Carnegie Mellon University

Open Learning Initiative

Third Progress Report

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Faculty Advisor: Prof. Valerie Ventura
Client: Norman Bier

INTRODUCTION

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Definition of Open Learning Initiative

Scientifically-based online learning environments:

- Support learning and instruction with high-quality, scientifically-based, classroom-tested online courses and materials
- Share courses and materials openly and freely
- Develop a community of use, research, and development

Project Summary

- Research at UCD has shown that students' performances went up during the pandemic when comparing to pre-pandemic performances
- This project is interested in exploring whether similar findings in the GSU dataset can be found.

Project Goal

- Define any use pattern changes on the OLI platform for instructors and students at GSU statistics course from Spring 2019 - Fall 2020 due to COVID

Project Scope

- Focus on comparing OLI use patterns for both instructors and students before and during the pandemic.
- Investigate how students' performances are changed during the same time period.

INTRODUCTION

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Client Background

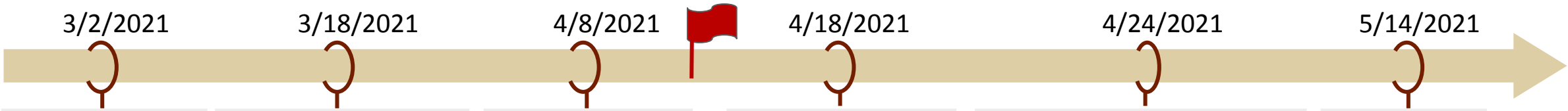
Norman Bier

- Director of OLI and Director of Training and Development at iCarnegie Inc.
- Taught Computer Science courses at Community College of Allegheny County

Objectives

- Use pattern changes for instructors and students during pandemic
- Impact on Students' performance
- Future research recommendations

Project Timeline



Kickoff Meeting	Data Cleaning, Preliminary EDA Findings and Next Steps	Use Pattern Changes for Instructors	Student use pattern and performance Changes	IMRAD Research Paper Draft	Submit Final Work Products

DATA

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MySQL file for each semester (Academic year 2019-2020)

Each MySQL file contains 34 .CSV tables

Students	Instructors	Course	Other information
• Student • Student activities per week • Student results per unit • Student results per module	• Instructor activities per week • Instructors	• Course • Modules • Question summary • Questions by unit	• Content • Activities • Units

DATA

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File Name	Inside .CSV File							
Instructor action per week	user_id	course key	week of year	week logins	dashboard views	gradebook views	gradebook action	activities started
Student action per week	user_id	course key	week of year	week logins	pages first accessed	activities started	learn-by-doing started	did-i-get-this started
Student results per week	user_id	course key	week of year	week logins	pages first accessed	activities started	learn-by-doing started	did-i-get-this started
Student	user_id	first name	last name	course key	total logins	checkpoint mean	quiz mean	checkpoint mean

DATA

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Number of students:

- S19 - 1,524
- F19 - 1,672
- S20 - 1,686
- F20 - 2,078

Number of instructors (identified by name):

- S19 - 2
- F19 - 3
- S20 - 4
- F20 - 2

- Focus on Spring and Fall 2020
- Focus on two instructors who taught multiple semesters

- Combine all sections taught by one instructor
- Then block on instructors

Spring 2019 different from other semesters

- 2%-3% pct double registration
- Low logins

METHOD

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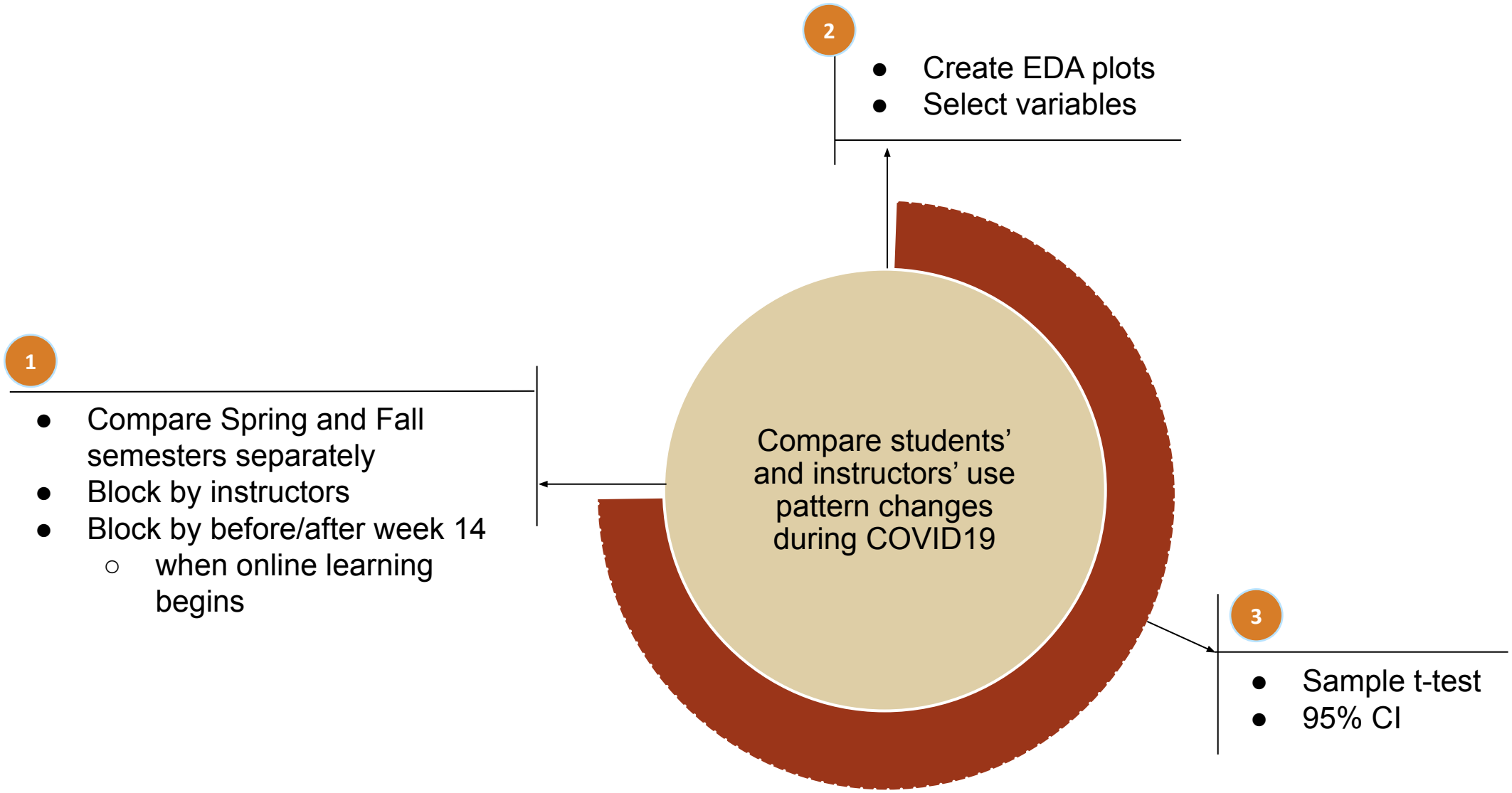

METHOD

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Analyses	Assumption	Variables Selected
Instructor Use Pattern	• instructors perform activities for all sessions during 1 login	• weekly logins • gradebook / dashboard activities ○ professor taught in all semesters
Student Use Pattern	• students taught by same instructors demonstrate similar behaviors	• weekly logins ○ block by instructor

