

# Flexible and Effective Learning Environment Creation Strategies in a Concurrent Hybrid Modality

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# Course Background

## Computer Applications in Forestry

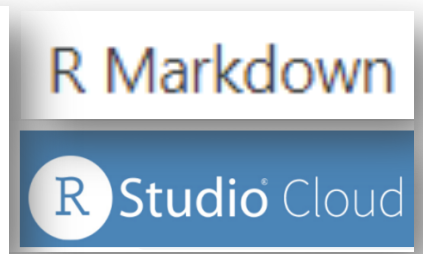
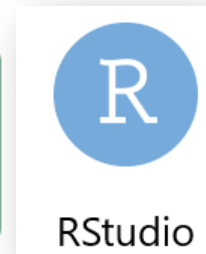
Preparing students to be proficient in high-level computing and analyze a wide variety of forestry-related data.



# Course Background

## Major Learning Component

- Document processing
- Data handling and analyzing
- Data visualizing and summarizing
- Managing and Analyzing geodata



# Hybrid Instructional Models

Have you tried any type of Hybrid modality in your class?

# Hybrid Instructional Models

1. Concurrent Hybrid
2. Asynchronous Hybrid
3. Sequential Hybrid
4. Multi-Section Hybrid
5. Alternating Hybrid

Discussion Paper on Hybrid Teaching and Learning:



# Hybrid Instructional Models

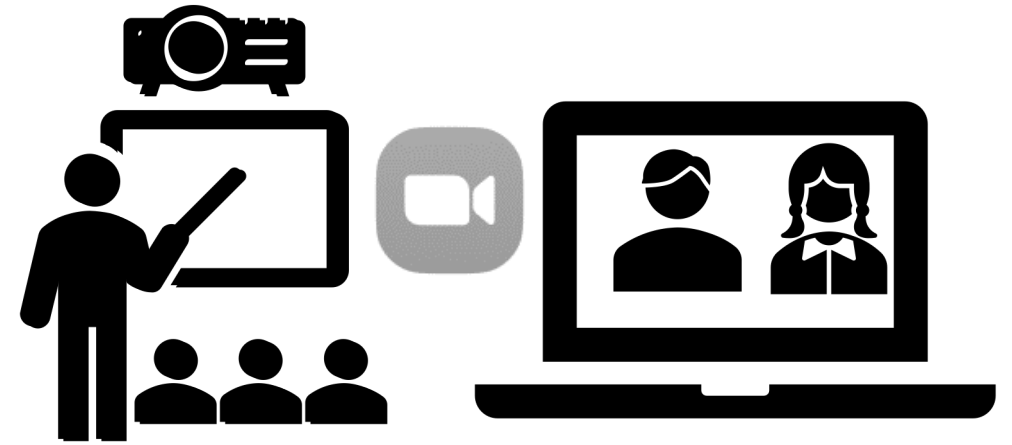
1. Concurrent Hybrid
2. Asynchronous Hybrid
3. Sequential Hybrid
4. Multi-Section Hybrid
5. Alternating Hybrid



Which hybrid modality might be the best for your course?

# Hybrid Instructional Models

1. Concurrent Hybrid
2. Asynchronous Hybrid
3. Sequential Hybrid
4. Multi-Section Hybrid
5. Alternating Hybrid



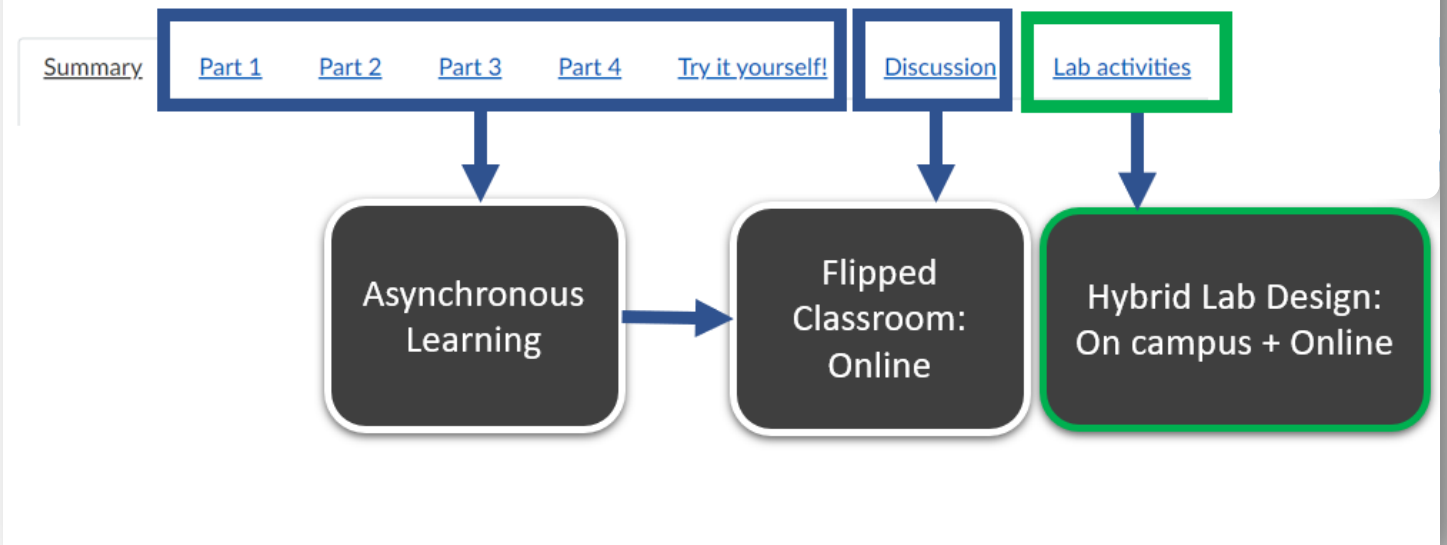
# Adaptation Strategies: Learning Module

