LAB TO LIFE: THE IMPORTANCE OF HANDS-ON EXPERIMENTS IN BIOLOGY CLASSES

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Witnessing the development of an abstract concept in front of students eyes has a certain impact. Reading about cell division in a biology lecture is one thing, but witnessing cell division under a microscope is quite another. Complex ideas become understandable and unseen processes become evident through practical trials. They make science more engaging and easier to understand by enabling students to become life explorers rather than passive recipients of information. As noted by Biology Junction (2024), this means that senior high school biology classes are more engaging and memorable because students are actually looking at onion root tip cells under a microscope rather than simply memorizing the fact that "mitosis has stages."

When theories are put to the test in real-world settings, learning gains greater significance. For instance, students learn that science is a process that occurs all around them rather than just a collection of words in a textbook when they measure the oxygen bubbles in aquatic plants to learn about photosynthesis. Students gain confidence as a result of this active participation since they understand that they can truly observe and explain the "why" behind the lesson. According to the Journal of Pedagogical Inventions and Practices (2023), interactive experiments like this aid senior high school students in bridging theory and practice One of the simplest ways to show photosynthesis in progress is by observing Elodea plants inside a beaker.

Experiments not only teach biology but also the scientific way of thinking. Students learn about enzymes and ecosystems as well as reasoning, patience, and problem-solving skills when they formulate hypotheses, test hypotheses, and evaluate

the outcomes. A failed experiment, for example, does not necessarily indicate failure; rather, it suggests reevaluating presumptions, modifying procedures, and trying again. High school students that consistently test their own hypotheses rather than relying solely on instructor lectures cultivate resilience and inquiry habits, which are essential for future research and higher education, claims Biology Junction (2024).

Beyond comprehension, labs produce memories that outlive lectures. Years after the lecture, many students still recall the excitement of seeing live microbes in pond water or the scent of iodine in a starch test. Reading by itself cannot anchor knowledge the way these visceral encounters do. When senior high school students work with microscopes, test tubes, and specimens, they are more motivated and retain more information—an result that traditional lectures usually fall short of (JoVE, 2024).

Additionally, practical work fosters teamwork, which is essential in both science and daily life. Whether students are sharing microscopes, comparing results, or discussing why their results differ, laboratory experiments frequently call for teamwork. As students share their thoughts and hear other people's points of view, this fosters not only collaboration but also communication skills. TipsJ (2025) points out that high school lab environments serve as training grounds for practical teamwork; when students engage on group projects, they inherently acquire leadership, accountability, and polite communication.

Curiosity is the foundation of experimentation. Students start to view biology as an open field of discovery rather than a closed book of answers when they are allowed to test theories and ask questions. Even seemingly insignificant tasks, such as raising seedlings under various lighting scenarios, inspire awe and a desire to never stop questioning "what if? and "why?" Senior high school students who participate in inquiry-based assignments are more likely to continue their scientific studies after graduation since their curiosity is stoked in the lab rather than only in textbooks, claims Biology Junction (2024).

The inclusiveness of laboratory operations is another advantage. Some children learn best when they can see, touch, and manipulate items; others learn best when they can read or listen. When charting experimental results or participating in a dissection exercise, a student who finds it difficult to follow a lecture may excel. Global Education (2020) highlights that biology laboratories in senior high school offer a variety of learning opportunities, which makes them particularly beneficial for students with varying learning styles, such as kinesthetic or visual learners.

Last but not least, laboratory experiences enable students to apply classroom knowledge to actual circumstances. Experiments ranging from analyzing water samples for pollution to obtaining DNA from fruits demonstrate how biology is intricately linked to daily existence and pressing global issues. These encounters inspire professional goals in environmental science, research, or medicine in addition to boosting motivation. According to Romantonepali (2023), these experiments provide senior high school students with more than simply "schoolwork"; they are windows into potential occupations that relate to biology and pique their interest in STEM fields.

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users into meaning-shapers who can make their own impression on the world.