Welcome to Linear Algebra

Dr. Lewis

Fall 2019

Team-Based Inquiry Learning

This course uses Team-Based Inquiry Learning and Standards Based Grading.

- There is a large body of research supporting the effectiveness of TBIL.
- There is a large body of research supporting the effectiveness of SBG.
- Today and Friday, you will learn how and why these pedagogies are implemented in this class.

Teams

Everybody stand up!

- Based on your responses to the survey, I have organized you into teams.
- I did this pseudo-randomly, ensuring a mix of majors on each team.

Team Names

- Introduce yourselves to each other
- Decide on a name for your team
- Elect a team member to stand up and introduce each team member to the class.

Why are we here?

- Learn as much as possible
- Mastery of the material
- Earn an 'A'
- Obtain course credit
- Better understanding of techniques used in other classes
- Passion for career

What is Linear Algebra?

Linear algebra is the study of **linear maps**.

- In Calculus, you learn how to approximate any function by a linear function.
- In Linear Algebra, we learn about how linear maps behave.
- Combining the two, we can approximate how any function behaves.

What is Linear Algebra good for?

- In an abstract sense, linear algebra is arguably the most used tool in higher math.
- In computer graphics, linear algebra is used to help represent 3-dimensional objects in a two dimensional grid of pixels.
- Differential equations are often very difficult (or impossible) to solve exactly; we use linear algebra to understand approximate solutions in a vast number of engineering applications such as fluid flows, vibrations, heat transfer, etc.
- Google's famed Page Rank algorithm is based on linear algebra
- Sports rankings

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- Use and apply algebraic properties of a linear transformation.
- Determine geometric information about a linear transformation, including computing determinants, eigenvalues, and eigenvectors.

What about Learning?

We are going to consider three important aspects of learning:

- Obtaining information (learning facts, principles, algorithms) and practicing rote procedures
- Learning why procedures work, and how to use and apply knowledge in new situations
- Developing life-long learning skills

While you are thinking about this, take a sheet of paper and fold it in three.

Q1

In the left-most section, write 'Q1', and a very large 1 2 or 3, corresponding to:

The MOST IMPORTANT thing for me is...

1. Obtaining information (learning facts, principles, algorithms) and practicing rote procedures
2. Learning why procedures work, and how to use and apply knowledge in new situations
3. Developing life-long learning skills

Q2

In the center section, write 'Q2', and a very large 1 2 or 3, corresponding to:

Which of these can be done most effectively OUTSIDE the classroom?

1. Obtaining information (learning facts, principles, algorithms) and practicing rote procedures
2. Learning why procedures work, and how to use and apply knowledge in new situations
3. Developing life-long learning skills

Q3

In the center section, write 'Q3', and a very large 1 2 or 3, corresponding to:

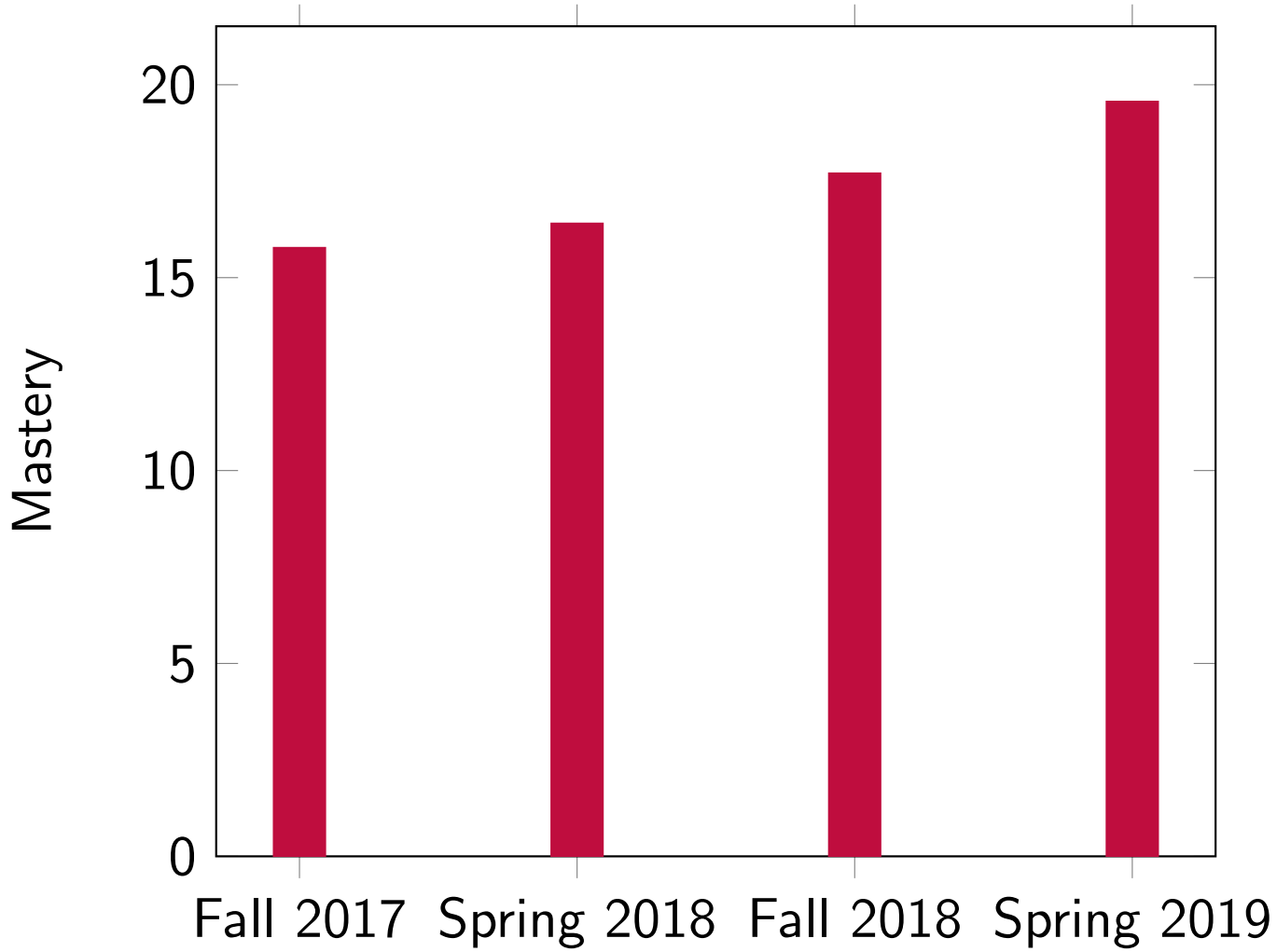
Which of these can be done most effectively IN the classroom, working with classmates and the instructor?

1. Obtaining information (learning facts, principles, algorithms) and practicing rote procedures
2. Learning why procedures work, and how to use and apply knowledge in new situations
3. Developing life-long learning skills