Student Performance	• students only get 1 chance for high stake assessment
	• student will answer low stake assessment multiple times until they get the correct answer
		• low stake assessment
		  ○ did-i-get-this & learn-by-doing
		  ○ average correctness
		• high stake assessment
		  ○ quiz & checkpoint
		  ○ first-attempt correctness

RESULT - INSTRUCTOR LOGINS

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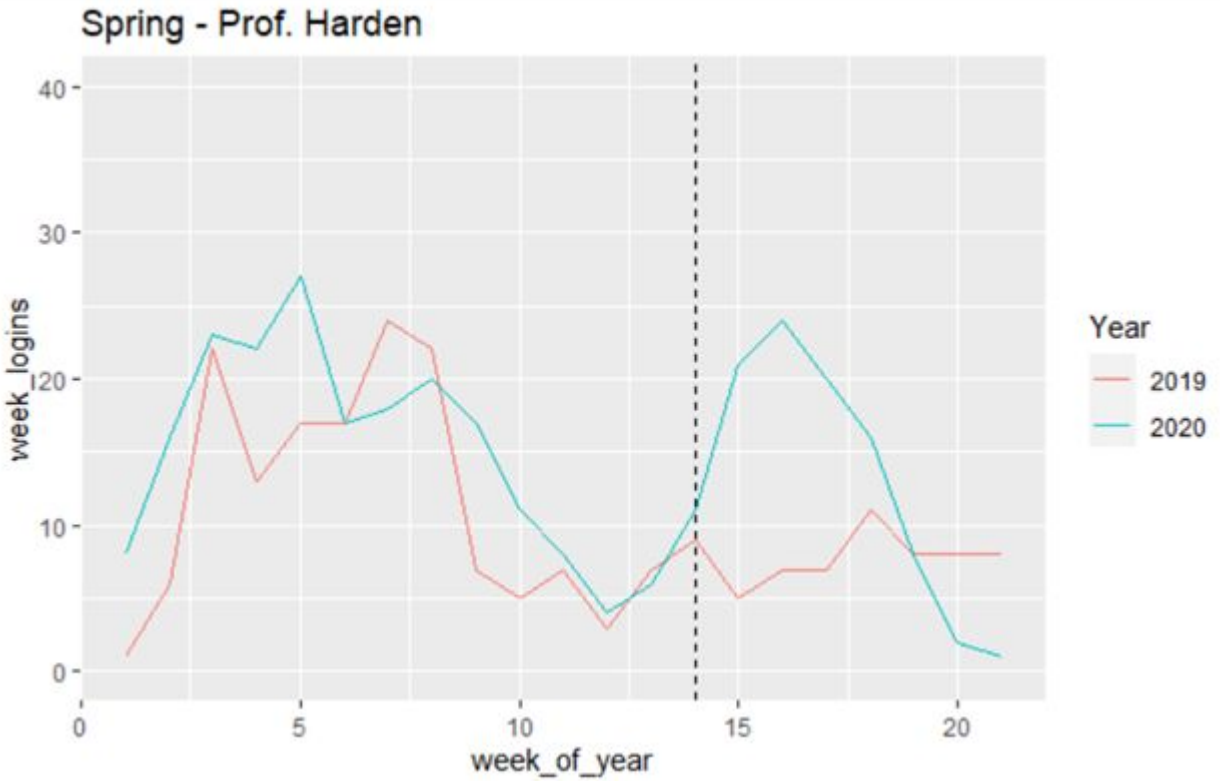

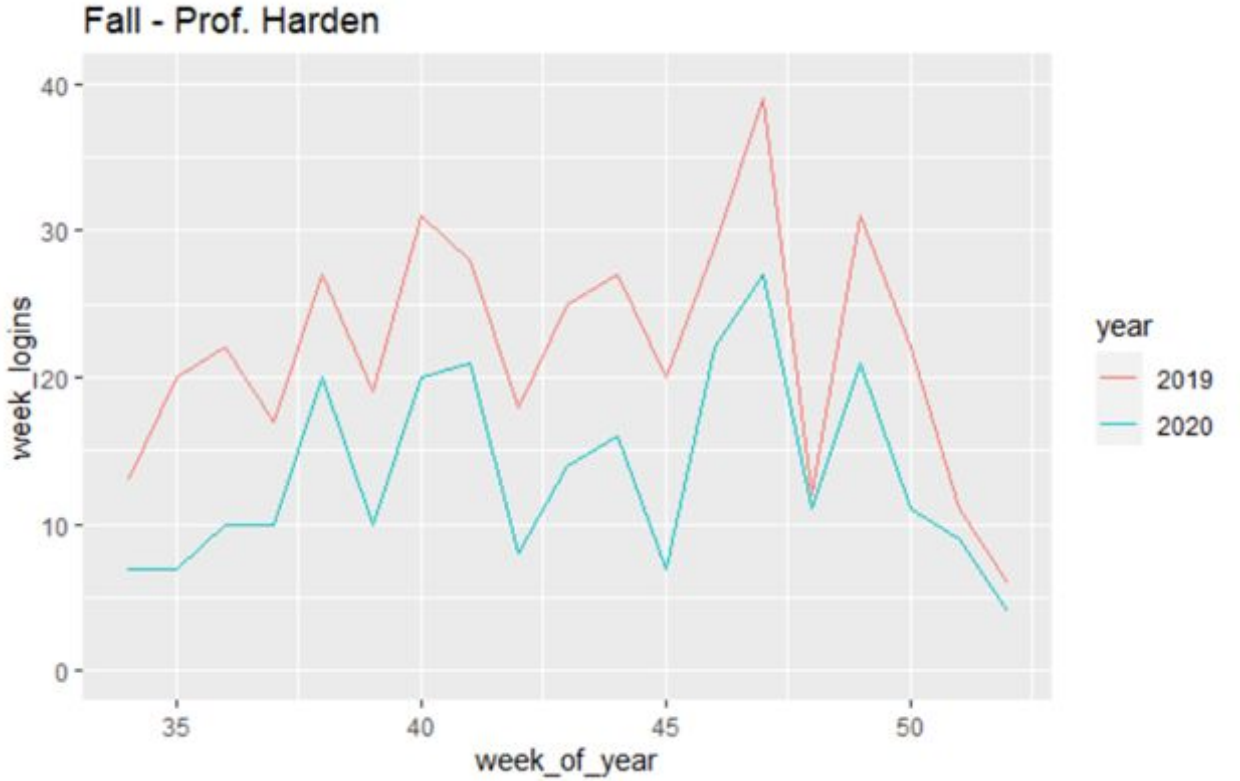

RESULT - INSTRUCTOR LOGINS

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T - Test Result			
Semester	**P-value**	**Mean of 2019**	**Mean of 2020**
2019 Fall vs. 2020 Fall	0.0012	21.947	13.421
2019 Spring vs. 2020 Spring (before week 14)	0.218	12.000	15.917
2019 Spring vs. 2020 Spring (after week 14)	0.082	7.750	13.500

