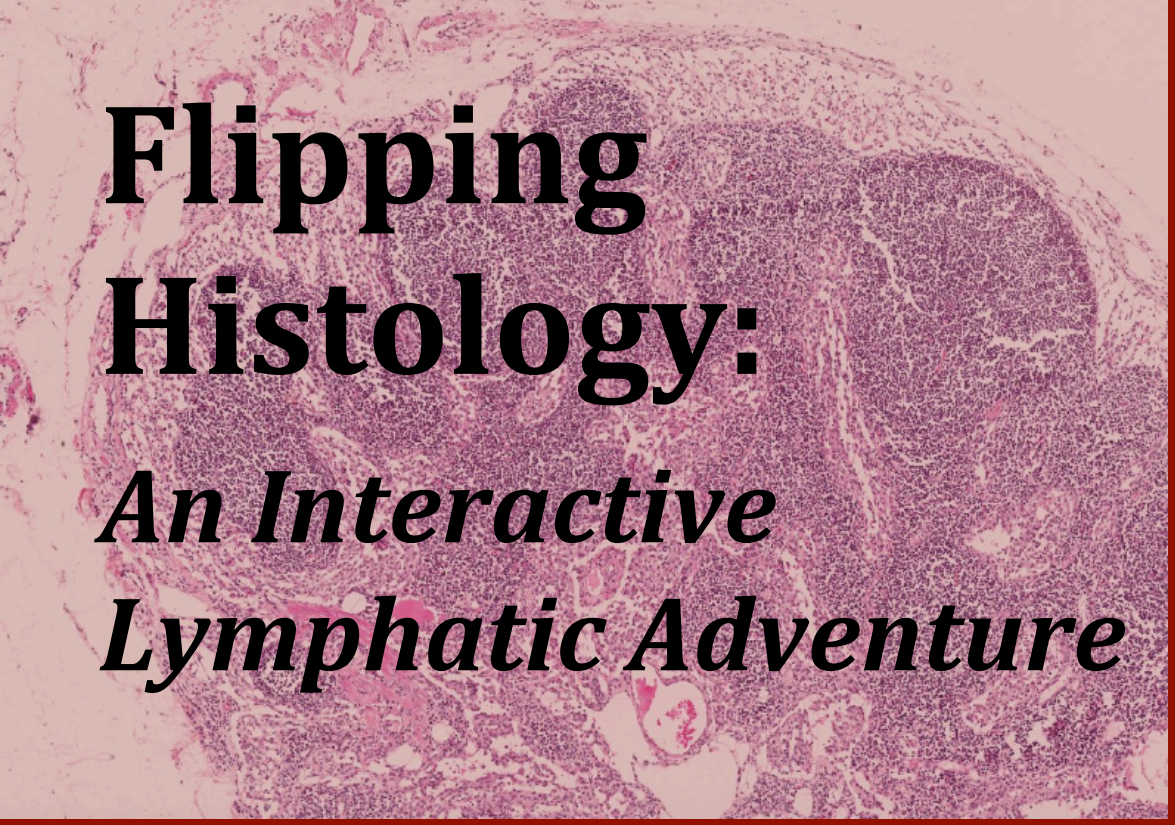


Flipping Histology:

An Interactive Lymphatic Adventure

Barbie Klein, M.S.

barbklei@indiana.edu

mybrainonanatomy.com

SCHOOL OF MEDICINE

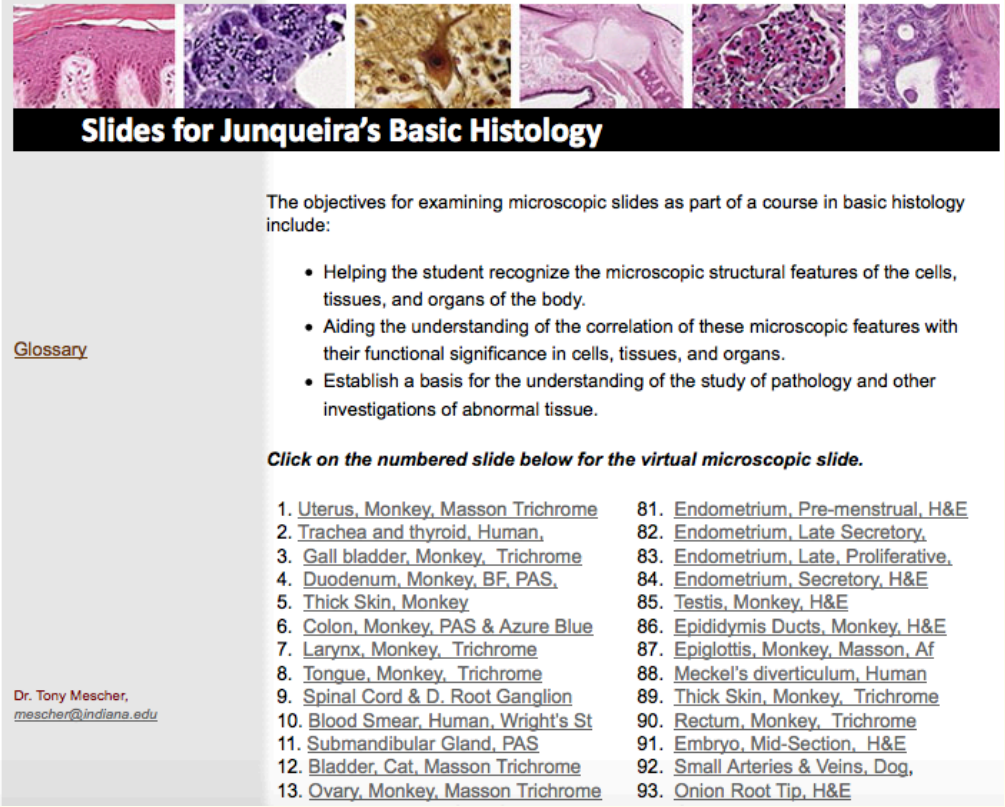
INDIANA UNIVERSITY

Fall 2014

Course – 500-level
Cell Biology and Histology

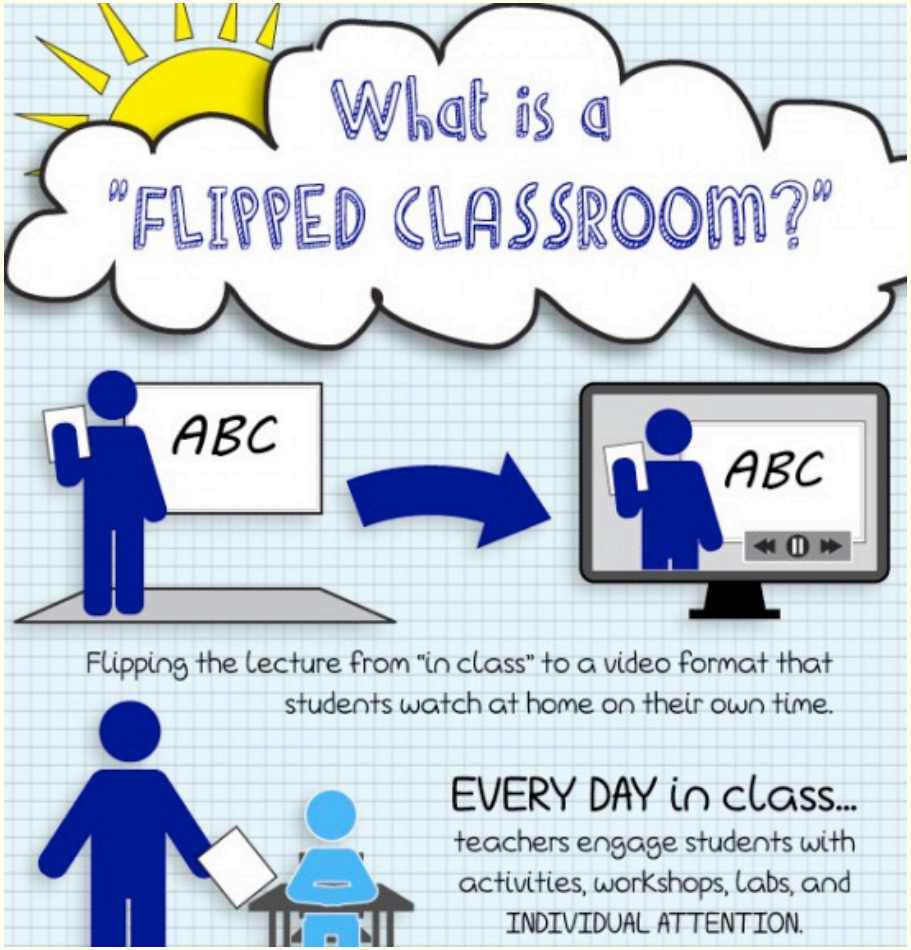
Class size – 41 students
(36 medical, 5 graduate)

Mode of teaching –
lecture and laboratory



Intervention – lymphatic system taught as a flipped class using a Team-Based Learning (TBL) model

...to flip a class!



http://elearninginfographics.com/what-is-a-flipped-classroom-infographic-plus-the-educator-guide-to-flipped-classroom/

