Learning-centered teaching for the non-traditional data science classroom

Katherine Simeon, Diya Das, & Angela Li

csv,conf,v5

May 13, 2020

Hi, I'm Katherine!
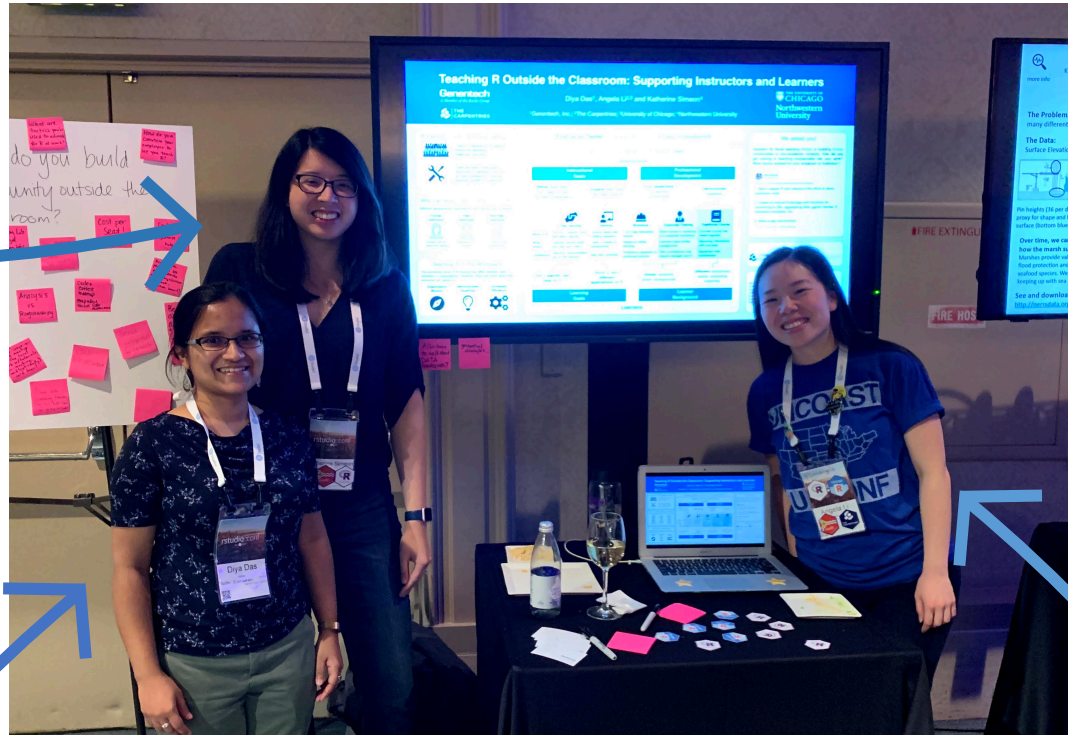
The plan

```
ggplot(iris,
       aes(x=Petal.Length,
       y=Petal.Width,
       colour=Species)) +
  geom_point(size=2)
```
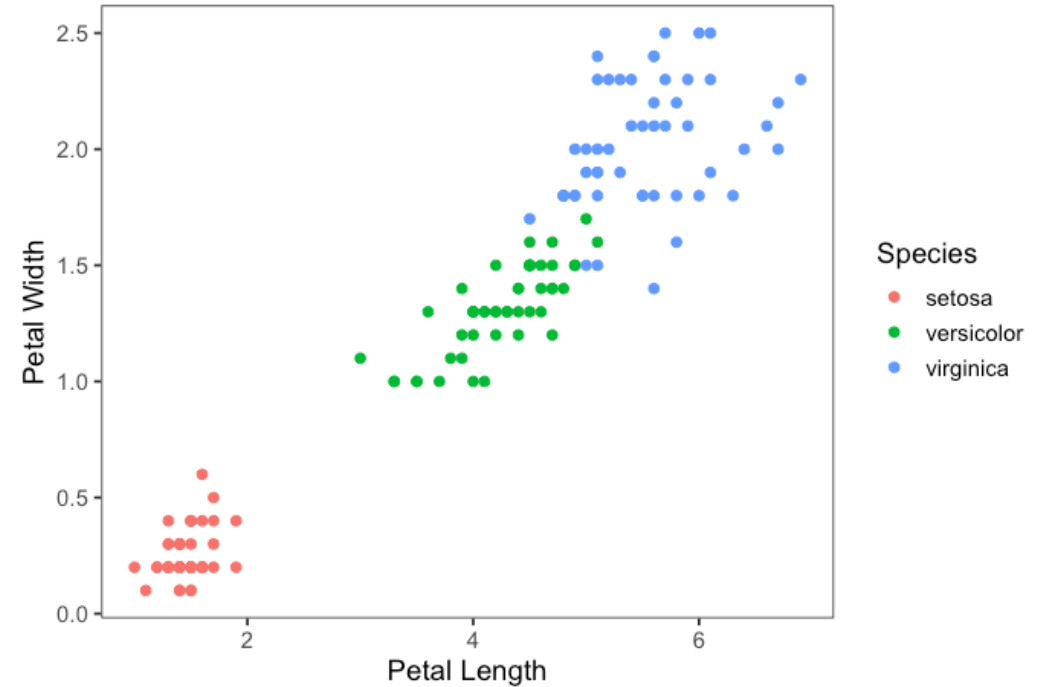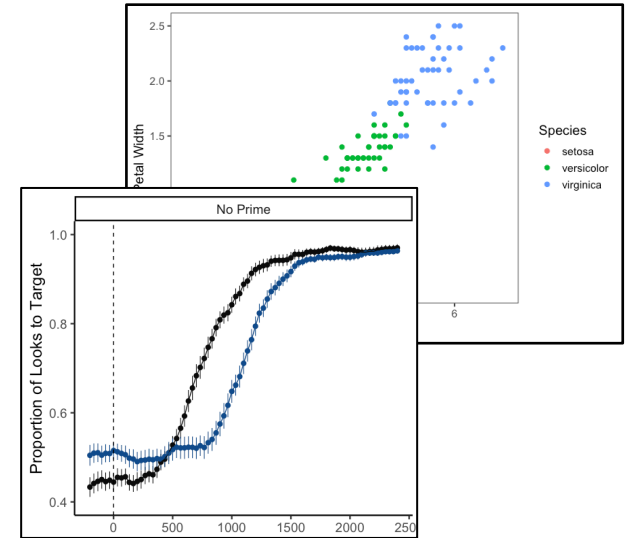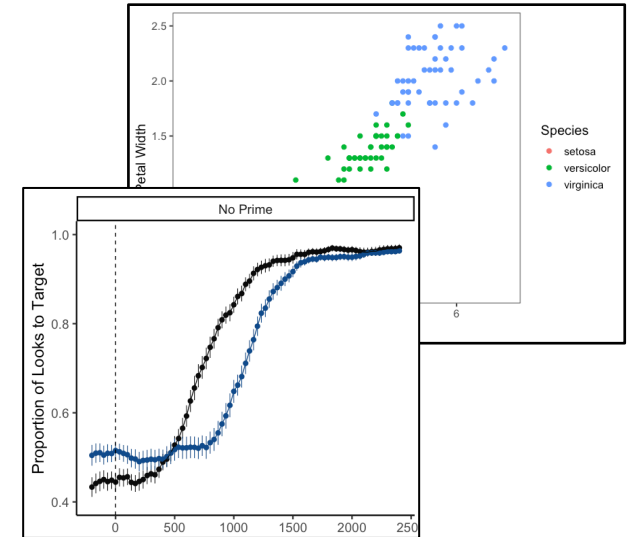
What we actually need to do