## Assessment of Learning

- Quiz
- Discussion questions
- Assignment
- Presentation and peer-review
- Exams

## Instructional Approaches

### Graphical Presentation in RMarkdown



Suitable location for a hybrid modality



# Learning Design

## Graphical Presentation in RMarkdown

[Summary](#)

[Part 1](#)

[Part 2](#)

[Part 3](#)

[Part 4](#)

[Try it yourself!](#)

[Discussion](#)

[Lab activities](#)

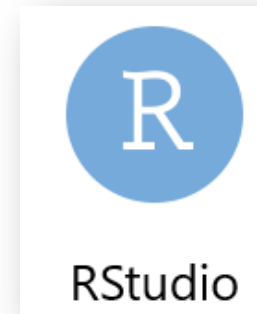
### Lesson Objectives

After studying this lesson you should be able to:

- Create scatter plots, line graphs, bar graphs, pie charts, and histograms
- Customize additional items on a graph
- Add legends to graphs
- Save graphs as an image or pdf file

Module checklist:

- [Part 1 Quiz](#)
- [Part 2 Quiz](#)
- [Part 3 Quiz](#)
- [Part 4 Quiz](#)
- [In-class Discussion](#)
- [Lab Assignment](#)



# Learning Design

## Graphical Presentation in RMarkdown

[Summary](#) | [Part 1](#) | [Part 2](#) | [Part 3](#) | [Part 4](#) | [Try it yourself!](#) | [Discussion](#) | [Lab activities](#)

### Basic Graphs: RStudio and R Markdown

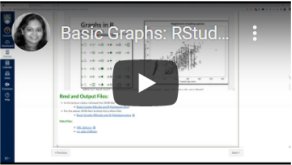
#### Lesson Objectives

After studying this lesson you should be able to:

- Familiar with creating a scatter plot
- Familiar with handling parameters in plot function and creating publication quality graphs
- Setting margins in a graph

#### Lecture Videos:

1. Audio Enabled Video



#### Lecture slides:

1. Basic Graphs in R: [Basic Graphs RStudio and R Markdown.pptx](#) ↓

#### Rmd and Output Files:

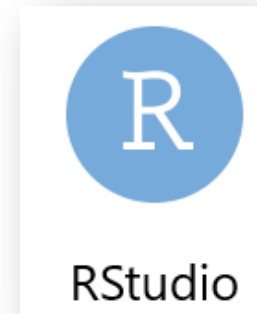
- In the lecture video, I showed the .RMD file:
  - [Basic Graphs RStudio and R Markdown.Rmd](#)
- For the above .RMD file I knitted into a Word and HTML file:
  - [Basic-Graphs-RStudio-and-R-Markdown.docx](#) ↓
  - [Basic-Graphs-RStudio-and-R-Markdown.html](#)