Flipping the Classroom: Explained
https://www.youtube.com/watch?v=iQWvc6qhTds

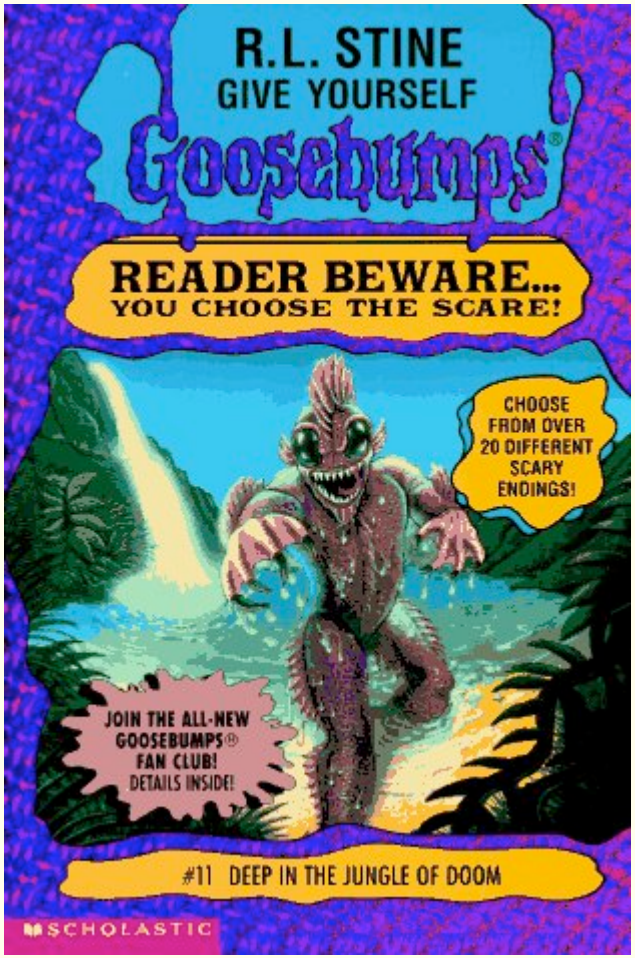
Flip Creation

1) Started with course objectives

2) Inspired by "choose-your-own-adventure" Goosebumps books
   - Created 3 hyperlinked text documents – each case was constructed as a clickable adventure guiding students through a story of questions based on learning objectives and prior coursework

3) Each case featured a different lymphatic organ

4) Each case included a variety of questions (multiple-choice, fill-in-the-blank, histology scavenger hunt, labeling)

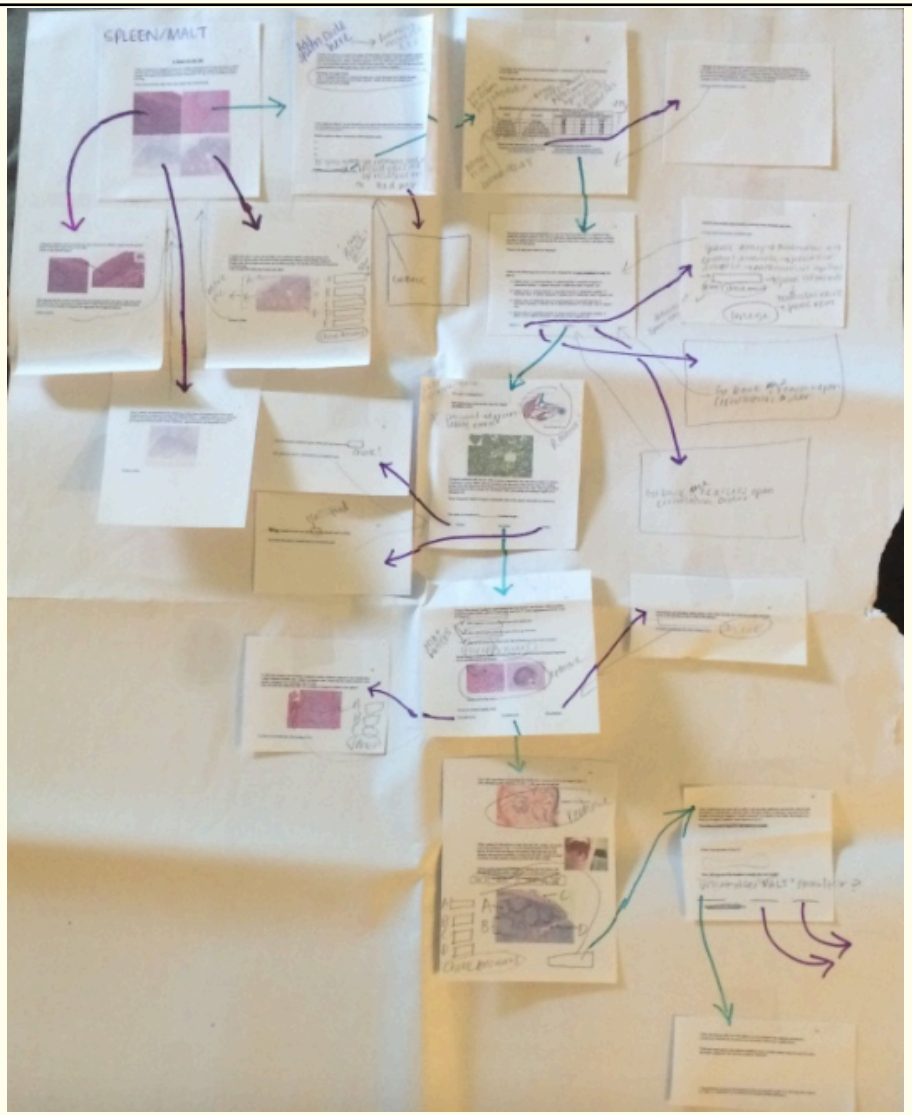


"It is not surprising that students are driven by assessment and report mock examinations as an effective way of learning." Smith et. al 2014
The context of learning anatomy - does it make a difference?

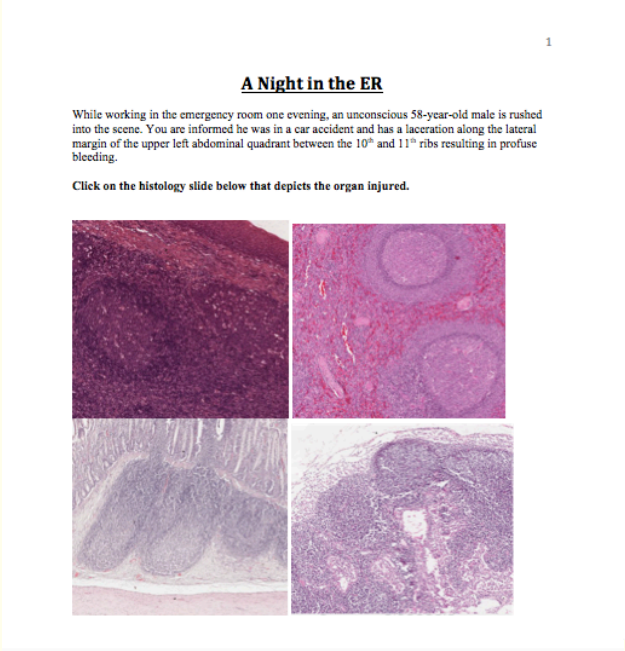
A flow diagram of each question

A Night in the ER Case

- Different colored arrows direct to incorrect (purple) and correct (green) answers
- Students work their way through the case with their choices affecting what they subsequently encounter
- A hyperlink at the end brings them back to the beginning to play again & encourages to click on wrong answers for additional questions



It's Alive!

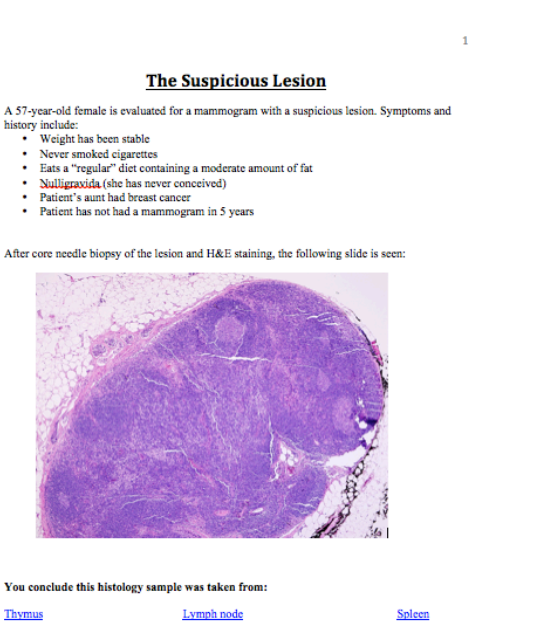


A Night in the ER

While working in the emergency room one evening, an unconscious 58-year-old male is rushed into the scene. You are informed he was in a car accident and has a laceration along the lateral margin of the upper left abdominal quadrant between the 10th and 11th ribs resulting in profuse bleeding.

Click on the histology slide below that depicts the organ injured.