What ends up happening

`read.csv(data)`

No such file or
directory

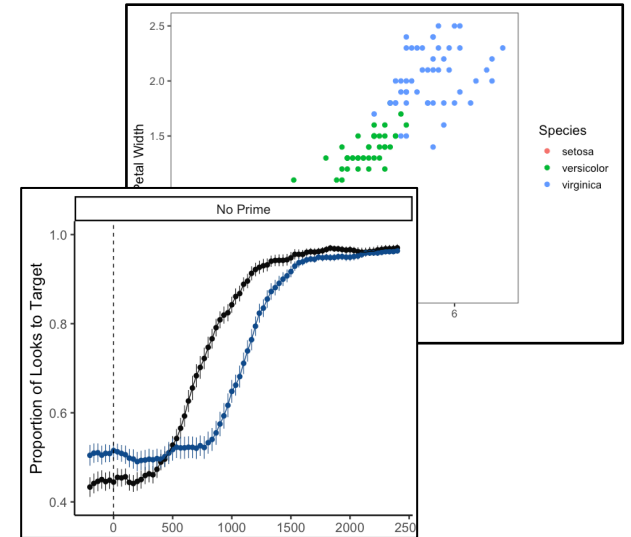# What ends up happening

`read.csv(data)`

No such file or
directory

`library(ggplot)`

there is no package
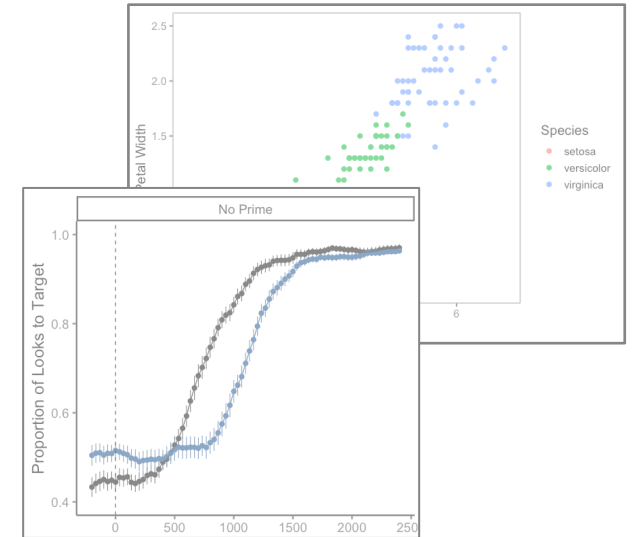called 'ggplot'

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called 'ggplot'

Multiple challenges

What are the learning objectives?

What do we want the learners to **accomplish**?

Multiple challenges

What are the learning objectives?

What do we want the learners to **accomplish**?

How do our learners learn best?

Multiple challenges

What are the learning objectives?

What do we want the learners to **accomplish**?