RESULT - INSTRUCTOR GRADEBOOK ACTIVITIES

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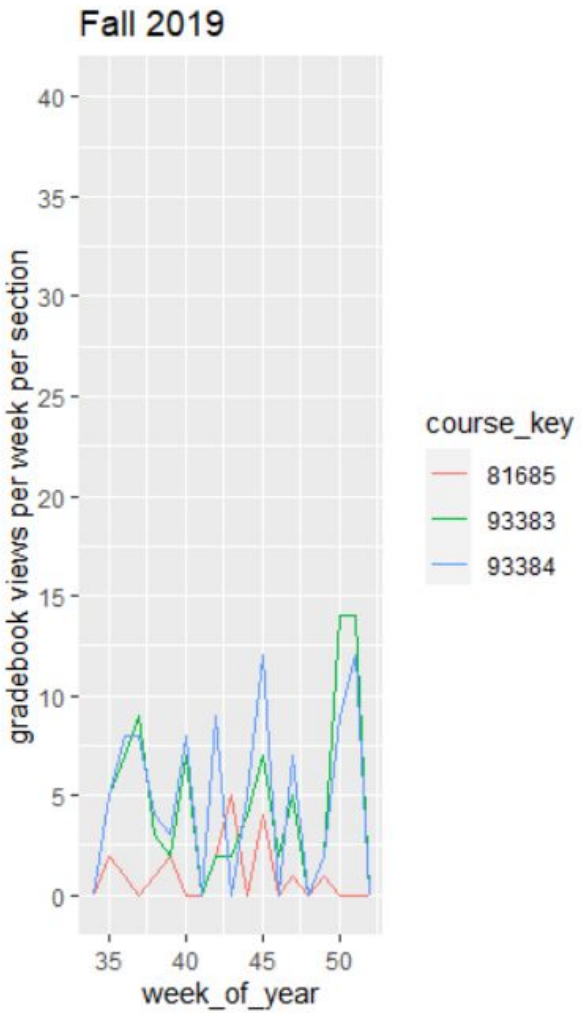

