

## MODERN TECHNOLOGY'S ROLE IN ADVANCING SCIENTIFIC LEARNING AND EXPERIMENTATION: INSIGHTS FROM MATHEMATICS AND SCIENCE STUDENTS AT UNIVERSITAS NEGERI MEDAN (UNIMED)

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### ABSTRACT

The integration of modern technology into education has profoundly influenced the teaching and learning processes, particularly in mathematics and science. This study explores the role of technological tools in enhancing scientific learning and experimentation among students at Universitas Negeri Medan (UNIMED). A mixed-methods approach was utilized, combining quantitative survey data and qualitative insights to capture a holistic understanding of students' experiences. The findings reveal that advanced tools such as simulations, virtual laboratories, and data analysis software enhance students' conceptual understanding, foster engagement, and bridge the gap between theoretical knowledge and practical application. However, challenges persist, including limited access to updated equipment, inadequate training, and technical malfunctions, which disproportionately affect Physics and Chemistry students. To address these issues, the study recommends upgrading laboratory resources, implementing comprehensive training programs, and establishing technical support systems. This research highlights the transformative potential of technology in higher education and provides actionable recommendations to optimize its integration, contributing to the advancement of scientific education in Indonesia.

**Keywords:** *Education Techonology, Scientific Tools, Virtual Labs, Student Engagement*

### INTRODUCTION

#### 1.1 Background

The rapid advancement of modern technology has significantly changed various aspects of human life, including education. In the field of learning and scientific experimentation, technology has redefined traditional pedagogical approaches and introduced innovative methods that enhance the teaching and learning process. Particularly in math and science education, technological tools such as simulation software, data analysis platforms, and virtual laboratories provide students with opportunities to explore concepts and conduct experiments beyond the constraints of physical resources. At Universitas Negeri Medan (UNIMED), the integration of technology into the academic environment has been embraced by both faculty and students. Students of the math and science faculties, in particular, have benefited from the use of digital tools and platforms that encourage interactive and engaging learning experiences. However, while the potential benefits have been widely recognized, challenges such as digital literacy gaps, access to resources, and educator and learner readiness are still important issues to address. This research aims to explore the impact of modern technology on the learning and experimentation process among mathematics and science faculty students at UNIMED. By examining their experiences and perspectives, this research seeks to identify the advantages and challenges of technology integration in these areas. In addition, this study also aims to provide insights into how technological advances can be effectively used to improve the quality of scientific education and experimentation in higher education institutions. The findings from this study will contribute to the ongoing discourse on educational technology and its role in shaping the future of scientific learning. By understanding the specific context of UNIMED, this research also offers practical implications for policy makers, educators, and students to maximize the potential of technology in education while overcoming its limitations. Previous research related to the title of this research are The Role of Technology in Enhancing Laboratory-Based Learning Experiences (Ghory, S., & Ghafory, H. 2021), Digital Learning in Higher Education: A Study of Online