Anatomy (Histology) 2011 Impact Grant Report

Project Committee

Histology members; Project lead
Lisa Lee, Human histology course content development

Histology members; Project contributors
Chris Premanandan, Veterinary histology course content development
Po-yin Yen, Human-computer interaction specialist
Daniel Jensen, IT support
Vinny Balzano, Undergraduate assistant
Katherine Fisher, Undergraduate assistant

Executive Summary

The project goal was to develop a comprehensive and customizable educational resource featuring online, digital histology content complete with interactive lecture modules, a pre-laboratory and a virtual laboratory experience. The public resource can be accessed at http://histology.osumc.edu/. A complementary Carmen course, providing enhanced resources for enrolled students, remains in development.

The resource includes interactive and customizable digital lectures and laboratory modules with specific objectives to promote maximum engagement by undergraduate, graduate, and professional students at OSU, with the potential of reaching over six hundred students per term. The pre-laboratory features a series of short video demonstrations of virtual slides presented by the instructor. Pre-lab modules are designed to mimic valuable, one-on-one student-instructor interactions in wet-laboratories, a component of histology education that is severely lacking in the OSU Medical and Dental histology courses. The virtual histology laboratory utilizes a computer application that simulates the examination of tissue slides under a microscope. Using this emerging technology and guided by structured laboratory objectives, students move the virtual slide around and zoom in or out to study histology.

With the proposed resource, a single instructor may reach more than a thousand students in a year without sacrificing knowledge transfer, thus significantly increasing faculty efficiency.
**Problem / Opportunity**

Histology is a fundamental course that is not typically offered to undergraduate students interested in pursuing careers in science. The main reason is the highly time consuming and visual nature of histology requires long instructor-student contact hours, and course resources are costly and difficult to maintain. Currently, there is a large unmet demand by undergraduate students at the Ohio State University and other undergraduate institutions for introductory and advanced histology courses.

Before this project, there was no introductory undergraduate human histology course, and only two advanced histology courses with limited seats were offered each year at OSU. Students in professional school who have taken undergraduate histology courses perform significantly better in integrated science courses than their peers who have not had such an opportunity. Additionally, the histology courses taught to medical and dental students at OSU offered didactic lectures but no laboratory components. The lack of a laboratory experience left an enormous gap in comprehensive understanding and appreciation of microscopic human anatomy, resulting in lower exam performance compared to a cohort exposed to the laboratory experience.

By creating a comprehensive and customizable educational resource featuring online digital histology content complete with interactive lecture modules, a pre-laboratory and a virtual laboratory experience, students at Ohio State now have an opportunity to access a stand-alone histology course, or blended learning modules, in related courses at OSU.

**Project Goal(s)**

The main goal of this project was to make histology education available to a wide audience by:

- Developing a completely online histology course appropriate for undergraduate students.
  - Using Quality Matters as a general guide.
- Developing online pre-lab modules and objective-driven virtual laboratories that medical, dental, graduate, and veterinary students could use as ancillary course material to enhance histology mastery.
- Establishing a centralized online histology educational resource for instructors at OSU.
- Making teaching and learning histology more effective and efficient for instructors and students.
- Enhancing students' foundational science knowledge as the result of firm histological understanding.
- Creating a highly ranked histology resource via Internet search results.
Success Criteria

- A public-facing histology resources website is successfully launched and is easily found through common histology key terms search.
  - Success
- An on-line virtual histology resource hub website is successfully launched and contains fully functioning lecture modules, pre-lab instructions, and a virtual histology laboratory for currently existing courses, enabling an increase in enrollment.
  - Success
- A completely stand-alone introductory histology course for OSU undergraduate students is ready and available for enrollment and participation by students anywhere.
  - In progress, partially complete
- Pre-lab and virtual-lab modules are available to the medical, dental, and veterinary students at the OSU via a Copy Course Components procedure whereby instructors copy relevant content from the resource hub into their courses.
  - In progress, partially complete
- http://histology.osumc.edu/ is a top online search result when searching with histology key terms.
  - Success
- Histology and related-fields instructors report satisfaction and efficient use of time with using the online histology resource hub and its modules.
  - Success
- Students’ exam performance equals or exceeds historical data while using the online histology resources and course.
  - Success

2011 Impact Grant Pilot Experience

Students affected by pilot:  
110 dental students; 40 graduate students in anatomy, anthropology, biomedical engineering, and other post-bachelorette programs.

