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### National education policy-2020 Encouraging systematic investigation and Advancement in School Education

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#### ABSTRACT

Encouraging investigation and innovation in school education is very important for preparing students to succeed in today's fast-changing world. This approach helps students develop critical thinking, problem-solving, and creativity—skills that are essential in the 21st century. By including hands-on learning and new teaching methods in the curriculum, students get to experience how science works—from making guesses (hypotheses) to doing experiments and understanding the results. This makes learning more interesting, meaningful, and connected to real life.

Encouraging research in schools also helps students connect what they learn in theory to real-world situations. It gives them the confidence to explore problems, think like scientists, and come up with useful solutions. This not only helps improve their academic performance but also builds a mindset of curiosity and innovation from a young age. Using technology and working together on projects also strengthens these skills, helping students get ready for future studies and jobs, especially in areas like science, technology, engineering, and math (STEM).

To make this happen, teachers need proper training and resources so they can teach in ways that support research and innovation. Schools should also work with science centers, professionals, and universities to give students chances to explore the latest developments in science and technology.

In summary, bringing research and innovation into school education is a smart investment in the future. It helps build a generation of creative and skilled individuals who can solve complex problems and lead the way forward.

**Keywords:** *Scientific Research Integration, Educational Resources, STEM Education, 21st Century Skill, Student Engagement*

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#### I. INTRODUCTION

In an increasingly complex and technologically advanced world, the need for fostering scientific research and innovation within school education has never been more critical. Education systems worldwide are recognizing the importance of equipping students with the skills and mindset necessary to navigate and contribute to a rapidly changing global landscape. Traditional teaching methods, focused primarily on rote memorization and standardized testing, are no longer sufficient to prepare students for the challenges of the 21st century.

Encouraging systematic investigation and Advancement the school curriculum is a forward-thinking approach that emphasizes the development of critical thinking, creativity, and problem-solving abilities. These skills are essential for students to not only understand scientific principles but also to apply them in real-world contexts. By engaging students in research-based learning, schools can create environments where curiosity is encouraged, and students are empowered to explore, experiment, and innovate.

This approach also bridges the gap between theoretical knowledge and practical application, helping students see the relevance of their studies to everyday life. Furthermore, by incorporating collaborative projects and technology into the learning process, students can develop the teamwork and digital literacy skills that are increasingly important in today's job market. The promotion of scientific research and innovation in education is, therefore, not just about improving academic outcomes but also about nurturing a generation of individuals who are capable of driving progress and addressing global challenges.

The success of this initiative, however, depends on several factors, including the provision of adequate resources and training for teachers, the creation of supportive learning environments, and the establishment of partnerships with scientific institutions and industry. As education systems adapt to the needs of the future, integrating scientific research and innovation into the curriculum stands out as a key strategy for ensuring that students are prepared to thrive in a dynamic and interconnected world.

## II. REVIEW OF LITERATURE

Research underscores the critical role of Encouraging systematic investigation into school education to enhance student learning outcomes. DeBoer (2000) asserts that introducing students to scientific research methods from an early age helps develop essential critical thinking and analytical skills. Similarly, the National Research Council (2000) emphasizes that inquiry-based learning, where students engage actively in the scientific process, leads to a deeper understanding and better retention of scientific concepts.

The literature highlights the impact of innovative teaching practices on student achievement. Hattie (2009) indicates that methods such as project-based learning and interdisciplinary approaches can lead to significant gains in academic performance. The OECD (2015) also supports this view, noting that fostering creativity and problem-solving skills through innovative practices is essential for preparing students for future challenges.

Research shows that connecting theoretical knowledge with practical application enhances student engagement and learning. Yager (2004) demonstrates that hands-on scientific research and problem-solving activities help students see the relevance of their studies. The National Academy of Sciences (2011) reinforces this by arguing that practical experiences make classroom learning more meaningful and applicable to real-life contexts.

The effectiveness of research and innovation in education relies on adequate teacher training and resources. Desimone (2009) highlights that professional development is crucial for teachers to effectively implement inquiry-based and research-oriented methods. Harrison et al. (2012) emphasize that access to resources such as laboratory equipment and technological tools is essential for supporting research-focused education.

