hope for a more promising future where science, technology, engineering, and mathematics will converge to create a universe of limitless possibilities.

Keywords: *STEM education, high school students, impact, academic achievement*



Introduction

STEM education, an amalgamation of science, technology, engineering, and mathematics, stands as a formidable nexus of academic fields poised to shape the future (National Science Foundation, 2020). Fostering multifaceted talents, STEM education artfully prepares students for a diverse array of professions, poised to confront and surmount the contemporary challenges that define our era (Bybee, 2013). Within this academic sphere, a symphony of disciplines harmoniously converges, nurturing students' aptitude for astute analysis and innovative problem-solving (National Research Council, 2011). At its core, STEM education shines a focused spotlight on science, technology, engineering, and mathematics, endeavoring to forge an indissoluble union among these four interwoven pillars (Brown, 2019). Students stand empowered, honing their acumen and actively engaging in these spheres of knowledge, as STEM education strives to chisel a cadre of critical thinkers primed to thrive in the ever-evolving landscape of tomorrow.

The educational field of STEM lays forth a detailed analysis of its fundamental elements, each strengthening the group's quest for knowledge. STEM finds its core in experiential learning, paving a rigorous road to solving the mysteries of the natural world (Smith et al., 2022). STEM is grounded in a tapestry of observation, experimentation, and data analysis (Jones & Williams, 2021). At the center of this search, science holds sway, illuminating the occult principles and unchangeable rules that support a wealth of innovations and discoveries in several fields (Brown & Davis, 2023). Students grow their critical thinking and curiosities in the furnace of scientific inquiry, where they are inspired to investigate and question the very nature of their surroundings. Engineering and technology emerge as the dependable co-pilots that steer evolution as we continue on this intellectual adventure. The two start a period of innovation and paradigm-shifting discoveries that will forever alter how modern civilization looks (Chen & Patel, 2020). The enormous field of technological and engineering wonders expands forth, encompassing environmental science as well as physics, chemistry, and biology, endowing human life with hitherto unimaginable wonders and possibilities.

A tapestry of disciplines converges in the revered halls of STEM education, nurturing a generation of curious minds ready to solve the mysteries of the natural world and design a future where human creativity serves as a tribute to our boundless potential (National Research Council, 2011). By putting scientific knowledge to use in real-world applications and problem-



solving, technology is essential to STEM. It makes data collection, analysis, and simulation possible, resulting in insightful information and accelerating scientific and engineering progress (Huang et al., 2021). Engineers and scientists may now invent and create novel solutions thanks to technology, which advances many different industries (Kapoor et al., 2020). The technology applies scientific knowledge to practical situations involving equipment, machinery, and systems to improve productivity.

Technology encourages automation and efficiency across a range of industries, boosting output and requiring less labor from people (Brynjolfsson & McAfee, 2014). Engineering is incredibly important in the exciting realm of STEM education! It's all about creating innovative concepts that directly address problems in the real world, utilizing the power of math and science. Imagine students getting involved in engineering projects and using their classroom learning in novel and fascinating ways. The effects are huge—in addition to encouraging new innovations, it also improves already existing ones, advancing technology.

Young minds explore robotics, programming, computer science, and digital literacy as part of the STEM education experience. Students get to watch their ideas come to life as they embark on a discovery adventure where creativity and logic meet. Engineering is a science of wonders. There are countless options in engineering! It includes a wide range of specializations, including civil, mechanical, electrical, and aeronautical engineering. These great engineers construct bridges, create cutting-edge machinery, and even launch rockets to explore space,

Let's explore the intriguing field of STEM mathematics! It's sort of like the supreme framework for understanding complex systems, linkages, and patterns. Science and technology marvels can be understood through the use of math, which serves as their foundation, key language, and toolkit. Math is our collective superhero in the huge field of STEM. It provides us with the necessary terms and tools to analyze data, draw conclusions, and meet the exciting challenges that lie ahead (Bressoud, 2018). Math takes a leading role in the fields of engineering and technology! It is the secret ingredient that enables engineers to simulate and model complex systems, unleashing their creativity to develop effective and optimal solutions. Math strengthens our ability to think critically and solve problems, which is crucial for dealing with real-world issues in science, technology, and engineering. Imagine the strength of calculus, statistics, algebra, and geometrical principles (Levi, 2021). They serve as the foundation for astounding



theories, perplexing algorithms, and ground-breaking STEM applications. Modern technologies like artificial intelligence (AI), data analytics, cryptography, and computer programming are all dependent on the unfailing and stupefying power of mathematics.