#### Data Files:

- [VRI\\_data.csv](#) ↓
- [vri\\_data-2.RData](#) ↓

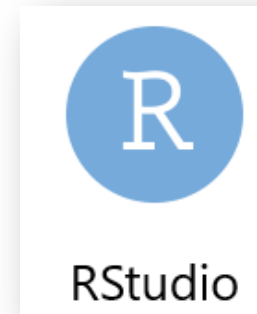
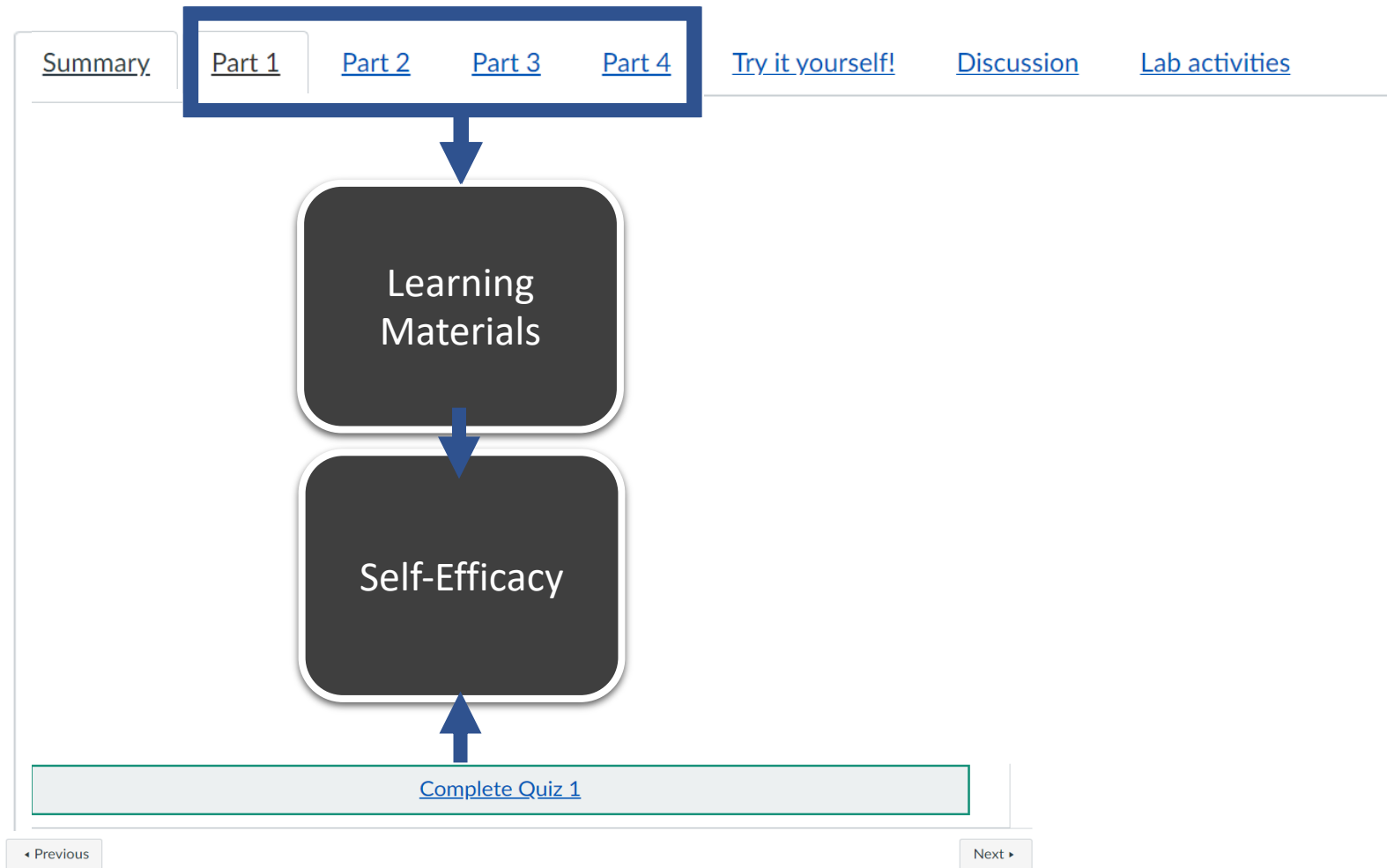
[Complete Quiz 1](#)

◀ Previous | Next ▶



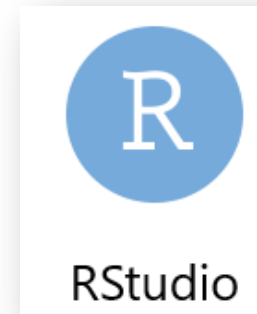
# Learning Design

## Graphical Presentation in RMarkdown



# Module Structure

## Graphical Presentation in RMarkdown



# Module Structure

## Graphical Presentation in RMarkdown

[Summary](#) [Part 1](#) [Part 2](#) [Part 3](#) [Part 4](#) [Try it yourself!](#) [Discussion](#) [Lab activities](#)

Discussion on Graphical Presentation in R

```
1. {r}
plot(Height,SDI,
     xlab="Height (m)",
     ylab="Stand Density Index",
     cex.lab=1,
     main="Height vs. SDI",
     cex.main=1.5,
     xlim=c(0,200),
     ylim=c(0,1000),
     cex.axis=0.7,
     pch=20,
     cex=1,
     col="blue")
...

```

Explain the components of this plot code in your own words (You can use bullet points). Think about what the code does.

```
2. {r}
png(Problem1_pdf, width=1, width=1)
...

```

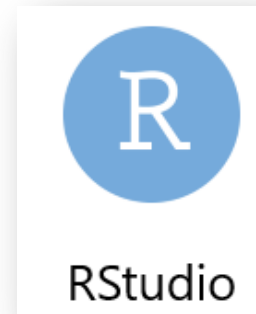
List all of the things that are wrong with this code and what you need to do to solve the errors. How might you avoid these errors in the future? (Feel free to talk about how you intend to mitigate other types of errors too)

3. Now that you've learned how to create graphs in Excel and R, under what situations would you rather use R than Excel? (Think about the codes that you can use or other processes that can be done in R)

**Note:** you can comment on each other's posts. You need to post before seeing other posts.

Search entries or author Unread [eye icon] [up/down arrows icon]

- Bring in questions to discuss.
- Solve discussion questions in a smaller group and submit
- Briefly introduce the next learning module and provide a guideline.



