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The Role of Technology in Higher Education : Exploring Current Trends and Challenges in Life Sciences Teaching and Learning

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ABSTRACT

One of the key elements of India's 2030 strategy for sustainable development is high-quality education. It seeks to guarantee all students receive a high-quality, inclusive education. Digital technology has become a vital instrument in accomplishing this objective. Digital technologies aim to increase productivity and efficiency while reducing or eliminating waste and pollution. Both students' and teachers' lives have been made easier by technological advancements in education. Students today employ a variety of software and tools to develop presentations and projects with the aid of the internet, as opposed to writing by hand. This survey study was conducted during September 2023 to December 2023 that looks into how life sciences are now taught and learned in higher education, with an emphasis on how technology is being used in the classroom. In order to obtain understanding of the application of technologically improved teaching techniques, difficulties encountered, and new trends in life sciences education, the study looks at the views of both faculty members and students also this survey research explores the contemporary patterns influencing the use of technology in life sciences education.

Keywords : Higher Education, Technology, Life-Sciences, Pedagogy

I. INTRODUCTION

Social well-being is a component of sustainable development and is reliant on education. Information technology has developed to disseminate knowledge and is a major impetus behind innovations in education. Education at college and other institutions has changed as a result of the introduction of new technology-assisted learning tools. Education and technology are practically essential in the current environment. The use of technology in education has grown to the point where neither educators nor learners, particularly in higher education, can imagine continuing to employ traditional teaching methods. One of the most economical approaches to teaching developing minds is the Internet of Things (IoT). It is also a strong system for incorporating an excellent educational experience for all(Keengwe& Bhargava,

2014).Traditional classroom instructions don't offer an instantaneous learning environment, quick assessments, or increased participation. On the other hand, technology and digital learning tools fill this gap. Traditional learning approaches cannot match some of the efficiencies offered by this technology. Given the growing public popularity of smartphones and other wireless technology devices, it makes sense for educational institutions like schools to effectively utilize them by integrating technology into the classroom. It is evident that technology is a prerequisite, especially in higher education.

We can sense it as well when we observe educators and learners packing their bags with tablets inside.In fact, the versatility and non-intrusive nature of today's technologies make education more appealing to the younger generation. But because conventional teachers are hesitant to use modern technology and gadgets in the classroom and see them as distractions rather than clever teaching tools, it could be a difficult strategy to implement at first(Vakaliuk et al., 2021).Students will find it easier to organize if we have an online classroom calendar that shows us when classes, exams, assignments, programs and semester breaks are scheduled. Student response systems, like clicker devices and smartphones, give teachers a quick and simple way to assess how well their pupils are understanding the material being delivered and whether further explanation is needed(Biletska et al., 2021). Digital learning is an excellent approach to save expenses, make better use of resources, encourage sustainability, and broaden the reach and impact for both students and teachers. It also has a positive environmental impact due to the reduced need for paper for notebooks, as well as the time savings and ease of conducting research(Beardsley et al., 2021). This survey study investigates the current trends affecting how technology is used in life sciences teaching.

The objectives of a survey study exploring current trends in life sciences teaching and learning in higher education could include:

1.1. Research objectives

The main research objectives of this research paper are as follows:

1. Assessment of Current Practices: To understand the existing methods and technologies being used in life sciences education.
2. Exploration of Technological Integration: To explore how technology is currently integrated into life sciences education, including the types of tools and platforms being utilized.
3. Identification of Emerging Trends: To identify emerging trends in technology adoption and innovation within life sciences education.
3. Identification of Challenges: To identify the challenges faced by educators and students in the context of teaching and learning life sciences.

II. MATERIALS AND METHODS

2.1 Study design

This survey research used a cross-sectional research methodology to look into current trends in life sciences teaching and learning in higher education institutions.This survey research was conducted during September 2023 to December 2023.