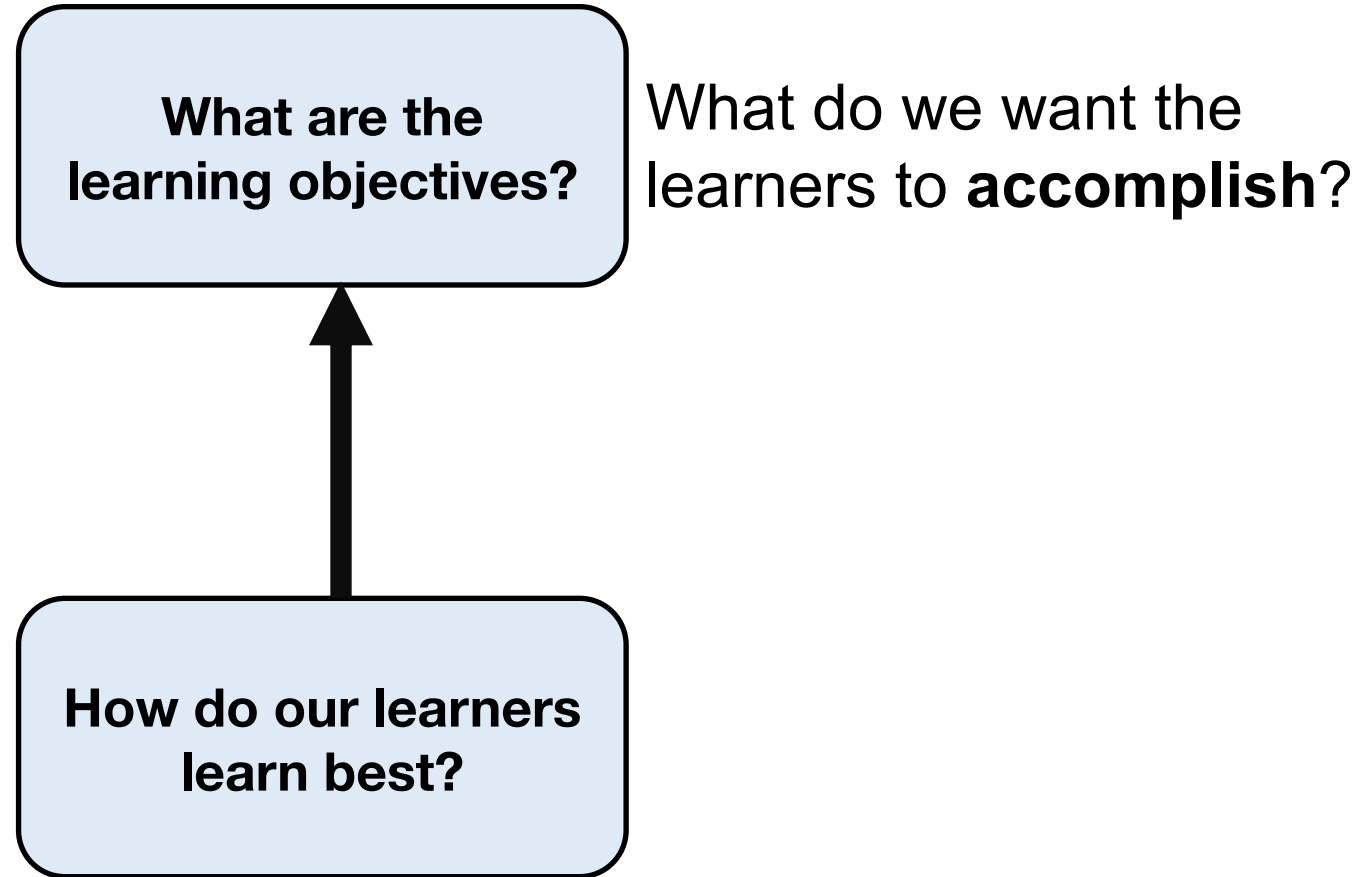What **motivates** our learners?

How do our learners learn best?

Multiple challenges

What are the learning objectives?

What do we want the learners to **accomplish**?

What **motivates** our learners?

What do our learners know **beforehand**?

How do our learners learn best?

Multiple challenges

What are the learning objectives?

How do our learners learn best?

What about in **non-traditional classrooms**?

Objectives

1   Identify different **non-traditional** data science classrooms.
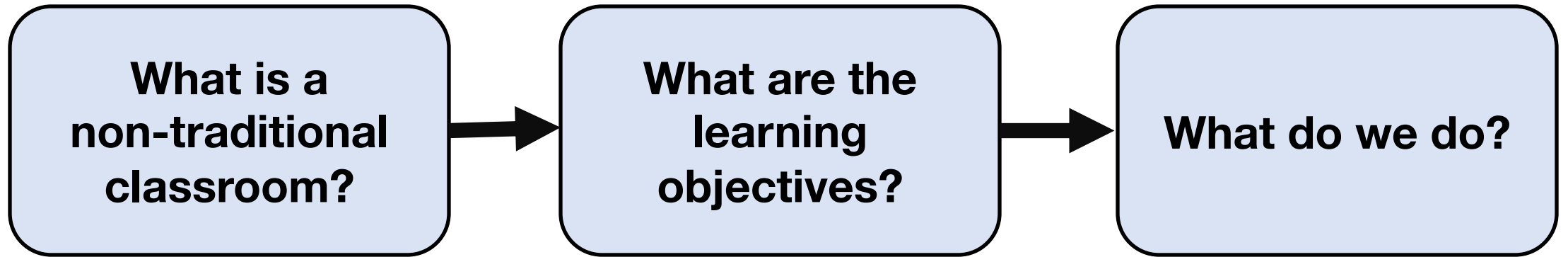
2   Consider how **learning objectives** are informed by **learners** in the non-traditional classroom.
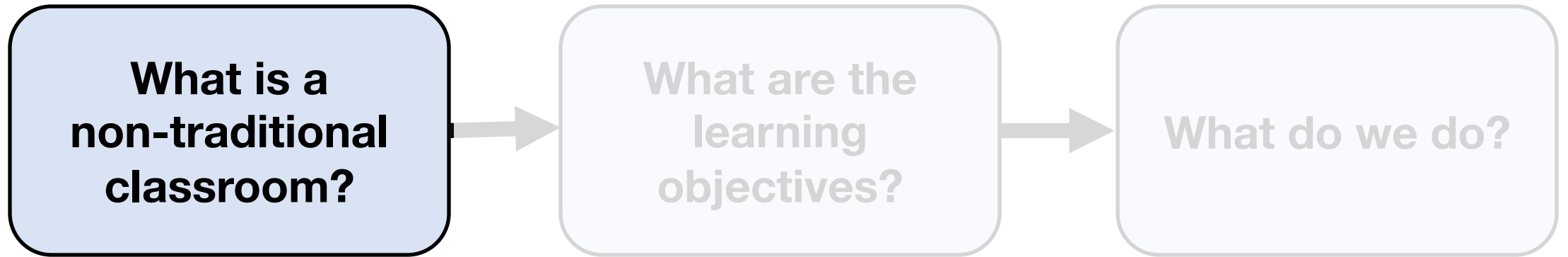
3   Implement **best practices** to teach data science skills to a diverse audience of learners.

