



# ACTIVE LEARNING IS THE HOOK

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**LEARNING  
ELEVATED**

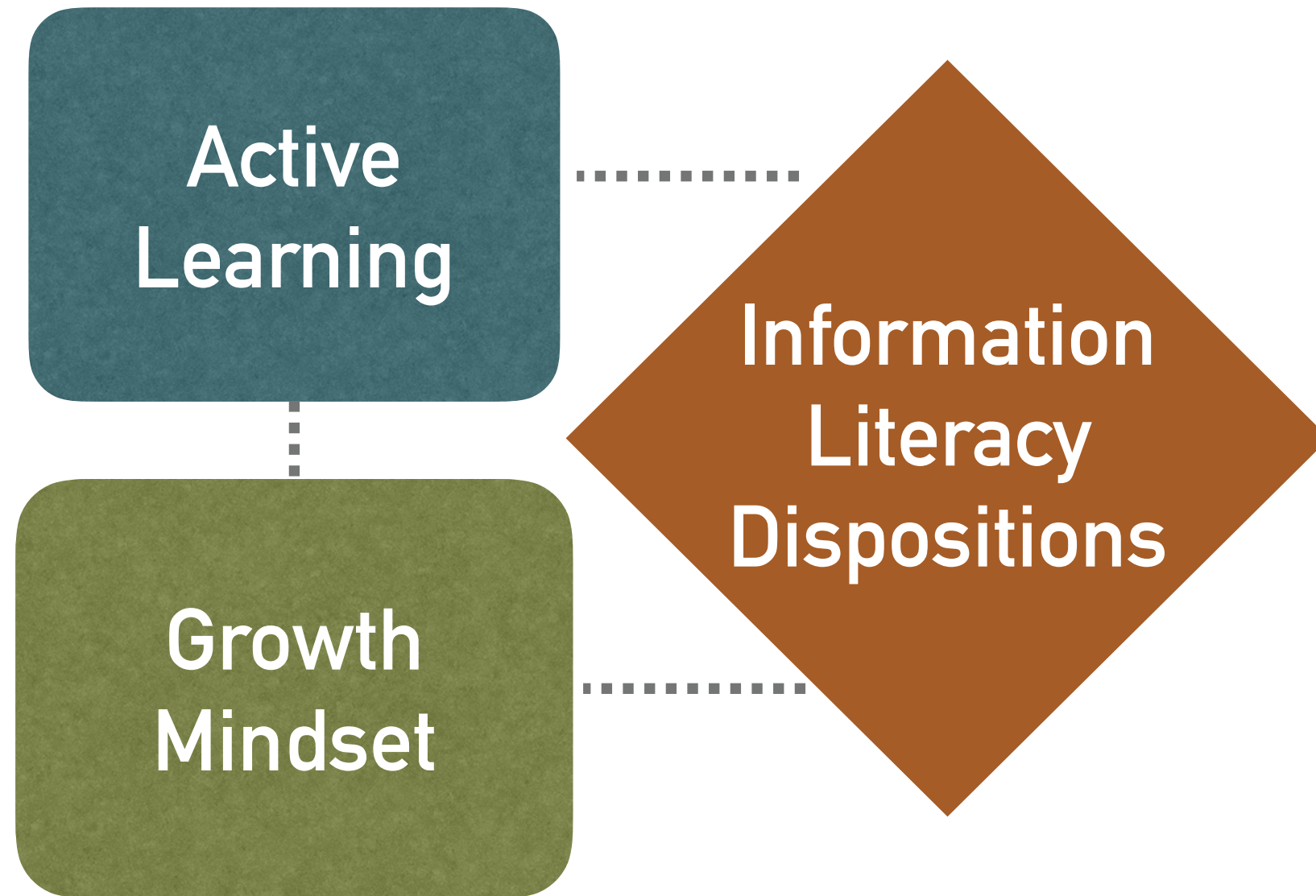
LIBRARY INSTRUCTION WEST

**June 8-10, 2016**

*Developing Information Literacy Dispositions in  
First-Year Calculus*

Kaila Bussert, Cal Poly San Luis Obispo





# INQUIRY-BASED LEARNING (IBL) IN MATHEMATICS

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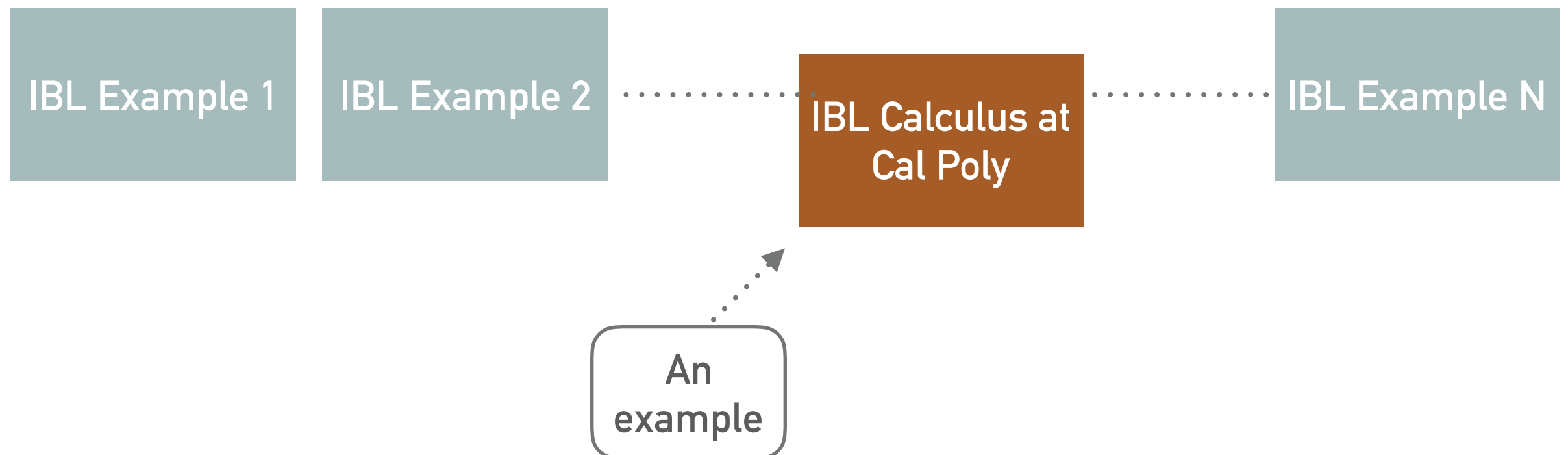


# MANY VARIATIONS OF IBL IN MATHEMATICS

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A large number of variations of IBL exist to accommodate variation in classes, content, student population, and institutional environments.