A Night in the ER (Spleen and MALT)



The Suspicious Lesion

A 57-year-old female is evaluated for a mammogram with a suspicious lesion. Symptoms and history include:

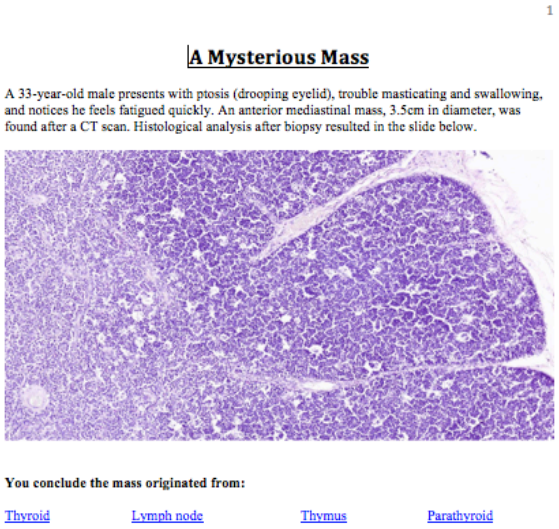
- Weight has been stable
- Never smoked cigarettes
- Eats a "regular" diet containing a moderate amount of fat
- Nulligravida (she has never conceived)
- Patient's aunt had breast cancer
- Patient has not had a mammogram in 5 years

After core needle biopsy of the lesion and H&E staining, the following slide is seen:

You conclude this histology sample was taken from:

Thymus Lymph node Spleen

The Suspicious Lesion (Lymph nodes)



A Mysterious Mass

A 33-year-old male presents with ptosis (drooping eyelid), trouble masticating and swallowing, and notices he feels fatigued quickly. An anterior mediastinal mass, 3.5cm in diameter, was found after a CT scan. Histological analysis after biopsy resulted in the slide below.

You conclude the mass originated from:

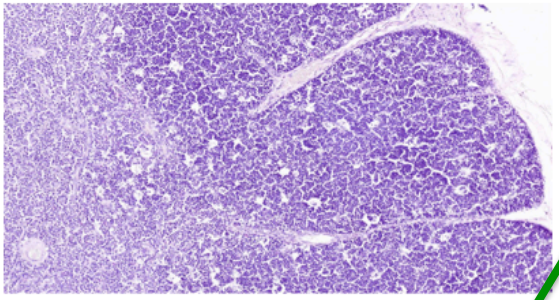
Thyroid Lymph node Thymus Parathyroid

A Mysterious Mass (Thymus)

1

A Mysterious Mass

A 33-year-old male presents with ptosis (drooping eyelid), trouble masticating and swallowing, and notices he feels fatigued quickly. An anterior mediastinal mass, 3.5cm in diameter, was found after a CT scan. Histological analysis after biopsy resulted in the slide below.

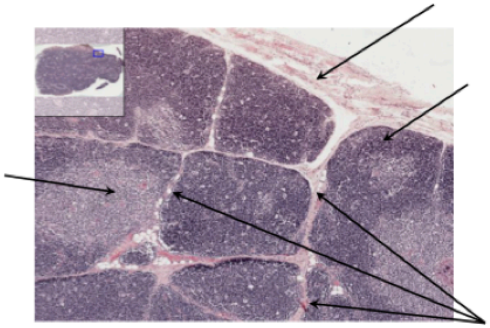


You conclude the mass originated from:

Thyroid | Lymph node | Thymus | Parathyroid

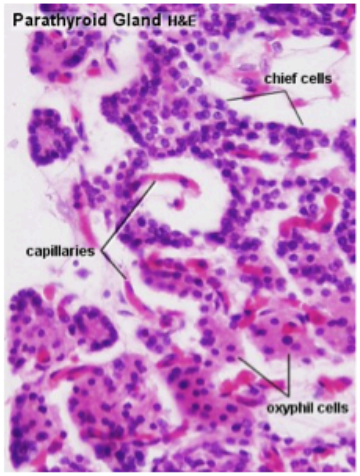
Correct! The thymus has a thin capsule that extends CT septa into the parenchyma separating the cortex and medulla into incomplete lobules.

Can you label the following thymus slide?



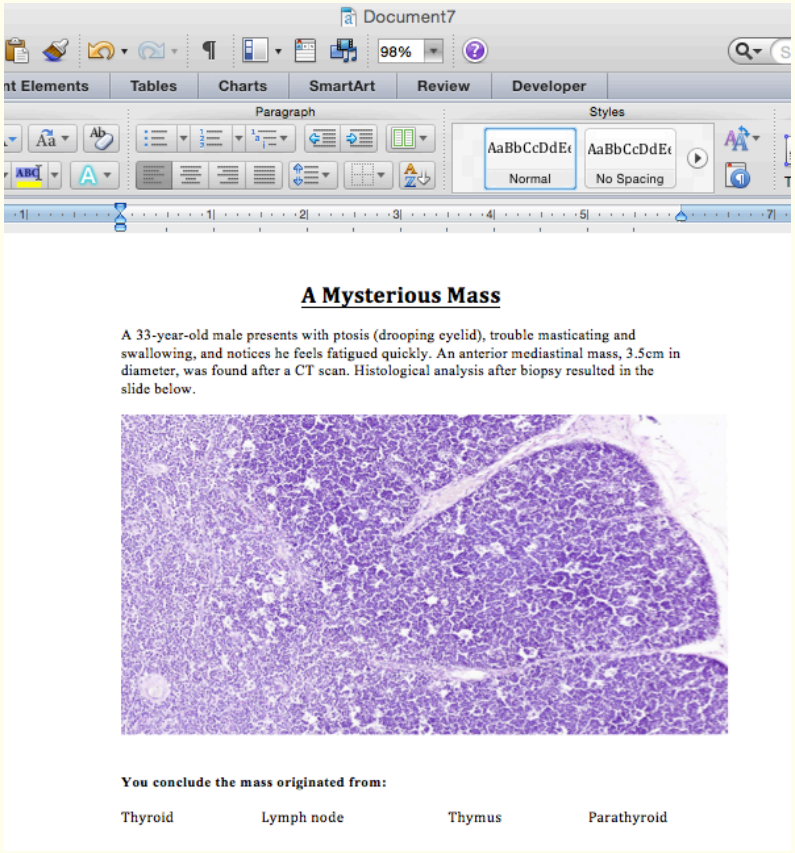
Parathyroid glands also have a connective tissue capsule that extends septa into the gland like the patient's slide exhibits. However, the parathyroid glands consist of densely packed clusters of *principal (chief) cells* that secrete *parathyroid hormone* in response to decreased blood calcium levels.

PTH binds receptors on osteoblasts. What paracrine factor is secreted by osteoblasts that stimulate osteoclasts?

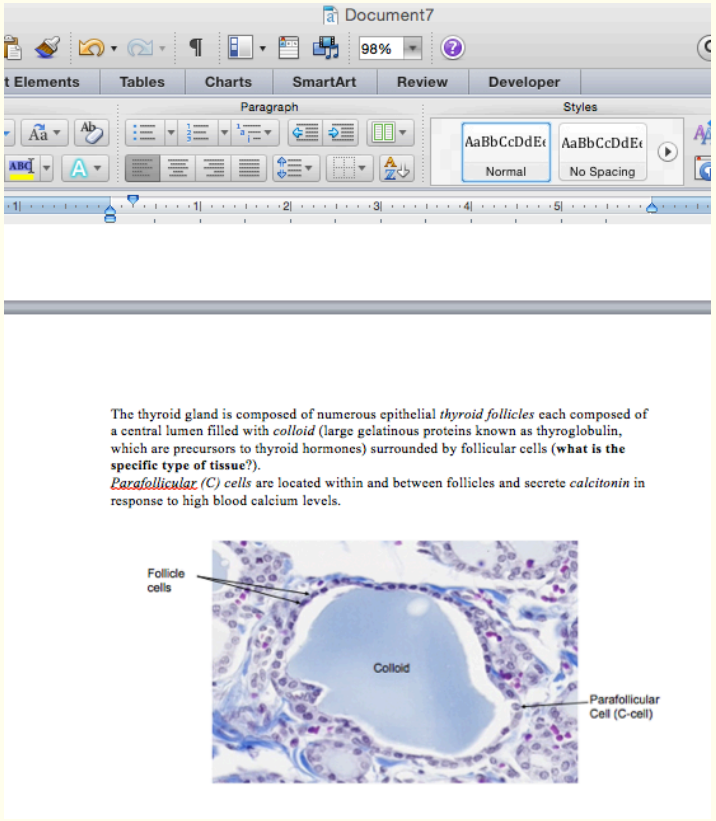


Return to investigate the slide from the mysterious mediastinal mass

Show Me How! Microsoft Word (Mac version 2011)