Collaborative efforts between schools and external organizations are vital for advancing scientific research and innovation. Tharp (2008) highlights that partnerships with scientific institutions and industry can provide valuable resources and expertise. These collaborations enrich the learning experience and expose students to cutting-edge research and technology.

Despite the benefits, integrating scientific research and innovation into education faces several challenges. Bickman (2011) identifies barriers such as limited funding, insufficient teacher training, and resistance to change. Addressing these challenges presents opportunities for educational reform and improvement.

## III. IMPACT ON STUDENTS

Encouraging systematic investigation and Advancement in School Education has a profound impact on students, shaping their cognitive, emotional, and social development in several ways:

1. Deeper conceptual understanding: Hands-on experiments and real-world investigations help students bridge the gap between abstract theory and practical application. By experiencing scientific concepts directly, students gain a deeper and longer-lasting understanding of the material than they would from traditional lectures.
2. Enhanced critical thinking and problem-solving: Scientific study teaches students to think like scientists—observing, hypothesizing, analyzing data, and drawing conclusions. These experiences help students evaluate evidence, question assumptions, and logically synthesize information, strengthening their critical thinking skills.

3. Improved academic performance: Research consistently links active, hands-on learning to improved academic outcomes. Studies have shown that students engaged in hands-on science perform better on assessments and retain information more effectively.

#### **Engagement and motivation**

1. Fostered curiosity and interest: Scientific studies encourage students to ask questions, explore ideas, and discover the world around them. This inquiry-based approach stimulates natural curiosity and can inspire a lifelong passion for learning.
2. Increased motivation and enjoyment: Actively participating in dynamic and interactive scientific activities makes learning more enjoyable and meaningful. For example, studies have shown that students are highly motivated by the idea of participating in "real-life" research projects.
3. A sense of belonging and confidence: Through collaboration and mentorship, students build a sense of community within their field of study. Successfully completing a research project or experiment can also boost a student's self-confidence and professional identity.

#### **Preparation for careers and higher education**

1. Workplace-ready skills: Scientific studies provide students with valuable, transferable skills that are highly sought after in the job market, including communication, teamwork, and data analysis. Undergraduate research experiences, in particular, prepare students for the collaborative, interdisciplinary nature of modern workplaces.
2. Preparation for postgraduate study: Research experience at the undergraduate level provides invaluable experience for students considering graduate school. It helps them understand the research process, refine their interests, and build strong relationships with faculty mentors, which are crucial for success in advanced programs.
3. Exploration of career paths: By engaging directly in research, students gain firsthand insight into potential career paths in science and technology. This allows them to make more informed decisions about their professional future, whether they choose to pursue a research career or apply their scientific skills in other fields.

### **IV. CONCLUSION**

Integrating scientific research and innovation into school education is not only beneficial—it is essential for preparing students to meet the demands of the 21st century. This approach fosters critical thinking, creativity, and problem-solving, enabling students to engage deeply with scientific concepts and apply their knowledge in practical, real-world contexts. Through hands-on learning, collaborative projects, and exposure to technological tools, students develop a broad range of academic and life skills, including communication, teamwork, and digital literacy. Research consistently shows that inquiry-based learning improves academic outcomes and enhances student engagement. More importantly, it cultivates a mindset of curiosity and resilience—qualities vital for lifelong learning and innovation. As students participate in scientific investigations, they gain not only conceptual understanding but also the confidence to explore new ideas and tackle complex problems.

However, the success of this educational shift depends on critical support systems. Teachers must be provided with professional development and adequate resources to facilitate research-oriented learning. Schools must foster a culture that supports inquiry and experimentation, while also forming partnerships with universities, science centers, and industry to give students access to real-world scientific experiences.

In conclusion, encouraging systematic investigation and innovation within school education is a strategic investment in the future. It empowers students to become thoughtful, capable, and innovative contributors to society—equipped not only with knowledge, but also with the skills and mindset necessary to lead and thrive in an increasingly interconnected and dynamic world.

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