

**LABORATORY AND LIBRARY FACILITIES: INVESTIGATING THEIR POTENCIES
IN PROMOTING STUDENTS' INTERESTS AND PERFORMANCES IN SCIENCE
SUBJECTS**

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Abstract

This study examines the roles of laboratory and library facilities in enhancing students' interests and performances in science subjects. Recognising the critical need for practical and theoretical knowledge in science education, this study highlights how access to well-equipped laboratories facilitates hands-on learning, allowing students to directly engage with scientific concepts and experimental procedures. This practical experience not only solidifies theoretical understanding but also stimulates curiosity and interest in scientific exploration. By providing access to current scientific literature, multimedia resources, and study spaces, libraries enable students to deepen their knowledge and stay updated with the latest scientific advancements. The study delves into the aspects of laboratory, science subjects, laboratory facilities, and the academic performance of a student, giving results that indicate a positive correlation between the availability of these educational facilities and the improvement of student outcomes. Indicating that students with regular access to laboratories and libraries demonstrate higher engagement levels and better academic performance in science subjects compared to those with limited access. The study examines the potency of laboratory facilities in promoting student performance in science subjects and the potency of library facilities in promoting student interest in science subjects, showing how laboratory performance is a vital access for student success, as well as the effect of library facilities on student interest and performance in science subjects. The study concludes that by engaging in experiments and witnessing scientific principles in action, students become more motivated and confident in their abilities, which translates into improved academic performance. One of the recommendations provided was that educational authorities should prioritise the development and maintenance of modern laboratory facilities in schools. Well-equipped laboratories enable students to engage in hands-on experiments, which are crucial for understanding complex scientific concepts.

Keyword: Science Subjects, Library Science, Laboratory Facilities, Science Laboratory, Students' Interests and Performances, and potency.

Introduction

Facilities for labs and libraries are essential for improving students' academic performance, especially in scientific classes. According to recent studies, rich library resources and well-equipped laboratories have a major role in boosting students' interest in and success in these subjects. Knowing the effects of these facilities becomes more crucial as educational establishments work to enhance scientific instruction.

Understanding scientific concepts and processes requires hands-on experience, which is mostly provided by laboratory facilities. The National Research Council (2017) emphasises that laboratory experiences are essential for learning science because they allow students to interact directly with the material world. Studies have consistently shown that students who engage in laboratory work develop better scientific inquiry skills, have a deeper understanding of scientific concepts, and show greater interest in science (Hofstein & Lunetta, 2017).

Libraries are essential resources for students, providing access to a vast array of scientific books, reference materials, and digital resources, in addition to labs. Libraries promote an atmosphere that is favourable to independent study and research in addition to aiding in the acquisition of information. According to Smith (2019), libraries that provide comprehensive collections and accessible digital resources significantly enhance students' ability to perform in-depth research, which is crucial for their success in science subjects. The availability of such resources ensures that students can keep up with the latest scientific discoveries and methodologies. According to Bassey (2020), Library facilities like the use of cards catalogue, flipping through several cards to the use of online public access catalogue (OPAC) through the use of computers. Libraries are gradually moving away from hard copies of books, and students project. This makes it easier for student in science subject promoting their performance and interest.

Moreover, the integration of digital technologies in libraries has transformed the way students engage with scientific information. Digital libraries and online databases have made it easier for students to access up-to-date research papers, journals, and other educational materials from anywhere, thereby promoting continuous learning (Johnson & Green, 2020). Williams and Wong (2021) highlighted that students who regularly utilised digital library resources showed improved academic performance and a higher level of engagement in their science courses. Despite the clear benefits, the effectiveness of laboratory and library facilities can be influenced by various factors such as funding, maintenance, and accessibility. Brown and Smith (2022) revealed that underfunded laboratories and poorly maintained libraries negatively impact student outcomes. They argued that continuous investment in these facilities is crucial for maintaining high educational standards and promoting students success in science subjects. Furthermore, ensuring that these facilities are accessible to all students, including those from marginalised communities, is essential for fostering an inclusive learning environment (Garcia & Hernandez, 2023). Library facilities helps sudents find materials to augmnet their lecture notes, classroom, assignments, etc. Bassey (2024) revealed that most science student users use the library virtually every day and that books, newspapers and magazines are the materials users utilize the most. By so doing young learners reading habits are encouraged and good academic performance is guaranteed.