# Module Structure

## Graphical Presentation in RMarkdown

Summary Part 1 Part 2 Part 3 Part 4 Try it yourself! Discussion **Lab activities**

Lab Activities: Graphical Presentation in R Markdown

### Graphical Presentation in R Markdown

**Learning Objectives:**

- Create figures from data in R
- Control parameters, legends, and plotting windows of the figures in R
- Save the figures as an image file

**Platform: R/RStudio/R Markdown**

Please download the following file before coming to the lab:

CSV file: [airquality.csv](#) ↓

RMD file: [lab6.Rmd](#) ↓

Word file: [lab6\\_demo.docx](#) ↓

Output files: [Problem\\_1.png](#), [Problem\\_3.png](#)

**Schedule:**

Time	Activities
45 minutes	• Demonstration
Break	• Break for 15 minutes
60 minutes	• Start working on your assignment with your group members

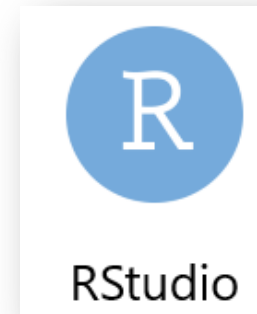
**Materials to be covered:**

1. Create point and line graphs using plot() function in R from different subsets of data
2. Adjust parameters in plot() function and add a legend
3. Create a side-by-side plot using par() function
4. Save graph as a .png file using png() function