2.2 Participants

A total of 50 teachers and 150 students were surveyed for this study. Students and teachers were chosen from a wide variety of graduation and post-graduation educational institution of S.R.T. M. University, Nanded that provided courses in the life sciences. Faculty members who teach courses in Zoology, Botany, Micro-Biology, and Biochemistry, as well as graduate or undergraduate students enrolled in these programs, constituted the sample.

2.3 Survey Instrument

To gather information on many facets of technology integration in life sciences education, a systematic questionnaire was created. The survey comprised of closed-ended inquiries, which employed Likert scales

for grading. The questionnaire was developed after consulting with specialists in the field of life sciences education and reviewing pertinent literature.

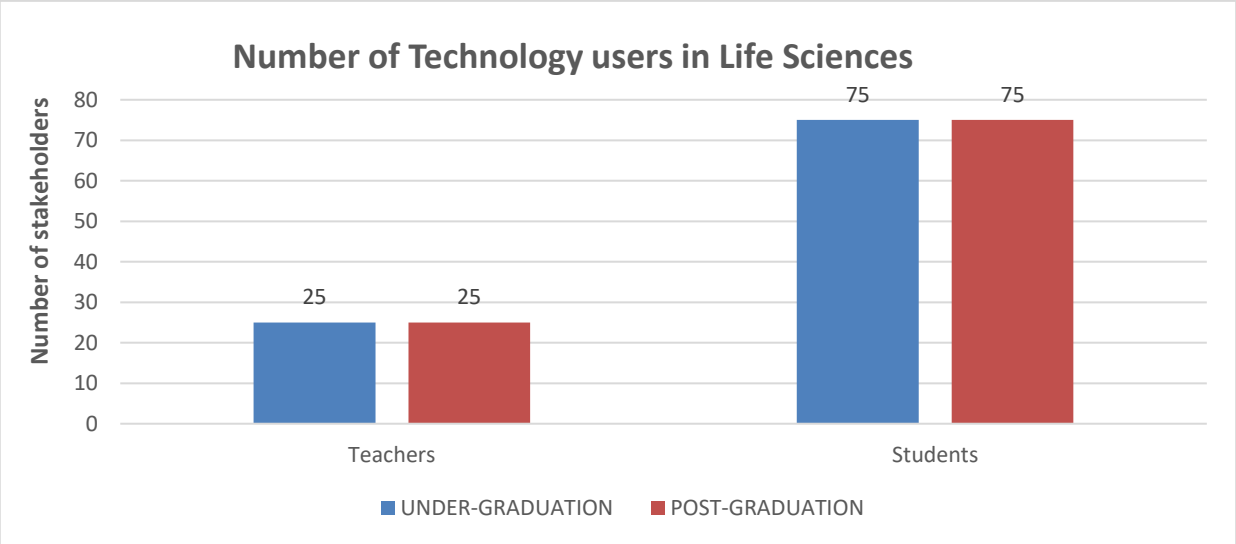
2.4 Data Collection

Data collection took place over a period of September 2023 to December 2023, during which participants were invited to complete the online survey. In order to ensure accessibility and convenience of response, the survey was conducted using Google forms. Participants received guarantees regarding the privacy of their answers. Before taking part in the survey research, each participant gave their informed consent.