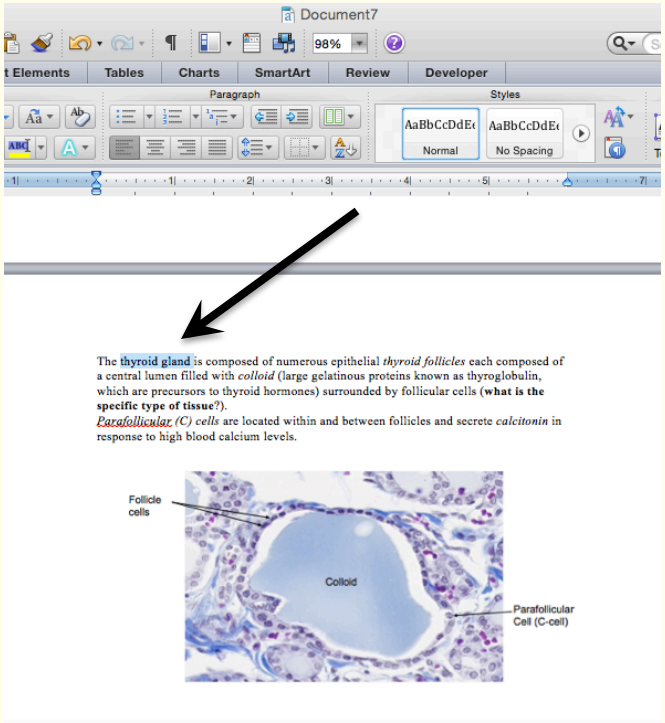


1.) Create first page with questions

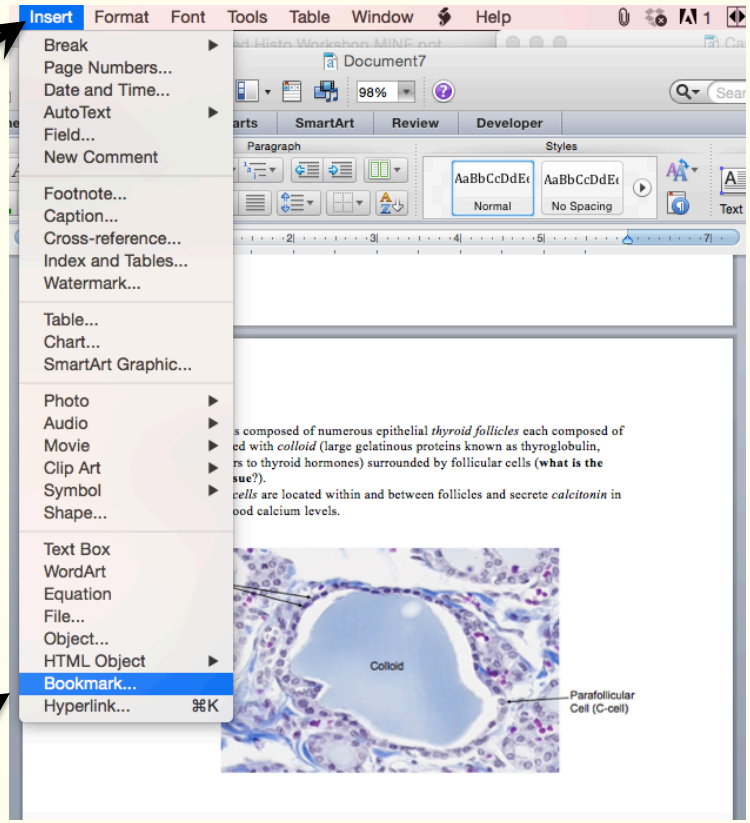


2.) Create a separate page for each answer

Show Me How! Microsoft Word

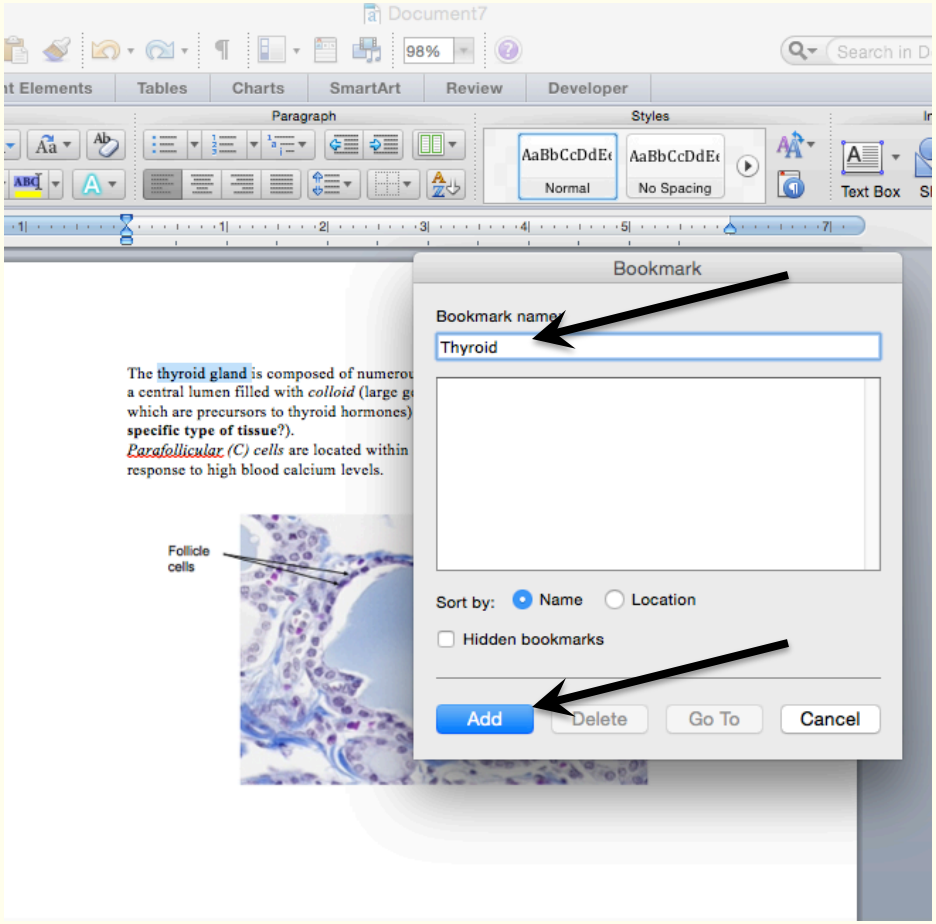


3.) Highlight the text within the answer page you wish to bookmark (this will be the destination for the future hyperlink)



4.) Click 'Insert" and scroll down to "Bookmark"

Show Me How! Microsoft Word

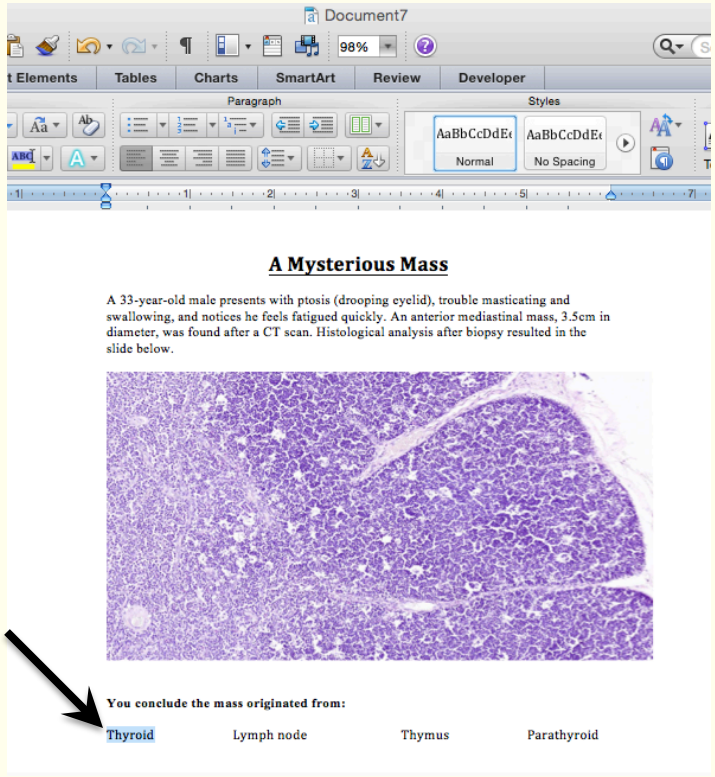


5.) Name the bookmark then click "Add"

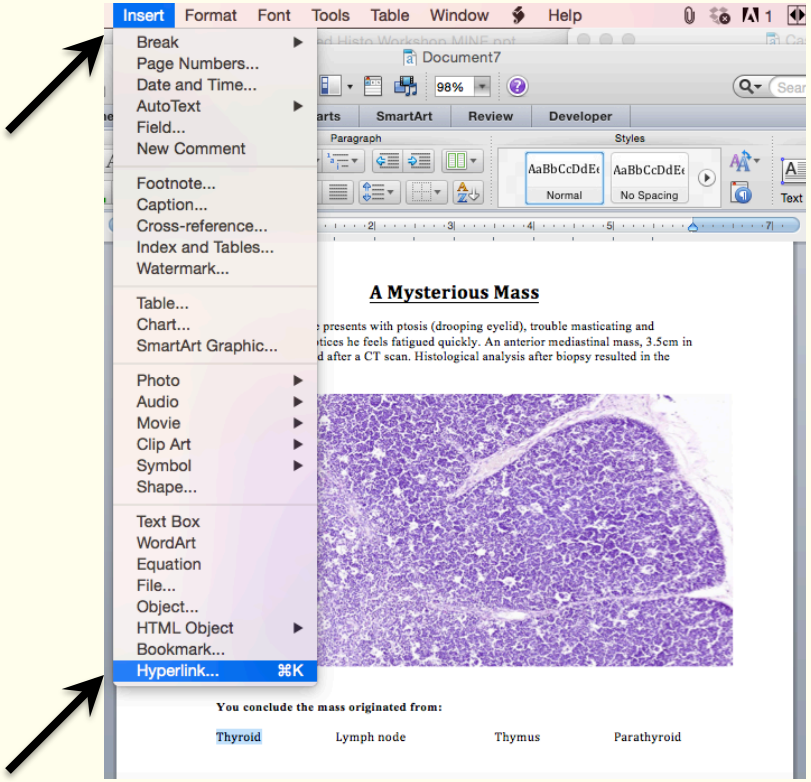
Note: For multi-word labels do not include spaces, for example Thyroid Gland = ThyroidGland

Tip: Be specific and exact with your Bookmark labels. They can accumulated as you continue creating your adventure!