◀ Previous Next ▶

• Demonstrate lab activities

• Solve problems in a group on a shared platform

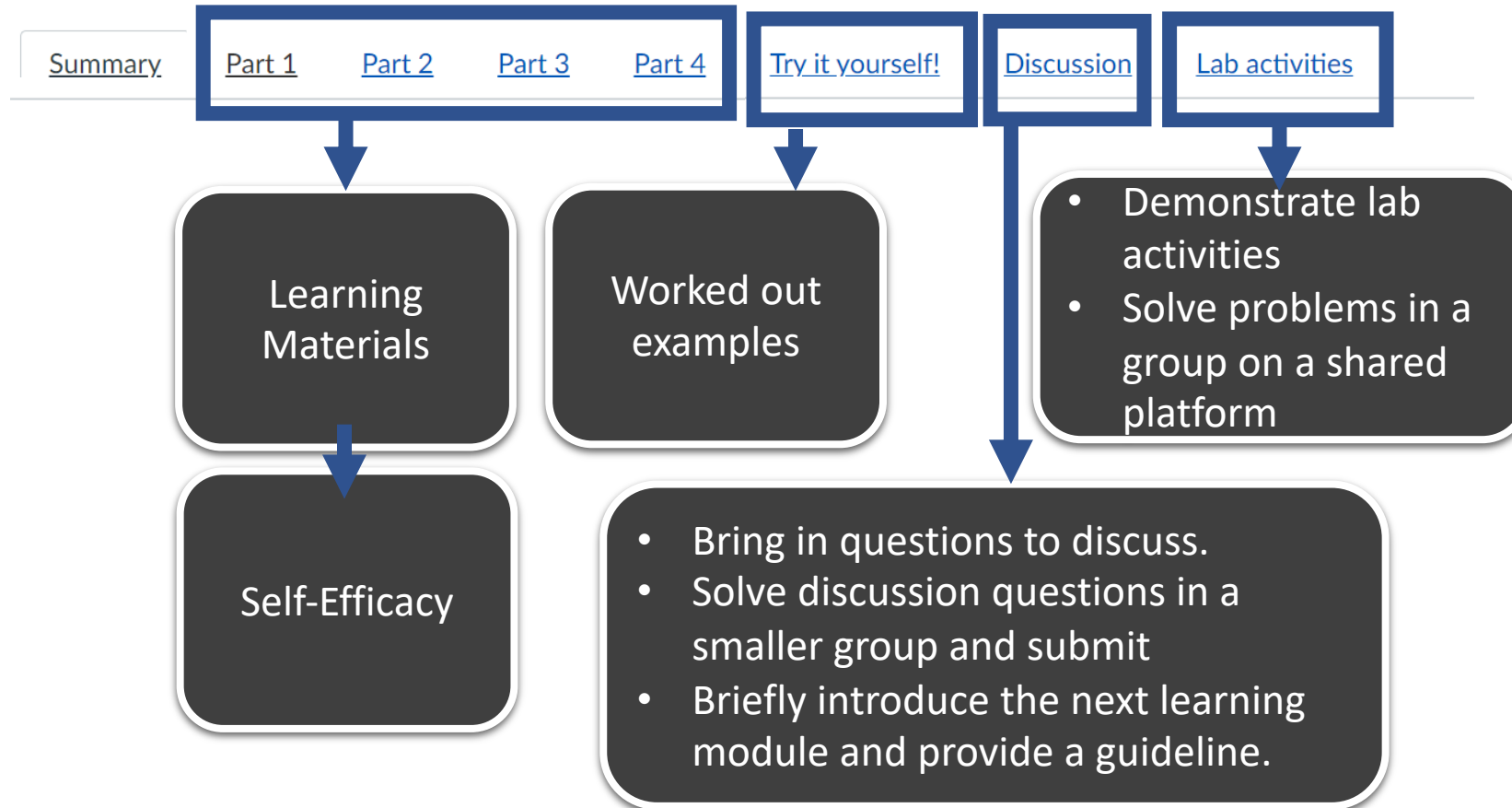




# Module Structure



## Graphical Presentation in RMarkdown



# Hybrid Class Design

Instructor

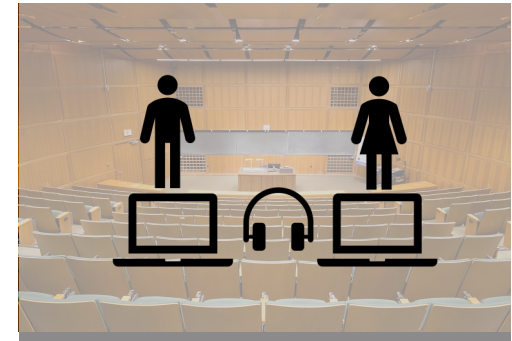
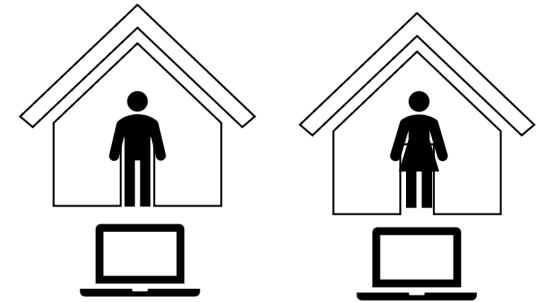


Teaching Assistants



## Instruments

1. Laptop
  2. Microphone that can cancel noise
  3. Headphone: blue tooth enabled or  
Mic for the classroom: lapel
1. Camera for live streaming
  2. Wired internet





# Facilitation

1. Training session: TAs

2. Specify hybrid design and expectation

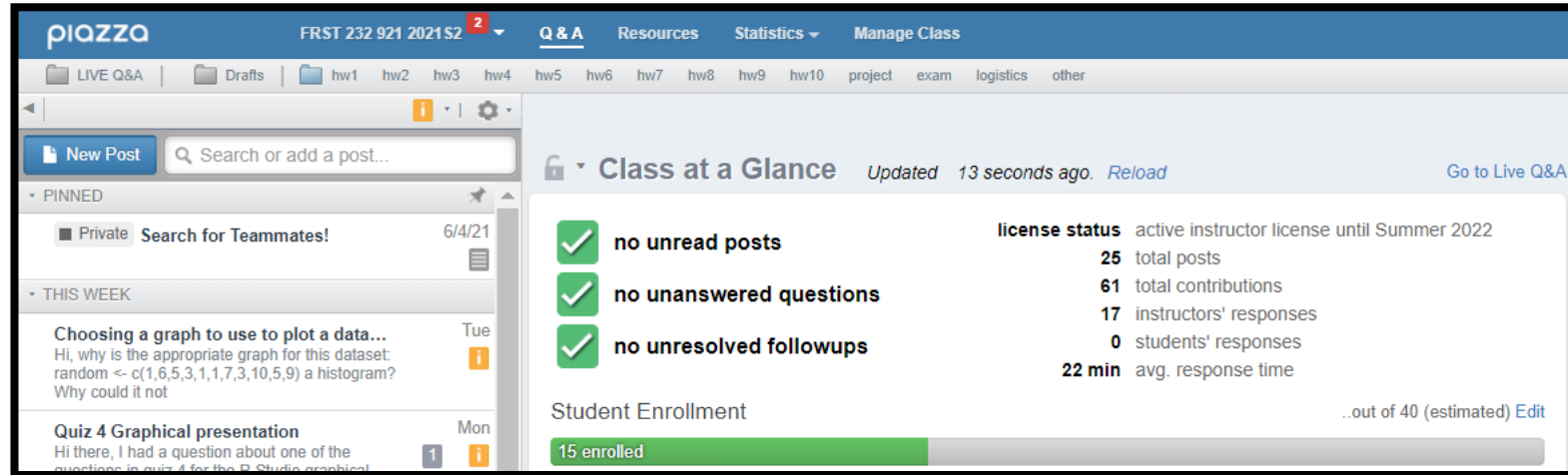
3. Late arrival or quarantine period

4. Flexibly join any platform: in-person or online

# Communication Tools



- Group discussion
- Solving Problems in a group
- Communicate with the teaching team and others



The screenshot shows the Piazza Q&A interface for a course titled "FRST 232 921 2021 S2". The interface includes a navigation bar with "Q & A", "Resources", "Statistics", and "Manage Class". Below the navigation bar, there are tabs for "LIVE Q&A", "Drafts", and a list of homework assignments (hw1 to hw10) along with "project", "exam", "logistics", and "other". The main content area is titled "Class at a Glance" and is updated "13 seconds ago". It features a "New Post" button and a search bar. The "Class at a Glance" section includes a "license status" section with the following details: active instructor license until Summer 2022, 25 total posts, 61 total contributions, 17 instructors' responses, 0 students' responses, and a 22 min avg. response time. There are also three green checkmarks indicating "no unread posts", "no unanswered questions", and "no unresolved followups". A "Student Enrollment" section shows a progress bar for "15 enrolled" out of 40 (estimated). The interface also displays a "PINNED" section with a "Private Search for Teammates!" post and a "THIS WEEK" section with a post titled "Choosing a graph to use to plot a data..." and a "Quiz 4 Graphical presentation" post.