IBL Calculus presented here is AN example and not THE example of IBL.





# CALCULUS 1: FALL QUARTER, 2015

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**2** *Mathematics Faculty*

**140** *First-Year, First-Quarter Students*



*50 minute classes*  
**4x** *per week*

**1** **Textbook**  
*for all sections of Calculus*

**Fixed List of Topics**

# TYPICAL DAY IN IBL CALCULUS 1

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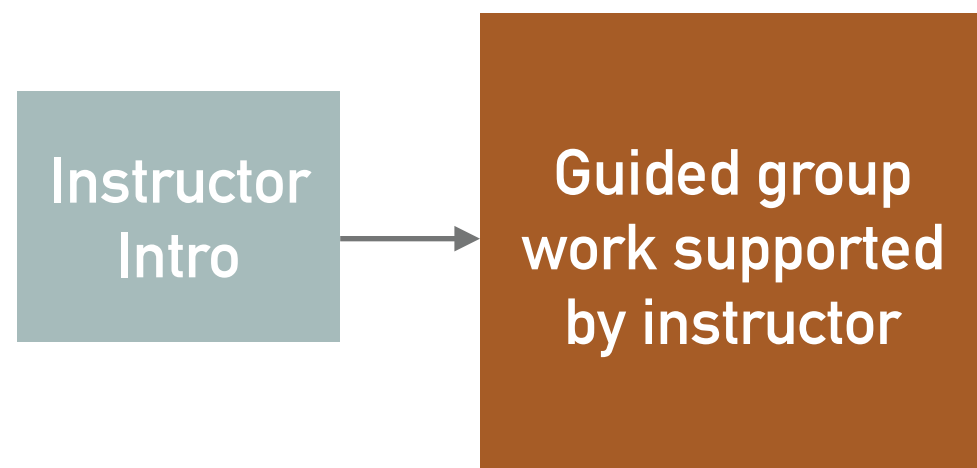
(1) Instructor starts class by introducing the topic of the day. Students bring a handout on that topic, which was written by the instructor. The handout contains a list of math problems to be done in class.