Road Map

Road Map

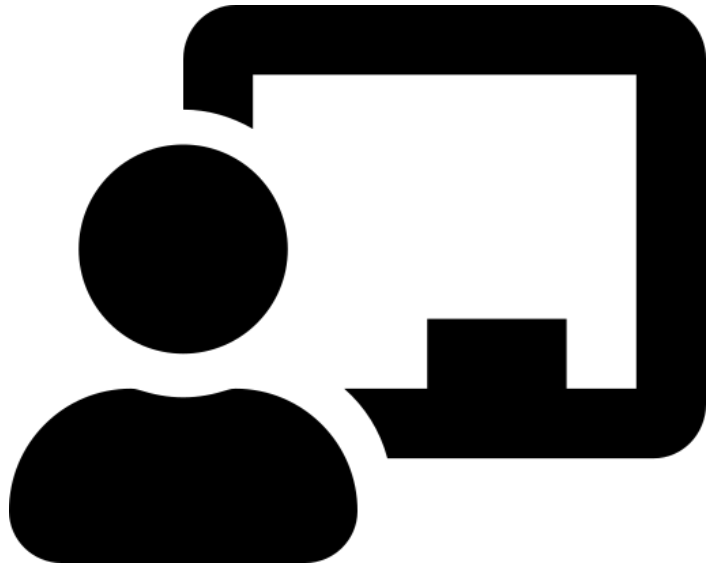What is a non-traditional classroom? → What are the learning objectives? → What do we do?

What is a non-traditional classroom?

What is a ~~non-~~traditional classroom?

What is a ~~non-~~traditional classroom?

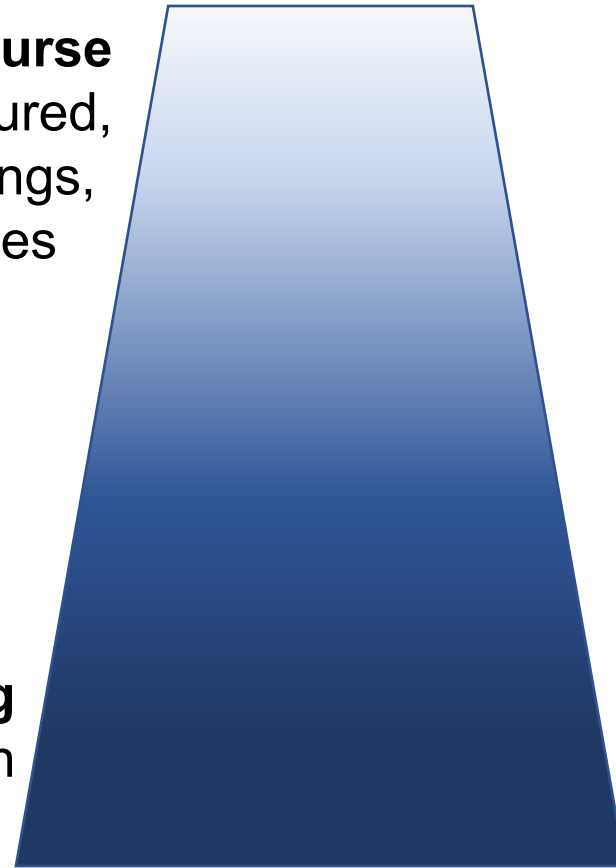**Structured, recurring meetings** over month(s) or a year

Students are held **accountable** via homework, exams, and/or grades.

What is a non-traditional classroom?

