

Current and Desired Lab Resources

Explain:

- *your current lab facilities, equipment, and/or resources*
- *why laboratory upgrade support is needed*
- *how a lab upgrade would impact your teaching, and your students' content knowledge.*

Laboratory Activity

Describe:

- *an innovative, replicable lab activity that you have implemented using limited school lab resources with assessments*
- *purpose and outcome with materials needed*
- *use of state and/or national standards*
- *list of safety issues and how you address them (www.nsta.org/about/positions/safety.aspx).*

SCIENCE INSTRUCTIONAL STRATEGIES

Our philosophy of teaching is that science educators are individuals who can successfully bridge the gap between the various curriculum disciplines. We are the only discipline that can incorporate all subject areas into one science question. We must be great teachers that make such a great impact on the lives of our students to where it motivates them to excel academically and emotionally. Our philosophy is to change the direction of their lives for the better. In our department we feel that there is no better satisfaction, in this profession, than knowing that we have had a positive influence on our student's lives. When we think of strategies to use in our underprivileged school setting, we have to think outside of the box. We use strategies such as peer tutoring, active learning, clicker use, collaborative learning, critical thinking, discussion learning, experimental, interdisciplinary, problem-based, team-based, team teaching, and writing assignments. We teach various subjects. Therefore, the strategies needed to reach each student varies. We use each strategy as a means to open up the mind's and spark their imaginations. The goal is to bring science to life by making it exciting and interesting. We also prefer these types of strategies in our department because it allows for to assess students through formative, alternate, and summative assessments. This allows us to be able to flexible with our teaching and assessing methods but remain in compliance with school and district mandated assessing and data analysis.

----- High School's Science Department begins each grading period with pretests. These tests not only assess students' performance levels, but are also used as a means by which we address students' preconceptions and misconceptions of materials to be taught. The science department encourages the use of learning styles assessments as a means of determining how individual students learn best. Application of resulting data from these two evaluations enables teachers to plan strategies that facilitate transition from conceptual to reality. Our teachers meet students where they are conceptually, armed with insight of students' strengths to build basic concepts towards complexity and deeper understanding. Science inquiry and methodology are taught early in science courses to be used as a learning tool throughout the courses. Inquiry as a learning strategy promotes independent discovery. Investigation and experimentation bring the theory to life in practice. For example, instead of only labeling a microscope picture, students prepare wet mount slides then magnify using microscopes. This activity encourages students' real world technical performance beyond conceptual knowledge.

It is important that each student believes that he/she can change the world, no matter what his/her circumstances or background consist of. It will be hard, however, for any student to change the world

without a solid academic background to foster the critical thinking required to assess and analyze areas of needed improvement in society. Available science courses with adequate hands-on resources and equipment is a necessity for students today. There are many exciting and engaging college-prep high school science courses that should be offered at the high school we are currently privileged to teach, but because of a severe lack of adequate resources available to properly teach such courses, these students will never have the privilege of prior exposure to common college classes. This will not prove beneficial to our students as they enter college and attempt to understand the new world of science that will be expanded to them.

Microbiology is one of those many potentially engaging courses that is not offered at South Pike Senior High. Even so, as biology teachers, we still want our students to have a glimpse of the world of microorganisms, as this area of science encompasses so much of the world around us. From the flu virus to cancer to staph infections, everyone has been affected by microbes. Who knows? One of our students could find the cure to cancer in the next decade. If we never introduce our students to that world of science, they may never have the confidence to even consider that field.

CURRENT LAB RESOURCES

The current lab is equipped with a gas and water. The science lab has a promethean board that works. A science lab with a ventilation hood that is nonfunctioning. The lab has limited resources for conducting lab experiments. The laboratory does not have a computer work station.

The laboratory support is needed to equip the current science lab with modern lab equipment and materials. This upgrade would enable students to perform science experiments that would allow them to adequately test hypothesis, observe how science concepts are put into practice, and interact more directly with the natural world. The laboratory is presently in need of preventive safety equipment such as safety goggles and disinfectant for safety goggles, aprons and gloves. The lab is missing equipment necessary to react to emergencies, particularly fire blanket and first aid kits. The lab is in need of a computer work station. This work station would be very useful for student-generated reports, findings, data input and tabulations.

Having a laboratory upgrade would impact teaching and students' content knowledge by:

- Ensuring that the laboratory contains relevant and up-to-date equipment and materials.
- Ensuring that lab activities further student understanding of the science curriculum.
- Ensuring that district policies support quality lab experiences.

LAB ACTIVITY

The Biology I state standard wherein a microbiology lab can be imposed was carefully selected by us. That state standard is found in the 2010 Mississippi Science Framework and it states:

Objective 4a. Compare and contrast cell structures, functions, and methods of reproduction to analyze the similarities and differences among cell types. (DOK 2) Prokaryotic/eukaryotic, Unicellular/multicellular, and Plant/animal/bacterial/protist/fungal

Pre-Lab

After discussing the similarities and differences among plant, animal, bacterial, protist, and fungal cells, we will allow the class to suggest some every-day biological problems that we can attempt to answer in the lab. In groups, students compete for the creation of the most engaging lab question. We will allow this to lead into presenting the question for the microbiology lab: "What kinds of bacteria are found on common surfaces? We record our hypotheses and the lab begins.

Lab Materials Include: Petri dishes, Agar, Cotton swabs, Test tubes, Microscope

Goals:

1. Inoculate plates with samples from surfaces at the school (with the use of cotton swabs and agar plates) and observe growth of bacterial colonies.
2. Analyze colonies and attempt to identify single bacterium within the colonies under a microscope.
3. Compare your sample to known samples of bacteria, investigating where these known samples are likely to be found.
4. Perform a gram stain on known bacteria and compare to your unknown sample.

Noted substitutions due to lack of equipment/resources include: using a handheld lighter to sterilize inoculating loops, as the current lab Bunsen burners are not usable due to a gas leak; pre-made agar by teacher as agar plates are not available; and allowing most of the class to be spectators of the lab, rather than participants in the lab. The gram stain will be shown and explained via video in the classroom, as an adequate heat source (which is absent from the lab) is crucial during the grain staining procedure.

In addition to the submission of a lab report, it is imperative that a post-lab be done by students to solidify concepts and to enhance the critical thinking of the students. In a school with limited resources, the imaginative minds of the students must be utilized extensively and frequently.

Post-Lab (done in classroom):

Big Post-it Notes will be distributed around and outside the classroom. Engaging prompts and questions related to the microbiology lab will be titled on the sheets. Prompts and questions will be tailored to various DOK levels and will include statements such as: "Can you recall which areas of the school your class chose to test?" (DOK 1); "Compare & contrast gram (-) and gram (+) bacteria." (DOK 2); "How is microbiology related to your life and your family/friends' lives? Explain in detail." (DOK 3); "Your school's student attendance for the week has just dropped drastically from averaging 300 students daily to only 139 students daily. It has been rumored that a resistant bacteria has been spreading from student to student. Design an experiment that will determine who is currently infected and that will effectively stop the spread of the microbe." (DOK 4)

Students will walk around the classroom in pairs, discussing and registering all responses into their science notebooks.

Students will be paired based on both current academic achievement in the course and learning style.

To further accommodate different learning styles, illustrations, and physical objects will be used with the prompts.

After each student has circulated the classroom, notes taken will be used as a study guide for the exam, which will include a short lab practical.