Instructor  
Intro

# TYPICAL DAY IN IBL CALCULUS 1

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(2) After a brief introduction, students work in groups on problems. Instructor visits groups to provide guidance and assist.

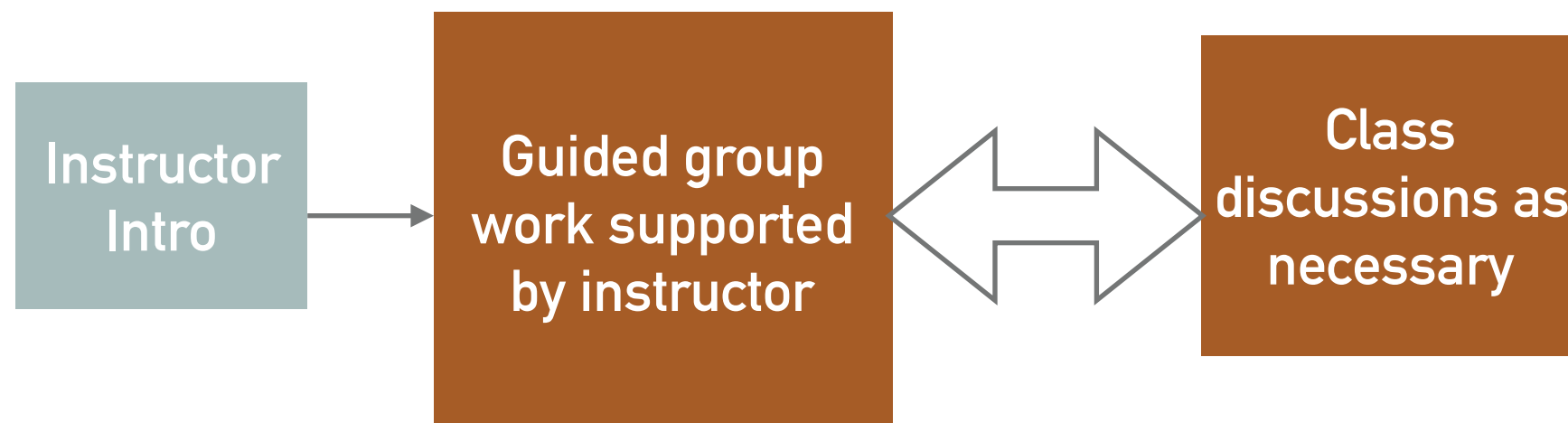




# TYPICAL DAY IN IBL CALCULUS 1

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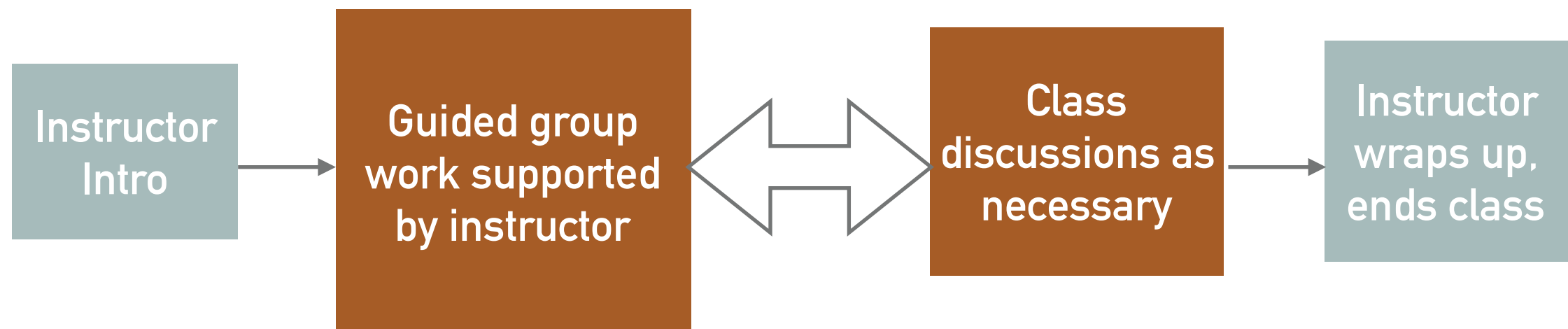
(3) As needed, whole group discussions led by the instructor are used to address common issues, general solution strategies, and techniques.