Any learning environment that is **not** "traditional"

A spectrum of learning environments

Traditional Course
Structured,
Recurring meetings,
homework, grades

Experiential Learning
Learning through
experience

A spectrum of learning environments

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Traditional Course
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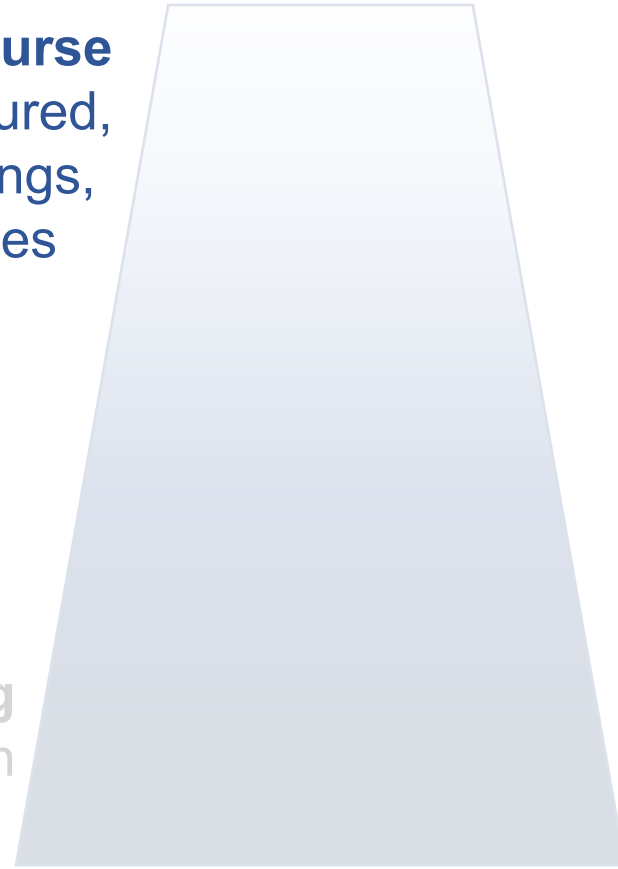Recurring meetings,
homework, grades

Experiential Learning
Learning through
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A spectrum of learning environments

Traditional Course
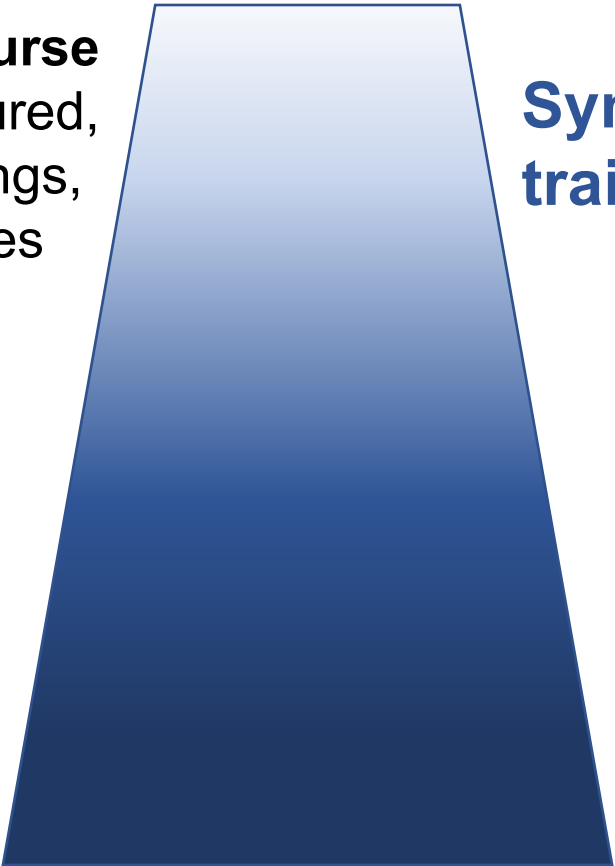Structured,
Recurring meetings,
homework, grades