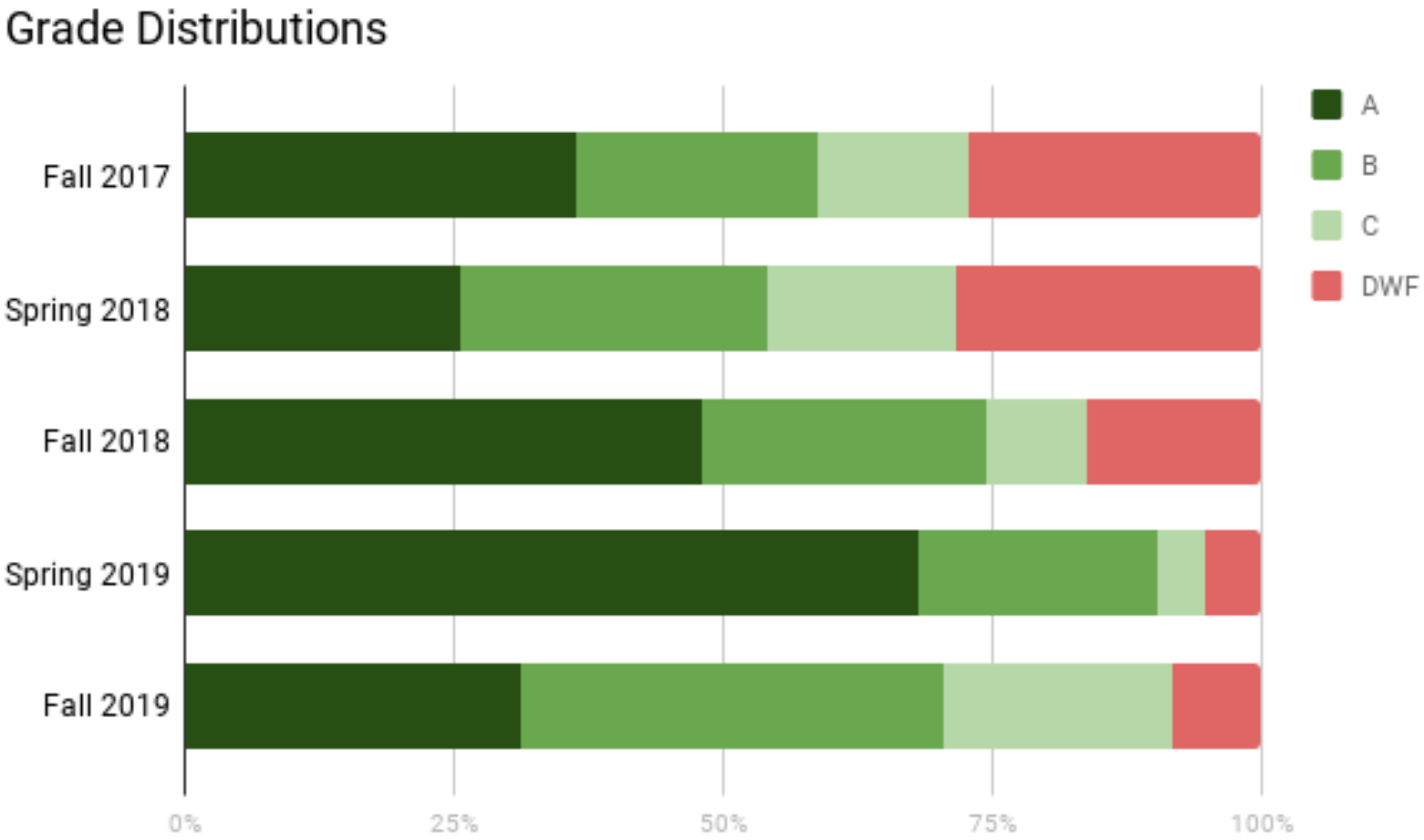
Team-Based Learning

In this class we will use **Team-Based Learning**.

- Research shows that TBL leads to improved student learning.



TBL Improves Course Grades



Overview of TBL

- The course is divided into 5 “modules”.
- The first day of each module is the Readiness Assurance Process.
- Remaining days are spent working on activities in your teams.

Readiness Assurance Process

- In USAOnline, you will find a list of the skills you should have **before each module starts**, along with resources to help you prepare.
  - Sometimes these skills are from previous courses.
  - Sometimes these skills are standards from earlier in this course.
  - Sometimes (but rarely) these are new skills you will learn by watching the videos and answering embedded questions.

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  - Sometimes (but rarely) these are new skills you will learn by watching the videos and answering embedded questions.
- On the first day of the module, the Readiness Assurance Tests will ensure you have these skills.
  - First, you will individually take the RAT
  - After everyone is done, you will take the RAT again collaboratively as a team.
- **The first Readiness Assurance day is Monday!**

Class Activities

Most days we will spend our time working in teams through a series of activities on the whiteboards.

- These activities are designed to help you **explore** the material.
- Often, you will not immediately know how to complete them. You will have all the tools you will need, but will have to apply them in a new way.
- Sometimes, it will be hard. That's okay!
- Research shows these kind of activities lead to deeper learning.

Readiness & Contribution Score

There will be four components to your Readiness & Contribution score

iRAT (individual)	%
tRAT (team)	%
Peer Evaluation	%
Attendance	%

In your teams, decide what percentage each of the four components should have. They should add to 100%.

What makes a good teammate?