# TYPICAL DAY IN IBL CALCULUS 1

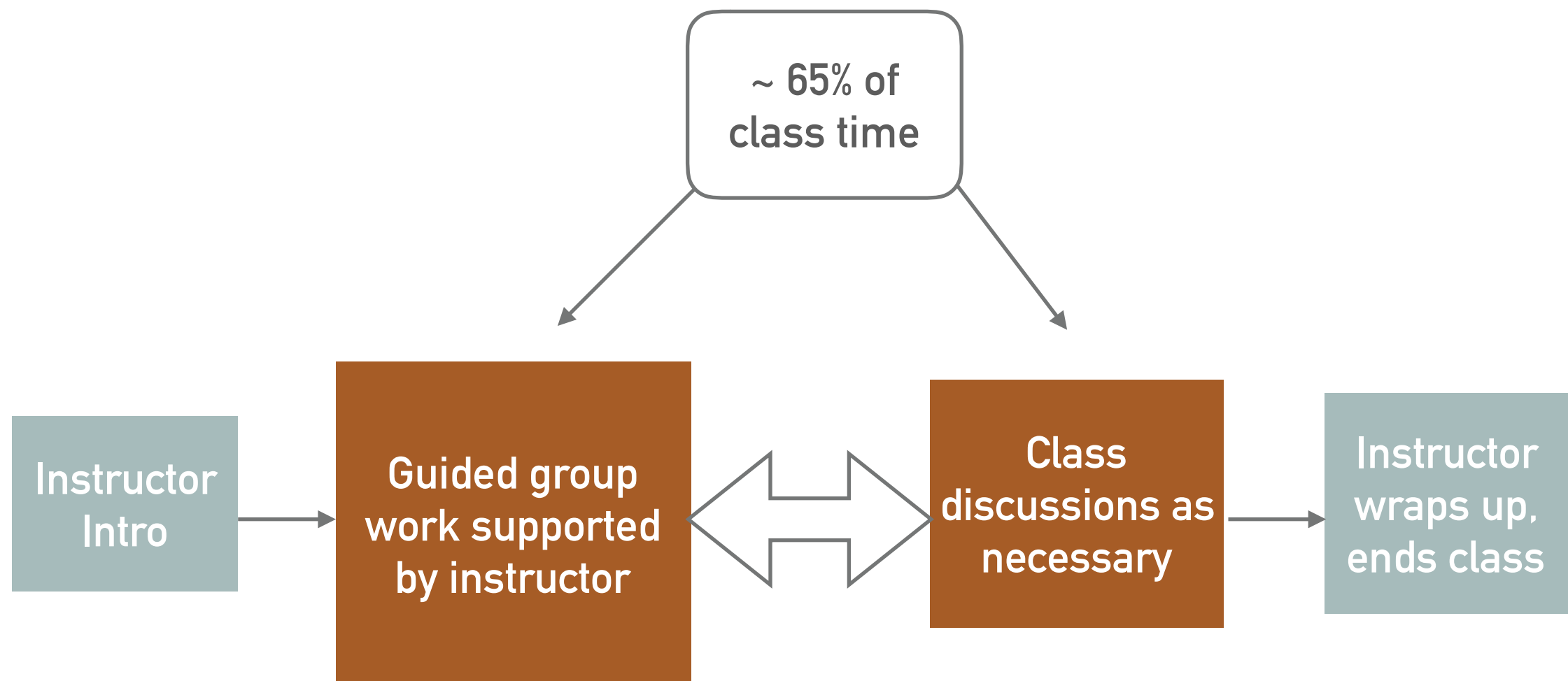
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(4) Instructor wraps up the class discussion.



# TYPICAL DAY IN IBL CALCULUS 1

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# COURSE CONTENT

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Standard Calculus Content	Productive Failure/ Growth Mindset	Information Literacy
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# COURSE CONTENT

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Standard Calculus Content

Productive Failure/  
Growth Mindset

Information  
Literacy

“Learn by Doing”  
Assignments



# COURSE CONTENT

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Standard Calculus Content

Productive Failure/  
Growth Mindset

Information  
Literacy

All three components + IBL instruction  
work together as a system!

