Task Books as an Assessment Tool for Demonstrating Basic Lab Skills in a Microbiology Course †

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INTRODUCTION

The demonstration of basic laboratory skills is a valued student-learning outcome in the microbiology laboratory classroom. The skills taught in a basic microbiology lab are fundamental for these future health care providers because they will work directly or indirectly with microbes. How does one assess these unique laboratory skills? Typically, students can be assessed via a lab practical where, in a testing situation, they are asked to demonstrate their newly learned skills. However, with this approach, students are usually given one opportunity to show proficiency. If they fail a technique, they do not have the chance to improve their performance. Another solution is needed to verify proficiency in basic lab skills.

The United States Forest Service and the Washington State Department of Natural Resources have adopted a method of ensuring proficiency for their firefighting workforce. For a given firefighter rating, they have identified the skill and knowledge set required to fill that position. It takes into account not only book knowledge, but also uses a mentor relationship to evaluate, through demonstration, the skills deemed necessary for the role the firefighter is seeking to achieve.

The Proficiency Task Book is the document these agencies have adopted to ensure proficiency. Before the employee is trusted with the responsibility of a specific position, he/she must go through a series of tasks designed to assess their knowledge and understanding of the skills of the position. This takes at least two separate evaluation periods. One is considered training, while the second, and usually final, evaluation is in a supervised role of some aspect of the position. When all of the tasks are checked off, the employee is deemed ready to fill the positions with full responsibility.

As an instructor for Microbiology, I have adapted the proficiency task book approach to the laboratory assessment of skills learned in class. I have encountered positive results with the use of a proficiency task book created for the microbiology lab.

PROCEDURE

The task book I use is three pages long (see Fig. 1) and is used throughout the entire course. The task book, with its 19 separate laboratory tasks, is given to each student at the beginning of the course. When students learn a new procedure and have practiced the method, they can ask that the instructor observe them as they demonstrate proficiency. If the students demonstrate correctly the prescribed steps, then the instructor can sign off on the task as proficient.

The task book was created in Microsoft Excel. Tasks that I felt were representative of what the students are taught and expected to demonstrate are listed. Tasks that require more than one application to demonstrate proficiency are listed up to 5 times where the instructor can initial the completion of a preliminary task.

![Figure 1: A page from the Lab Proficiency Task Book.](http://www.asmscience.org)
the preliminary tasks is completed, the student can then be signed off as proficient. For example, the microscope task (see Fig. 2) has five slots for initials. The student must correctly locate and focus the image using the 100 power oil immersion lens. Once the fifth initial is received, the student is considered proficient in using the microscope and the instructor signature is given for the task.

The task book has a value of 5%–10% of the student’s total grade. However, students take the task book very seriously and go out of their way to ensure everything is checked off. In fact, unless they complete the task book, my policy is they will not be allowed to take the final exam.

My experience with teaching microbiology over 19 years at the community college level has given me a unique perspective. Before using the task book, I would assign labs but there seemed to always be a handful of students who would do minimal effort on the lab and then go home. This left me wondering if they really learned any significant procedures. I tried giving lab exams, but still this was not much more than a snapshot in time of what the students could demonstrate. And, as with all exams, there are students with test anxiety whose minds would freeze and they would do less than their best at demonstrating proficiency.

Now with the Lab Proficiency Task Book, students must practice a particular task in order to be signed off as proficient. If they cannot demonstrate proficiency at the moment then, unlike a test, they will be instructed and coached until they are indeed proficient.

I like knowing students leave my Introductory Microbiology course having demonstrated that they are proficient—nearly 100% of the class can be rated as such.

**CONCLUSION**

Use of the Lab Proficiency Task Book in the Microbiology Laboratory class has been an exceptionally positive experience. It ensures that all of the key hands-on skills are covered, and motivates students to ensure they learn the skills. Additionally, it encourages the timid student, who typically allows the stronger personalities of the group to do much of the hands-on work, to develop their own hands-on skills.

The concept of a proficiency task book is easily modified and applied to each unique class. If, as the instructor, you are focusing on a different skill set, you can create your own set of tasks for the proficiency task book. What I have included here is a task book for a beginning microbiology course (see Appendix 1).

**SUPPLEMENTAL MATERIALS**

Appendix 1: Sample Task Book as a PDF file

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<table>
<thead>
<tr>
<th><strong>Microscope</strong></th>
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<tbody>
<tr>
<td>• Correctly Label a microscope diagram</td>
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<tr>
<td>• Identify parts of microscope correctly to Instructor</td>
</tr>
<tr>
<td>• Properly adjust lightings for Low Power to Oil Immersion</td>
</tr>
<tr>
<td>• Demonstrate correct handling and cleaning</td>
</tr>
<tr>
<td>• Correctly locates and focus image on 100 X Oil Immersion</td>
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</table>

FIGURE 2. The microscope task. Student must receive five instructor initials before the task can be signed off as complete.