Welcome to Linear Algebra

Dr. Lewis

Fall 2020

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 we will discuss how and why these pedagogies are implemented in this class.

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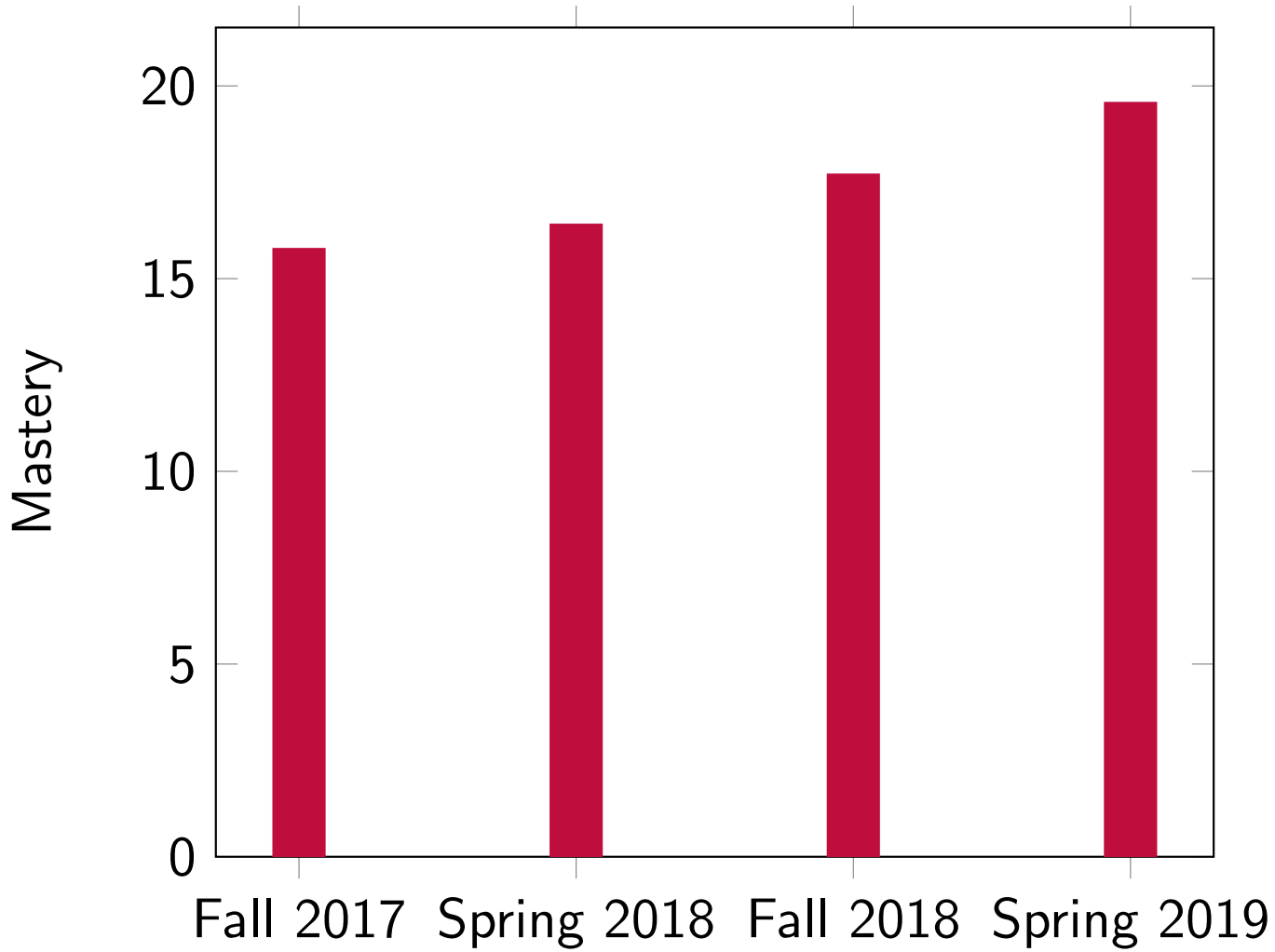
- Use and apply algebraic properties of a linear transformation.
- Determine geometric information about a linear transformation, including computing determinants, eigenvalues, and eigenvectors.