“Learn by Doing”  
Assignments



# LEARN BY DOING ASSIGNMENTS

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Productive Failure/  
Growth Mindset

Information Literacy

Math  
Autobiography

The  
5  
Elements  
of  
Effective  
Thinking

Reading  
Reflections

Productive Failure

It's Okay to Be  
Stuck!

Library Resources 1 -  
Group Study

Library Resources 2 -  
Identify Course-Related  
Books

Library Resources 3 -  
Research in the Google  
Era

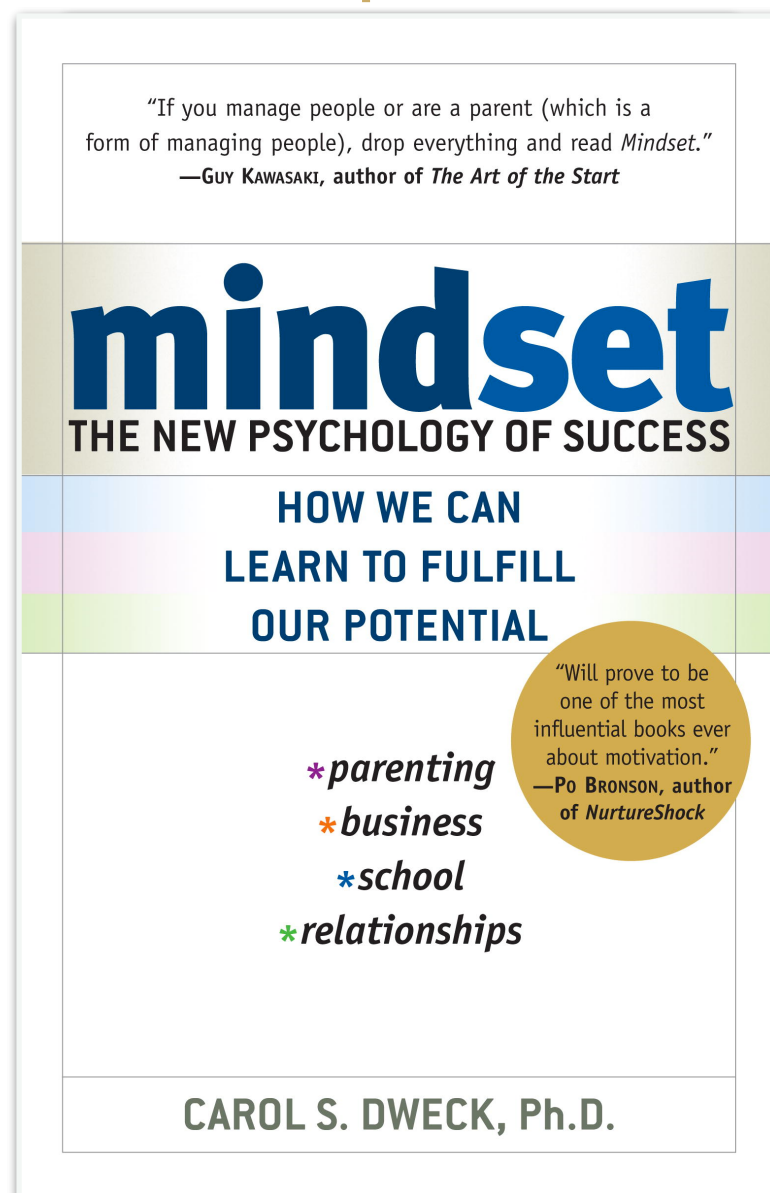
Looking Back Reflection

# LEARN BY DOING ASSIGNMENTS

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Productive Failure/  
Growth Mindset

Information Literacy





# What Kind of Mindset Do You Have?



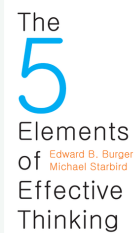
I can learn anything I want to.  
When I'm frustrated, I persevere.  
I want to challenge myself.  
When I fail, I learn.  
Tell me I try hard.  
If you succeed, I'm inspired.  
My effort and attitude determine everything.



I'm either good at it, or I'm not.  
When I'm frustrated, I give up.  
I don't like to be challenged.  
When I fail, I'm no good.  
Tell me I'm smart.  
If you succeed, I feel threatened.  
My abilities determine everything.