Concept of Science Subject

Science is the methodical study of nature by means of analysis, experimentation, and observation. It includes a number of disciplines, including earth sciences, physics, chemistry, biology, and astronomy. Fundamentally, science aims to comprehend the underlying laws controlling the cosmos and to formulate hypotheses supported by empirical data. Science is defined by its quest for understanding and knowledge. Science is essential to the advancement of human knowledge and the development of new technologies.

According to Almarode (2018), science subjects are not static; they continuously evolve as new discoveries are made and technologies advance. This dynamic nature requires that science education also be adaptive, incorporating the latest research findings and technological innovations into the curriculum. Keeping the curriculum up-to-date ensures that students are well-prepared for future scientific challenges and opportunities. Furthermore, science permeates daily life and is not only found in labs and educational settings. Scientific knowledge is ingrained in many facets of society, from knowing the fundamentals of nutrition to sustain a balanced diet to understanding the dynamics of climate change to make educated decisions.

In recent years, the importance of science in addressing global challenges has become increasingly evident. The COVID-19 pandemic highlighted the critical role of scientific research in developing vaccines, understanding the spread of the virus, and implementing public health measures to mitigate its impact. As emphasised by the World Health Organisation (2020), "Science is critical in guiding responses to health emergencies and other global challenges."

The objectives of science education are to foster profound comprehension of scientific concepts, critical thinking, and problem-solving abilities. It pushes pupils to think critically, pose questions, carry out experiments, and examine data. The advancement of knowledge and technology depends on the scientific method. Students who participate in science classes develop their analytical skills and get ready for a variety of vocations in science and technology by learning how to apply scientific ideas to real-world issues.

Concept of Library Science

The administration, distribution, and organizing of information resources are the focus of the multidisciplinary area of library science. It includes a wide range of tasks, such as providing user services that encourage information literacy and access as well as categorizing both digital and physical items. Encouraging the efficient use of information and making it available to a wide range of users is the primary objective of library science. Library science is always adapting, using new techniques and technologies to improve user experience as libraries develop in response to societal shifts and technology advancements.

Information organization is among library science's fundamental concepts. To facilitate effective retrieval, organizing and categorizing library items is required. There are several systematic methods for classifying resources, including the Dewey Decimal System and the Library of Congress Classification. Librarians may make sure that people can find the information they need with ease by using these systems. This branch of library science promotes the preservation of historical and cultural knowledge in addition to making library materials more usable.

Information retrieval is another crucial area within library science. It focuses on how users search for and access information, emphasizing the design and functionality of information retrieval systems. Modern libraries utilize online catalogs, databases, and discovery tools that streamline the search process. Research in this field explores user behavior, search strategies, and the effectiveness of various retrieval systems. By understanding these dynamics, librarians can enhance the ways in which users interact with information resources.

In the digital age, library science has expanded to include the management of digital libraries. Digital libraries encompass a wide array of resources, including e-books, online journals, and digital archives. The integration of technology into library services not only improves access but also poses challenges related to digital preservation, copyright, and user privacy. As libraries increasingly transition to digital formats, library science plays a critical role in developing strategies for effective digital curation and management.

Ethics and intellectual freedom are foundational principles in library science. Librarians are tasked with ensuring that all users have equitable access to information, regardless of their background or beliefs. This commitment to intellectual freedom is enshrined in professional codes of ethics, which advocate for the protection of user privacy and the right to access diverse viewpoints. As challenges to information access continue to arise, the role of library science in advocating for these principles becomes ever more significant (American Library Association, 2019).

Concept of Science Laboratory

A fundamental component of contemporary education, the scientific lab provides an environment conducive to real-world experimentation and experiential learning. It makes theoretical concepts easier to apply and lets students interact directly with scientific ideas. Inquiry-based learning is encouraged in this dynamic setting where students can pose queries, develop hypotheses, and carry out experiments to investigate scientific phenomena. The laboratory environment helps students comprehend and remember complex concepts by turning abstract theories into concrete experiences (Duggan & Gott, 2018).

The efficacy of a science laboratory as an educational setting is contingent upon its configuration and layout. An ordered and effective workflow is made possible by the specific spaces allotted for testing, preparation, and equipment storage in a well-designed laboratory. Because safety is of the utmost importance, laboratories are furnished with emergency procedures and safety gear, including fire extinguishers, eyewash stations, and personal protective equipment (PPE) to safeguard employees and students. According to Zacharia (2019), reasonable zoning, accessibility, and enough space are necessary to guarantee that all students—including those with disabilities—can participate in laboratory activities.