III. OBSERVATION AND RESULTS

3.1 Assessment of Current Practices

1. Use of technology in education



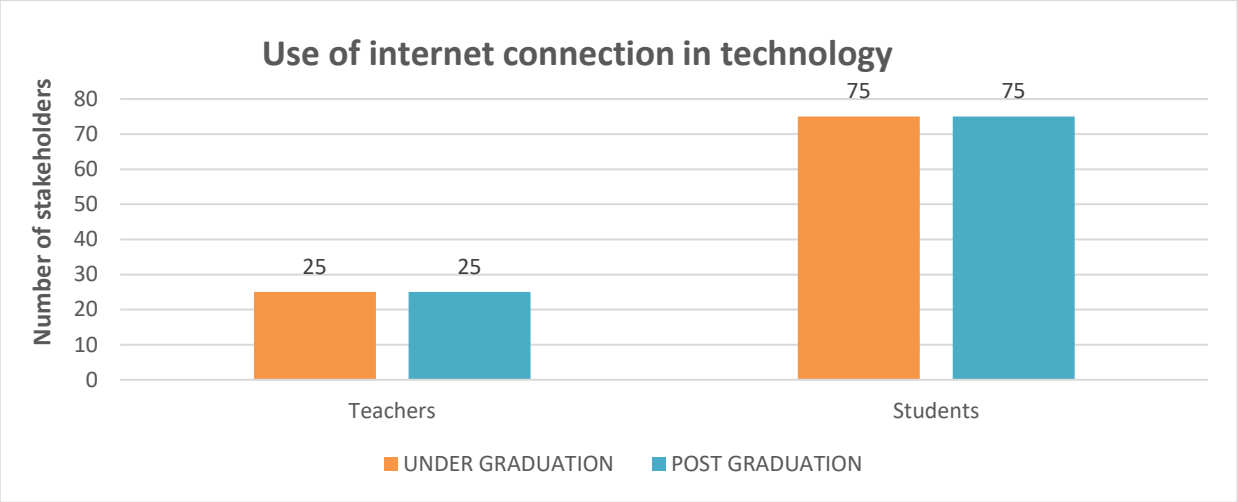
The study revealed that a significant majority of both teachers and students, comprising 100% of the sample, reported using technology in their educational practices.Total number of participants surveyed: 200 (50 teachers and 150 students). Percentage of both teachers and students using technology in life science education was found to be 100%

The survey unequivocally demonstrates that everyone has chosen to use technology to acquireeducation. Books are unquestionably a valuable source of knowledge, but the cost and hassle of purchasing, transporting, and maintaining books has increased. For quick reference, the majority of them choose to read e-books, online journals, and occasionally blogs. In addition to having access to a wealth of resources for class notes and preparation, even the teachers felt that they had the ability to quickly consult with references.

2. Use of internet connection in technology

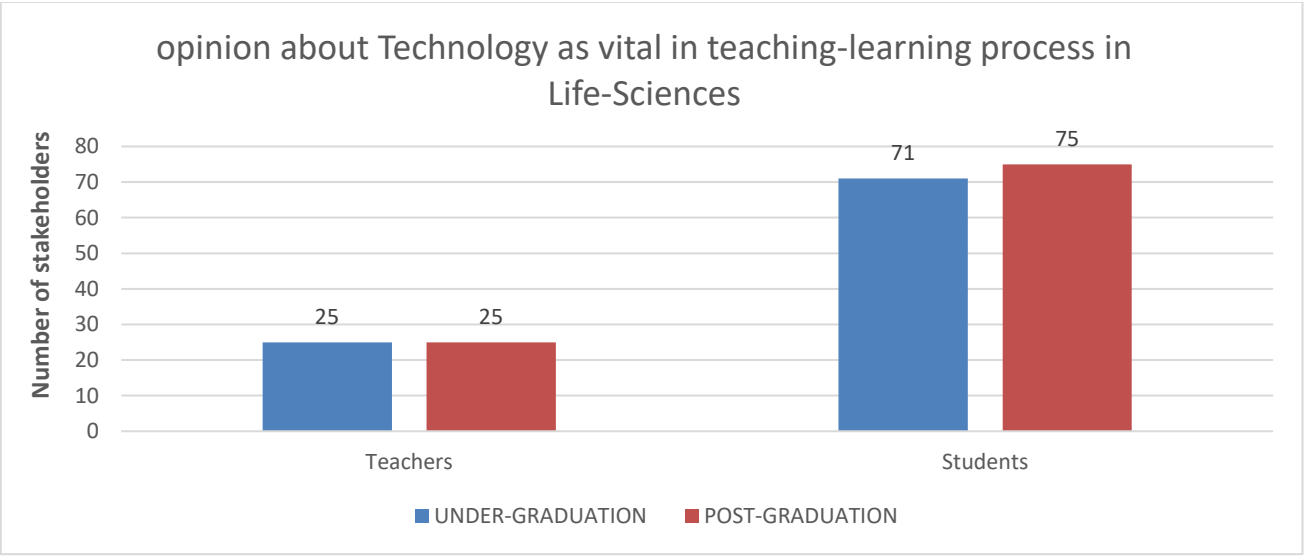
The survey indicates that when it comes to using technology in higher education, the internet is essential.