STEM education is getting a lot of attention worldwide because it's crucial for a country's progress. The emphasis on STEM education in Pakistan has grown over time. Schools are introducing specific initiatives and curricula to encourage students' scientific and technological knowledge.

Education in the STEM fields, i.e., science, technology, engineering, and mathematics, plays a significant role in schools. It became more significant in the modern world. A study conducted by Arslan, Zdemir, and Aydn (2022) examined the impact of STEM education on high school students' achievement in mathematics. Students who learned STEM had better math scores than those who learned traditionally. Thus, highlighting the effectiveness of STEM education in improving academic outcomes in specific subjects. STEM education prepares students for the workforce. The U.S. Bureau of Labor Statistics claims STEM occupations are projected to grow at a faster rate compared to non-STEM occupations.

The development of STEM education will have a significant impact on the economy and have a number of benefits. This targeted effort directly results in increased levels of innovation, productivity, and competitiveness. A wise investment in STEM education results in the emergence of new sectors in addition to the growth and expansion of already existing ones. A trustworthy STEM workforce attracts investments from companies looking for a qualified labor force, acting as a magnet. As a result, this promotes economic expansion and creates numerous job opportunities. Numerous studies, such as the esteemed "STEM: Good Jobs Now and for the Future" report by the U.S. Department of Commerce, delve into the economic advantages bestowed upon us by the realm of STEM education.

STEM education offers numerous benefits, such as fostering critical thinking, problem-solving skills, and innovation among students. It equips them with the knowledge and skills necessary to thrive in a rapidly evolving technological world. However, despite these benefits, there are uncertainties surrounding its impact on academic achievement. While some studies indicate a positive correlation between STEM education and academic performance, others suggest that the relationship may not be as straightforward. Factors such as teaching methods, curriculum design,



and student engagement levels can influence the effectiveness of STEM education in improving achievement outcomes.

The significant lack of competent workers in STEM subjects is a major global concern. But by promoting STEM education inside our educational institutions, this projected skill gap may be closed, and the appeal of qualified talent can be increased. The comprehensive study "STEM Education, Innovation, and U.S. Competitiveness" by the Committee on STEM Education, a leading voice within the National Science and Technology Council, reverberates with a clarion appeal. This study emphasizes how important STEM education is to achieving the country's top goals.

STEM education places a pronounced emphasis on honing the skills of analysis, problem-solving, and critical thinking—an emphasis that resonates deeply in the context of grappling with the intricate challenges of our modern world (National Academies of Sciences, Engineering, and Medicine, 2018). Illuminating the pivotal role of STEM instruction in fostering these essential abilities, the study conducted by Akcay et al. titled "A Meta-Analysis on the Effects of STEM Education on Students," sheds light on the profound advantages it bestows upon students in cultivating their capacity for critical thought (Akcay et al., 2022).

Within the realm of STEM education, a beacon of diversity and inclusion emerges, igniting the aspirations of women and minorities to embark on enriching journeys in STEM careers (Hill et al., 2020). This endeavor carries profound significance, for STEM professions stand tall as some of the most lucrative and rapidly burgeoning fields globally. In our collective pursuit of closing the gender gap within STEM disciplines and ensuring equitable opportunities for women, it becomes paramount to inspire more young girls to embrace STEM-focused studies (Archer et al., 2019). The pivotal role of STEM education in addressing gender disparities finds affirmation in a study published in the *Journal of Women and Minorities in Science and Engineering*, underscoring its significance.

Investigating the relationship between STEM education and academic achievement holds immense significance for educational reforms and workforce readiness. By having a clear understanding of this relationship, educators and policymakers may effectively customize curriculum and teaching methods, giving students the tools they need to succeed in STEM disciplines and beyond. By identifying the factors that influence the impact of STEM education



on achievement, research in this area provides valuable insights into improving educational practices and fostering student success. Moreover, as industries increasingly rely on STEM expertise, cultivating a strong foundation in STEM education is crucial for preparing a skilled workforce capable of addressing complex challenges and driving innovation in various sectors. Therefore, by investigating more on this relationship, research contributes to the advancement of educational reform and enhances workforce readiness in a rapidly changing global context.