# Productive Failure/ Growth Mindset

Math  
Autobiography



Reading  
Reflections

Productive  
Failure

It's Okay to Be  
Stuck!

Write a 1-2 page Math  
Autobiography. Comment on your  
math experiences in your school  
days (K-12).

- a. What kind of math experiences  
did you have?
- b. Do you like Math?
- c. Explain
- d. Do you feel you can be  
successful in Math classes?

# Productive Failure/ Growth Mindset

Math  
Autobiography

The  
**5**  
Elements  
of  
Effective  
Thinking

Reading  
Reflections

Productive  
Failure

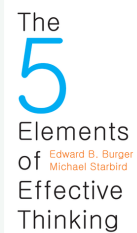
It's Okay to Be  
Stuck!

The  
**5**  
Elements  
of Edward B. Burger  
Michael Starbird  
Effective  
Thinking



# Productive Failure/ Growth Mindset

Math  
Autobiography



Reading  
Reflections

Productive  
Failure

It's Okay to Be  
Stuck!

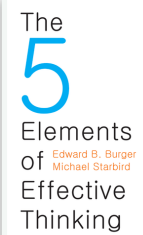
Write about a problem you were stuck recently in Math 141, and include a description of the problem and 1-2 paragraphs about what you learned from the mistake.

Discuss two strategies for using mistakes (#PF) in the future to enhance your learning.



# Productive Failure/ Growth Mindset

Math  
Autobiography



Reading  
Reflections

Productive  
Failure

It's Okay to Be  
Stuck!

Identify a problem (or type of problems) you have been stuck on this quarter in Math 141. Describe the problem here (without a solution) and what you were stuck on.

Discuss new strategies (to you) that you will employ when you are stuck in the future.

# LEARN BY DOING ASSIGNMENTS

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Productive Failure/  
Growth Mindset

Information Literacy



# Information Literacy

## Big Mindsets

- Value the role of the library as a contributor to academic success
- Seek guidance from experts, e.g. librarians, professors, and professionals
- Think critically and reflectively about the research process
- Seek out scholarly conversations on a topic

Library Resources 1 -  
Group Study

Library Resources 2 -  
Identify Course-  
Related Books

Library Resources 3 -  
Research in the  
Google Era

# Information Literacy

## Library Resources 1 — Group Study in the Library

### Math 141 LBD Assignment #2: Library Resources 1

First Name:
Last Name:
Section: 04 or 07

Log your math study hours for the week. Think 25-35!

Sun	Mon	Tu	Wed	Th	Fri	Sat

**Instructions:** The Kennedy library has a portfolio of support programs to help students succeed. In this assignment, you will focus on collaborative study spaces at the library. Visit the library and learn how to reserve a “fishbowl.” Form a study group of classmates from your section of Math 141. Your group must reserve a “fishbowl” with 2-4 other classmates for at least 1 hour. After your study session, all students should complete the following

1. List the names of the other students who attended the “fishbowl” study session.


2. Describe in a paragraph the topics you worked on together, and what you personally worked on.

3. Attach/embed a photo of the group study session as proof here:

[Paste a Photo]





# Information Literacy

## Library Resources 2 — Identify Course-Related Books

### Assignment 5: Library Resources 2

First Name:

Last Name:

Section: 04 or 07

Log your math study hours for the week. Think 25-35!

Sun	Mon	Tu	Wed	Th	Fri	Sat

### Instructions:

This assignment has two parts. Part 1 is to use the Mathematics section of the library to learn about the resources available to you related to this course. Part 2 is to study with a group of students from Math 141, as you did in the first library resources assignment.

1. Visit the Kennedy library and find the Mathematics section of the library. Visit <http://lib.calpoly.edu> to get acquainted with the services and resources available to you.
2. Find an alternative textbook for Calculus that you could use as an additional resource.
  - a. Title:
  - b. Author(s):
  - c. Publication Date:
  - d. Explain what makes this calculus book useful to you:
3. Find another college-level book related to your major. List the
  - a. Your major:
  - b. Title of math book related to your major:
  - c. Author(s):
  - d. Subject:
  - e. What course(s) would you use this book/reference for?

### Research 101: Your Research Survival Guide

Get started with essential tools and strategies for successful research at Cal Poly.