Every single stakeholder consented to using the internet with technological assistance. Because of this, internet service providers have moved to 4G and now 5G in order to guarantee the quickest possible internet access for optimal use.Total number of participants surveyed: 200 (50 teachers and 150 students).



The survey indicates that when it comes to using technology in higher education, the internet is essential. Every single stakeholder consented to using the internet with technological assistance. Because of this, internet service providers have moved to 4G and now 5G in order to guarantee the quickest possible internet access for optimal use.Total number of participants surveyed: 200 (50 teachers and 150 students).It was discovered that 75 out of 75 students and 25 out of 25 teacher's undergrads were using technology that involved an internet connectionand for post-graduation It was discovered that 75 out of 75 students and 25 out of 25 teachers were using technology that involved an internet connection.

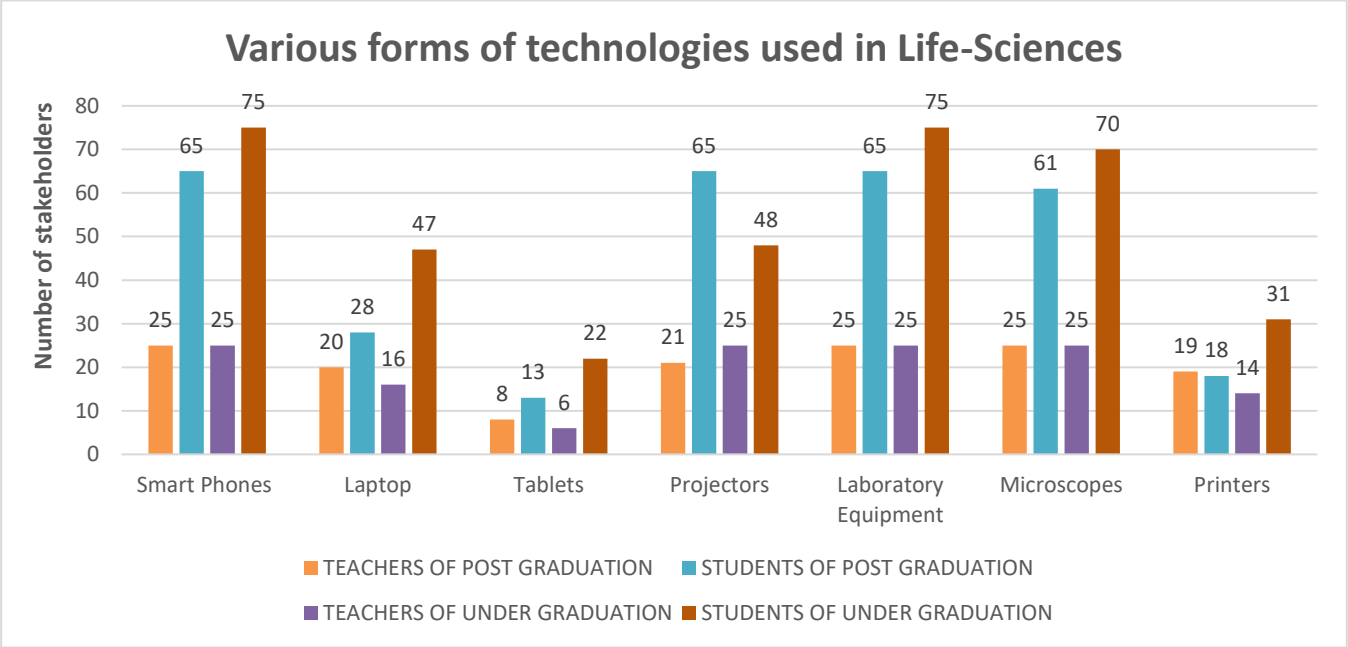
3. Stakeholders opinionabout Technology as vital in learning process in Life-Sciences



Many educators and researchers in life sciences understand that technology can enhance teaching and learning experiences. It was discovered that 25 out of 25 teacher's and 71 out of 75 students undergrads depicted that technology is vital in learning process in life sciences and for post-graduation It was discovered that 25 out of 25 teachers and 75 out of 75 students were using technology that depicted that technology is vital in learning process in life sciences.