The emphasis on STEM education in Pakistan has grown over time. This is a result of both the government's ambition to create a workforce with greater technological proficiency and the growing significance of STEM skills in the global economy. Pakistan's STEM curriculum is being designed and revised by the government to align with international standards and best practices. Problem-solving, critical thinking, and the use of STEM principles in real-world settings are all highly valued components of the new curriculum. To highlight the STEM-related initiatives and inventions of students, the government and educational institutions host scientific fairs, exhibitions, and contests. These activities inspire students to investigate scientific ideas, hone their analytical abilities, and cultivate their creativity. Pakistan fosters collaborations between educational institutions and corporate businesses to advance STEM education. Businesses frequently contribute materials, mentorship, and assistance to STEM-related educational activities. Pakistan takes part in international science and math competitions known as Olympiads, which are competitive occasions for students to demonstrate their prowess in these fields on a worldwide scale. These contests support the discovery and development of young STEM talent. Scholarships and incentives are provided by the government and private organizations to students who excel in STEM fields. These prizes and scholarships are intended to inspire students to seek higher education as well as careers in science and technology. Pakistan has also been attempting to incorporate technology into the process of teaching and learning. To improve students' comprehension of STEM courses, many schools have computer laboratories and other digital resources. Pakistan has been investing in teacher training to improve their abilities and understanding of science, technology, engineering, and mathematics to ensure effective implementation of the STEM curriculum. Modern teaching techniques and strategies are provided to instructors through professional development programs. To promote STEM education, efforts are made to involve parents and the larger community. To emphasize the value of STEM and foster support for students' interest in these fields, awareness campaigns and



seminars are run. STEM instruction is highly valued in Pakistani schools. It acts as a catalyst for the country's advancement and growth across several fields. By combining science, technology, engineering, and math into the curriculum, STEM education provides students with the analytical, critical thinking, and problem-solving skills they need. It encourages a culture of inquiry and investigation and develops creativity and innovation. STEM education fills the skills gap in the nation while educating students for future employment and advancing Pakistan's industrial and technology sectors. Additionally, it stimulates lifelong learning, advances scientific literacy, and gives students the tools to make wise judgments. Despite continuing challenges, Pakistan's emphasis on STEM points in the right direction in terms of developing a knowledgeable and competent workforce in the scientific and technological fields.

In summation, the significance of STEM education within the educational landscape cannot be overstated. It serves as the crucible where essential knowledge and competencies for thriving in the twenty-first century are forged (National Academies of Sciences, Engineering, and Medicine, 2020). STEM disciplines encompass Science, Technology, Engineering, and Mathematics, and they serve as the crucible for equipping students with invaluable problem-solving acumen, analytical prowess, and fertile ground for nurturing creativity (Hanushek et al., 2021). Students who go through the rigors of STEM education come out better prepared to meet the many problems posed by our society's growing complexity and reliance on technology. They lead the way in innovation, promote economic success, and set the road for lucrative future jobs (Chen & Wei, 2022).

The adoption of STEM education inside educational systems aims to develop people ready to significantly contribute to their communities. By doing this, schools provide kids with the skills and resilience necessary to succeed in a world that is always changing. All parties interested in growth and improvement must collectively recognize the crucial necessity of STEM education and make significant investments as the global landscape changes quickly.

Statement of the Problem

It is quite concerning how STEM education affects students' academic success. STEM education programs are always designed to boost students' understanding of these subjects. It is still unclear whether these initiatives help children do better academically in all disciplines. To ascertain if the concentration on these disciplines broadens the success of students or if there are other factors at play. It is critical to investigate the relationship between STEM education and students'



accomplishments. For curriculum development, resource allocation, and instructional techniques to maximize educational results, policymakers, educators, and stakeholders must make educated judgments. To assess how STEM-based learning affects students' accomplishments, this study will also look at how STEM education affects student achievements.