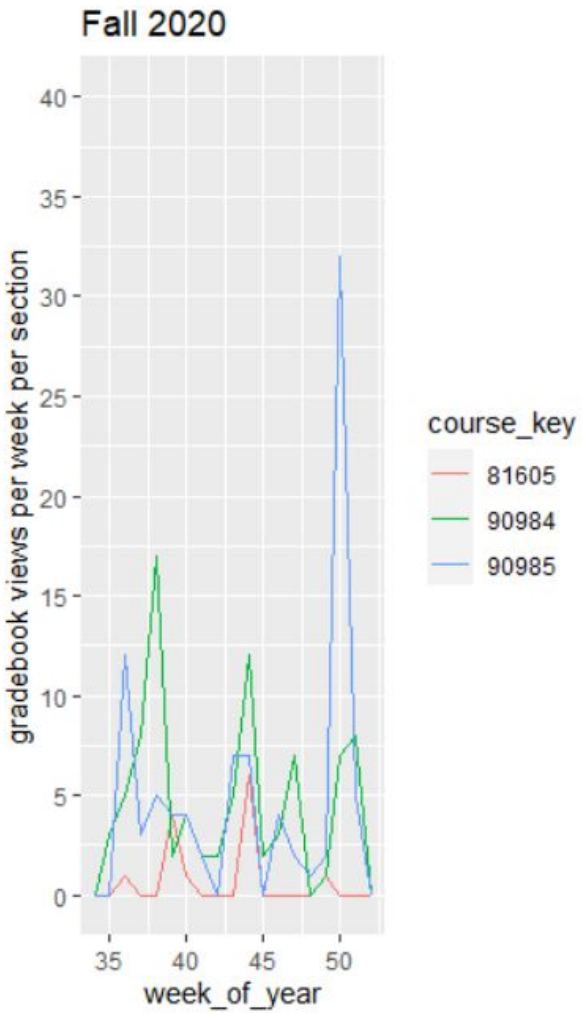

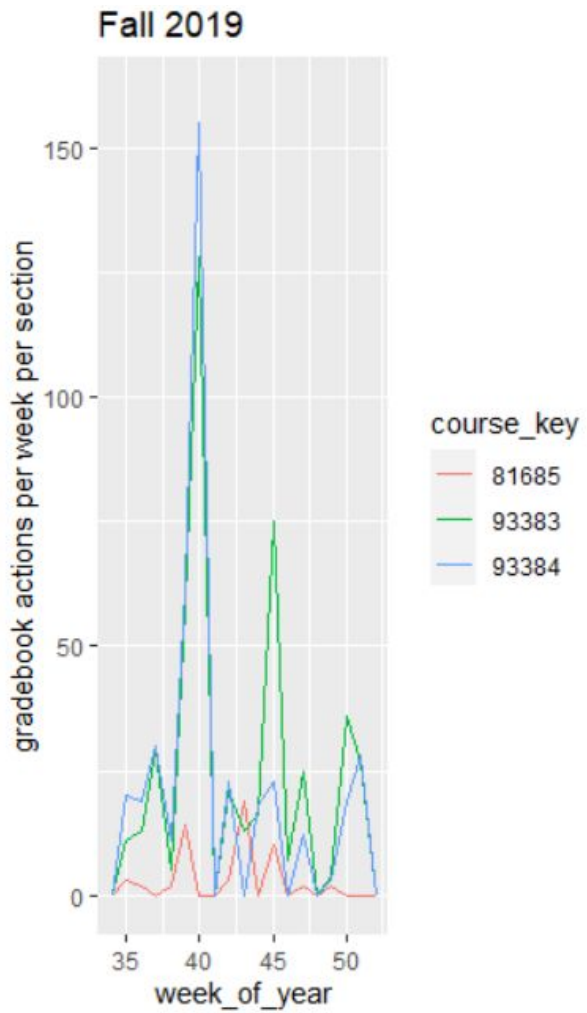

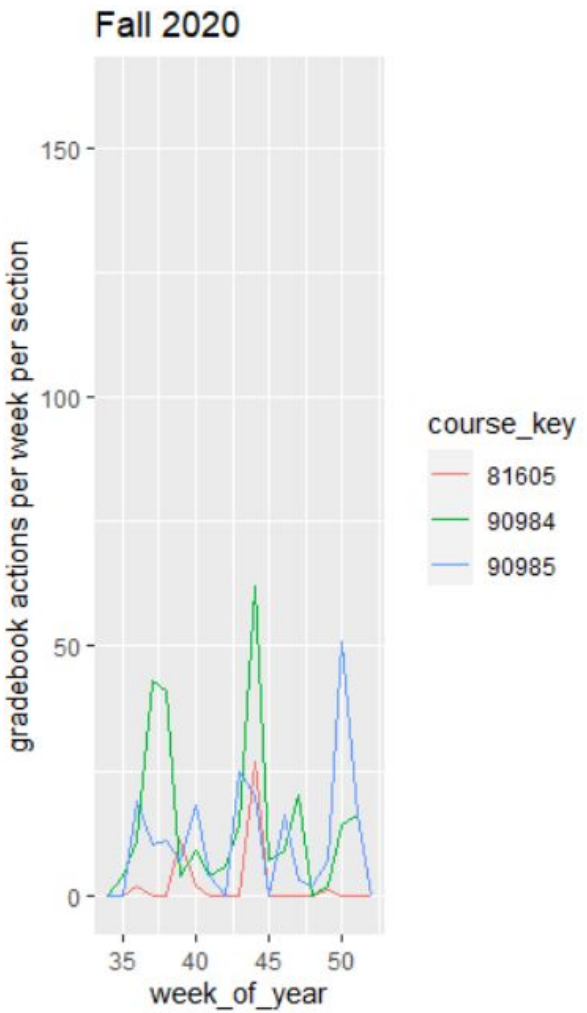

RESULT - INSTRUCTOR DASHBOARD ACTIVITIES

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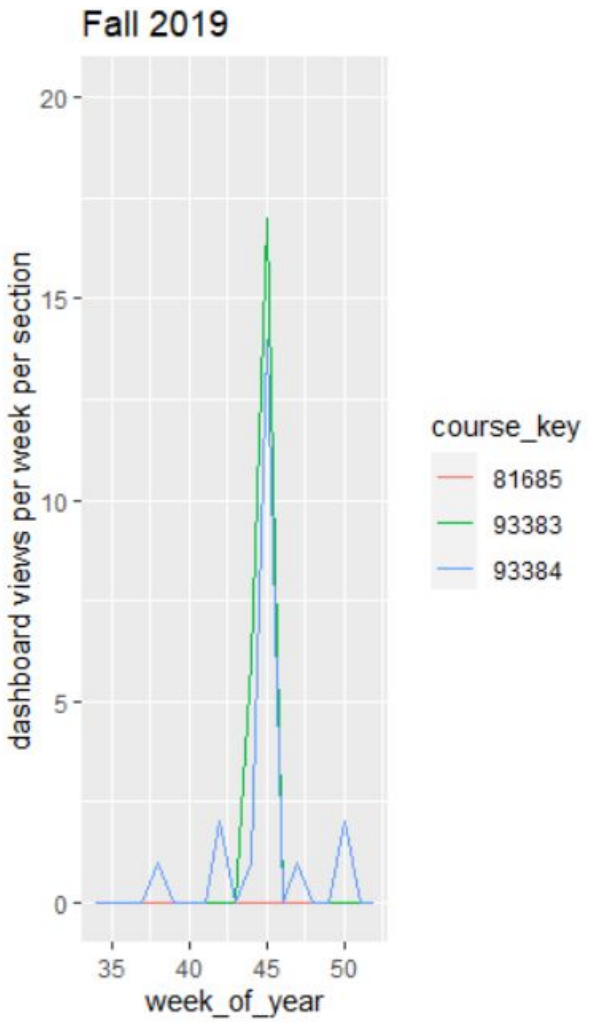