#### Introduction

The Research Cycle  
Orientation: Kennedy  
Library Scavenger Hunt

#### Choose Your Topic

Develop Keywords  
Background Sources

#### Find the Best Sources

Articles & Databases  
Books  
Images  
Data & Statistics

Historical Primary  
Sources

Course Reserves

Cal Poly Information

Evaluate Sources for  
Credibility and Relevance

Cite Sources

Start Your Research Tutorial

#### How to Use Research 101

Research 101 provides the essential tools, concepts, and strategies you need for successful research at Cal Poly.

If you need help with finding, evaluating, and citing information sources for any type of research assignment, follow the pages of this guide or stop by the library's Research Help Desk. Librarians and LibRATs are here to help!



#### Research Help

- Come to the Research Help Desk on the 2nd floor of Kennedy Library, where a student LibRAT or librarian can help with any question you have!
- Call the Research Help Desk at (805) 756-2649.
- [Chat online with a librarian or a LibRAT](#). 24/7!
- Make a personal appointment to meet with your [College Librarian](#).

For help writing your paper you can contact the [The Writing Center](#).

You can call the Circulation Desk for basic library information at (805) 756-5760.

# Information Literacy

## Library Resources 3 — Finding Credible Information in the Google Era

### Assignment 8: Library Resources 3

Finding Credible Information in the Google Era

First Name:

Last Name:

Section: 04 or 07

Log your math study hours for the week. Think 25-35!

Sun	Mon	Tu	Wed	Th	Fri	Sat

**Introduction:** Sites like Google and Wikipedia are highly useful, but have significant limitations that you should be aware of. When using any search engine, you are relying on the assumptions and algorithms that are embedded in that search algorithm. Important questions come to mind.

- How do we know the search engine found the right kinds sources for our needs?
- Can we be sure that the sources we have found are credible?
- How do we measure the credibility of the sources found by the search engine? What are the “levels of credibility?”
- What are the conflicts of interests between private company search engines, profits, and seeking knowledge?
- What are ways to find sources, such as peer-reviewed journal articles?

The purpose of this LBD assignment is help you become aware of a research process that goes beyond simple internet searches, adding library databases to find sources of information that may not be captured by a simple internet search.

### Sample General Research Workflow

#### Step Zero

Start with Google or Wiki or other to gather basic info

#### Step One

Use the Cal Poly “Search Everything” feature [lib.calpoly.edu](http://lib.calpoly.edu) to search a variety of databases and sources, not necessarily covered by Google.

#### Step Two

Refine your search to match search results to your specific needs. Use the “advanced search” features to add criteria.

#### Step Three

Download, selections and evaluate their credibility.

Read sources and rerun searches as necessary to collect enough sources for the assignment.



# Information Literacy

## Library Resources 3 — Finding Credible Information in the Google Era

### LBD Assignment #8 Specifics

#### Choose a Topic

- Who is the first female winner of the Fields Medal? (The Fields Medal in Mathematics is equivalent to the Nobel Prize.)
- Who is the person who cracked the Nazi Enigma Code in World War 2?
- Who is the mathematician portrayed in the movie, "A Beautiful Mind"?
- Learn about the mathematician from UCLA, who appeared on the TV show, *The Colbert Report*.
- Learn about the actress, who majored in Mathematics, who co-starred in the TV series, "The Wonder Years."
- Who is the mathematician that solved the infamous problem, Fermat's Last Theorem?

#### Assignment

- Use the research process described above for this assignment. Describe the specific searches, keywords used, and refinements you used to find your sources.
- Find one **newspaper article** that provides biographical information about the mathematician that answers "Who is this person, and what did they do?"

Newspaper	
Author(s)	
Publication date	
Title of Article	
What is the article about?	

- Find one **peer-reviewed journal** research article in Mathematics that the person published. Use the library website's "research databases" feature, to find the **MathSciNet** database. **MathSciNet** is one of the premier databases for publications in research Mathematics.