Significance of the Study

Investigating how STEM programs perform and how they affect student learning outcomes in the classroom offers important new perspectives on their effectiveness. These studies' conclusions support the advancement of educational innovation, equity, and inclusion, initiatives for educational reform, future workforce readiness, and evidence-based decision-making (Mann et al., 2021). Education institutions may develop further and provide students with the skills they need to flourish in the twenty-first century by recognizing the connection between STEM and academic performance (Dabrowski et al., 2020). STEM studies can also benefit a country by driving economic growth, fostering technological advancements, creating employment opportunities, increasing global competitiveness, addressing societal challenges, advancing scientific knowledge, and ensuring national security. By prioritizing and investing in STEM education, a country can position itself for sustainable development, innovation, and prosperity in the modern world.

Research Objectives

1. To analyze the impact of STEM on students' achievements
2. To investigate the relationship between STEM and students' achievements
3. To evaluate how much student achievement is affected by STEM
4. To analyze whether there is a difference between male and female schools

Research Hypothesis

- STEM play's a very important role in secondary schools
- Schools with STEM-based learning have a high rate of achievement.
- STEM programs in high schools positively impact students' academic achievements.
- STEM education in high school fosters the development of practical skills and knowledge.
- STEM education in high schools enhances students' motivation and interest in learning.
- STEM-facilitated schools and resources have a significant positive impact on students.



Literature Review

This study aims to evaluate the emphasis on STEM achievements among the students of secondary schools in Rahim Yar Khan District. STEM has always been the center of attraction for great studies. A lot of studies have been conducted to ensure the importance of STEM in every aspect of education. STEM-based learning schools have different advantages over non-based learning schools. A study by Akcay, Mirasyedioglu, and Balim (2021) conducted a meta-analysis on the effects of STEM education and found that it positively influences students' critical thinking abilities, problem-solving skills, and academic performance across multiple disciplines. It emphasizes critical thinking in the students, balanced thinking, and a problem-solving approach. In recent years, we have seen a major shift towards STEM education because of its ability to provide a modern and competitive workforce. The purpose of this literature review is to investigate how STEM education affects high school students. This review looks at studies that show how STEM education improves students' academic performance, prepares them for careers, and develops critical thinking abilities. Teachers and decision-makers can improve the educational experiences of high school students by studying the effects of STEM education.

STEM education is important for students' achievements. A study conducted by DeWitt and Jones (2018) found that STEM education has a positive impact on student achievement in STEM topics. It gives students the essential skills they need to succeed in the modern world. STEM subjects are all about problem-solving, critical thinking, and creativity. These are skills for success in any field, but they are crucial in STEM fields. According to research, participating in STEM education programs enhances students' academic performance. A study by Sanders and Wells (2018) found that high school students involved in STEM activities demonstrated higher scores in mathematics and science compared to their non-STEM counterparts. These results show that STEM education, especially in STEM-related fields, helps students achieve better academic results. Additionally, a 2016 study by Gnagey and Lavertu found that STEM high school students who attended inclusive institutions did better on math and science standardized tests than those who attended typical public high schools.

STEM education develops abilities and skills that are in great demand in the labor market today. According to Wang, Moore, Roehrig, and Park (2011), students exposed to STEM education in high school are more likely to pursue STEM-related careers in the future. Students who have a



better grasp of diverse STEM subjects increase their interest in and desire to pursue STEM careers. Also, according to a study by Preus (2012), kids who took part in STEM summer programs were more likely to exhibit an interest in STEM employment later on. Students are encouraged to think critically and tackle challenging challenges through STEM education. The critical thinking abilities of high school pupils who participated in practical STEM activities significantly improved, according to a study by Smith, Brown, and Steinberg (2020). These learning experiences encourage analytical thinking and decision-making skills through problem-solving, experimentation, and inquiry-based learning.

Students' involvement and engagement in learning may be increased by the interactive and practical learning experiences offered by STEM education. Increasing student involvement in STEM can have many benefits for students. It can raise academic achievement and give students a solid background in science and mathematics. Also, it can encourage a love of learning in students, which is necessary for success in all areas of endeavor. This involvement may increase students' interest in STEM courses and motivate them to continue their studies in related fields. A study by Mataric, Juricic, and Kamienkowski (2023) investigated the impact of STEM education on students' motivation and engagement. The findings revealed that STEM education promotes intrinsic motivation, curiosity, and a positive attitude toward learning, leading to increased student engagement and academic success. Students who study STEM learn how to solve difficulties. Any field could benefit from this useful skill. A STEM education may help students find a passion for learning. Students can benefit from this skill for the rest of their lives. STEM education initiatives could address concerns about inclusion and diversity in the sector. According to research by Williams and Williams (2020), participating in STEM education increases access to STEM learning opportunities for high school students from underrepresented groups, enabling them to pursue jobs in STEM fields. Furthermore, Maltese and Tai (2016) performed a meta-analysis of the variables impacting engagement in STEM areas and discovered that girls are less likely than boys to engage in STEM activities and pursue STEM jobs. This inclusive strategy encourages diversity and deals with the racial and gender disparities sometimes found in STEM professions.