Experimentation is made easier in a science laboratory by the variety of tools and supplies that are available. Glassware (beakers, flasks, pipettes), measurement tools (thermometers, pH meters), and safety gear (gloves, goggles) are examples of common laboratory equipment. Students' learning experience is enhanced by the opportunity to conduct a wide range of experiments thanks to the availability of high-quality and diverse equipment. Additionally, using advanced lab equipment helps students get ready for further coursework or employment in STEM (science, technology, engineering, and mathematics) industries (Miller et al., 2020).

Any science lab must follow safety procedures to avoid mishaps and injury. All employees and students must receive thorough safety training that covers handling chemicals, emergency protocols, and equipment usage. Gonzalez (2021) asserts that consistent safety exercises and appropriately identifying hazardous chemicals help foster a culture of safety in the lab. Respecting safety a regulation not only keep people safe but also encourages ethical behavior when it comes to scientific research.

Science labs are essential learning environments that give students practical experience and encourage critical thinking and active learning. Their layout, tools, and security measures have a big impact on how well science is taught. The need for scientifically competent people in society is growing, hence it is imperative that science labs be secure and well-equipped.

Concept of laboratory facilities

In order to facilitate experimentation, analysis, and innovation in a wide range of disciplines, including chemistry, biology, physics, engineering, and medicine, laboratory facilities are essential parts of scientific research institutions, educational settings, and industrial environments. The idea of laboratory facilities includes a variety of components that enhance its usefulness, security, and capacity to facilitate scientific research.

First and foremost, specialist infrastructure designed to meet particular research objectives is what distinguishes laboratory facilities. For investigations requiring liquids, wet laboratories with sinks, fume hoods, and bench space are ideal, whereas dry labs with computers and simulation software are best for computational analysis and modelling. Clean rooms for the production of semiconductors, biological containment facilities for handling infections, and animal research facilities for preclinical investigations are examples of more specialist fields.

Moreover, laboratory facilities are equipped with a diverse array of instruments and equipment essential for conducting experiments and measurements. These may include microscopes, spectrometers, centrifuges, chromatographs, incubators, autoclaves, and more, depending on the nature of the research being conducted. The availability of cutting-edge instrumentation facilitates precise data collection and analysis, enabling researchers to explore complex phenomena and develop innovative solutions to scientific challenges (National Institutes of Health, 2022).

Safety is paramount in laboratory facilities due to the potential hazards associated with certain experiments and materials. As such, these facilities are equipped with robust safety measures, including ventilation systems to remove fumes, protective gear such as lab coats and goggles, emergency eyewash stations and showers, and protocols for handling hazardous materials. Compliance with regulatory standards such as OSHA and EPA guidelines ensures the safety of personnel and the environment (American Chemical Society, 2022). Additionally, laboratory facilities often employ support staff, including lab managers, technicians, and research assistants, to assist with day-to-day operations, equipment maintenance, and experiment implementation. These personnel play a crucial role in ensuring the smooth functioning of the laboratory and facilitating research activities.

Concept of academic performance of a student

A student's success and accomplishment in their academic efforts are referred to as their academic performance. This is often determined by their grades, results on standardised tests, involvement in extracurricular activities, and other learning and achievement markers. Academic success is influenced by a number of variables, including socioeconomic status, family history, school atmosphere, and individual traits.

One significant determinant of academic performance is the student's level of motivation and engagement. Motivated students tend to be more focused, persistent, and resourceful in their learning endeavours, leading to higher levels of achievement. Factors such as intrinsic motivation, interest in the subject matter, and a sense of purpose or goal orientation can significantly impact a student's academic performance (Dweck, 2016).

Additionally, a supportive family environment and parental involvement in education have been consistently associated with better academic outcomes for students. Parents who are actively engaged in their child's education by providing support, encouragement, and resources create a conducive environment for learning and academic success. The quality of teaching and instructional practices employed in the classroom plays a crucial role in shaping student performance. Effective teachers utilise a variety of instructional strategies, provide meaningful feedback, and create a positive learning environment that fosters student engagement and comprehension (Hattie, 2019).