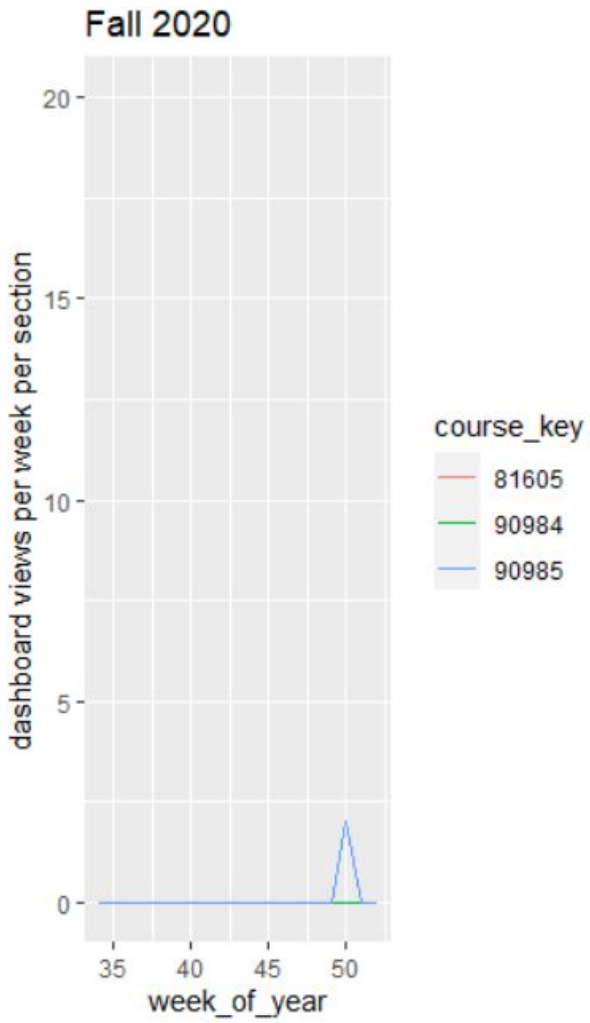

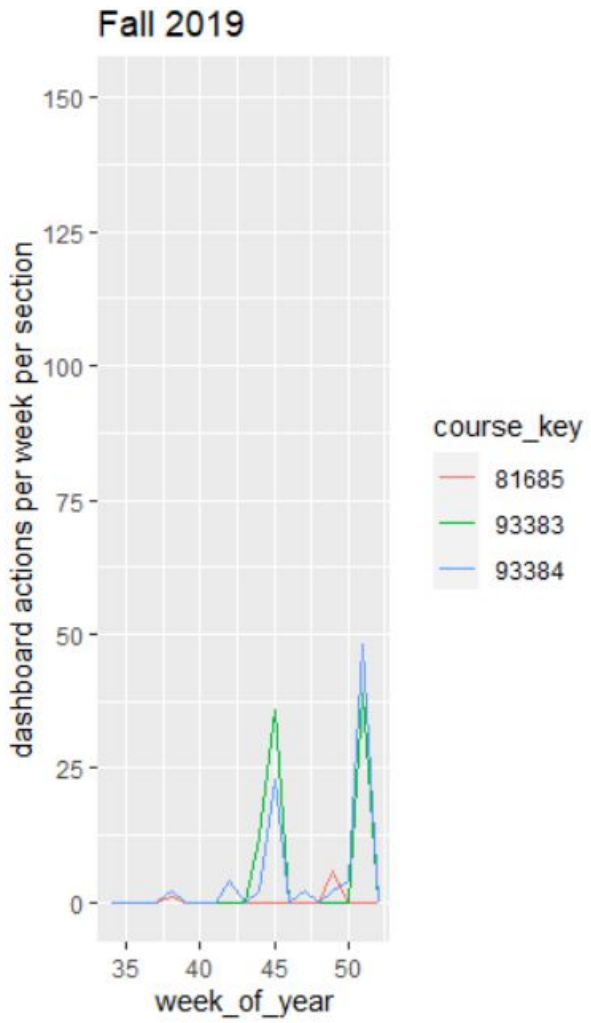

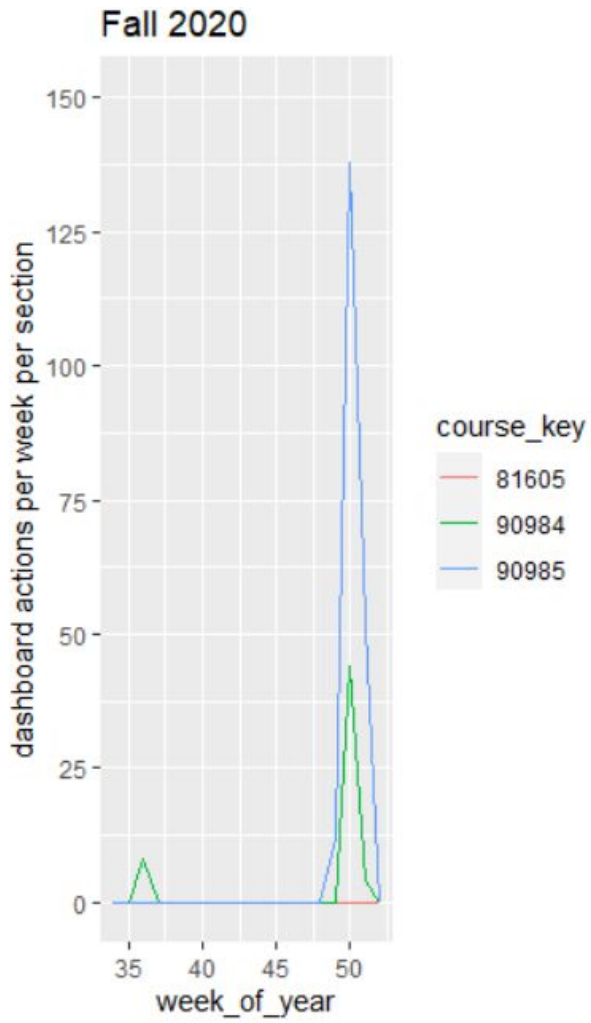

RESULT - STUDENT PERFORMANCE CHANGE

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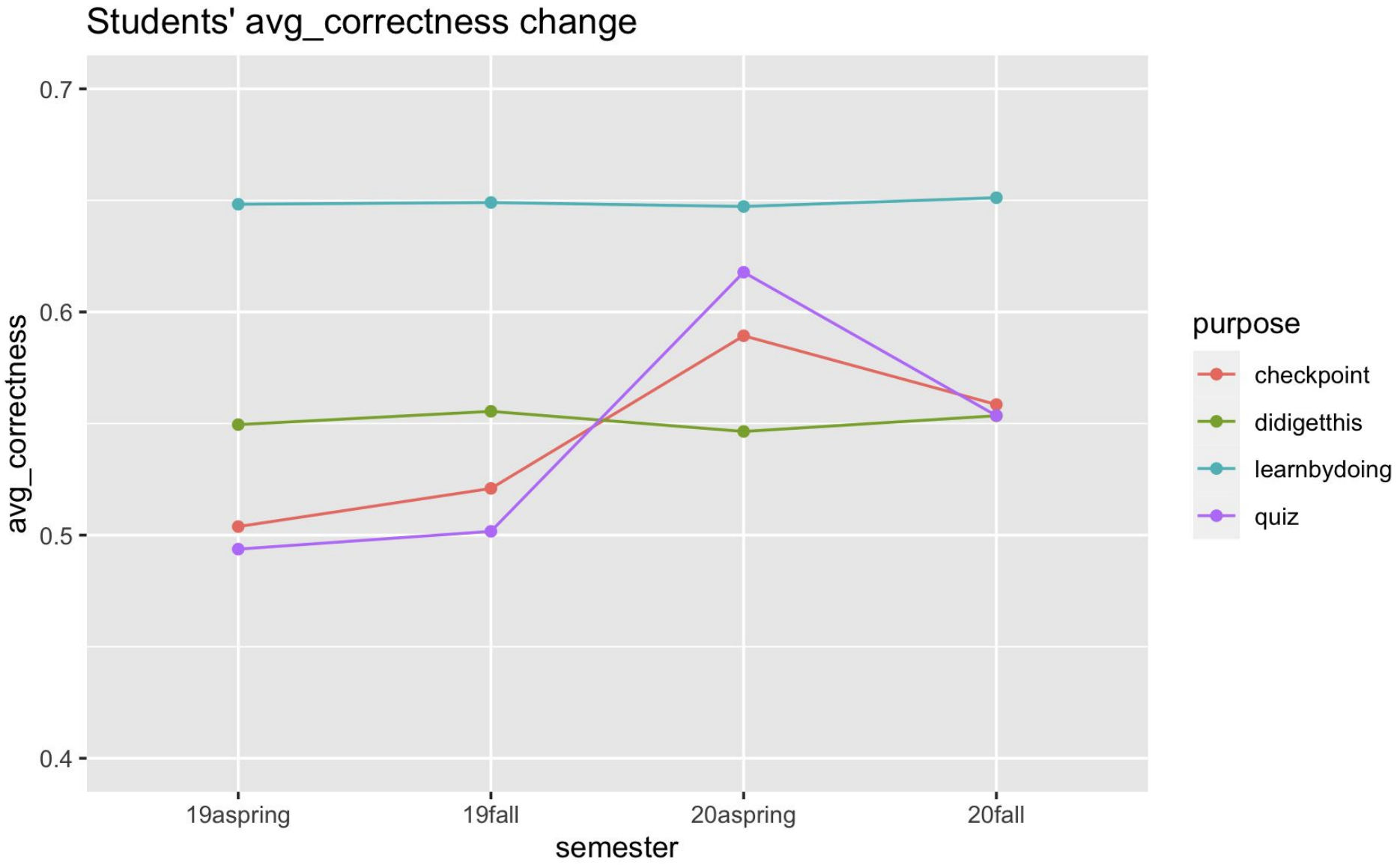