As a result of its many advantages and close connection to academic success, STEM education is critical to high school students' educational development (Anderson et al., 2020). Students gain the abilities, information, and mindset required for success in the contemporary world through



participation in STEM-related activities (National Science Board, 2018). Critical thinking, problem-solving techniques, and practical skills, which are highly appreciated in both academic and professional settings, can be developed through STEM education (Polly et al., 2021). The focus on STEM education in high school improves students' academic performance in STEM topics while also cultivating transferable abilities that can help them succeed academically in general.

Through student engagement, the development of critical thinking abilities, and the encouragement of the practical application of STEM concepts, particular STEM teaching strategies and curriculum designs significantly enhance STEM education. For instance, project-based learning encourages students to work collaboratively on hands-on projects, such as building a solar-powered car or designing a sustainable city, which not only reinforces STEM concepts but also develops problem-solving abilities and creativity. Similarly, inquiry-based learning encourages students to ask questions, conduct investigations, and draw conclusions, enabling them to develop a deeper understanding of scientific principles and methods. Furthermore, incorporating technology into the curriculum through the use of robot programming or simulation software gives students real-world experience and gets them ready for careers in STEM industries. By implementing these teaching methods and curriculum designs, educators can create engaging and dynamic learning environments that inspire students to pursue STEM subjects and excel in their future endeavors.

Aside from that, STEM education fosters a strong sense of engagement, curiosity, and love for learning that extends outside of STEM subjects and has a favorable impact on students' academic success in general (Bybee et al., 2019). Teachers and politicians both combine to create the foundation for future innovators, problem solvers, and leaders (Bencze et al., 2020). These future leaders, innovators, and educators can contribute to the advancement of science, technology, engineering, and mathematics by developing enthusiasm for STEM education. They should also be provided with the resources to succeed.

Therefore, supporting STEM education for high school learners is essential for their academic performance and their future success in this modern world. The relevance and effectiveness of STEM education, however, still require much research and understanding. An in-depth investigation of teaching approaches, best practices, and other tactics that can improve the



delivery of STEM education in secondary schools is required. This study will give us useful information about how STEM education can be updated to satisfy students' changing needs and the needs of the labor market. If stakeholders continue to support research in this area, STEM education can inspire the upcoming generation of scientists, technicians, engineers, and mathematicians.

STEM education faces several limitations and gaps that hinder its effectiveness in preparing students for future challenges. There are still gaps in access; many pupils, especially in impoverished areas, lack access to competent teachers and high-quality materials. Diversity and inclusion remain significant issues, with women and minority groups underrepresented in STEM fields. Furthermore, rigorous curricula and standardized testing frequently place academic knowledge over creative thinking and practical abilities. Teacher preparedness is another concern, as many educators lack the training and support needed to effectively teach STEM subjects. Additionally, the fast speed of technological advancement makes it difficult to keep STEM education relevant, and students may not be fully aware of the variety of employment prospects accessible in STEM subjects. Addressing these limitations requires collaborative efforts from policymakers, educators, industry leaders, and communities to ensure that all students have equitable access to high-quality STEM education and are prepared to thrive in an increasingly complex and technology-driven world.

To ensure a robust future for STEM education in Tehsil Rahim Yar Khan, it's imperative for stakeholders across various sectors to collaborate and enact policies that prioritize and support STEM initiatives. Governments and educational institution heads should invest in comprehensive STEM programs from primary to higher education levels while also allocating resources for teacher training and professional development. Industrialists and employers can contribute by offering mentorship programs, internships, and financial support for STEM education initiatives. Teachers and educators play a critical role in fostering engaging learning environments and providing access to resources for hands-on experiences. Parents and communities can advocate for increased funding and encourage children to explore their interests in STEM fields. Together, these stakeholders can create a supportive ecosystem that empowers students to excel in STEM subjects, ultimately shaping a workforce equipped to tackle the challenges of tomorrow's world.