Show Me How! Microsoft Word

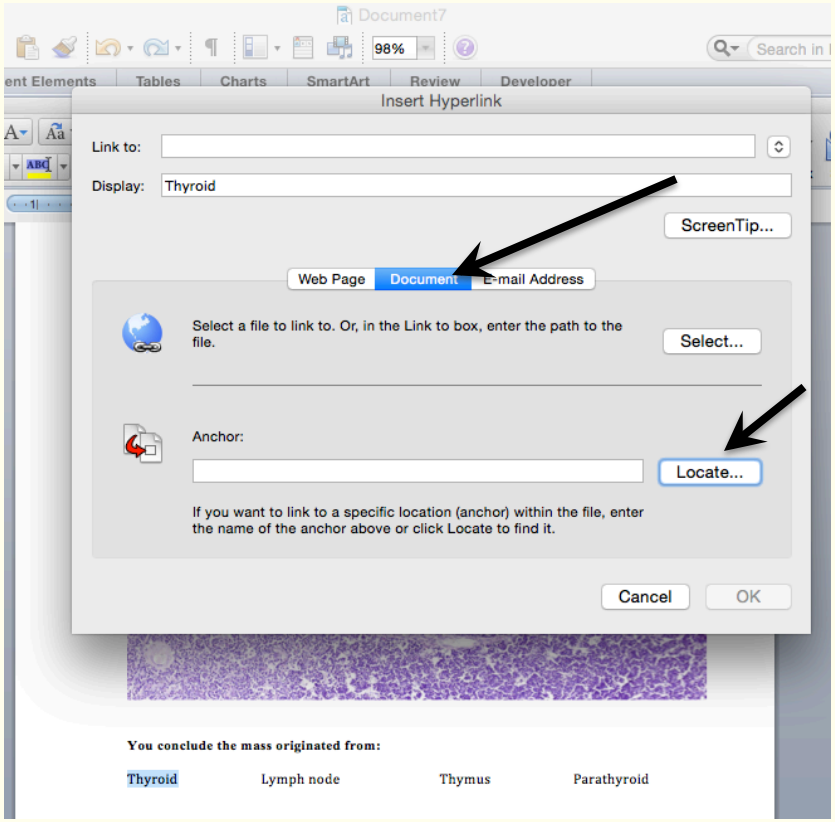


6.) Return to original question page and highlight the text corresponding to the bookmarked answer

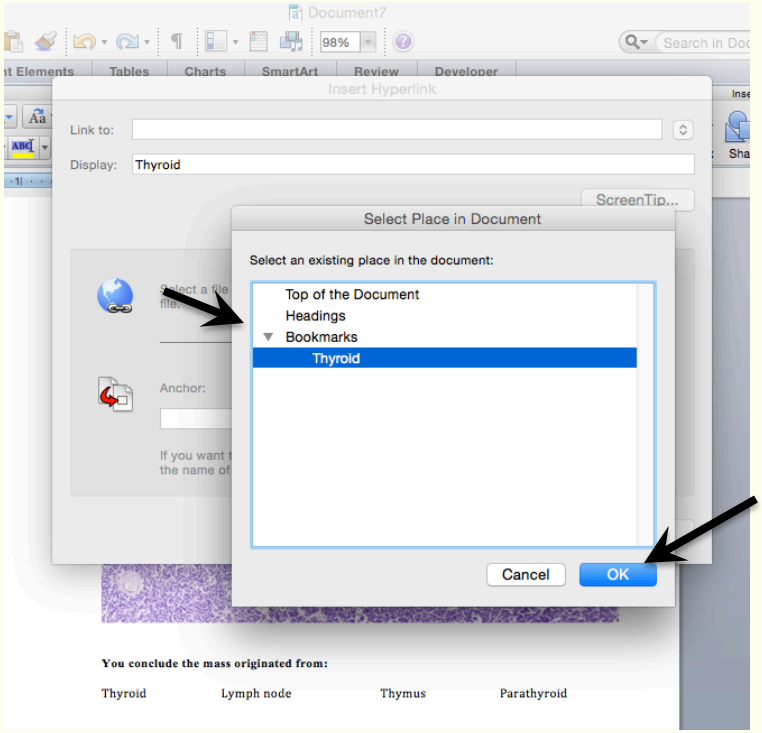


7.) Click the “Insert” and scroll down to “Hyperlink”

Show Me How! Microsoft Word

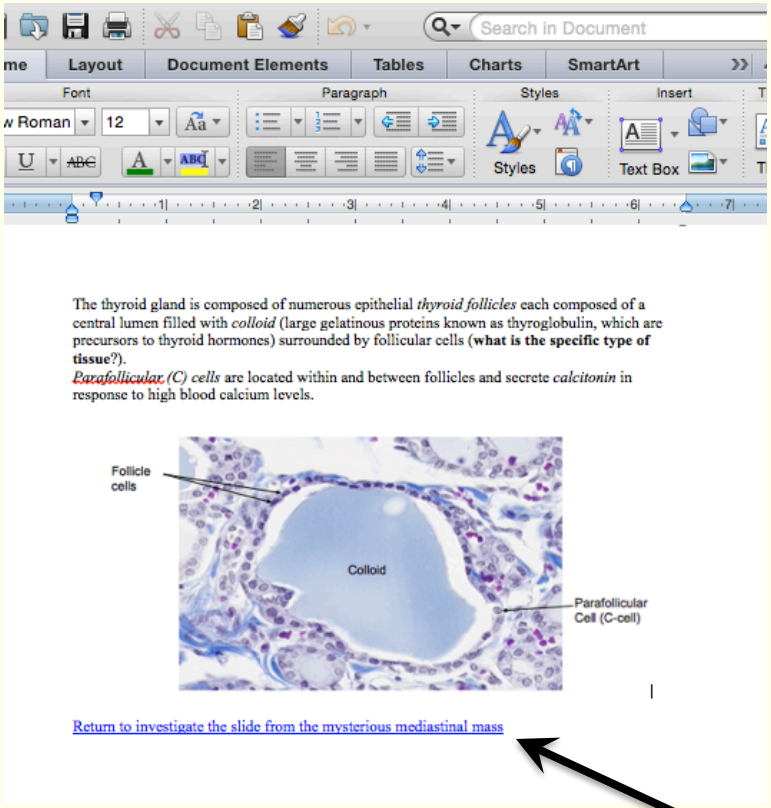


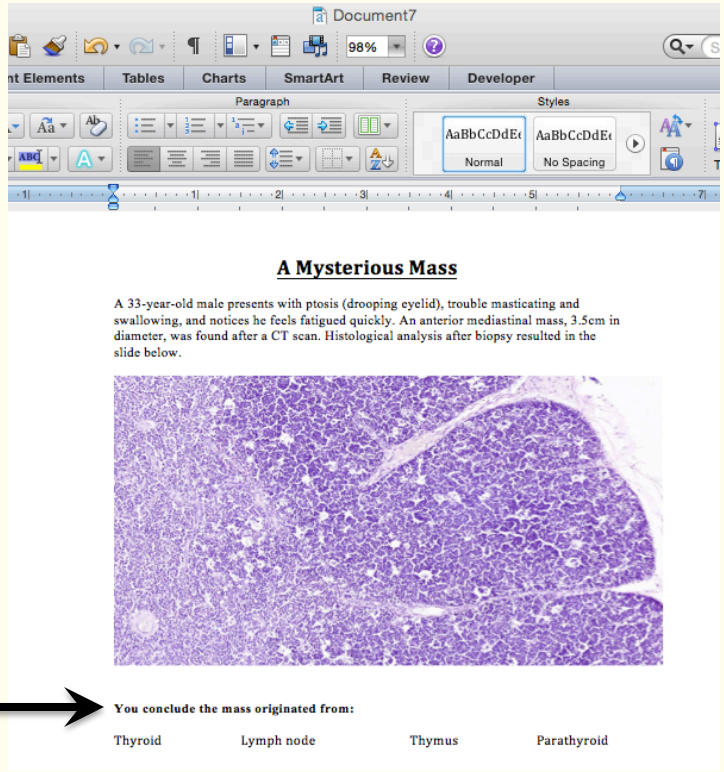
8.) Click the "Document" then click "Locate"