Synchronous workshops or trainings

THE CARPENTRIES

Experiential Learning
Learning through
experience

A spectrum of learning environments

Traditional Course
Structured,
Recurring meetings,
homework, grades

Self-Paced Online Tutorials

Experiential Learning
Learning through
experience

A spectrum of learning environments

Traditional Course
Structured,
Recurring meetings,
homework, grades

Peer learning or mentoring
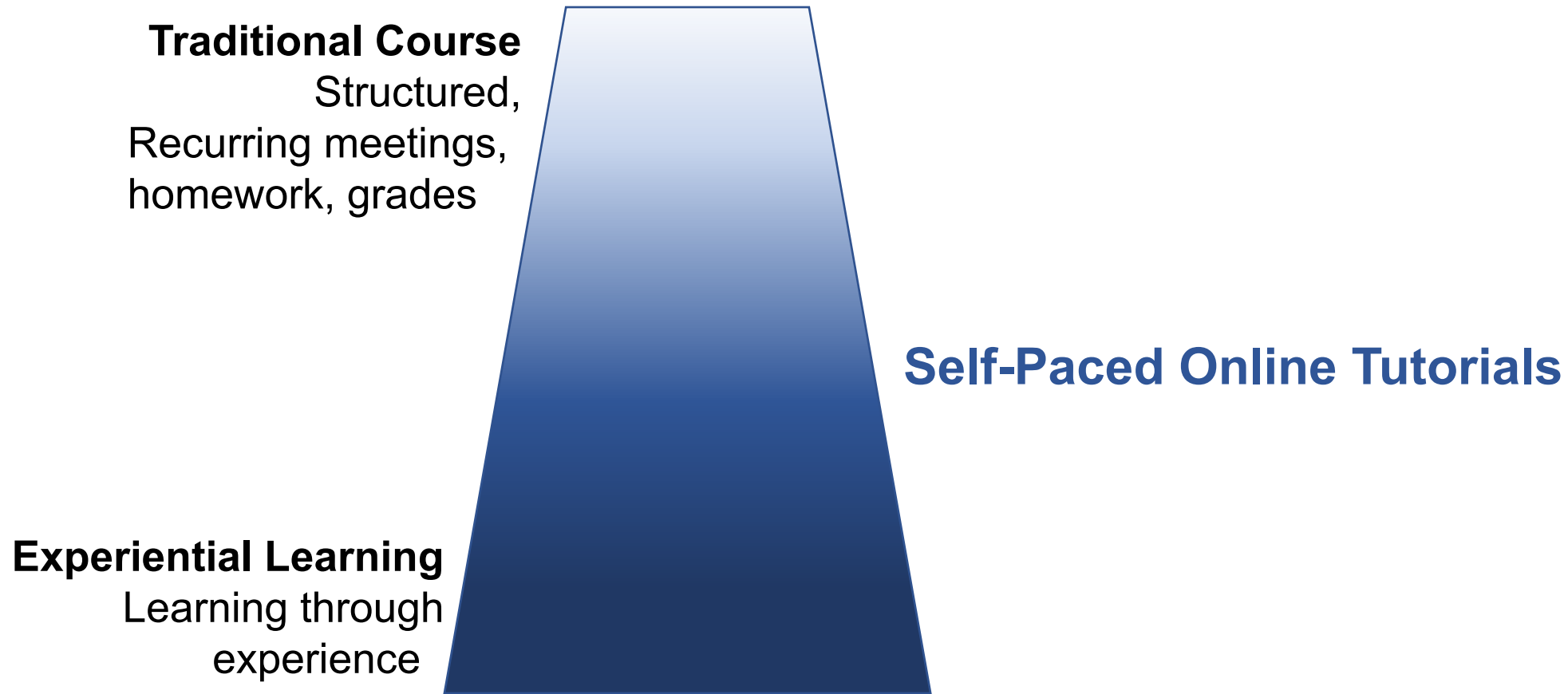
Experiential Learning
Learning through
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A spectrum of learning environments