Research Methodology

The study aims to investigate the relationship between high school students' STEM learning and academic success. To integrate and develop abilities in students and help them perform better across all subject areas, it strives to provide future research approaches to enhance STEM methods of learning. Data has been gathered using modern research techniques like online surveys and paper-based surveys.

The research has a descriptive design. A sample of 500 students has been taken from the population, of which 250 are male and 250 are female. The study uses quantitative methods to assess how STEM has affected high school students' academic performance. Students from Rahim Yar Khan's ninth and tenth-grade government higher secondary schools make up the study's population.

In this study, a questionnaire was used as a tool for collecting data. A sequence of closed-ended questions serves as the study's direction. The questionnaire was piloted and tested before being distributed to ensure reliability and validity. Following a pilot research examination, the language and content have been upgraded. It is ensured that no ambiguous questions are added to the questionnaire. Also, the students are assured that their responses will remain confidential and will generate honest and genuine responses.

During the survey, it also makes sure to students that there are no right or wrong answers and encourages them to provide their genuine opinions and experiences. Implement measures to minimize response bias, such as providing a balanced range of response options, avoiding leading questions, and using neutral language throughout the survey. Five Likert-type scales are utilized, with the options being strongly disagree, disagree, neutral, agree, and strongly agree, keeping in mind the purpose and scope of the study.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) is used to examine the data that has been gathered from the sample. To determine the response to the research question, the organized data is then analyzed. Response frequencies and percentages have been calculated. The percentages of the responses served as the basis for the outcomes. There have been findings reached and suggestions given.



Research Findings

The questionnaire's results, which were determined by data analysis and interpretation, are as follows.

1. 78% of High school students believe that STEM education offers opportunities to solve real-world problems.
2. 84.2 % of students are aware of the value of STEM fields for their success in the future.
3. 78 % of students viewed analytical and critical thinking abilities as being fostered by STEM education.
4. 82.4 % of students feel motivated to pursue STEM-related subjects and careers.
5. 75.4 % of students think STEM education is believed to improve problem-solving skills.
6. 76.8 % of Students perceive STEM education as enhancing their understanding of the world.
7. 81 % of students perceive STEM education as promoting creativity and innovation.
8. 89% of students find STEM subjects rewarding and challenging.
9. 74.6 % of Students feel confident in applying STEM concepts and principles.
10. 84.6 % of students viewed STEM education as encouraging collaboration and teamwork.
11. 88% of Students believe that STEM education prepares them for future career opportunities.
12. 82% of Students express interest in pursuing careers in STEM fields.
13. 86.7% of Students perceive that STEM education has improved their problem-solving abilities outside of school.
14. 83% of Students find STEM education to be stimulating and engaging.
15. 80% of Students believe that STEM education improves their problem-solving abilities in everyday life.
16. 82% of Students express confidence in their ability to apply STEM knowledge to real-world situations.
17. 81% of Students enjoy participating in STEM-related extracurricular activities.
18. 85 % of students see STEM education as encouraging curiosity and questioning.
19. 87% of Students believe that STEM education prepares them for further studies in college/university.



20. 71% of Students feel that STEM education is relevant to their daily lives.
21. 96% of students believed STEM education improves problem-solving skills in mathematics.
22. 85.7 % of Students perceive that STEM education expands their career options.
23. 86 % believe STEM education is seen as helping students become more technologically literate.
24. 68% of Students feel that STEM education improves their communication skills.
25. 83%of Students enjoy working on STEM projects and experiments.
26. 74.6%of students think that STEM education is believed to enhance students' ability to think critically about scientific issues.
27. 76% of Students perceive that STEM education enhances their problem-solving skills in technology.
28. 78% of Students feel that STEM education enhances their problem-solving skills in engineering.
29. 62% of students express that STEM education is believed to help students develop a logical and analytical mindset.
30. 85% of Students perceive that STEM education enhances their problem-solving skills in science.
31. 72.6% of Students enjoy exploring STEM concepts beyond the standard curriculum.
32. 74% of Students feel that STEM education enhances their problem-solving skills in mathematics.
33. 68% of Students enjoy participating in STEM competitions and challenges.
34. 83% of Students believedSTEM education was a tool to improve students' ability to understand and use technology.
35. 75%believe that STEM-based education helps them become more innovative.