RESULT - STUDENT PERFORMANCE CHANGE

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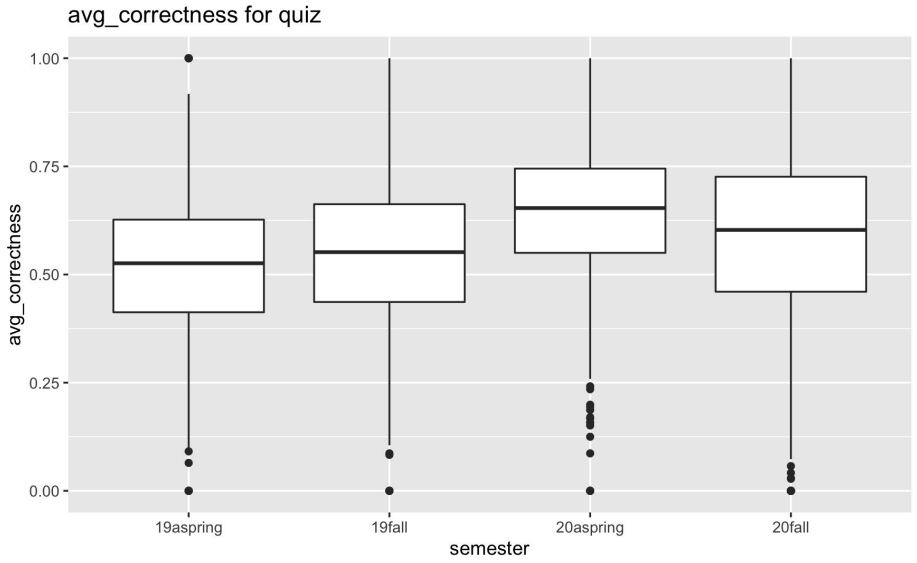
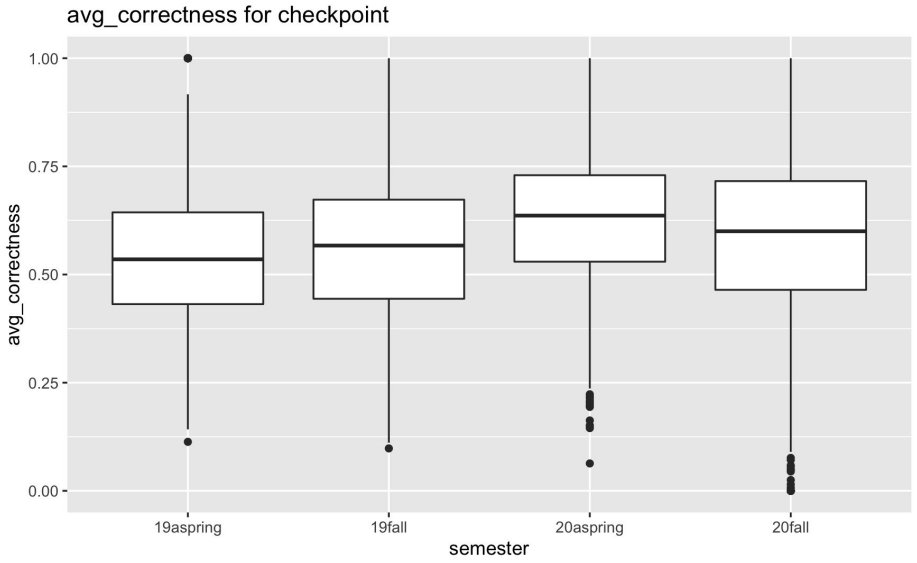
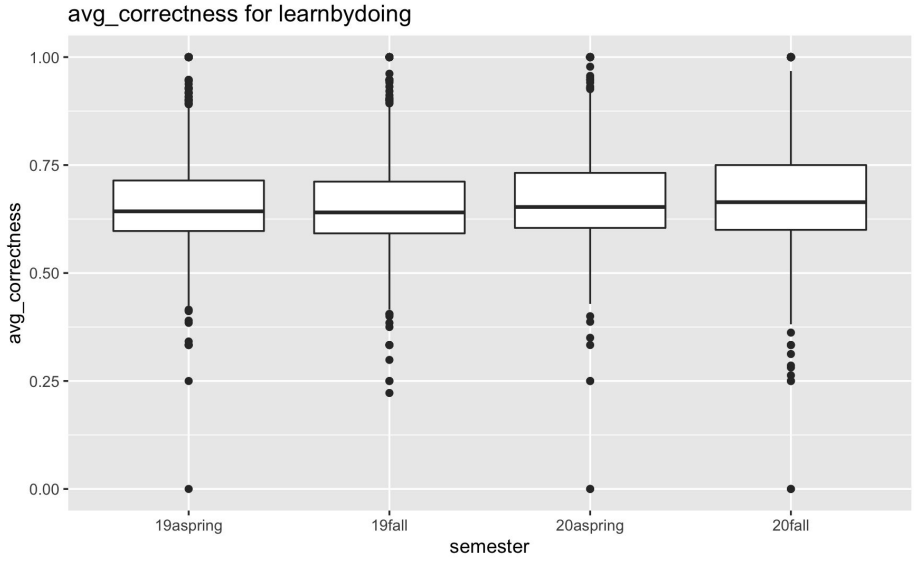
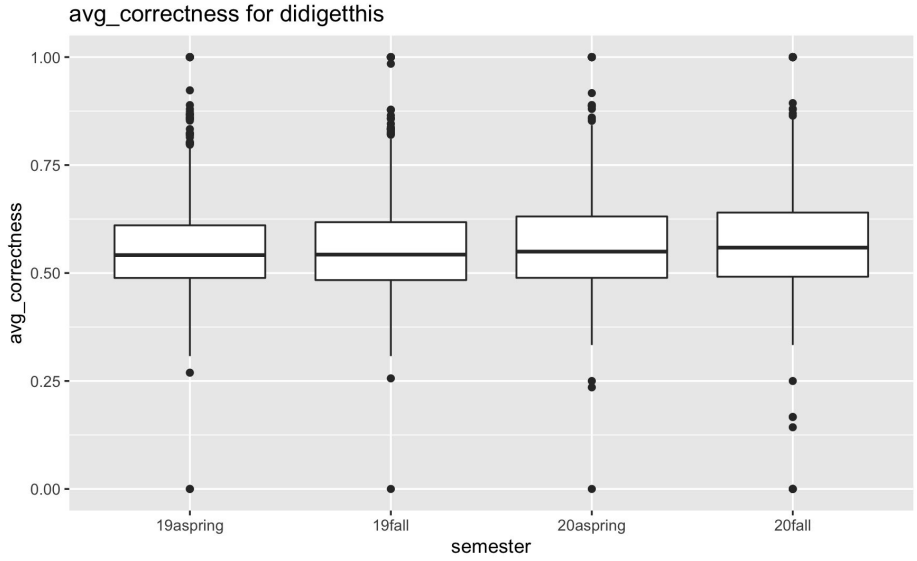