In your teams, come up with a list of qualities a good teammate has.

What things do you want your teammates to do this semester, and what should they expect of you?

Peer evaluations

In your teams, come up with a list of questions you think should appear on peer evaluations.

- Responses will be a level of agreement (e.g. Strongly Agree, Agree, etc.)
- These will make up part of your Readiness & Contribution score.

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Your main job in this course is to **master the covered material** and **demonstrate that mastery to me**.

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You will be given several opportunities to demonstrate mastery throughout the semester, and if at first you don't succeed, you can try again without any penalty.

SBG is different!

SBG has many advantages

- You can learn and demonstrate mastery at **your** pace, not the instructor's.
- No high stakes exams – you can always reassess at a later date.
- You can demonstrate mastery in multiple ways.

But it's different!

- Some students take some time to adjust. Unlike many courses you have taken before, **you will not succeed by only accumulating partial understanding.**
- The best advice former students give is to not delay mastering standards.

SBG

The course material is broken down into 24 learning **standards**.

- Each attempted exercise will be simply marked according to whether or not your solution demonstrates mastery of the relevant standards.
- Each solution that demonstrates complete mastery counts as a **checkmark** for that standard.
- Up to two checkmarks may be earned for each standard. Your grade depends on the total number of checkmarks you earn this semester (up to 48).
- Standards will be assessed several times, and there's no penalty for incorrect solutions. So, if you don't succeed the first time, keep practicing and try again!

Assessment Opportunities

Checkmarks may be earned as follows.

- **Quizzes**: Most weeks, one day at the end of class we will have a quiz.
- **Exams**: Periodically we will have longer assessments (usually on Friday).
- **Final Exam**: Your final opportunity to demonstrate mastery, cumulative over the entire course.
- **Office Hours Reassessments**: A limited number of opportunities will be provided to earn checkmarks outside of class.

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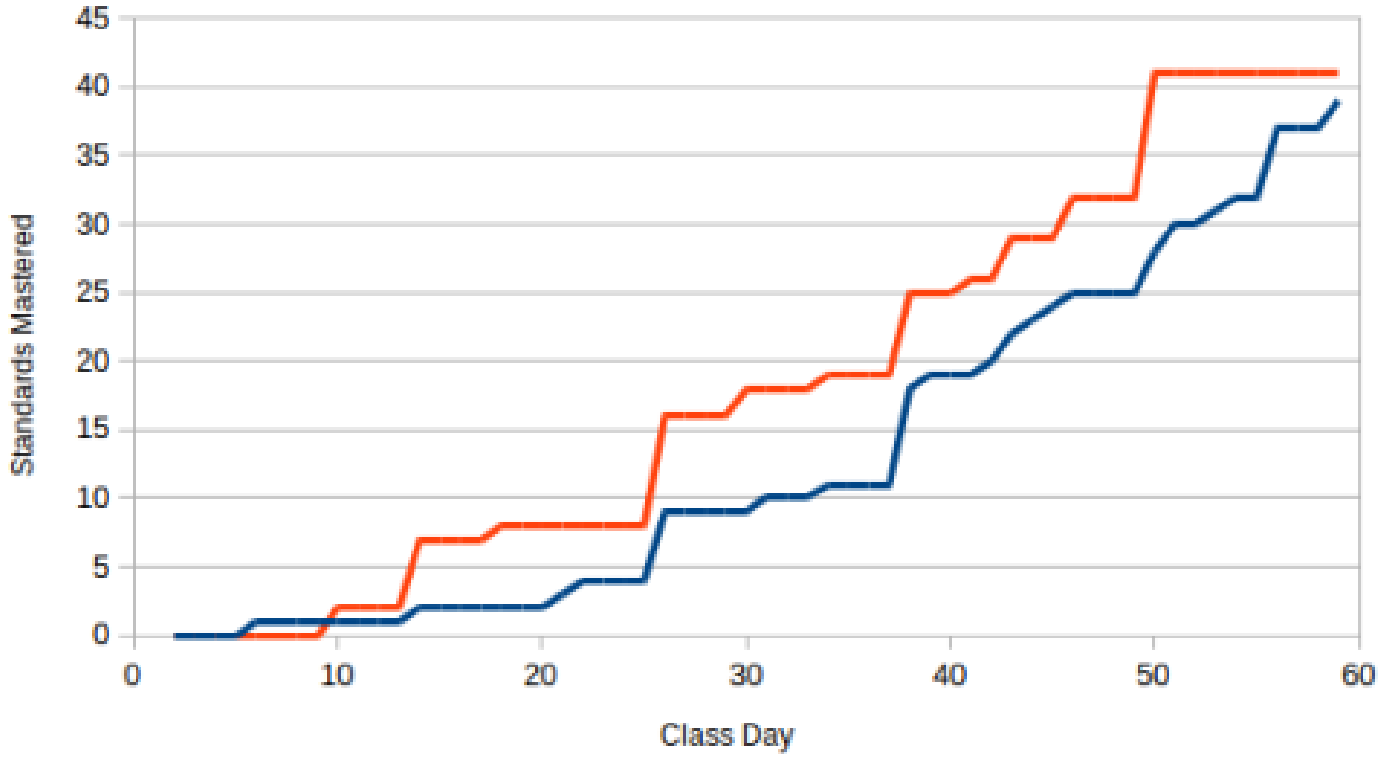
The assessment method (quiz/exam/etc.) you used to earn a checkmark isn't important: **I only care that you learn the material and demonstrate that mastery to me before the end of the semester!**