- Introduce themselves
- Post questions outside the class time
- Get help from the teaching team and peers

# Communication Tools

zoom

Your current Time Zone and Language are (GMT-07:00) Vancouver, English [✎](#)

[Upcoming Meetings](#) [Previous Meetings](#) [Personal Meeting Room](#) [Cloud Recordings](#)

Show my course meetings only

Start Time	Topic	Meeting ID
Recurring	<a href="#">Student Café 1</a>	612 3931 2611
Recurring	<a href="#">Student Café 2</a>	687 3025 5837
Recurring	<a href="#">Student Café 3</a>	694 3688 6438
Recurring	<a href="#">Office Hours</a>	671 7996 8679
Recurring	<a href="#">Lab</a>	679 7099 4011
Recurring	<a href="#">In-Class Discussion</a>	682 0820 2676

- Group Discussion outside the class time
- Get help from the teaching team every weekdays


# Evaluation: Achieving Learning Goals

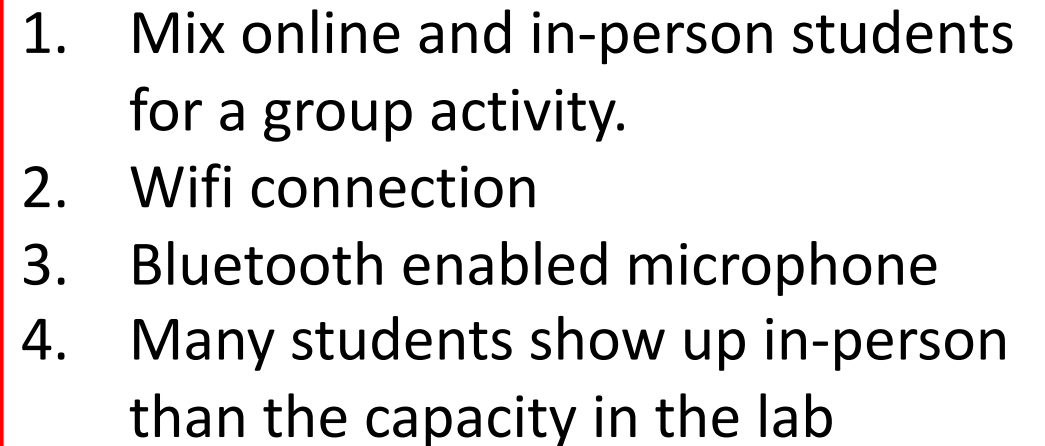


# Advantages



# Challenges

- 
1. High level of flexibility
  2. Single communicating platform
  3. Split TAs
  4. Solving problems on a shared page
  5. Bluetooth enabled microphone
  6. TA training
  7. Practice session for students
  8. Organize learning modules and activities with a clear guideline
  9. Recorder the live-streamed demonstration segment and make it available asap

- 
1. Mix online and in-person students for a group activity.
  2. Wifi connection
  3. Bluetooth enabled microphone
  4. Many students show up in-person than the capacity in the lab

# Adjustment and Challenges

- Any adjustments needed to adopt hybrid modality in your course?
- Any challenges that may come up for the teaching team and students?

# Research Objectives

1. Measure changes in confidence in learning modules
2. Measure changes in self-efficacy and engagement
3. Trends for the mastery of content knowledge
4. Mastery difference among online and in-person students
5. Making inference for mastery levels based on previous experience, joining platform (online or in person) and demographics

# Evaluation Strategies

## Three Stages Surveys:

1. Beginning of the term

Learning goals, expectations, prior experience and demographics

2. Midterm

Self-efficacy, confidence in applying independently, mastery gained and engagement

3. End of the term

Meeting the learning Goals and joining platform most of the time

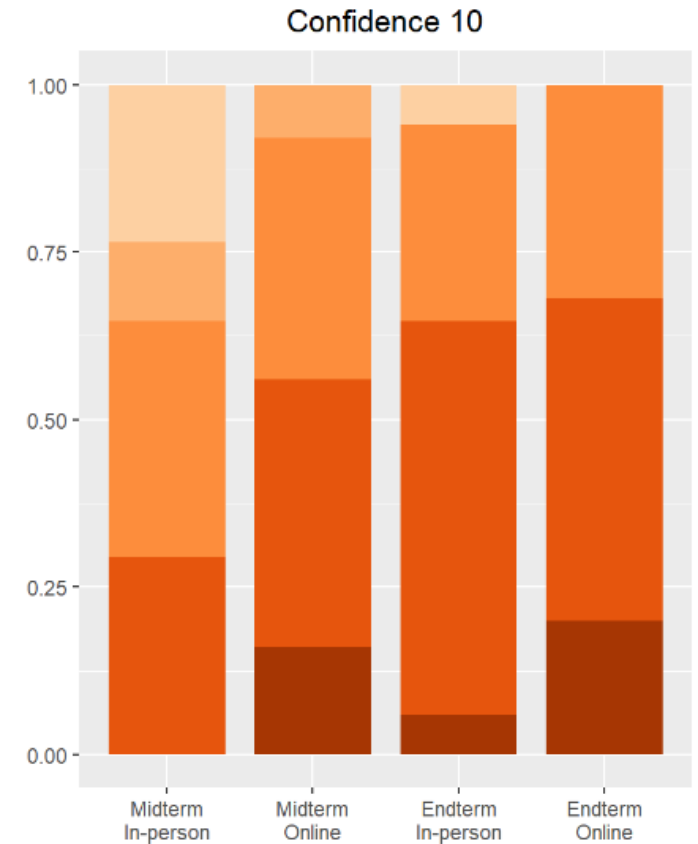
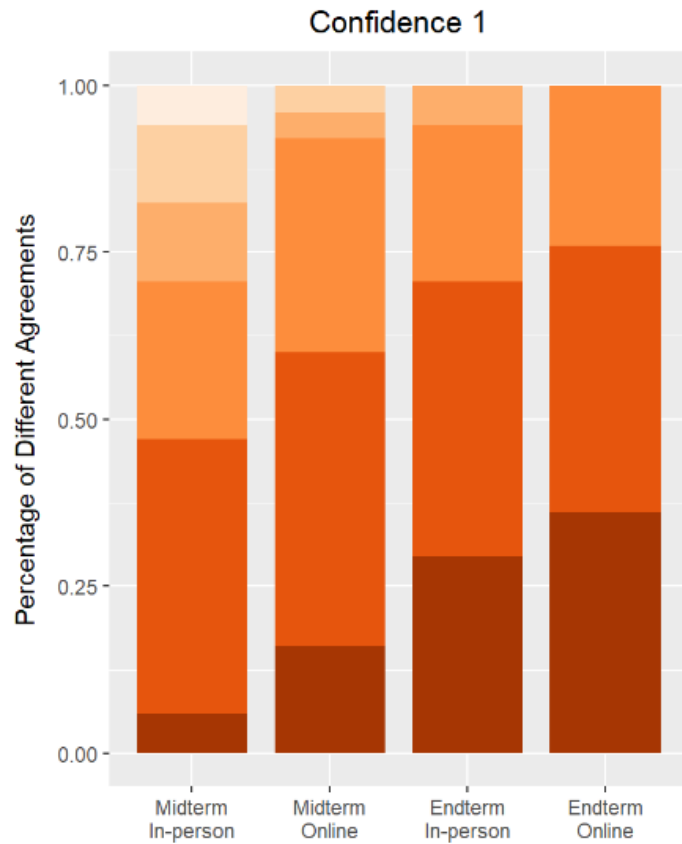