9.) Click the small arrow next to Bookmarks then find and click on the appropriate one and click "OK"

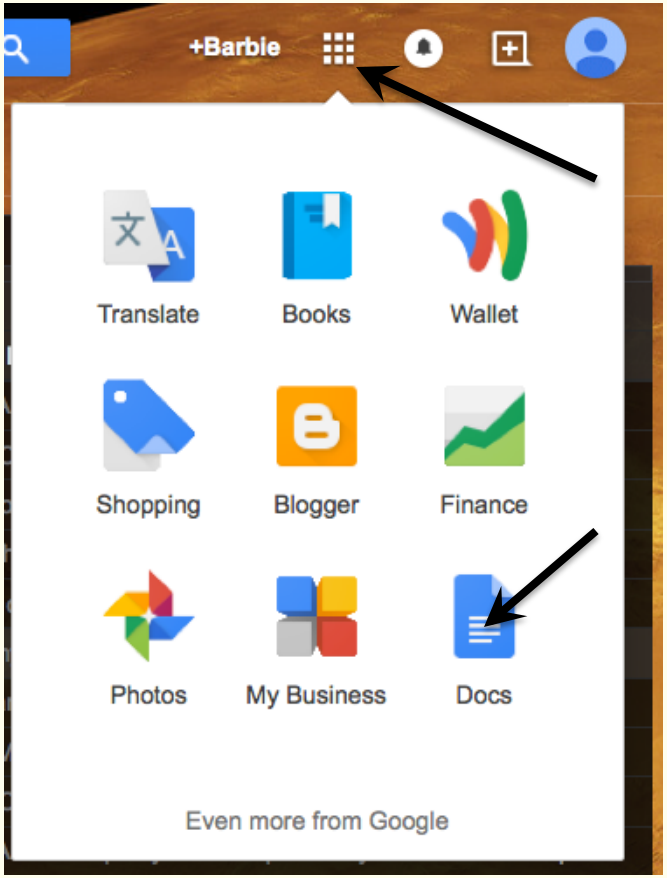
Show Me How! Microsoft Word



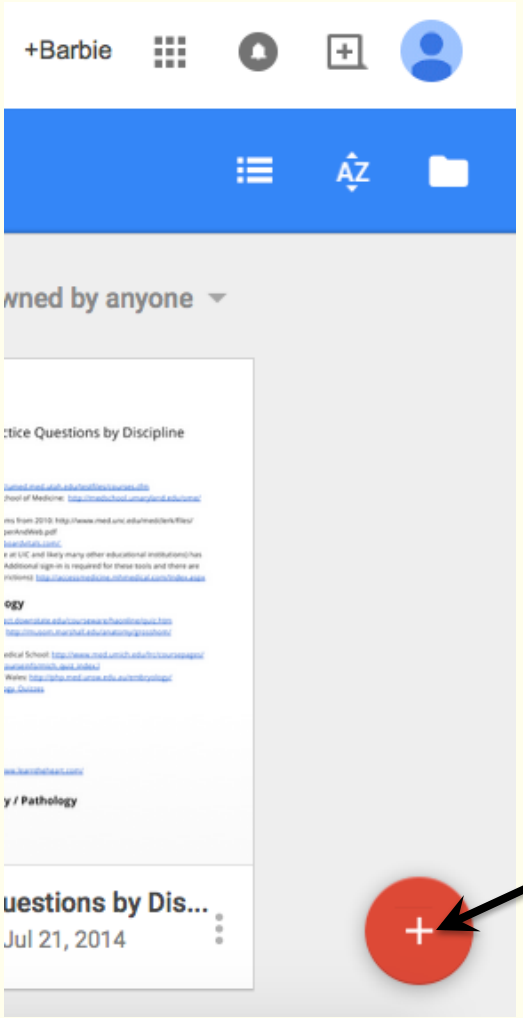


Don't forget to create a return hyperlink for students to go back to the original question