Moreover, socio-economic factors such as family income, parental education level, and access to resources also influence academic performance. Students from disadvantaged backgrounds may face additional challenges such as limited access to educational resources, inadequate nutrition, and exposure to stressors that can negatively impact their academic achievement (Sirin, 2015). Academic performance is a multifaceted construct influenced by various factors, including individual characteristics, family support, teaching quality, and socio-economic background.

Types of science subject

Science courses may be roughly divided into various categories, each of which focuses on a distinct facet of the natural world. The primary categories are as follows:

Physical Sciences

This category encompasses disciplines that study non-living systems. Physics explores the fundamental forces and properties of matter, while chemistry investigates the composition, structure, and properties of substances. Astronomy delves into celestial objects and phenomena beyond Earth (Carroll & Ostlie, 2017), and Earth Sciences study the planet's composition, structure, and processes.

Biological Sciences

This branch focuses on the study of living organisms and their interactions. Biology examines the structure, function, growth, origin, evolution, and distribution of living organisms. Zoology and botany specialise in the study of animals and plants, respectively (Hickman, 2021). Genetics explores the inheritance and variation of traits, while ecology studies the relationships between organisms and their environments.

Environmental Sciences

Interdisciplinary in nature, environmental sciences analyse the interactions between humans and the environment. Environmental biology investigates the impact of human activities on ecosystems, while environmental chemistry examines the behaviour and fate of chemicals in the environment. Environmental engineering focuses on developing solutions to environmental problems, and environmental policy addresses regulations and management strategies (Dresner, 2015).

Social Sciences

This category encompasses disciplines that study human behaviour and societies. Psychology explores mental processes and behaviour, while sociology examines social relationships, institutions, and structures (Giddens, 2017). Anthropology investigates human culture, evolution, and diversity (Haviland 2019), and economics studies the production, distribution, and consumption of goods and services.

Mathematics and Statistics:

Fundamental to scientific inquiry, mathematics provides tools for modelling and analysis. Statistics offers methods for data collection, analysis, interpretation, and presentation (Navidi, 2018).

Computer Science and Information Technology

These fields focus on computing systems and information processing. Artificial intelligence involves the development of intelligent agents (Russell & Norvig, 2016), while data science focuses on extracting knowledge and insights from data.

Health and Medical Sciences

This category encompasses disciplines related to human health and disease. Medicine involves the diagnosis, treatment, and prevention of illness (Kumar, 2020), while nursing focuses on patient care and health promotion. Pharmacology studies the effects of drugs on biological systems, and public health addresses population health issues.

Engineering

This field applies scientific principles to design and build structures, machines, systems, and processes. Mechanical engineering deals with the design and production of mechanical systems (Gere & Goodno, 2018), while civil engineering focuses on infrastructure and environmental systems. Electrical engineering involves the study of electrical and electronic systems (Hambley, 2017), and chemical engineering deals with chemical processes and manufacturing.

The Potency of Laboratory Facilities In Promoting Students Interest In Science Subject

By providing hands-on experiences, supporting inquiry-based learning, and cultivating a deep comprehension of scientific concepts, laboratory facilities are essential resources for improving student performance in a variety of science courses. In light of current research and academic literature, this essay clarifies the role that laboratory infrastructure plays in improving student academic performance in scientific education.

To begin, laboratory facilities afford students the invaluable opportunity to engage in hands-on experimentation, a cornerstone for grasping abstract scientific principles. Recent studies affirm that active participation in laboratory activities significantly boosts students' conceptual understanding and retention of scientific concepts (Schwartz, 2019). By immersing themselves in practical work, students can witness scientific phenomena firsthand, manipulate variables, and analyse empirical data, thereby reinforcing theoretical knowledge garnered in traditional classroom settings (Shernoff, 2017). For instance, conducting experiments in physics laboratories enables students to validate theoretical principles such as Einstein's theory of relativity through direct observation and empirical exploration (Villard, 2020).

Moreover, laboratory experiences serve as catalysts for inquiry-based learning, wherein students develop critical thinking and problem-solving skills by formulating hypotheses, designing experiments, and interpreting findings. Recent pedagogical research underscores the efficacy of inquiry-based approaches in science education, highlighting their role in cultivating scientific literacy and promoting lifelong learning (National Academies of Sciences, Engineering, and Medicine, 2018). Through scientific inquiry, students learn to pose meaningful questions, gather and analyse evidence, and construct coherent explanations, thus deepening their comprehension of scientific phenomena. Evidence suggests that inquiry-based laboratory activities lead to enhanced academic achievement and heightened enthusiasm for scientific exploration among students.