Anticipated number of students affected by new course design in 2012:  
220 dental students (Class of 2015 and 2016); 40 graduate students in anatomy anthropology, biomedical engineering, and other post-bachelorette programs; 250 medical students.
Approximate time spent by Anatomy (Histology) faculty and staff on the revision project:

<table>
<thead>
<tr>
<th>Team Member</th>
<th>Approximate Hours</th>
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<tbody>
<tr>
<td>Lisa Lee</td>
<td>300</td>
</tr>
<tr>
<td>Chris Premanandan</td>
<td>20</td>
</tr>
<tr>
<td>Po-Yin Yen</td>
<td>30</td>
</tr>
<tr>
<td>Daniel Jensen</td>
<td>40</td>
</tr>
<tr>
<td>Vinny Balzano</td>
<td>130</td>
</tr>
<tr>
<td>Katherine Fisher</td>
<td>20</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>540</strong></td>
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Approximate total cost (not including LT staff time):

<table>
<thead>
<tr>
<th>Resource</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web developer</td>
<td>$5,000</td>
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<tr>
<td>IT support</td>
<td>$3,713</td>
</tr>
<tr>
<td>Collaborator release time</td>
<td>$4,624</td>
</tr>
<tr>
<td>Software Purchase</td>
<td>$500</td>
</tr>
<tr>
<td>Undergraduate assistants</td>
<td>$2,000</td>
</tr>
<tr>
<td>Project release time</td>
<td>$3,000</td>
</tr>
<tr>
<td>Histology images, processing, lab equipment</td>
<td>$5,000</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$25,837</strong></td>
</tr>
</tbody>
</table>

Impact Grant outcome summary:

- Course scores were not significantly different in the technology-enhanced section.
- The instructor spent significantly less time covering laboratory material both in class and physical lab.
- Graduate students reported greater preference for using the virtual laboratory rather than the physical laboratory.
  - Common reasons included easier access, better quality of tissue images, efficient use of time, conducive to team based learning, and so on.
- 1,879 unique visitors studied the [http://histology.osumc.edu](http://histology.osumc.edu) virtual lab site during Autumn Quarter 2011, with 10,822 page views and an average time spent of 4:33.
- A majority of students preferred a customizable course, allowing for stand-alone, hybrid, and in-person lessons.
Learning Technology Research

Data from surveys, focus groups, other pilot-specific feedback:
In an attempt to construct the most effective stand-alone histology course, we have conducted a series of interviews and focus groups with graduate and dental students. The results of the study revealed a number of features students expect that are in line with the Quality Matters standards. More importantly, we have identified features to implement in the course to meet specific QM standards that were difficult to achieve, due to the visual and interactive nature of a histology course.

Most first year dental anatomy students positively received the future histology course online modules. A few students expressed the online video modules may be better suited as an ancillary resource to the face-to-face lectures, while some students stated they would prefer to access online modules to in-class lectures. Based on this feedback, it appears that a customizable course—stand-alone, hybrid, and in-person—is a good option.

Data from attendance, mean GPA, and other course indicators to comparator sections or historical data:
Preliminary data analyses comparing histology practical scores between dental students who had access to virtual histology lab vs. those who didn't, reveal that there was not a significant performance improvement. However, the instructor has spent significantly less time with the laboratory material both in class and in the physical lab. Graduate students also reported a preference for utilizing the virtual laboratory rather than the physical laboratory, citing easier access, better quality of tissue images, efficient use of time, and similar features. More detailed analyses of students' feedback and course performance are in preparation for peer-reviewed publication.

The Impact Grant Process

Reflections on the grant process – what went well:
• The process of web development for the virtual histology laboratory surpassed my expectations. The level of support, expertise, communication, and education the LT team provided were superb!
• Identifying useful resources and personnel for online course design was extremely helpful.

Reflections on the grant process – what did not go well:
• The main roadblock was my time. I was assigned an additional teaching load during spring quarter, which was a huge hit on the time I could devote to the project. As a result, the online course was not completed, and we could only test a small portion of it.
Server space and IT support for the virtual histology webpage was an issue. There was a disconnect between the time promised and the time available to work through administrative privileges for the server space and ongoing local support to maintain, update, and secure the virtual histology webpage.
  o Note, midway through the project, the Department of Biomedical Informatics provided designated server space and administrative access to host the virtual histology laboratory.