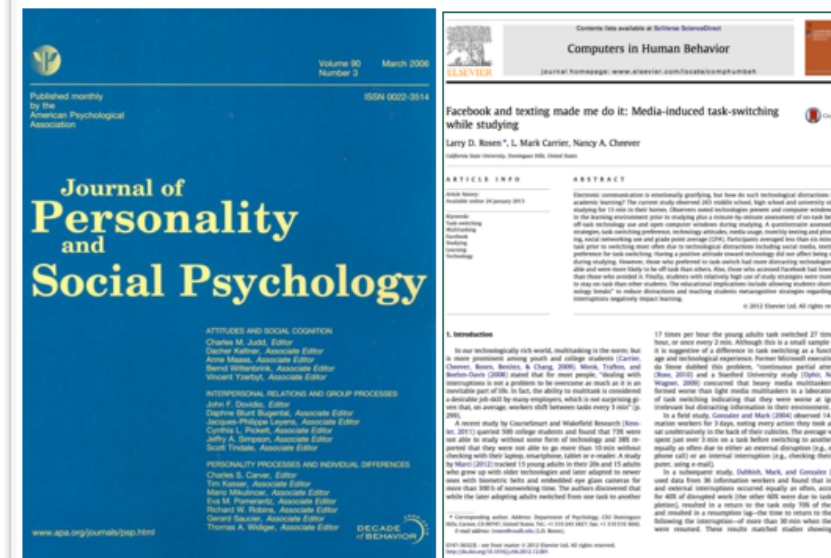
Please start by using the AUTHOR search and use the person's last name. Login to the portal so that you can download the pdf articles.

Click on the "article" link in search result citations to download articles.

Journal Name	
Author(s)	
Publication date	
Title of Article	

- Discuss in 2-3 paragraphs two (or more) things you learned about the person you researched.

### Scholarly, Peer-Reviewed Journal Articles



**Purpose:** Inform other scholars and students in higher education of new research and findings (research books (book reviews).

**Authorship:** Experts in their fields: researchers conducting original research, practitioners, professors university presses and scholarly groups.

**Accuracy:** An editorial board made up of other scholars and researchers reviews the articles. Many, but considered the gold standard of tested information.

#### Look for:

- long, in-depth articles
- data and evidence, e.g. tables, charts, graphs, images (but no advertisements)
- specialized or discipline-specific language and jargon
- reference lists and in-text citations
- abstract or summary
- author affiliations
- peer-review information: dates of article submission and acceptance (provided in some journals)

See: [Anatomy of a Scholarly Article](#); [What is Peer-Review?](#)

# Productive Failure/ Growth Mindset

## Information Literacy

### Assignment 9: Looking Back

First Name:

Last Name:

Section: 04 or 07

Log your math study hours for the week. Think 25-35!

Sun	Mon	Tu	Wed	Th	Fri	Sat


1. Discuss two things you learned from the Learn by Doing Assignments?
2. University Libraries are more than a stacks of books. Explain what you have learned about the Cal Poly library that you can use in subsequent quarters.
3. Personal Reflection (open topic and graded only for effort): Please share your comments related to one (or more) of the major themes addressed in the LBD assignments.

## Looking Back Reflection

Discuss two things you learned from the Learn by Doing Assignments.

University Libraries are more than a stack of books. Explain what you have learned about the Cal Poly library that you can use in subsequent quarters.

Personal Reflection.



The two main things I have learned from the LBD assignments are probably that failing is okay, and can actually be productive, and that the library website has a lot of online capabilities to find credible sources for magazine articles, newspaper articles, journals, etc. Being new to the school it's nice to know that if I need a source for something, I don't necessarily need to trek to the library, because I have so much available right on my computer!

I really liked the research assignment where one of the research options was about the German Enigma Machine from World War Two. It was a very interesting topic that was such an important part of history that many people are unaware of. I am still reading more articles on it, learning more about how it worked as well as the extreme difficulty in solving it.

## FOR NEXT TIME (FALL QUARTER 2016)

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- Be more explicit with students about the meaning of information literacy in connection with lifelong learning mindsets
- Tie “being stuck” in solving math problems to “being stuck” in research (e.g., “Understand that first attempts at searching do not always produce adequate results” )
- Include more supplementary materials and online guidance, e.g., short instructional videos

# THANK YOU!

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*[kbussert@calpoly.edu](mailto:kbussert@calpoly.edu)*





# RESOURCES

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Dweck, Carol S. *Mindset: The New Psychology of Success*. Ballantine Books, 2007.

Burger, Edward B., and Michael Starbird. *The 5 Elements of Effective Thinking*. Princeton University Press, 2012.

Google Shared Folder: [tinyurl.com/LBDassignments](https://tinyurl.com/LBDassignments)