Furthermore, laboratory facilities facilitate collaborative learning and peer interaction, which are essential for honing communication skills and fostering teamwork. Recent studies underscore the importance of collaborative inquiry in science education, emphasising its role in promoting social learning and knowledge construction. Working in groups during laboratory sessions enables students to engage in scientific discourse, share ideas, and negotiate meaning collectively (Keane & Berland, 2017). Collaboration fosters a supportive learning environment wherein students can articulate their thoughts, justify their reasoning, and engage in meaningful scientific dialogue (Pier, 2020). Additionally, peer interactions during laboratory experiments encourage students to adopt multiple perspectives, thus enriching their understanding of scientific concepts (Walker, 2018).

Despite the myriad benefits of laboratory facilities, their potency in promoting student performance hinges on various factors, including resource allocation, instructional support, and curriculum alignment. Recent educational research emphasises the importance of equitable access to well-equipped laboratory resources, particularly in underserved communities. Furthermore, effective utilisation of laboratory time necessitates strategic planning, ongoing professional development for educators, and alignment with curriculum standards and learning objectives.

The Potency of Laboratory Facilities In Promoting Students Performance In Science Subject

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Effect of Library Facilities on Student Interest and Performance In science Subject

Science students' interest and performance are greatly impacted by the availability and calibre of library resources. Libraries offer vital resources that help students in their academic endeavours and enhance their comprehension of scientific ideas, such as scientific journals, textbooks, and digital media. Students can investigate topics outside of the classroom curriculum when they have access to a well-stocked library, which promotes a more thorough and involved learning process.

Libraries serve as quiet, dedicated study spaces where students can concentrate on their work, collaborate on group projects, and access diverse learning materials. Studies have shown that students who regularly use library facilities exhibit higher academic performance due to the

enriched learning environment and the availability of up-to-date information resources. The presence of knowledgeable library staff who can guide students in their research and information literacy skills further enhances the educational benefits of library use (Edinyang & Ubi, 2017).

Additionally, the integration of advanced technological tools such as augmented reality (AR) within library facilities can make learning more interactive and engaging. AR tools, for example, help visualise complex scientific phenomena, making them more accessible and understandable for students (Obasi & Nwankwo, 2019). This innovative approach not only sparks students' curiosity but also promotes sustained interest in science subjects.

Petrov (2020) mentioned that well-equipped library facilities play a crucial role in promoting student interest and performance in science subjects by providing access to necessary resources, fostering a conducive learning environment, and incorporating advanced technologies to enhance the learning experience. Investments in library infrastructure and professional development for library staff are essential to maximising these benefits and improving educational outcomes in science education. Library facilities like the electronic resources i.e online learning, the printed materials i.e books, periodical, government publications and the non-printed materials i.e audio, visuals, and audio visuals has the potency in promoting good performnace among students in science subjects (Bassey 2017).

The Roles of Library Science in the Academic Performance of Students in Science

Students' academic performance is greatly improved by library science, which is primarily concerned with the management, organization, and preservation of information. This is especially true for students studying the sciences. A vital field that guarantees students can efficiently access, assess, and use enormous volumes of data and academic materials is library science. This is due to the exponential growth of scientific information and the increasingly multidisciplinary character of modern science. The following are the main contributions that library science makes to students' academic success in science:

- **Supporting the Information Literacy**

Information literacy development is one of library science's most important contributions to scientific students' improved academic achievement. The capacities to recognize, locate, assess, and make efficient use of information is known as information literacy. Information literacy is crucial for success in the sciences, since data interpretation and research are vital. In a study on the effects of library literacy programs on science-related students, Tadesse and Gill (2020) discovered that students who actively engaged in these programs outperformed their peers in terms of critical thinking abilities, research capabilities, and academic performance.

- **Having Access to Resources for Specialized Science**

In order to give students access to specialized scientific resources including journals, databases, and research repositories, library science is essential. The library is often the first point of access to both subscription-based and open-access resources that are essential for scientific research and academic study in many educational institutions. Smith and Robinson (2021) assert that a variety of digital databases, such as those found on platforms like Scopus, Web of Science, and PubMed, are readily available in contemporary academic libraries and are crucial for students undertaking scientific research. According to the study, students who have access to these

resources typically turn in superior academic work, which improves their grades and research outputs.