Show Me How! Google Docs

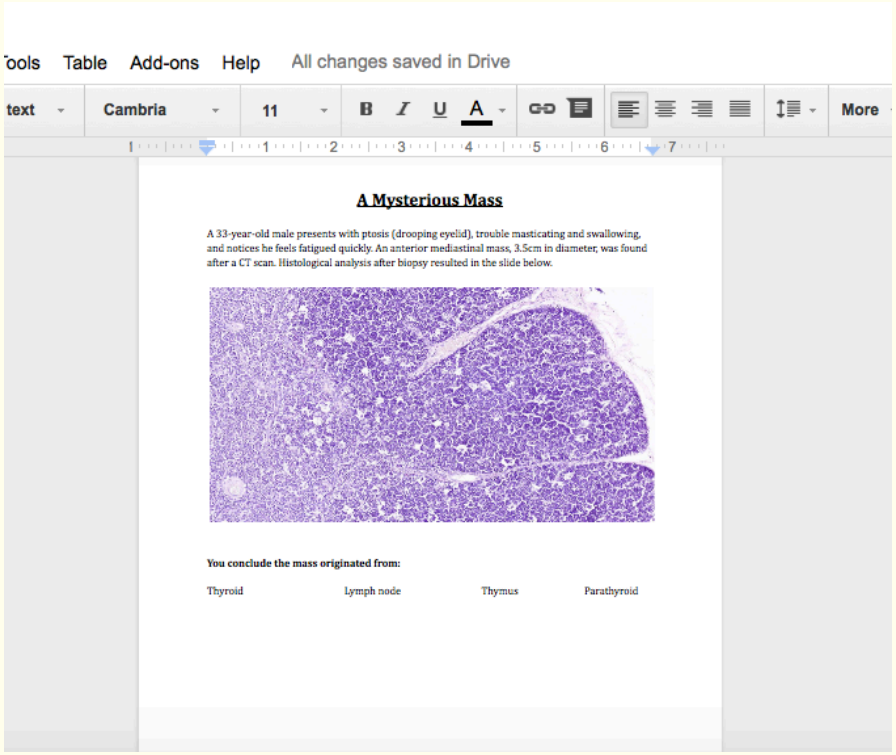


1.) Click the "Apps" icon then click Docs

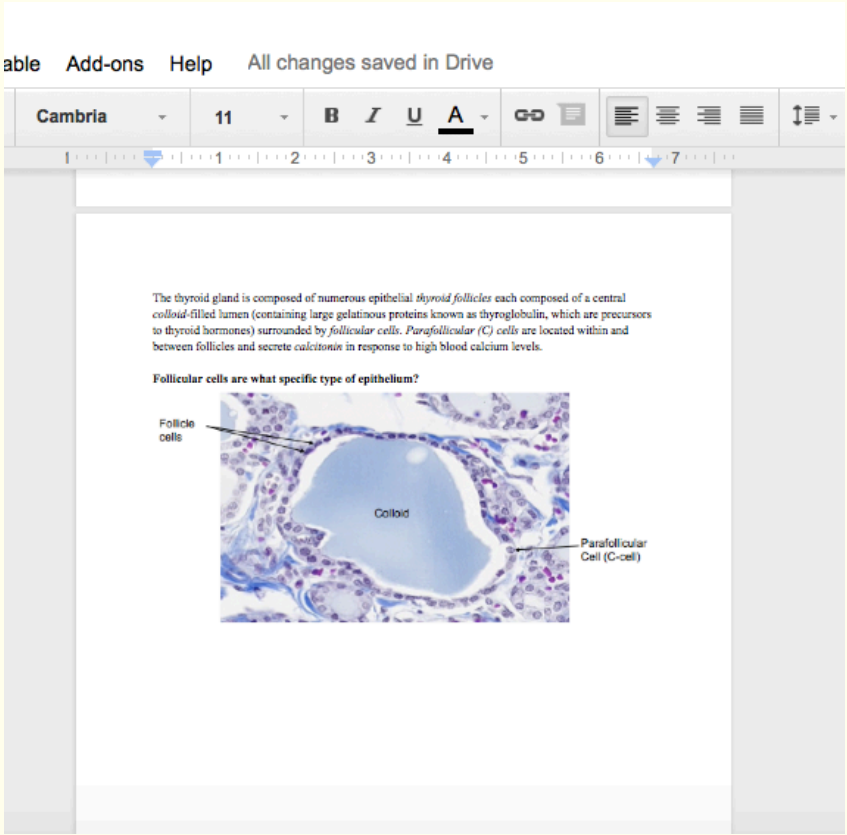


2.) Click New Doc button

Show Me How! Google Docs

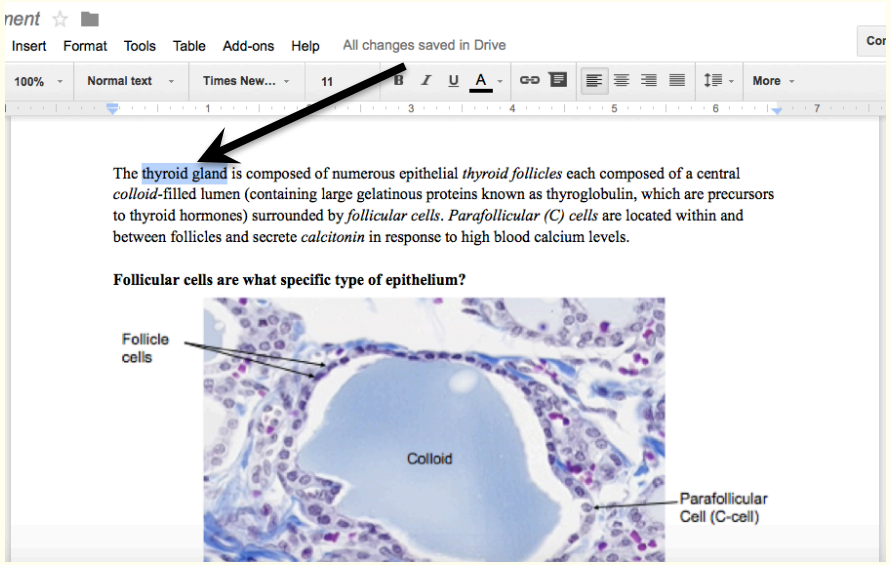


3.) Create first page with questions

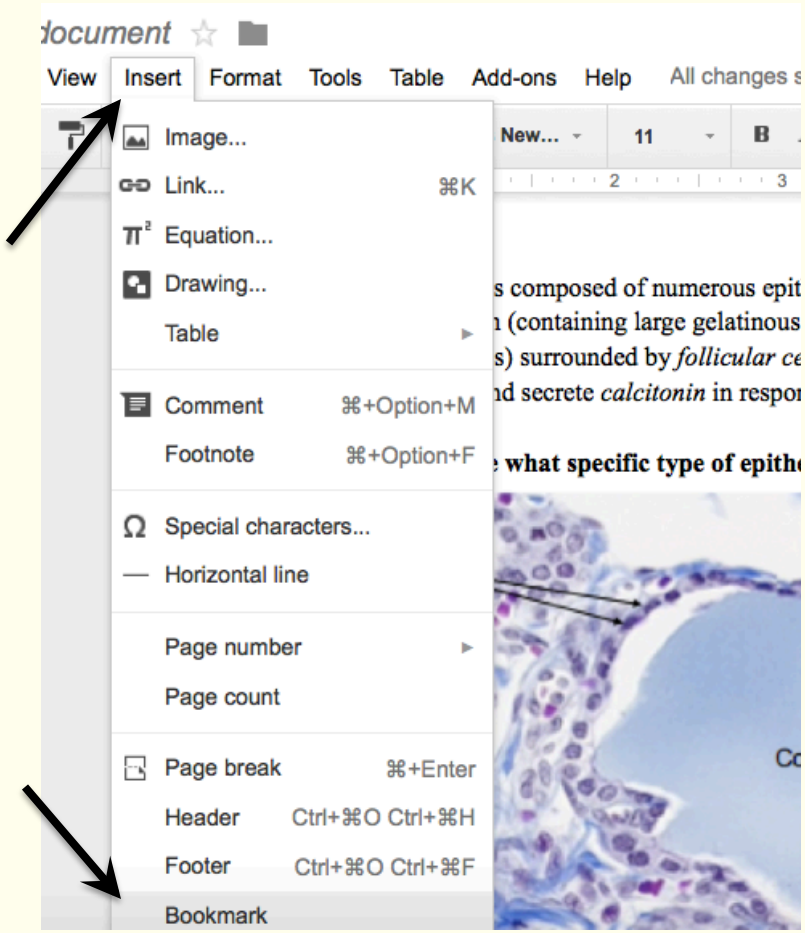


4.) Create a separate page for each answer

Show Me How! Google Docs

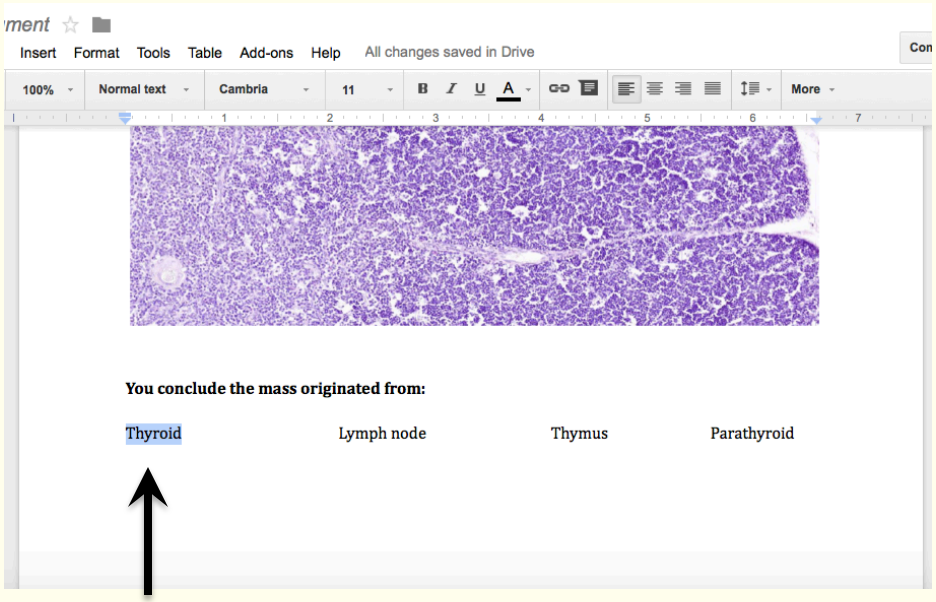


5.) Highlight the text within the answer page you wish to bookmark (this will be the destination for the future hyperlink)

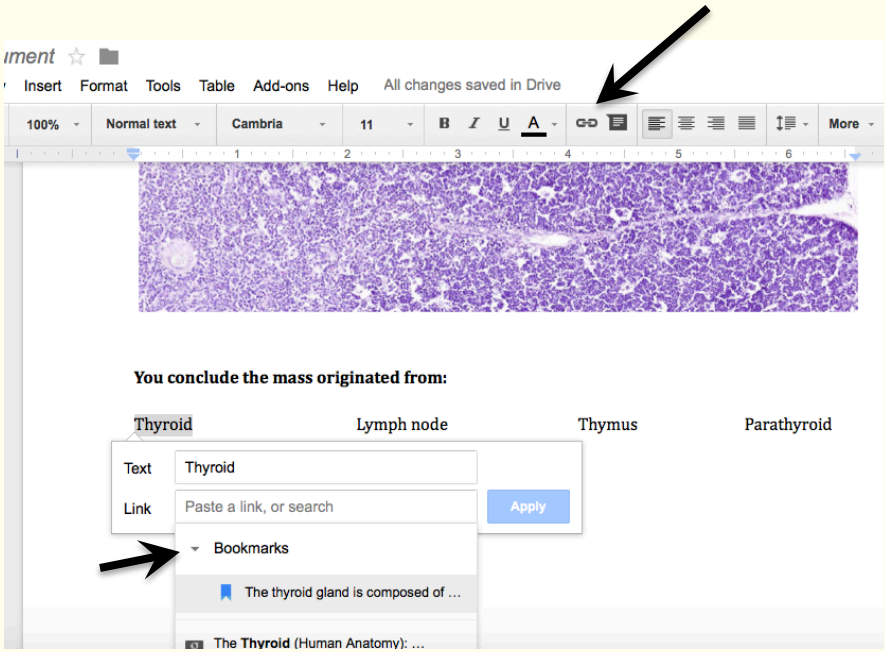


6.) Click 'Insert" and scroll down to "Bookmark"

Show Me How! Google Docs



7.) Return to original question page and highlight the text corresponding to the bookmarked answer



8.) Click the “Insert link” button (or click the “Insert” tab then click “Link”)
Click “Bookmarks” in the drop-down menu then find your bookmark and click “Apply”

Web-based Cases

- Visit **mybrainonanatomy.com**

- Find access to:
  - ✓ Learning objectives
  - ✓ Pre-test
  - ✓ Clinical cases
  - ✓ Case references and more information about flipped classes
  - ✓ HAPS 2015 Conference presentation

The Day of the Flip

Preparation – students were asked to:

- watch a podcast (traditional lecture recorded from last year)
- review a presentation of laboratory terms
- read an assigned chapter (Junqueira, 13th edition)

41 (graduate + medical students) assigned groups (6 per group, 1 group with 5)

IRAT/GRAT – class began with a 5-question multiple-choice online quiz followed by small group discussions about the quiz questions

Interactive clinical cases – assigned groups completed one of three clinical cases. They were encouraged to start another case once finished with their own

Wrap up – final class-wide discussion of the cases and any other questions

For the future:

*Make my own podcast: Captivate, Notability, Educreations

*Let groups choose their adventures

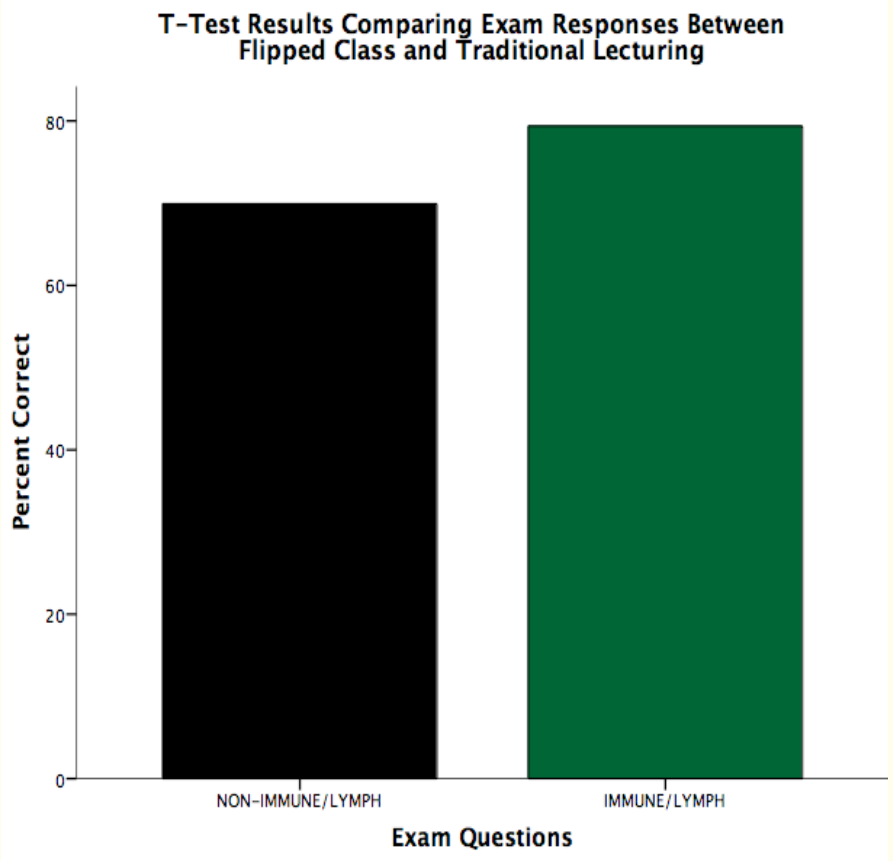
*Smaller groups & emphasize to use each other during the GRAT (no textbooks/notes)

Flipping = Better Exam Performance!

...but no statistically significant difference in test scores based on an independent samples t-test (p = .061)

- **Flipped Question Mean** = 0.79
- **Non-flipped Question Mean** = 0.70

Total Number of Exam Questions = 47
- 8 Immune/lymph questions
- 39 Non-immune/lymph questions



Survey Says!

Response rate = 58.5% (24/41)

- Anonymous, voluntary 12-item questionnaire
- 6 Likert scale questions (each with an optional free response section)
- 3 Yes/No questions regarding the assigned material
- 3 open-ended response questions: what did you like most, dislike, and what to improve

The Good

- Most respondents enjoyed the **interactive clinical cases**, with 83% agreeing that they improved their learning
- Several commented that they enjoyed the **investigative design** of the cases and liked **collaborating** with classmates
- **Learning from incorrect answers** with additional questions and explanation was a popular feature of the cases

The Bad

Frequent negative comments included:

- **General dislike** for anything other than traditional lectures
- The **amount of preparation** required to obtain the most benefit from the flip
- The **length** of the flipped class (~2.5 hours)

Qualitative Response Code		Positive	Neutral	Negative
# of Responses		6	13	5
Exemplary Quote		*"It was something different, better than being lectured at"*	*"I didn't really dislike anything, simply prefer traditional lectures."*	*"it takes too much work/time to prepare for them"*
Preparation	Watched Podcast	67%	69%	60%
	Read Chapter	50%	23%	40%
	Viewed Lab Presentation	67%	69%	80%

The design of the flipped class may have a large impact on student perceptions.

They want:

- Efficiency
- Fun/creative activity

Try to balance:

- Requirement to learn the material
- Everyone is at different levels
- Preference for traditional lectures

Working Toward a Flipped Formula

How to create a fun, creative activity while still being efficient.

- ✓ **Be transparent** – inform students about what a flipped class is and the reason you are incorporating this style of instruction
- ✓ **Provide a pre-class worksheet** – a pre-class assignment will focus students' preparatory studying and aid in alleviating cognitive overload
- ✓ **Be efficient** – set time limits to complete activities to keep students on task
- ✓ **Incorporate mini-lectures** – to clarify confusing or complex topics
- ✓ **Give students freedom** – providing options for students and a sense of personal control is more likely to motivate them for learning
- ✓ **Add a graded component** – not too low-stakes so that students realize it doesn't really count for much, however not too high-stakes preventing students from enjoying the flipped class and the discovery element of the learning process

Working Toward a Flipped Formula

How to create a fun, creative activity while still being efficient.

✓ **Be transparent** – inform students about what a flipped class is and the reason you are incorporating this style of instruction

- ❑ Assign an intro video
- ❑ Provide research-based evidence for flipping

"Maybe a little more information on the front end. I guess I was sort of confused about what exactly a flipped class was…"

Dr. Jeff Kraakevik explained that providing some kind of introduction or preparatory material can ease the integration of the flip activity, "One student liked how there was defined and pre-presented content for the team-based learning session, as that allowed more efficient preparation for the session."

"…instructors who attempt to revolutionize teaching with new methods or techniques may find that they are only frustrating the needs and expectations their students have developed in the culture of the college. So, if you are trying something new, be sure that students understand why the new method is likely to be valuable."
McKeachie, p. 4

Working Toward a Flipped Formula

How to create a fun, creative activity while still being efficient.

- ✓ **Provide a pre-class worksheet** – an assignment due at the beginning of the flip can focus students' preparatory studying and aid in alleviating cognitive overload
  - ❑ 1-2 page assignment?
  - ❑ Concept map?

"I enjoyed the flipped class, but it was somewhat hard to prepare for. We had an abundance of resources, so it was hard to pick out the points that were truly important."

Working Toward a Flipped Formula

How to create a fun, creative activity while still being efficient.

- ✓ **Be efficient** – set time limits to complete activities to keep students on task
  - ❑ Use a timer – encourage students to reach a goal within the given time
  - ❑ Use wrong answers for additional questions

"I liked how the hyperlinked document was intrinsically filled with review, especially if you got an answer wrong."

*Another struggle: some groups worked faster than others

Working Toward a Flipped Formula

How to create a fun, creative activity while still being efficient.

- ✓ **Incorporate mini-lectures** – to clarify confusing or complex topics
  - ❑ Stop the activity at intervals to quickly review concepts
  - ❑ Keep the reviews short, sweet, and simple

Nayak explained in *The Broken Lecture: An Innovative Method of Teaching* that students begin to lose concentration and focus after about 20 minutes of lecturing

Working Toward a Flipped Formula

How to create a fun, creative activity while still being efficient.

✓ **Give students freedom** – providing options for students

"Students who have options and a sense of personal control are likely to be more highly motivated for learning." (McKeachie, p. 17)

- ❑ Let groups choose which case to start first rather than assigning them
- ❑ Emphasize everyone is responsible for all cases

Start with synopsis of each case giving them a feel for what they will encounter:

"The Suspicious Lesion"
A 57-year-old female is evaluated for a mammogram with a suspicious lesion…

"A Mysterious Mass"
A 33-year-old male presents with an anterior mediastinal mass…

"A Night in the ER"
While working in the emergency room one evening, an unconscious 58-year-old male is rushed into the scene…

Working Toward a Flipped Formula

How to create a fun, creative activity while still being efficient.

- ✓ **Add a graded component** – not too low-stakes so that students realize it doesn't really count for much, however not too high-stakes preventing students from enjoying the flipped class and the discovery element of the learning process

"Add a grade to it so I am forced to give it my full attention"

"…The problem is when I am allowed to sit and do something that doesn't directly involve my grade I struggle to focus…"

Flipped Day Outline

– Introduction and instruction to navigate to Canvas for quiz (2 minutes)
– Take pre-test (10 minutes)
– Discuss with group and choose letter to hold up for GRAT (5 minutes)
– Go over answers to quiz as a class (13 minutes)

Total time for IRAT/GRAT = 30 minutes

Instruct to navigate to www.mybrainonanatomy.com. As a group select the case that you would like to start with. You have one hour to complete all three clinical cases

Break for 10 minutes

Total time for GAE (group application exercise) = 1 hour 10 minutes

Return to discuss cases as a class. Ask students which cases they want to do first, second, third. Have only the questions that were not given an answer on a PowerPoint to review.

20 minutes per case = 1 hour

Total time for GAE review = 1 hour

Total time for Flip = 2 hours 40 minutes

Optional Questions and Answer period

Acknowledgements

Dr. Valerie O'Loughlin for continued support & inspiration throughout this project *(& my graduate life!)*

Dr. Bauman for reviewing the cases for clinical accuracy

Dr. Mescher for reviewing the cases for inclusion of appropriate histology

Sue Childress *~ a very special thank you ~* for her histology expertise and encouragement

Also, thank you to:

- Lisa Kurz, Principal Instructional Consultant, Center for Innovative Teaching and Learning (CITL)
- The graduate and medical students who participated in and provided valuable feedback about this flipped class experience

IRB Approval: 1409211952

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Thank You!

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