Conclusion and Discussion

Discussion and Analysis

In recent times, an upsurge of interest has enveloped the realm of research, centered on the evaluation of STEM education's impact on high school students. STEM education, at its essence, strives to furnish students with the indispensable knowledge and competencies requisite for



thriving in our technologically advanced society (Breiner et al., 2012). Implementing STEM education programs is not an easy task. IT needs investment and long-term planning. Effective implementation of STEM programs requires addressing challenges like ensuring access to resources and providing adequate teacher training. Researchers have been exploring the various dimensions of STEM education, from its pedagogical approaches to its effects on student achievement and career readiness (Bybee, 2013; Stohlmann et al., 2012).

Within the crucible of high school classrooms, students are presented with fertile ground to nurture their critical thinking and problem-solving acumen through dedicated STEM-focused coursework. These educational encounters serve as catalysts, igniting students' drive to employ their projects, experiments, and real-world predicaments as arenas for the exercise of critical, creative, and rational thinking. Drawing from research findings and the scholarly contributions of Lee and Lai in 2017, it becomes evident that students who partake in STEM programs not only bolster their problem-solving capabilities but also fortify their resolve to grapple with multifaceted challenges (Source: Lee & Lai, 2017).

Additionally, STEM education can enhance students' academic performance. It can motivate them and thus have a positive impact on their lives. STEM education makes scientific and math concepts more interesting and applicable by involving students in real-world applications. This can lead to increased interest, motivation, and ultimately improved academic performance in STEM-related fields (National Research Council, 2012).

Furthermore, high school students benefit from STEM education by developing their communication, cooperation, and collaboration abilities. Working in groups is common in STEM projects and activities, so students must cooperate, share ideas, and convey their conclusions. It can boost their confidence and thus increase their ability to make timely decisions. These collaborative experiences mirror real-world work environments where teamwork and effective communication are highly valued (Eccles, 2013).

Conclusion and Recommendation

In closing, the evidence unequivocally underscores the positive and encompassing impact of STEM education on the achievements of high school students. STEM education, through engaging and hands-on experiences, emerges as a catalyst that not only elevates academic attainment but also nurtures the invaluable attributes of critical thinking and problem-solving



(Harlen, 2020). Within this dynamic educational framework, students undergo a transformative journey, acquiring the proficiencies and competencies essential for triumph in our rapidly evolving world. Moreover, STEM education champions the cultivation of effective cooperation, collaboration, and communication skills, all of which stand as indispensable cornerstones for success in the contemporary industrial landscape.

This study shows high percentages of students reporting positive experiences with STEM education. A very high percentage of students shows their problem solving skills improved. Also, students enjoy being challenged by real-life problems. This shows how critical STEM education is for students.

Furthermore, the information provided unequivocally highlights the significant contribution STEM education makes to high school students' growth. Therefore, it is strongly advised that educational institutions give STEM education top priority and fully include it in their curricula. This goal must be accomplished by giving children crucial chances to develop their creativity, problem-solving skills, and critical thinking abilities. By adopting strategies like professional development workshops for teachers on integrating technology into STEM lessons, we can bring new life to STEM programs. STEM education enables students to handle the complex problems of the modern world by providing them with the information and skills needed for future professions in the dynamic STEM fields. Notably, STEM education increases kids' overall academic success by fostering motivation, encouraging active involvement, and instilling a positive view of learning. This can make a huge difference in their current lives and will have a positive impact on their future lives.

Policymakers, educators, and stakeholders must make investments in professional development programs for teachers. Teacher training programs about the impact of STEM should be included. It is necessary to inform the teachers about the importance and upcoming trends in STEM. Thus, regular training sessions can play a key role in delivering STEM-based learning for the students. Must encourage access to STEM resources and technologies and offer equal opportunities for all students. We must allocate a whole budget to different STEM programs and built a variety of computer labs, and provide different accessories. Access to all required resources must be ensured to guarantee the long-term advantages of STEM education.



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