Supporting Research Methodology and Data Management

Library science specialists are crucial in helping students manage big datasets and research methods in the era of data-driven science. Services provided by libraries now include help with metadata standards, data curation, and using specialist tools for data visualization and statistical analysis. On the other hand, these services assist scientific students in better managing their research data, which enhances both academic achievement and research outputs.

- **Promoting Collaborative Learning and Interdisciplinary Research**

These days, libraries are built with a greater emphasis on interdisciplinary research and collaborative learning, two things that are essential to the modern scientific education process. Students from different scientific disciplines can collaborate thanks to the resources, scientific software, and collaborative workspaces that many libraries offer. The effect of cooperative library settings on science students' academic achievement was investigated by Johnson in 2021. According to their research, students who participated in multidisciplinary research projects and group study sessions led by librarians were more adept at solving challenging problems and performed better academically.

- **Providing Academic Support and Enhancing Student Engagement**

Because library science gives students the tools they need to succeed, it also improves academic success. As facilitators, librarians assist students in navigating the vast array of scientific material that is available. Additionally, they provide students with individualized support in the form of one-on-one consultations and research aid, both of which are crucial for those studying difficult scientific subjects. Additionally, research on the function of academic libraries in fostering student engagement revealed that students who routinely made use of the resources available to them and asked librarians for advice engaged with the course materials more deeply and fared better academically.

- **Encouraging Lifelong Learning and Critical Thinking**

In addition to promoting immediate academic achievement, library science fosters the growth of critical thinking abilities and lifetime learning, both of which are necessary for success in the scientific fields. Library science promotes autonomous learning and intellectual development by teaching students how to approach research with a critical eye, assess the reliability of sources, and traverse the large body of scientific literature. Williams and Thomas's (2020) recent study emphasizes the value of libraries in encouraging scientific students to think critically. They also showed that students were more likely to acquire the critical thinking abilities necessary for success in both their academic and professional careers if they actively used library science resources and took part in workshops.

The Roles of Science Laboratory in the Academic Performance of Students in Science

Science labs are essential in today's classrooms because they give students real experiences and insights into scientific ideas. Science labs play an important role in the cognitive, practical, and emotive development of students in the classroom. The following are some important roles:

Hands-on Education

Students can participate in experiential learning in laboratories by seeing, doing experiments, and learning scientific principles directly from the source. When compared to learning solely from theory, this practical method aids in idea understanding and retention for pupils.

- **Application of Theoretical Knowledge:**

In laboratories, students will be able to apply the theoretical knowledge they have learned in science classes to practical situations. Students get the chance to see and feel how the theoretical ideas they are taught in the classroom are applied practically in laboratories. This aids pupils in comprehending scientific ideas and seeing their applicability in real-world circumstances.

- **Critical Thinking and Problem-Solving**

By guiding students through experiments, examining data, and drawing conclusions, science labs impart critical thinking and problem-solving skills. These abilities are applicable to many facets of life and are necessary for success in scientific domains.

- **Development of Practical abilities**

Working in a laboratory fosters the growth of a variety of abilities, including measurement, interpretation, data analysis, and observation. Students gain knowledge about how to conduct experiments, make observations, record data, and use scientific equipment. These are very useful skills in the workplace and in the classroom.

- **Promoting Interest and Curiosity**

Lab environments offer a dynamic and engaging atmosphere that piques kids' interest in science and piques their curiosity. Experiments can ignite a desire for research and discovery in science. It is urged of students to research science outside of textbooks, create original experiments, and pose questions.

- **Preparation for Higher Education and Careers**

Students gain the experience and skills necessary for more advanced science courses, as well as other advanced studies and careers in STEM fields (science, technology, engineering, and mathematics), through practical work in state-of-the-art laboratories.

- **Vigilance for Safety**

Comprehending and adhering to safety protocols are vital abilities that students can employ in diverse scientific and professional environments, not limited to lab environments. Labs provide a controlled setting where students can practice and learn about safety procedures.

- **Cooperation & Teamwork**

Professional and academic environments both benefit from interpersonal skills. Group work is a common component of laboratory activities, making it an excellent means of encouraging students to collaborate, communicate, and operate as a team.

- **Technology Integration**

Students can engage with state-of-the-art instruments and equipment in modern scientific labs by integrating cutting-edge technologies into their learning experiences. They benefit from this exposure by being able to keep up with the latest developments in the various scientific domains.