A tale of two students

These two students took very different paths, but both earned the same grade.



Interpreting Feedback

On each assessment, for each standard you will receive one of the following marks.

- **M** means you demonstrated **Mastery** of that standard. Great job! Check off another box on your progress sheet.
- * means you have a minor mistake, but if you can come by my office hours and explain it, this mark will be changed to **M**.
- **W** means you have demonstrated understanding, but not written a complete solution. Often, notation is poor or ambiguous. You can provide a **Written** re-working of the same problem (fixing any errors) to earn an **M**.
- **R** means you made a good faith effort and demonstrated partial understanding, but not complete mastery. You are eligible to **Reattempt** the standard outside of class.
- **N** means there was **No Significant Evidence** of understanding.

Marks other than M do not improve your course letter grade,

Course Grades

A	• Earn 45 mastery checkmarks. • Complete 10 Self-Assessment Reports. • Have a 90% Participation Score.		
B	• Earn 40 mastery checkmarks. • Complete 8 Self-Assessment Reports. • Have a 80% Participation Score.	OR	45 ✓s
C	• Earn 35 mastery checkmarks. • Complete 6 Self-Assessment Reports. • Have a 70% Participation Score.	OR	40 ✓s

Self-Assessment Report

Each Friday, you should hand in a Self-Assessment Report. Blank forms are available in Sakai.

For each standard, you will be asked to:

- Report how many mastery checkmarks you have earned on assessments
- Report your self-assessment of your understanding on a 4-level scale:
  1. I need more time to understand this.
  2. I can do this with the help of an example.
  3. I can do this, but I still make errors sometimes.
  4. I can do this and explain my solution to others.

You'll also report what homework problems you worked for practice.

The first one should be handed in Friday, January . Late reports are not accepted.

Office Hours (Student Hours)

Office Hours are meant to be for the following things (among others):

1. Questions
2. Conversations
3. Reassessments

Office Hours (drop-in) are MWF 8:15-9:00 and 11-12:00. If you can't make these times, send me an email for an appointment.

My office is room 439 (upstairs).

Homework

Homework is practice. A list of homework exercises, organized by standard, is available in Campuswire.

- I will not collect or grade homework.
- You report what homework you worked on the weekly self assessment report
- If you need help or feedback, come to my office hours or post in the class discussion site.

Campuswire

We will be using an online discussion site called Campuswire this semester.

- After you work an activity in class, one team member should take a picture of your whiteboard, and upload it to Coursewire later that day.
- If your whiteboard solution for an activity is incomplete or incorrect, your team should add a correct solution.
- There is also space to ask questions about the content or the class; you are encouraged to answer your classmates' questions!

Reminder

The first Readiness Assurance Day is Friday!!!