3.2 Exploration of Technological Integration

1. **Using various forms of technology within the teaching and learning process**



In terms of using various forms of technology within the teaching-learning process in life sciences the present survey found that smart phones and laboratory equipment were highly used in teaching- learning process followed by use of microscopes, projectors, laptops, printers and tablets. Incorporating many types of technology into the educational process can significantly improve student engagement, accessibility, and efficacy.

When taking into account stakeholders who are both under-graduation and post-graduation, it was observed that about 95% of them used smartphones and lab equipment, followed by microscopes (90.5%), projectors (79.5%), laptops (55.5%), printers (41%), and tablets (24.5%).

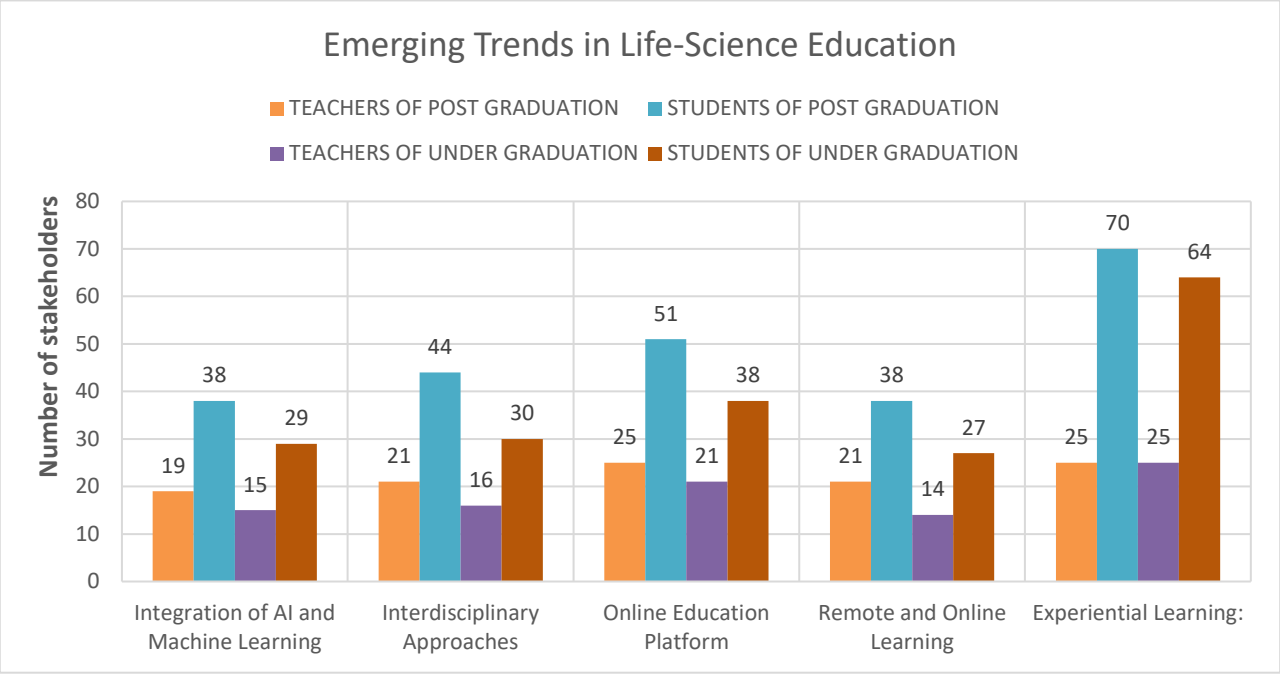
In terms of using various forms of technology within the teaching-learning process in life sciences the present survey found that smart phones and laboratory equipment were highly used in teaching- learning process smart-phones use and laboratory equipments higher use has been observed among instructors and students below the graduation level. This could be due availability of resources from colleges and universities, as well as a increase in the use of microscopes has also been observed. Along with that Post-graduation students make extensive use of the projectors, particularly while making presentations as compared to under-Graduation students. Even among post-graduate instructors, there may be less usage of projectors due to a lack of availability or a continued preference for the chalk-duster method of instruction. But it's noteworthy to notice that teachers of the next generation are utilizing them a lot, which will probably lead to an increase in data soon.