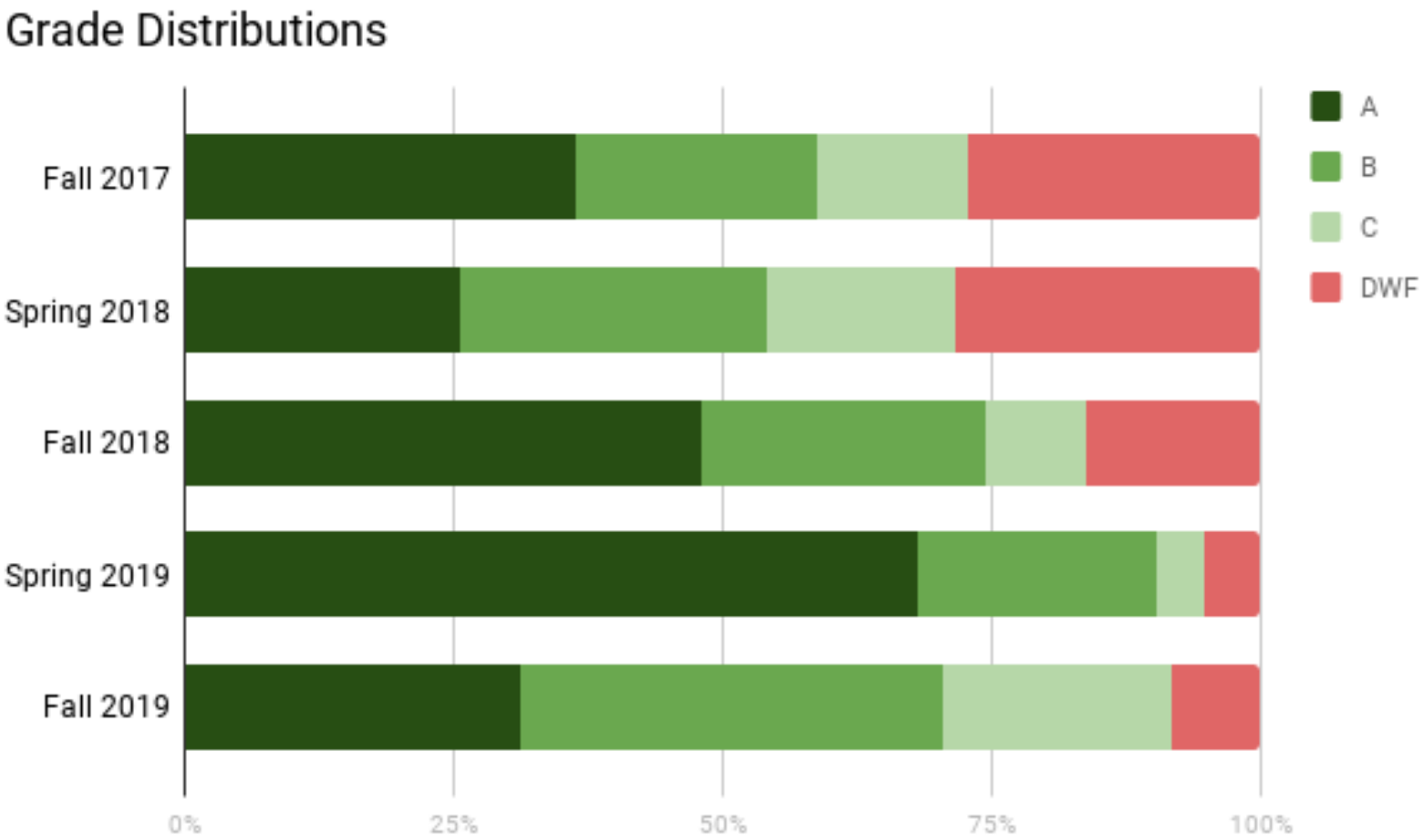
Team-Based Learning

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 Canvas, 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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- 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 Friday!**

Class Activities

Most days we will spend our time working in teams through a series of activities in our teams

- 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.

Teams

- 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.

Google Jamboards

TODO

Download slides

TODO

Team Names

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

Team Assets

Think about what makes a good team member. For each member of your team:

- List three assets (strengths) that each person brings to the team.

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- List three assets (strengths) that each person brings to the team.
- List one thing each member of the team would like to improve at.

Team and Class Norms

In your teams, come up with a list of norms you would like your team (and the class to follow)

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

Peer evaluations

- At several points in the semester, you will evaluate and offer anonymous feedback to your teammates.
- I will remind you of the class norms we just agreed upon and ask you to reflect how your teammates are upholding the norms.

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What should a grade represent?

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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 (usually on Friday).
- **Exams**: Periodically we will have longer assessments (usually on Friday).
- **On Demand Reassessments**: You can also complete a reassessment of an individual standard whenever you like.