# Data Summary

	In-person (N=17)	Online (N=25)	Overall (N=42)
<b>Gender</b>			
0 Female	10 (58.8%)	17 (68.0%)	27 (64.3%)
1 Male	7 (41.2%)	8 (32.0%)	15 (35.7%)
<b>Language</b>			
0 Non-native Eng. Speaker	2 (11.8%)	12 (48.0%)	14 (33.3%)
1 Native Eng. Speaker	15 (88.2%)	13 (52.0%)	28 (66.7%)
<b>Previous Course Taken</b>			
Mean (SD)	0.294 (0.772)	0.400 (0.816)	0.357 (0.791)
Median [Min, Max]	0 [0, 3.00]	0 [0, 3.00]	0 [0, 3.00]
<b>Year Level</b>			
Mean (SD)	1.94 (0.556)	2.32 (0.945)	2.17 (0.824)
Median [Min, Max]	2.00 [1.00, 3.00]	2.00 [1.00, 4.00]	2.00 [1.00, 4.00]
<b>SC0</b>			
Mean (SD)	2.24 (1.03)	2.72 (1.28)	2.52 (1.19)
Median [Min, Max]	2.00 [1.00, 5.00]	3.00 [1.00, 7.00]	2.00 [1.00, 7.00]

Previous  
Experience  
SC0

# Descriptive Analysis

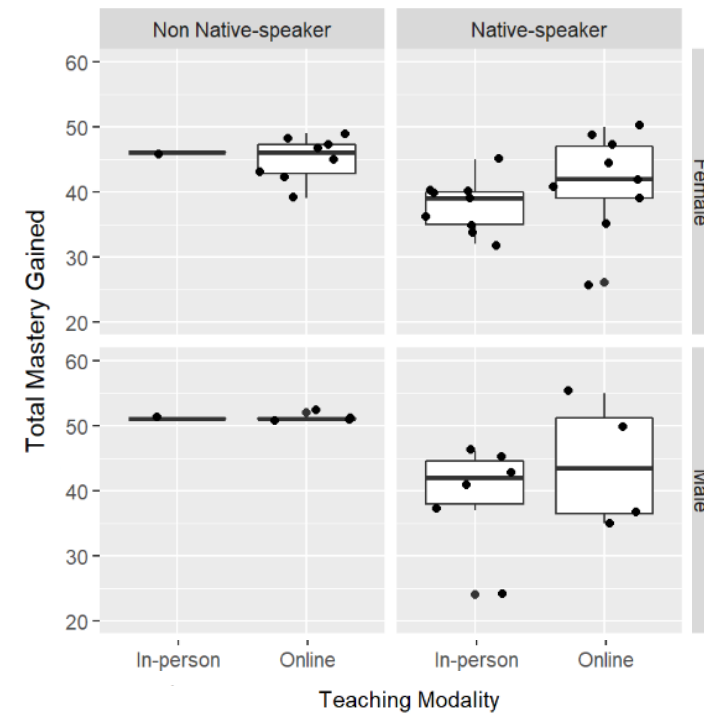
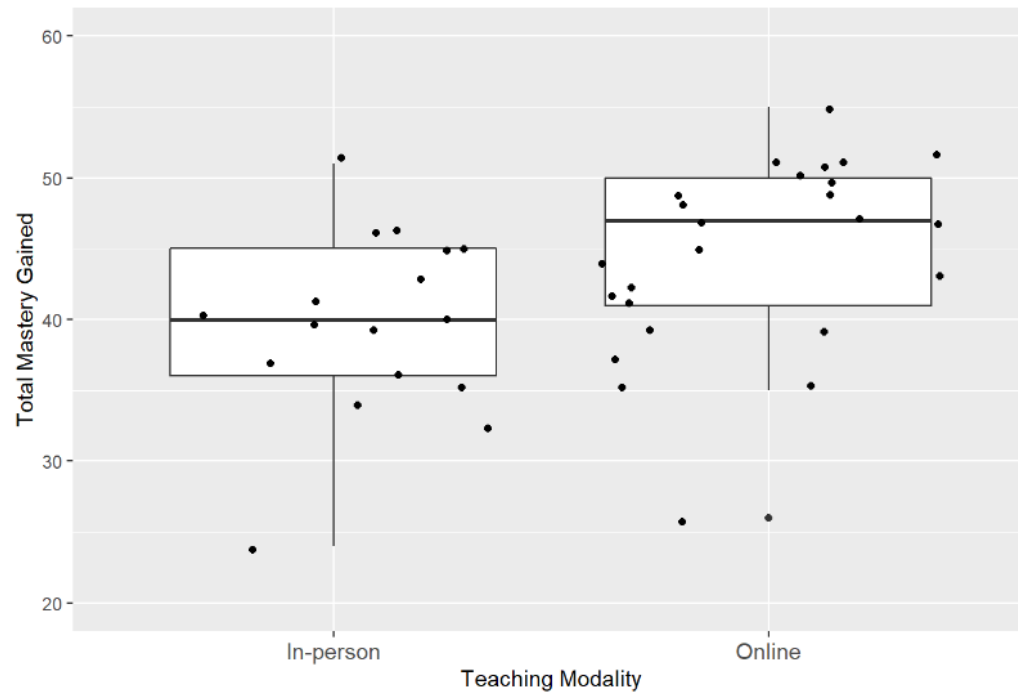