3.3 Identification of Emerging Trends

1. Emerging trends in life sciences technology education

Regarding the emerging trends in technology in life sciences education, as per the survey it was observed that experiential learning played crucial role. When taking into account stakeholders who are both under-

graduation and post-graduation, it was observed that about 92% of them relied on experiential learning, followed by online education platform (67.5%), interdisciplinary approach (55.5%), integration of AI and machine learning (50.5%), and least on remote and online learning (50%).



3.4 Challenges in Life Sciences Teaching and Learning

Life science education is complicated, and this presents both teachers and students with a variety of difficulties. Providing access to cutting-edge laboratory facilities, facilitating collaborative learning experiences, accommodating a range of learning styles and aptitudes, and effectively visualizing abstract concepts are some of these obstacles. Also, in order for curricula and teaching approaches to stay current and responsive to new trends and discoveries, the quick speed of scientific breakthroughs demands that they be updated on a regular basis.

1. Access to Advanced Laboratory Facilities

Modern laboratory facilities are not available in many institutions, despite the fact that practical laboratory experience is essential to a life sciences education. Insufficient resources could limit experiential learning opportunities, impeding students' capacity to acquire fundamental laboratory skills and carry out experiments that replicate real-world research environments.

2. Keeping Pace with Rapid Scientific Advancements

The life sciences are an area that advances quickly and has changing paradigms. To ensure that students have current and relevant information and abilities, educators must constantly update curricula and instructional materials to reflect the most recent research findings, technology advancements, and emerging trends.

3. Integration of Interdisciplinary Knowledge

An interdisciplinary approach is becoming more and more necessary in life sciences education, as students must incorporate concepts and techniques from other scientific fields. However, there are difficulties in designing curricula and delivering teaching when traversing the interconnections between biology and computer science.

4. Engaging Students in Active Learning:

Traditional lectures and other passive learning strategies might not successfully involve students in the learning process. Teachers need to use active learning techniques like problem-based learning, group discussions, and practical exercises to help

students gain a deeper comprehension, develop critical thinking skills, and apply their information.

IV. DISCUSSION

The study revealed that a significant majority of both teachers and students, comprising 100% of the sample, reported using technology in their educational practices. Total number of participants surveyed: 200 (50 teachers and 150 students). Percentage of both teachers and students using technology in life science education was found to be 100%

The survey indicates that when it comes to using technology in higher education, the internet is essential. Every single stakeholder consented to using the internet with technological assistance. Technology has the potential to improve teaching and learning processes, as many life science educators and researchers are aware of. It was found that 71 out of 75 undergraduate students and 25 out of 25 teachers indicated that technology is essential to the life sciences learning process and to post-graduation education. It was found that 75 out of 75 students and 25 out of 25 teachers used technology, demonstrating how important it is to the learning process in the life sciences. True learning has been achieved through the effective use of technology, which has improved and transformed classrooms into smart learning environments(Firmin & Genesi, 2013).

In terms of using various forms of technology within the teaching-learning process in life sciences the present survey found that smart phones and laboratory equipment were highly used in teaching-learning process smart-phones use and laboratory equipments higher use has been observed among instructors and students below the graduation level. This could be due availability of resources from colleges and universities, as well as an increase in the use of microscopes has also been observed. According to(Demir & Akpınar, 2018) as the world changes constantly, mobile devices like smartphones and tablets continue to change our lives by enabling accessibility and communication.