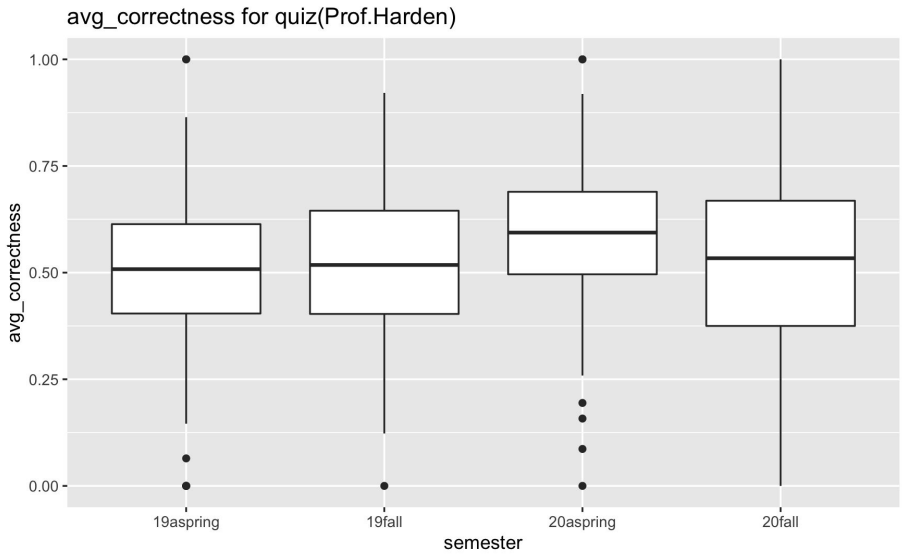


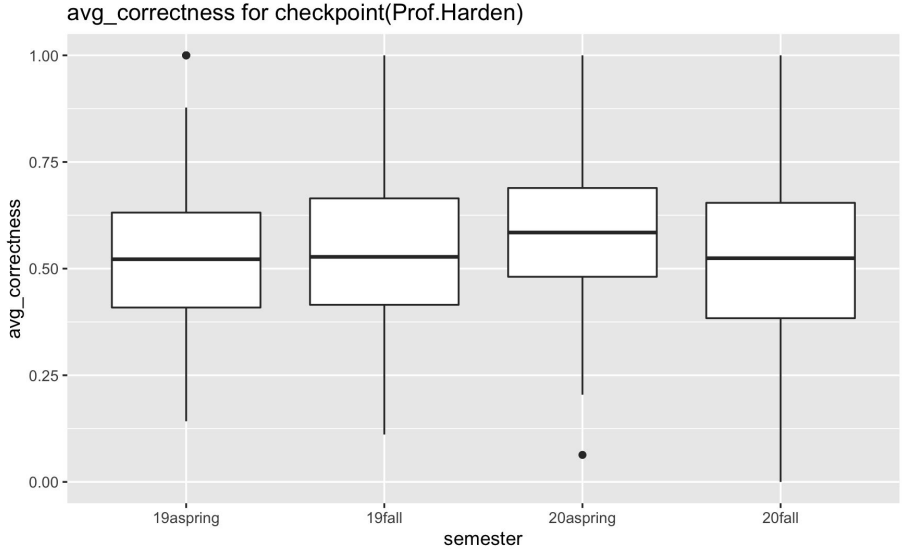


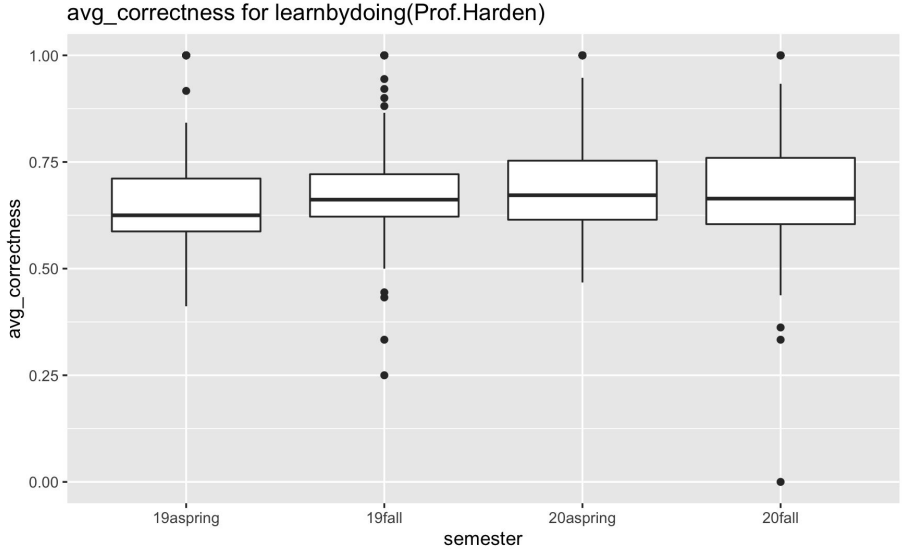


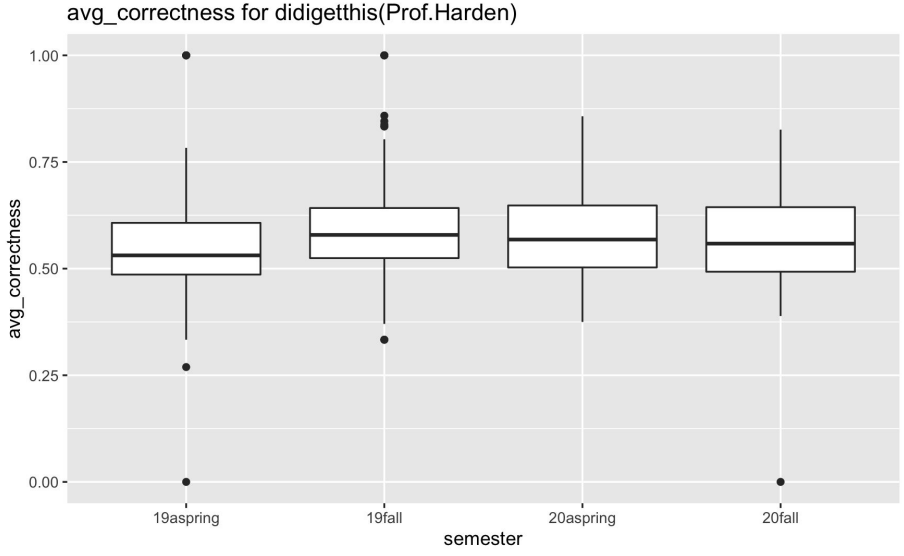

```
19spring vs 20spring(quiz)
t = -21.355, df = 2949.7,
p-value < 2.2e-16
alternative hypothesis:
true difference in means is
not equal to 0
95 percent confidence
interval:
 -0.1318518 -0.1096750
sample estimates:
mean of x mean of y
0.5202814 0.6410448
```

RESULT - STUDENT PERFORMANCE CHANGE










```
19spring vs 20spring(quiz)
t = -5.7468, df = 450.37,
p-value = 1.678e-08
alternative hypothesis:
true difference in means
is not equal to 0
95 percent confidence
interval:
 -0.11924712 -0.05847211
sample estimates:
mean of x mean of y
0.5005464 0.5894060
```

RESULT - STUDENT LOGIN CHANGE

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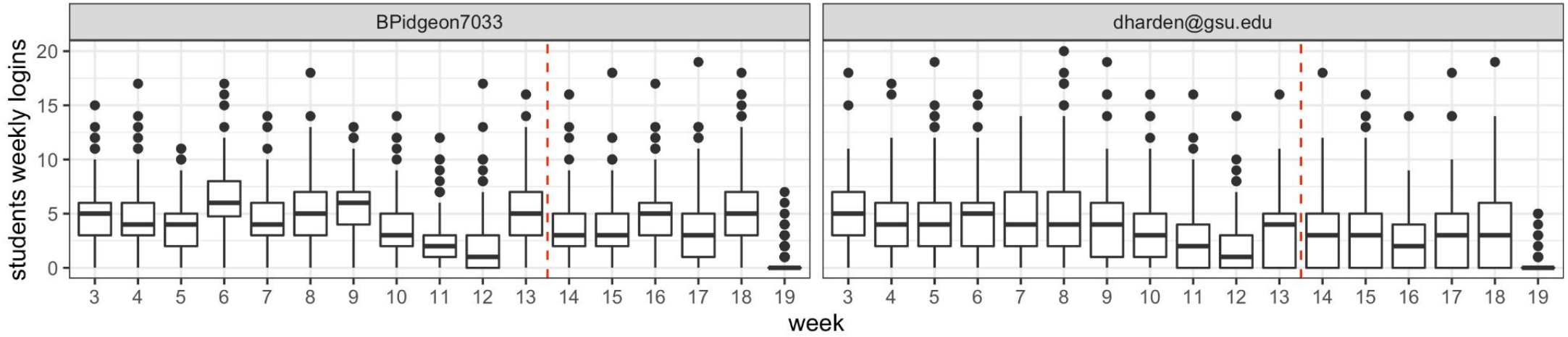
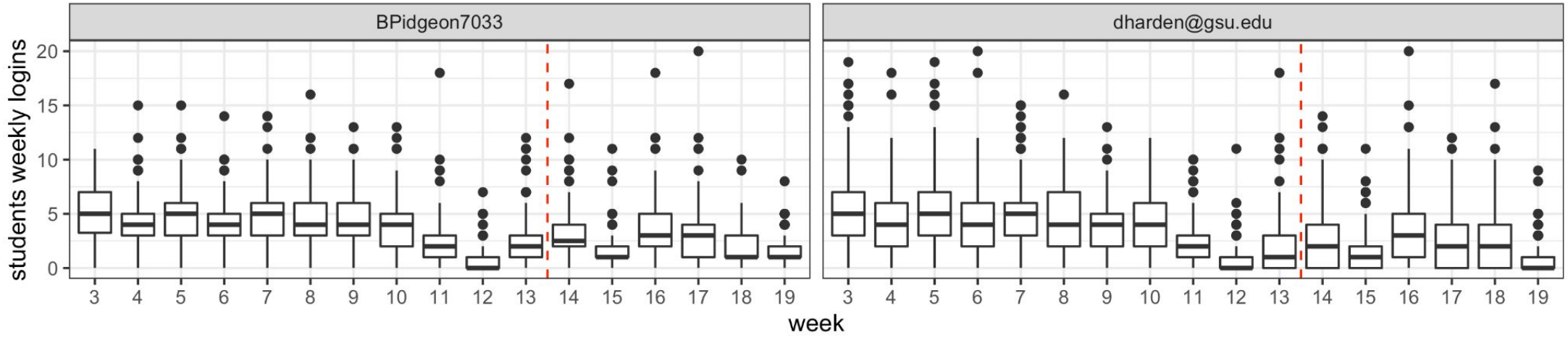
Spring 2019 Student Logins by Week