Rate your agreement to the following statements:  
I am comfortable learning computer applications in forestry

Rate your agreement to the following statements:  
I am confident that I can generate data summaries and create compelling visualizations (e.g. graphs or tables)

# Descriptive Analysis

## Self-reflection of Total Mastery Gained: In-person vs. Online



# Analysis and Conclusion

## Compared confidence and self-efficacy in groups: midterm vs end-term

1. Wilcoxon paired tests to compare if there is significant difference between midterm and end-term in aspects of each evaluation item in in-person and online groups.
2. Wilcoxon tests to compare if there is significant difference between in-person and online teaching modality in aspects of each evaluation item in midterm and end-term surveys.

### Conclusion using p-values:

- Among online group, there is a significant difference on student's confidence level between midterm and end-term for four confidences and other confidences have no differences.
- For most confidence and self-efficacy variables, we don't have enough evidence to reject the null hypothesis that there is no difference between in-person and online group in midterm evaluation.

# Analysis and Conclusion

## Ordinal logistic regression to predict the mastery levels

Mastery Levels: 0 (not at all confident) to 10 (extremely confident)

Explanatory variables:

- Platform (1: In-person; 2: Online)
- Gender (0: female; 1: male)
- Language (0: Non-native speaker; 1: Native speaker)
- Corresponding experience level (1: No Experience; 2: Some Experience; 3: Proficient)
- Previous experience (variable “SC0” — evaluated by course took before + year level)

# Analysis and Conclusion

## Fitted model:

Variable	Coefficient Estimate (Standard Error)	P-value
Platform	1.42 (0.688)	0.0392386
Gender	1.4 (0.697)	0.0451031
Native Speaker	0.95 (0.817)	0.2466385
Some Experience/No Experience	0.41 (0.741)	0.5766236
Proficient/ No Experience	0.85 (1.582)	0.5921903
SC0	0.73 (0.378)	0.0528596
Intercept:		
3 5	-0.15 (0.932)	0.9364973
5 6	1.08 (1.773)	0.5413203
6 7	1.7 (1.757)	0.3307912
7 8	3.63 (1.812)	0.0451235
8 9	5.25 (1.903)	0.005758
9 10	7.7 (2.147)	0.0003389

## Conclusion from the fitted model:

Variables	OR	Interpretation
Platform	4.13	Online students have 4.13 times higher mastery level than in-person students
Gender	4.04	Male students have 4.04 times higher mastery levels than female students
Native Speaker	2.58	Native English speakers have 2.58 times higher mastery level than non-native speakers
Some Experience/No Experience	1.5	Having some experience shows 1.5 times higher mastery levels than no experience
Proficient/ No Experience	2.33	Proficiency shows 2.33 times higher mastery levels than no experience
SC0	2.08	For one unit increase in student's previous experience, the odds of having higher mastery level is multiplied by 2.08

# Summary

1. Confidence levels in most of the learning module increased over the term
2. For most confidence, engagement and self-efficacy variables resulted that there is no difference between in-person and online group
3. Language, previous experience and corresponding experience played an important role for gaining mastery in each learning module.

# References

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Dowling, C., Godfrey, J. M., and Gyles N., 2003. Do Hybrid Flexible Delivery Teaching Methods Improve Accounting Students' Learning Outcomes. Accounting Education: An International Journal, 12 (4), 373-391.

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Thank You!



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