- **Evaluation of Comprehension**

Teachers of chemistry and science can evaluate their students' grasp of scientific ideas in real-world situations through their laboratory activities. This type of evaluation is an addition to conventional testing techniques.

Science Laboratory Maintenance for Effective Utilization

Sustaining a scientific lab is essential to guaranteeing its successful application in learning and research environments. In addition to protecting users' health and safety, proper maintenance increases the effectiveness of laboratory operations as a whole. This calls for a methodical approach to maintenance that takes into account good inventory management, cleanliness, equipment operation, and safety compliance. By emphasizing upkeep, educational institutions may create an environment conducive to learning, experimentation, and innovation.

- **Cleaning and Organization**

One of the core parts of laboratory upkeep is frequent cleaning and organization. Because there is less chance of contamination and mishap in a clean lab, researchers and students can concentrate on their work. Daily, weekly, and monthly cleaning assignments should be a part of regular cleaning schedules to guarantee that storage spaces, equipment, and surfaces are kept spotless. Equipment should be stowed correctly after use, and workbenches should be cleansed of extraneous objects. Putting in place a system for labeling supplies and chemicals can also help with organization by making it simpler to find necessary products quickly (Aldrich, 2020).

- **Equipment maintenance and Calibration**

Regular maintenance and calibration of laboratory equipment is crucial to guaranteeing that tests produce accurate and dependable findings. Balances, spectrophotometers, and microscopes are examples of equipment that needs to be inspected for functionality and calibrated in accordance with manufacturer guidelines. Regular checks for wear and tear, cleaning of delicate parts, and prompt repairs or replacements when necessary should all be included in maintenance. Every piece of equipment should have a maintenance log kept up to date in order to track service dates and spot trends that might point to the need for replacement (Eldin, 2019).

- **Safety Compliance and Training**

Safety is crucial in any research laboratory. To guarantee that safety devices like fire extinguishers, eyewash stations, and safety showers operate properly in an emergency, regular maintenance is necessary. Frequent safety audits can assist in locating any risks and guarantee that safety laws are being followed. Furthermore, it is imperative that staff and students receive continual training on emergency procedures, safe chemical handling techniques, and safety regulations. New safety regulations and procedures should be reflected in this training on a regular

basis. A well-kept laboratory lowers the risk of accidents and injuries by promoting a culture of safety and readiness.

- **Inventory Management**

Another essential component of laboratory maintenance is efficient inventory management. Maintaining inventory of chemicals, equipment, and supplies helps to guarantee that there are never any shortages and that the laboratory runs efficiently. Creating an inventory system can assist with managing stock levels, keeping track of expiration dates, and monitoring material usage. Inventory can be regularly audited to find goods that need to be replaced or disposed of because they are expiring. This proactive strategy guarantees that all resources required for trials and research are available and avoids needless expenses.

- **Fostering a Collaborative Environment**

Last but not least, encouraging a collaborative atmosphere in the lab adds to its efficient use. Learning and innovation can be improved by fostering collaboration and communication between faculty and students. Organizing regular meetings to talk about current projects, exchange research results, and handle maintenance concerns can help foster a sense of accountability and ownership for the lab. Users can report maintenance issues, make improvements suggestions, and take part in decisions about how the laboratory is run by putting in place a feedback system (Schoon, 2019). Institutions can maximize the use of available resources by developing a vibrant and engaged laboratory community through collaboration.

Conclusion

Laboratory and library facilities play crucial roles in enhancing student interest and performance in science subjects. Laboratory facilities provide hands-on experiences that are vital for understanding scientific concepts and developing practical skills. These interactive sessions help students connect theoretical knowledge with real-world applications, thereby deepening their comprehension and fostering a genuine interest in scientific exploration. By engaging in experiments and witnessing scientific principles in action, students become more motivated and confident in their abilities, which translates into improved academic performance.

Recommendations

- Educational authorities should prioritise the development and maintenance of modern laboratory facilities in schools. Well-equipped laboratories enable students to engage in hands-on experiments, which are crucial for understanding complex scientific concepts.
- Schools should invest in enriching their library collections with current and comprehensive scientific literature, including textbooks, journals, and digital resources.
- Curriculum planners should incorporate structured and regular use of laboratory and library facilities into the science curriculum. This integration ensures that students not only learn theoretical concepts but also apply them through practical experiments and further reading.

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