Spring 2020 Student Logins by Week



RESULT - STUDENT LOGIN CHANGE

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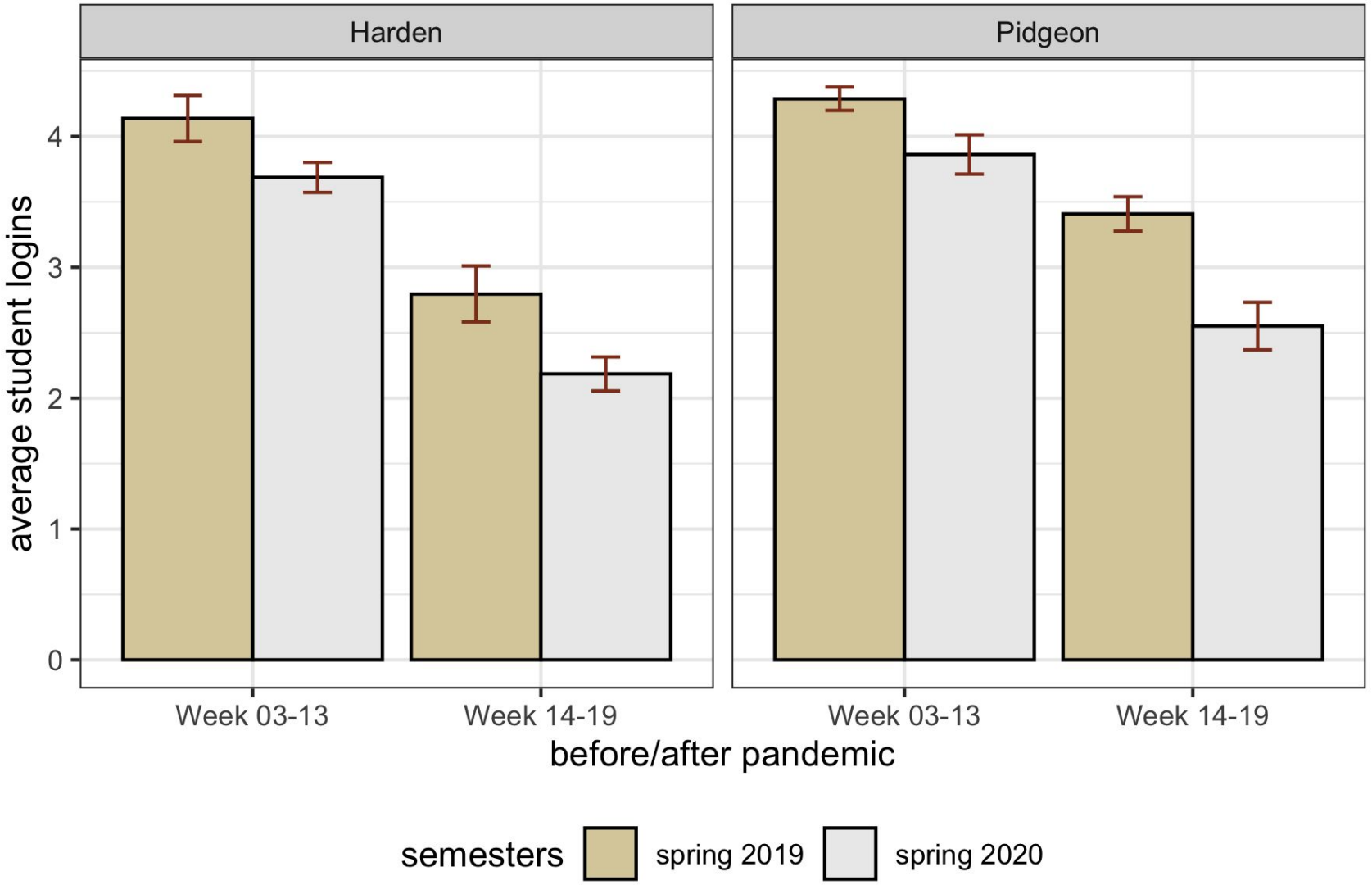

Findings

- S20 average logins lower than S19
- Average logins after COVID lower than before COVID

Next Steps

- Students might log in for fewer times but have longer study sessions after COVID
- We are asking our client for login-time data

DISCUSSION

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Limit of Our Project

- **Change of course policy due to COVID**
  - instructors might allow student to drop several quiz scores
- **Change of material covered**
  - instructors might remove or add some materials in s20 compare to s19
- **Change of quiz format**
  - instructors might change multiple choice to free response or even course project because of online learning

Possible Next Steps

- **Looking for methods other than sample t-test to compare use patterns of different semesters and before/after COVID**
  - Fit a distribution then bootstrapping
- **Create a time series for student quiz scores**
  - If student performs better after school goes fully remote
  - Concern: we only have quiz scores by module/unit. We will be able to order quiz scores in chronological order but not sure about when pandemic happens

DISCUSSION

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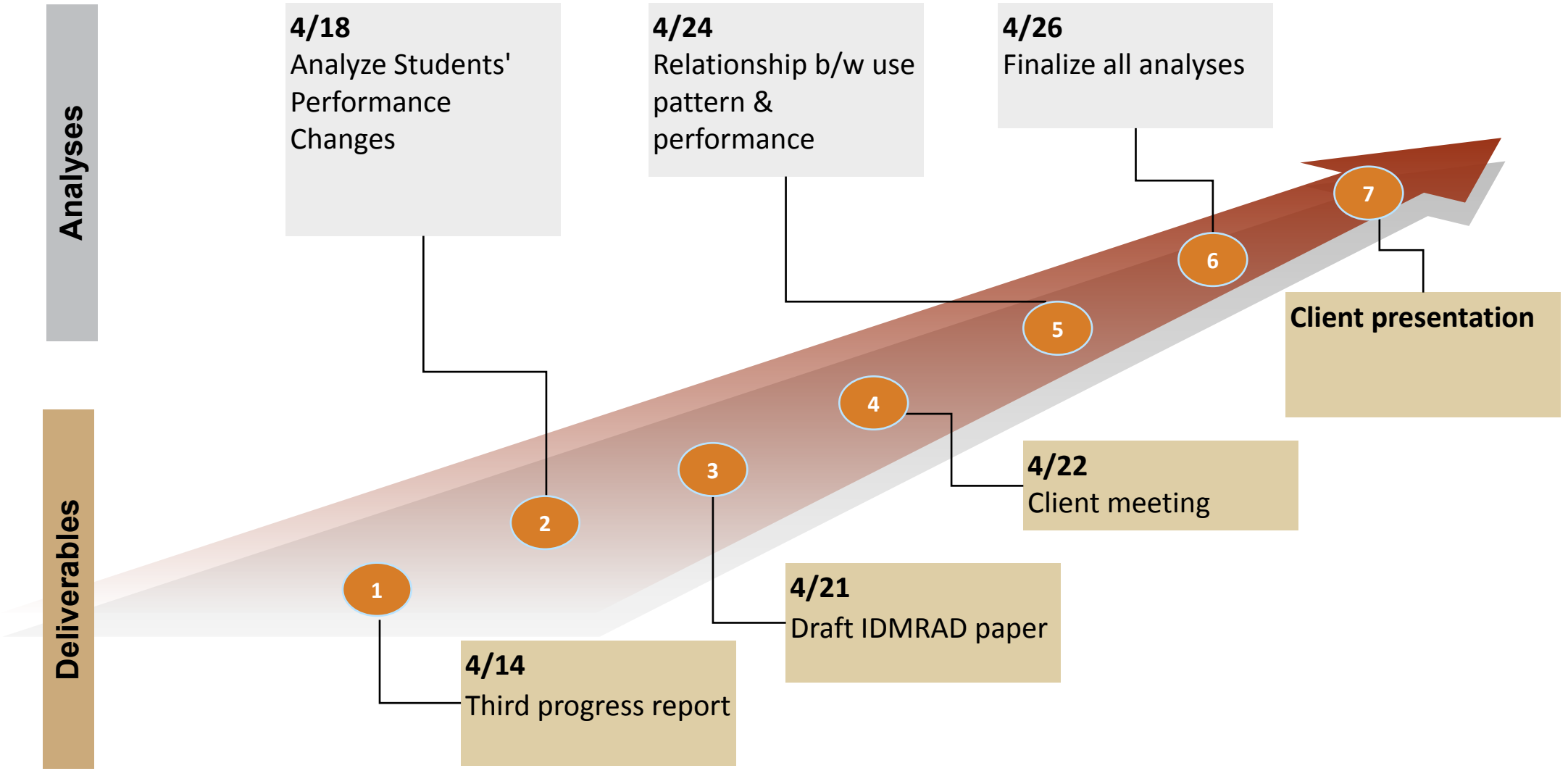

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Thank You!