Traditional Course
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Experiential Learning
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Trial-by-fire 🔥🔥🔥
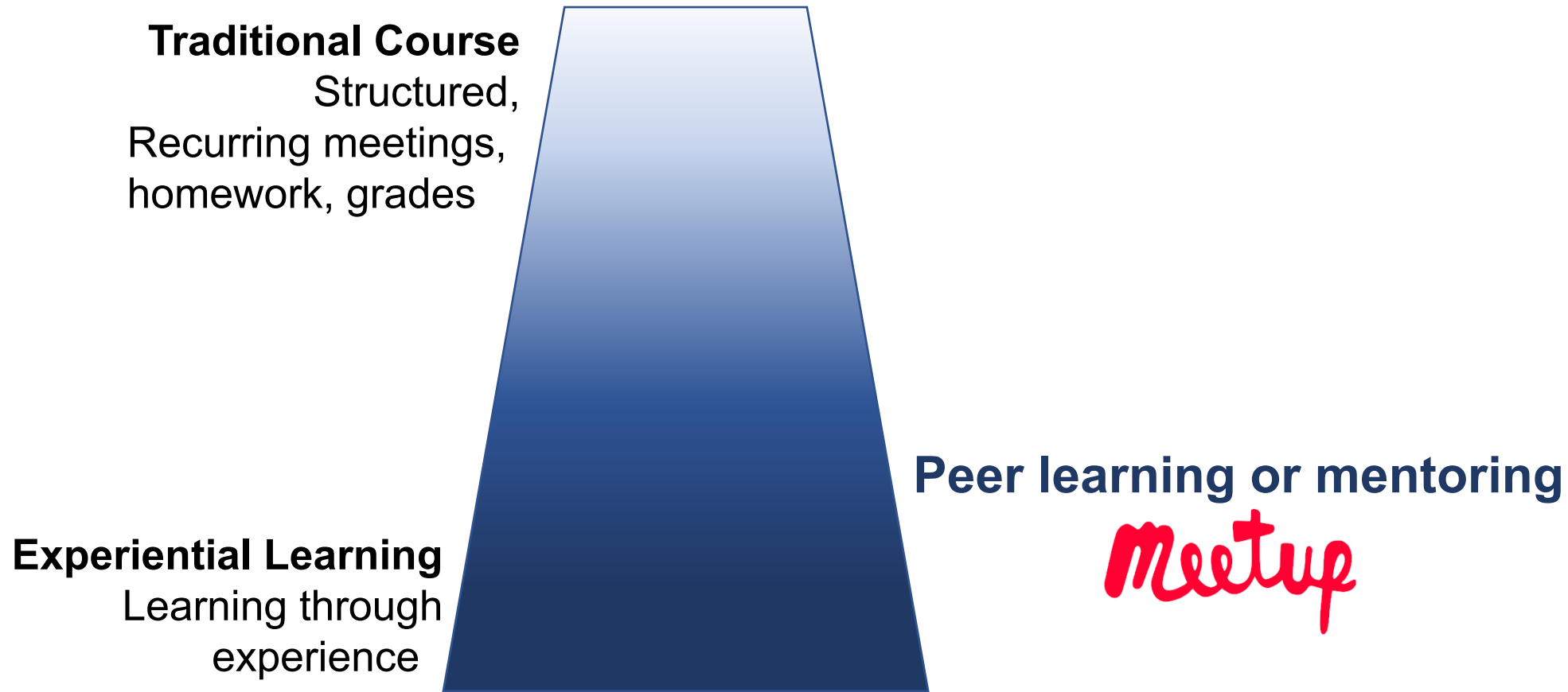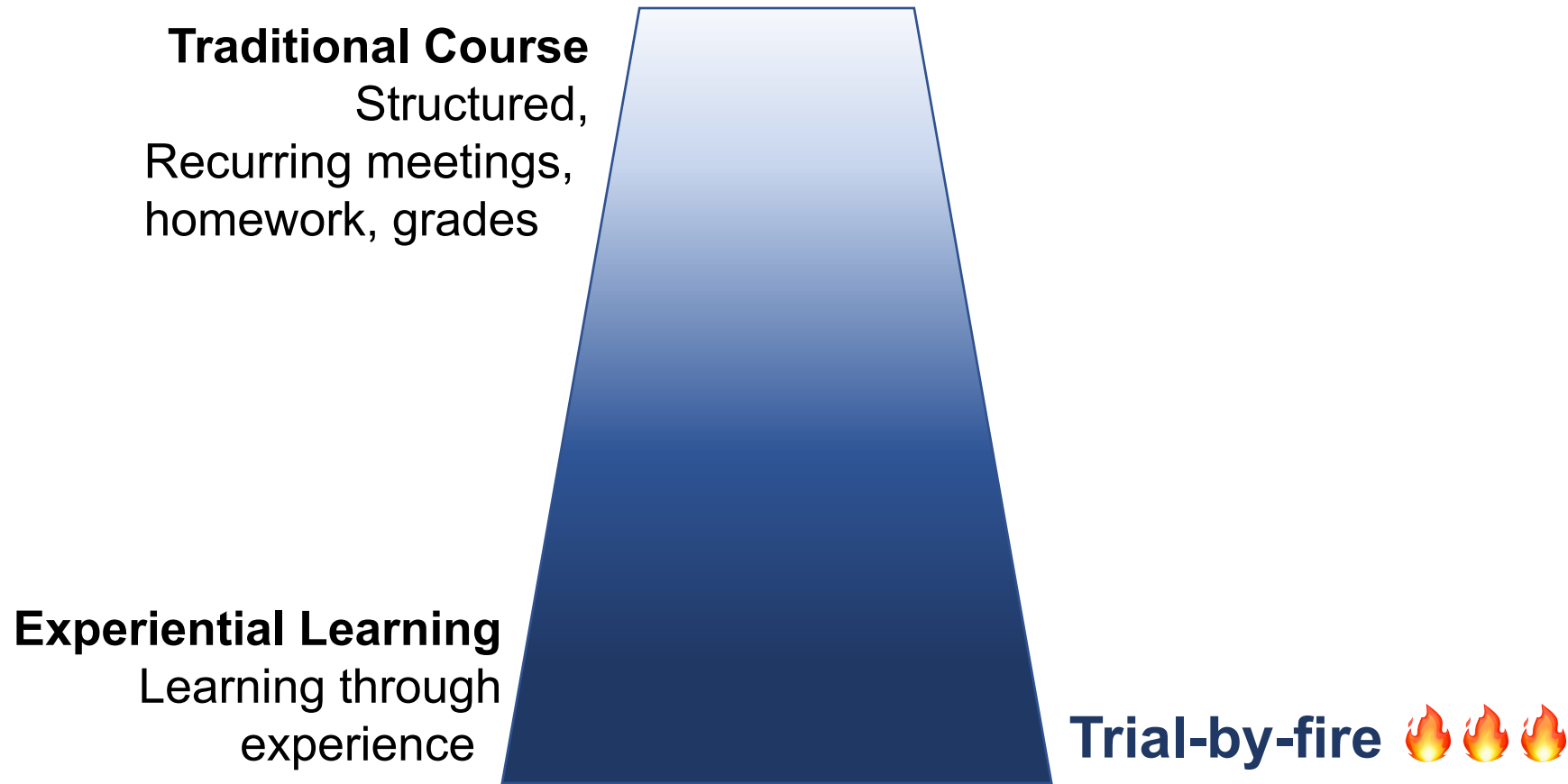
Advantages

- Hone & demonstrate your expertise

- Ability to be creative

- Create a learning community

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Challenges

- There's not enough time
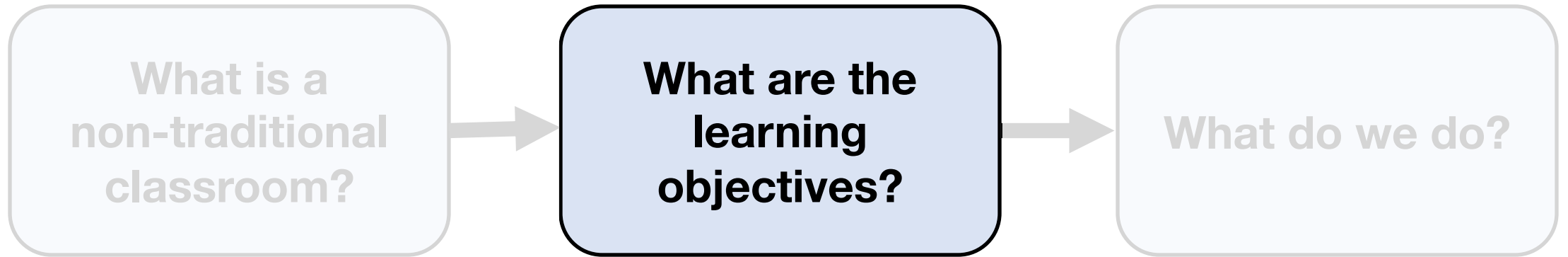- Addressing learners' assumptions & motivations

