

Microscope Essentials:  
A Teaching Tool for High School Biology  
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### Formal Proposal

The purpose of this project is to create a web-based resource for high school students to use when learning basic microscopy. Microscopy is rarely taught in high schools due to lack of funding and the number of microscopes available at schools, making tactile learning nearly impossible. This capstone project will make learning how to use a microscope more accessible. The website will teach students parts of a microscope and an understanding of basic microscopy concepts.

The website builder, Adobe Muse, will be used to display the content. A mobile version of the website will also be available, allowing students to learn outside of the classroom. The capstone project will be designed to be in conjunction with teachers' lesson plans, not as the sole basis of learning.

To construct the website, every part of a Brightfield microscope will be photographed. Sample slides will also be photographed at each magnification and different settings of the aperture diaphragm. Video of the field stop will also be created. Clicking on each part of the microscope will display information about it and, depending on the part, may provide a link to another webpage on the site to explore the topic more in depth.

Due to the virtual nature of this project, the projected costs are very low. The greatest expenses would be equipment rental and photo editing software. However, due to student access to the Rochester Institute of Technology photo cage, these charges are part of tuition.

### Abstract

This capstone project will consist of creating web content for the purpose of science classes in secondary education. The website will provide information about the different functions of a microscope and an understanding of basic microscopy. Microscopy is rarely taught in a classroom due to lack of access to equipment. This project will provide in depth information to the students without the need for a physical microscope. Using an online medium will engage students in the topic and a mobile option will give students the opportunity to learn outside of the classroom. Each part of the microscope will be displayed alongside a description of its function. Attachments to webpages for pieces that may require a more in-depth explanation will also be provided. The expected outcome of this capstone project is a functioning website that teachers will be able to provide for their students. The final product will be user-friendly and easy to understand for an audience between the ages of fourteen and seventeen.

## Executive Summary

For this capstone project, I will be creating a web resource for high school students that outlines the different parts and functions of a microscope.

## Introduction

Based on a survey conducted of 100 high school students, only eight stated that they have never used a microscope before. Out of those that have, 51.6% said the teacher set up the microscope for them. (Appendix A) While tactile learning may not be possible in the classroom, this project will offer an additional resource for teachers to aide in their students' understanding of the functions of a microscope.

With the presence of technology in students' everyday lives, it is more practical to provide an online resource for students over a print resource. The online resources that are already available to learn about the parts of a microscope are unnecessarily lengthy and do not provide detailed photographs or examples of slides. (Appendix B) This capstone will have a sleeker design, making reading the information easier to understand, and comprehensive photographs that will reinforce the written information.

### Project Goals

A website will be created that focuses on the different parts of a Brightfield Microscope and each of their functions. The goal of this project is to provide an online resource for high school students to use when learning about microscopy.

### Project Schedule

WBS Level	WBS	Task	Predecessors	Start	End	Work Days	Cal Days
1	1	<b>Proposal</b>					
2	1.1	Rough Draft		Sun 1/01/17	Mon 1/23/17		
2	1.2	Final Draft		Thu 1/26/17	Tue 2/07/17		
1	2	<b>Descriptions</b>					
2	2.1	Rough Draft		Wed 2/01/17	Sun 2/12/17		
2	2.2	Final Draft		Sun 2/12/17	Thu 2/16/17		
2	2.3	Professor/Teri Review		Thu 2/16/17	Thu 3/02/17		
2	2.4	Finalize Edits	2.3	Mon 3/06/17	Wed 3/15/17		
1	3	<b>Photograph Microscope</b>					
2	3.1	Photograph in Studio		Sat 2/25/17	Mon 3/06/17		
2	3.2	Edit photographs	3.1	Mon 3/06/17	Sat 3/18/17		
1	4	<b>Photograph Slides</b>					
2	4.1	Photograph Slides/Video		Sat 2/18/17	Sat 3/11/17		
2	4.2	Edit photographs/Video	4.1	Sun 3/12/17	Wed 3/22/17		
1	5	<b>Composite Website</b>					
2	5.1	Design website format		Sat 3/18/17	Sun 4/09/17		
2	5.2	Insert photographs		Sat 3/25/17	Thu 4/20/17		
2	5.3	Insert writing		Mon 3/20/17	Thu 4/20/17		
2	5.4	Final Edits		Thu 4/20/17	Sun 4/30/17		
1	6	<b>Edit proposal</b>		Sat 4/22/17	Tue 4/25/17		
2	6.1	print at ISL	6	Tue 4/25/17	Fri 4/28/17		

## Budget

<b>Expenses</b>	<b>Cost</b>
*Canon 5D Mark III	\$2,499.00
*50mm lens	\$125.99
*85mm lens	\$369.99
Macbook Pro 2014	\$1,299.00
Tethering cord	\$24.95
*Olympus brightfield microscope	
White tabletop seamless	\$50.00
A-clamp (4 at 3.50/ea.)	\$14.00
*Adobe PS/LR (4 months at \$10/mo.)	\$40.00
Time - 35hr (\$20/hr)	\$700.00
Website builder (Adobe Muse)	\$24.99/mo.
<b>Total:</b>	<b>\$5,147.92</b>

Due to resources provided by the Rochester Institute of Technology at the Photo Cage, equipment notated with an asterisk (\*) did not contribute to the actual cost of the project. The Macbook Pro, tethering cord, seamless, and A-clamps had already been purchased prior to the creation of this project, accumulating no additional costs. Subtracting the equipment either provided or already possessed, the cost of this capstone project is \$724.99 representing the projected time spent working on the project and a one-month subscription to Adobe Muse. Without the resources provided, a real-world estimation of the cost of this project would be around \$5,100.