Authentication issue involving granting access to course materials to only those students enrolled in class. Unfortunately, this issue remained unresolved for several reasons:
  o Difficulty facilitating communication between the OSU main campus and OSUMC networking personnel.
  o Limited time designated to solve this issue.
  o Limited understanding about Shibboleth.
  o PI had limited time to follow up and push for resolution.

Suggestions for future recipients:
Ensure a firm commitment from the department unit for faculty release time.

A-ha moment of the grant process:
The day when the virtual histology laboratory website was launched. It was the day that the website I envisioned for the past 3 years came to realization. I had an epiphany that the rest of the grant project would be a challenge but it too could come to realization...that it would require even greater teamwork and persistent efforts.

Next steps:
  • Winter quarter: completion of the online histology course
  • Spring quarter: pilot studying the online histology course as a completely online section in Anatomy 700 (graduate histology)

Working with LT staff:
In three words:
  1. Enlightening
  2. Fun
  3. Supportive
Evaluation of working with LT staff during the grant project (Strongly Agree to Strongly Disagree):

1) I am satisfied with the communication I received from the LT staff.
   a. **Strongly Agree**

2) I am satisfied with the project contributions I received from the LT staff.
   a. **Strongly Agree**

3) I have learned the skills necessary to continue related work on my own.
   a. **Agree**

4) I found the LT staff approachable.
   a. **Strongly Agree**

5) The lessons learned during this pilot will guide future course design.
   a. **Strongly Agree**

6) Additional comments or feedback

   Thank you so much for everything!

**Chair Statement of Impact**

Statement of Impact Letter from Deb Larsen is forthcoming.
LT Involvement

LT Project lead
Robert Griffiths

Approximate time spent by LT staff on the revision project:
170 hours

- Cindy Gray (Digital Union) spent considerable time (60 hours) on web design and construction work.

Reflections on the grant process – what went well:
Lisa Lee was a joy to work with because she has great passion for teaching and a wonderful sense of humor that made it easy to share ideas and train her and her team on the relevant technology. Our skills complemented each other very nicely in that her team had grand ideas that put our skills to the test, but we brought project management and technical skills that helped focus the project and make it a reality. Further, we’ve had more consultations and project areas from the Medical Center due to the exposure of our work in that area of campus.

Reflections on the grant process – what did not go well:
The technical requirements of the original vision were too great to overcome during the timeline of the grant. As a result, we were only able to make the public facing website as a general resource whereas the original plans had an augmented, secure site that was linked in with Carmen to provide tuition-paying students more access.

There were two main issues. First, there was miscommunication about the support available from the local tech support group. More support was originally offered than was actually available due to competing priorities and limited resources. Second, local technical support did not have the experience, time, or expertise to resolve competing security credentials (those the Medical Center uses and those used by the rest of the university).

A lot of energy and resources were expended to keep the security conversations going, but ultimately the problems could not be resolved within the project timeframe. In hindsight, the effort to build an authenticated site in addition to the public facing site should have been a phase two attempt.

Also, communication between Anatomy and Learning Technology became more infrequent midway through the project when Lisa took on an additional teaching load that was not anticipated. This impacted our available time to work through the entire online course components. Instead, we did create templates for modules, produce graphically based quizzes, and integrate the Virtual Histology lab into Carmen. Further, Lisa recorded and streamed several video lessons to pilot. This work allows her and her team to follow the templates for the remaining lessons.
One of the main problems we had to overcome was that some of the programs necessary for student work required Internet Explorer 7, which put us to the test to make the website accessible from a wide range of browsers.

**Working with the Anatomy (Histology) team:**

In three words:

1. Challenging
2. Satisfying
3. Fun

**Changes to OCIO processes from this grant experience:**

This grant was a great opportunity to become better collaborative partners with faculty and staff from around the Medical Center. We have since had more grant applications from OSUMC units, as well as more consults and conversations. We have become more sensitive to the type of security restrictions and issues that apply in learning spaces over there, as well.

In all, we made better connections and relationships as we strive toward One University and simplicity in what we do. We now better understand where our services integrate and where we have more work to do.