Along with that post-graduation students make extensive use of the projectors, particularly while making presentations as compared to under-Graduation students. Even among post-graduate instructors, there may be less usage of projectors due to a lack of availability or a continued preference for the chalk-duster method of instruction. But it's noteworthy to notice that teachers of the next generation are utilizing them a lot, which will probably lead to an increase in data soon.

Experience-based learning has long been acknowledged as a successful teaching strategy in a number of academic fields. Its importance in the field of life sciences education highlights the special advantages it provides, especially in an area where practical skills and real-world applications are essential.

Online learning environments provide a wide range of digital materials, interactive courses, and virtual labs to meet the changing demands of learners in the digital era. Their comparatively high dependence highlights the rising need for adaptable and easily available learning resources. Students can experience technology-oriented classrooms made possible by technological breakthroughs and their successful implementation, as well as use tools to access a wide variety of information(YILMAZ, 2021). The teachers stated that the development of 21st century skills and competences in the teaching and learning of life sciences is greatly dependent upon the integration of technology. The application of integrated technology facilitates the exploration of alternative teaching methodologies(Higgins et al., 2012). Students can use integrated digital technology to improve their skills and competences.

In order to address difficult challenges in the biological sciences, the interdisciplinary approach stresses the integration of knowledge and approaches from many disciplines. With access to the right tools and applications, technology can revolutionize

education and equip students to compete in the global market(Umugiraneza et al., 2018). But according to (Higgins et al., 2012), technology can impede and disturb learning.

Its limited emphasis emphasizes the significance of holistic education and the understanding of the connections between different scientific subjects. A wider viewpoint is promoted via interdisciplinary education, which inspires students to make connections between topics that at first glance appear unrelated and come up with creative solutions. (Cheung et al., 2021) state that dependent on the characteristics of the teacher and the learner, digital technologies enable teaching and learning that is enhanced and improved by features and preferences discovered in ICT tools. A revolutionary development in life sciences education is the merging of artificial intelligence (AI) and machine learning, which makes data-driven analysis, predictive modeling, and task automation possible.

Digital technologies are intelligent because they enable personal growth. In spite of comparatively lower reliance, remote and online learning is still a good choice, especially in light of recent technology developments and the growing digitization of education. Its presence indicates that accessibility and flexibility in education are important, particularly in light of recent worldwide occurrences like the COVID-19 pandemic. No matter where they are in the world, students and instructors can collaborate and share information through asynchronous and synchronous interactions made possible by remote and online learning.

The teaching of life sciences in higher education faces many obstacles, such as subject complexity and restricted access to cutting-edge lab facilities. Since it can be challenging to visualize abstract concepts like cellular processes, novel teaching strategies like interactive simulations are required. Differentiated education and ongoing professional development are also necessary to meet the needs of students with varied learning styles and to stay up with the swift advances in science. Fostering a deeper understanding and preparing students for the dynamic field of life sciences need integrating multidisciplinary knowledge and involving them in active learning through problem-based techniques.

V. CONCLUSION

The integration of technology into life sciences teaching and learning in higher education is crucial for addressing the evolving challenges and ensuring the delivery of high-quality education. The results of the survey demonstrate how widely technology is being used by teachers and students, emphasizing its crucial place in current teaching methods. According to the survey, technology is widely used by both teachers and students, and it plays a crucial part in modern teaching methods. Technology improves accessibility, efficacy, and engagement. Examples of this include smart phones and AI tools.

A major concept that emphasizes practical experiences for skill development is experiential learning. Furthermore, AI integration and internet platforms show dynamic innovation. Collaborative solutions are necessary to address ongoing challenges such as lab access and interdisciplinary integration. To address these, institutions, and educators must work together to promote inclusive and creative practices. In order to build compelling learning environments, the study recommends continuing to integrate technology in conjunction with multidisciplinary and experiential learning methodologies. Higher education may prepare by using technology as a catalyst for creativity.

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