### Proposed Resources & Deliverables

The main sources of information that will be utilized for this project are print publications found at the Wallace Center library, *Fundamentals of Light Microscopy Course Workbook* by Michael Peres, and various web resources that will be cited in the final product.

Physical resources to complete this project will be provided by the Photo Cage at RIT, as notated in the budget (Page 6.) The final deliverable for the capstone project will be a website created through Adobe Muse, displaying the different parts of a microscope and their functions.

### Project Assessment

Once the written material is positioned on the website with its corresponding photographs, the information will be compared to the research, determining that it is correct. After the website has been verified, it will be presented to college freshmen who do not know how to use the microscope. The students will be asked to setup the microscope using this website for reference as a way to determine the functionality and clarity of the project.

Appendix

Appendix A

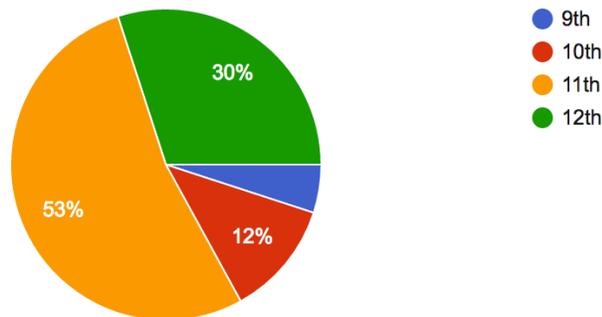
i. Sample survey given to one hundred high school students via print or

Google forms:

1. What grade are you in? _____			
2. What science class(es) have you taken/ are taking in high school? _____			
<hr/>			
3. Have you ever used a microscope in a science class before?	YES	NO	
4. If "NO," would you like to learn how to use a microscope?	YES	NO	
5. If "YES," please answer the following:			
a. Did the teacher set up the microscope for you?	YES	NO	IDK
b. Did you look at the sample at different magnifications?	YES	NO	IDK
c. Did you learn how the microscope works?	YES	NO	IDK
d. Did you learn the different parts of the microscope?	YES	NO	IDK
e. Would you like to know more about microscopes?	YES	NO	

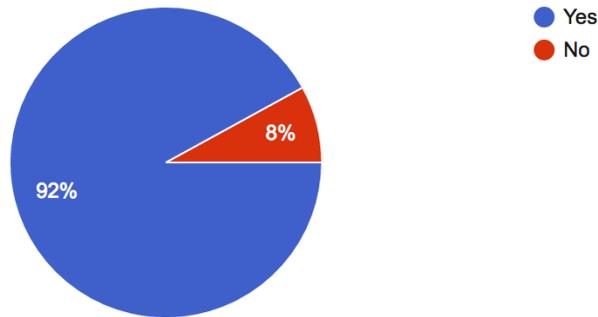
ii. Survey response to Question number 1:

What grade are you currently in? (100 responses)



iii. Survey response to Question number 3:

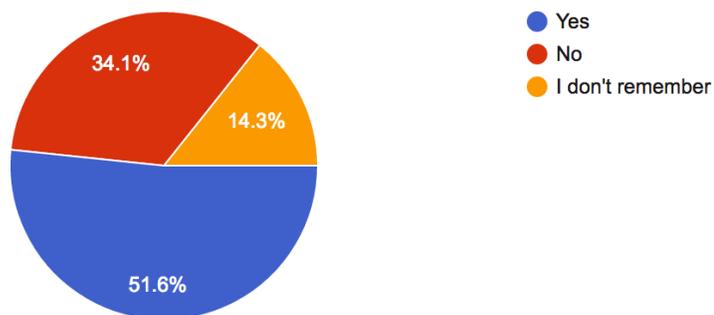
Have you ever used a microscope in a science class before? (100 responses)



iv. Survey response to Question number 5a.

If "yes," please complete the rest of the survey: Did the teacher set up the microscope for you?

(91 responses)



## Appendix B

Bibliography of websites that are found similar to this capstone project's purpose:

"How to Correctly Use a Microscope." *TeacherTube*. N.p., 1999. Web. 25 Jan. 2017. <<http://www.teachertube.com/video/how-to-correctly-use-a-microscope-6264>>.

"MICROSCOPE PARTS AND FUNCTIONS." *AmScope*. N.p., 2015. Web. 25 Jan. 2017. <<http://www.amscope.com/microscope-parts-and-functions/>>.

"Parts of a Compound Microscope with Diagram and Functions." *MicroscopeMaster*. N.p., 2016. Web. 25 Jan. 2017. <<http://www.microscopemaster.com/parts-of-a-compound-microscope.html>>.

"The Microscope ." *The Parts of a Microscope*. N.p., 2015. Web. 25 Jan. 2017. <<http://www.microscope-microscope.org/basic/microscope-parts.htm>>.

## Biography

Laura is in her third year at the Rochester Institute of Technology. She is graduating in the spring of 2017 with a degree in Photographic and Imaging Technology with an immersion in Art History. Laura is planning on pursuing a career teaching photography to high school students. Last summer, she held a teaching apprenticeship with the Putney School Summer Program in Vermont. While Laura enjoys technical photography, she is working on photomicrographs with fine art concepts.