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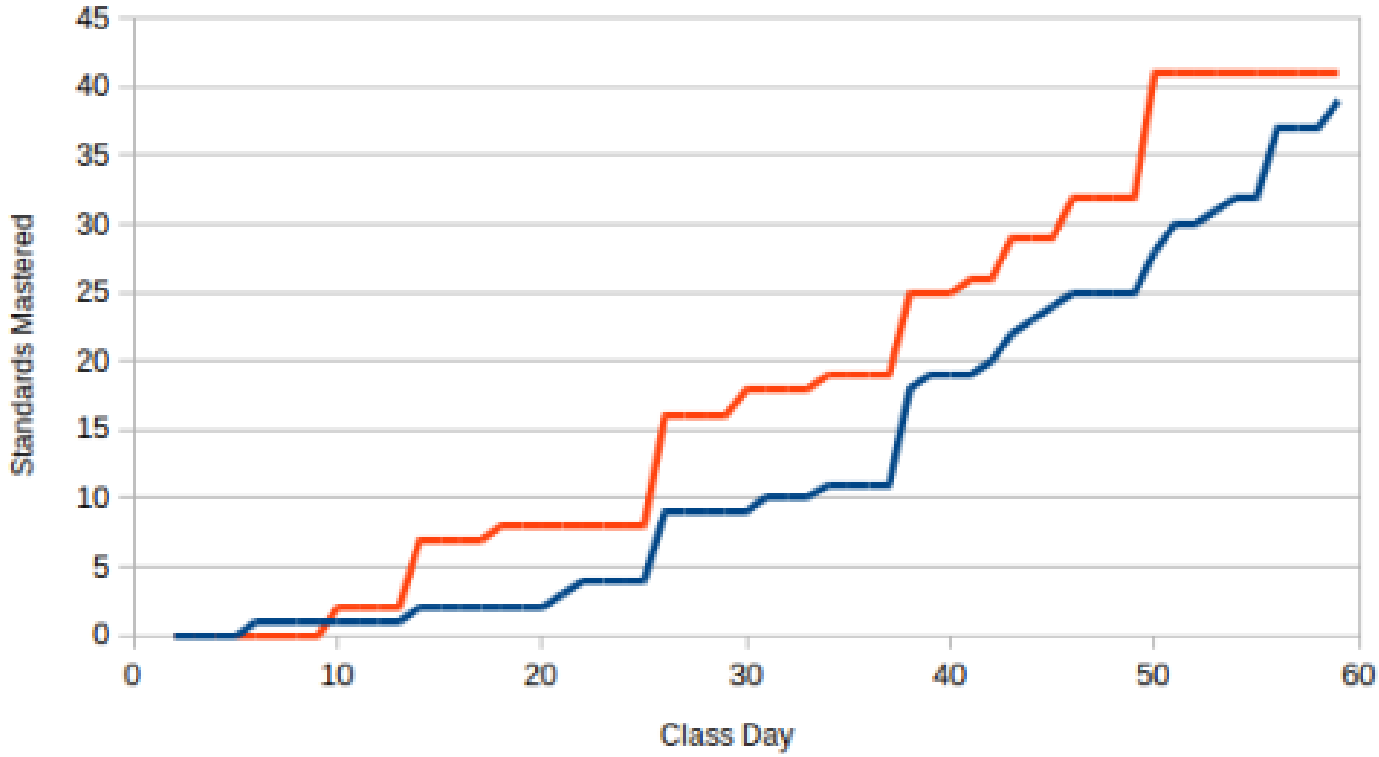
The assessment method (quiz/exam/etc.) you used to earn a checkmark isn't important: **I only care that you learn the material and demonstrate that mastery to me before the end of the semester!**

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.

- **Demonstrated Masttery**: Great job! Check off another box on your progress sheet.
- **Minor Revision Needed** means you have a minor mistake, unrelated to the standard. Often these are arithmetic mistakes or notation errors. You can rework the same problem, fixing your mistakes, and resubmit to demonstrate mastery.
- **Reassessment Needed** means you made a good faith effort and demonstrated partial understanding, but not complete mastery. You will need to **reassess** on the next quiz, exam, and/or in an on demand reassessment.

Course Grades

A	Earn 45 mastery checkmarks.
B	Earn 40 mastery checkmarks.
C	Earn 35 mastery checkmarks.
D	Earn 30 mastery checkmarks.

Other Assessments

In addition to mastering content, I will ask you to do some other things because experience shows these help students learn.

- Class Attendance
- Individual & Team Readiness Assurance Tests
- Peer Evaluations
- Self Assessments
- Weekly Discussion
- Homework

Office Hours (Student Hours)

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

1. Questions
2. Conversations
3. Reassessments

Office Hours are scheduled by appointment through Canvas.

Homework

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

- I will not collect or grade homework.
- You will need to show me your homework in order to reassess in my office hours
- If you need help or feedback, come to my office hours or post in the Canvas discussion forum.

Class Activities

- TODO

Questions

TODO

Reminder

The first Readiness Assurance Day is Friday!