Advantages

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- **Addressing learners' assumptions & motivations**
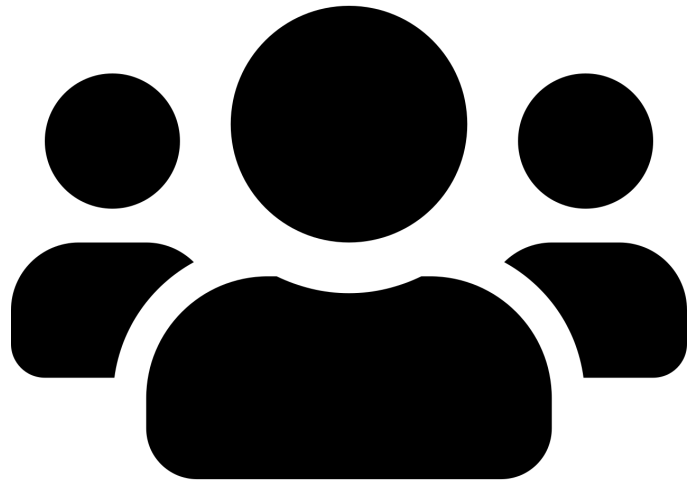
Road Map

What is a learning objective?

A statement in **specific** and **measurable** terms of the intellectual skills and abilities a student will develop in a given course.
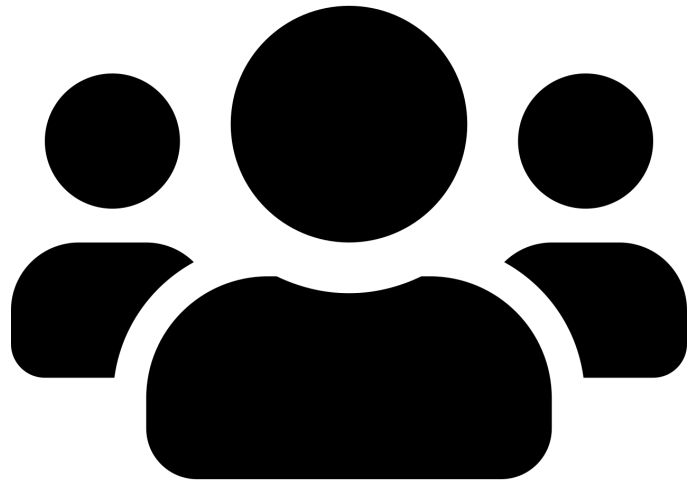
Formulate a learning objective

Who are the **learners**?

What are the **logistical constraints**?

Formulate a learning objective

Who are the **learners**?

What are the **logistical constraints**?

Learner Profiles

1 What is the learner's **background** & **interests**?

2 What is their **previous experience** with the topic?

3 **Why** are they interested in learning?

Learner-centered objectives

What do we **prioritize**?

Learner-centered objectives

What do we
prioritize?

What is
relevant?

Learner-centered objectives

What do we
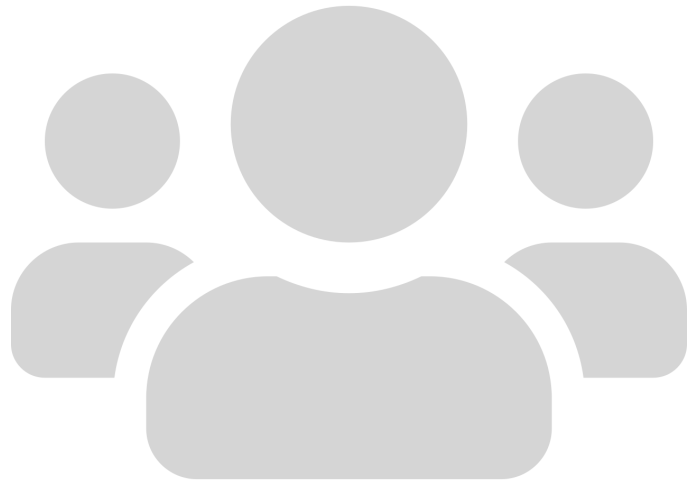**prioritize**?

What is
relevant?

How do we
communicate?

Formulate a learning objective

Who are the **learners**?

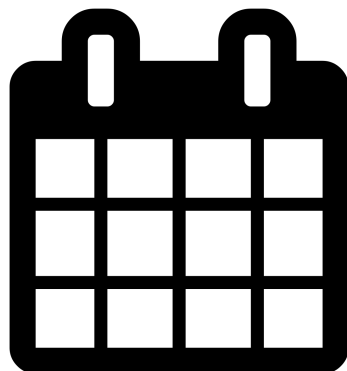What are the **logistical constraints**?

Learning Objectives are SMART

Specific

Measurable

Achievable

Relevant

Transparent

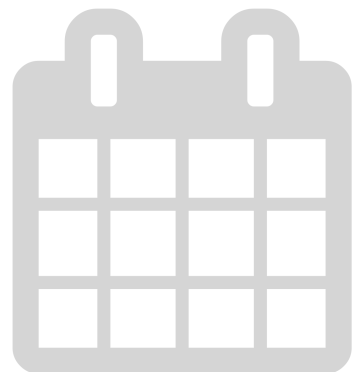Anderson & Krathwohl (2001); Chatterjee & Corral (2017)

Given the time constraints...

*In a **week-long** workshop*

Write a script that loads a .csv file and creates a scatterplot in R.

Given the time constraints...
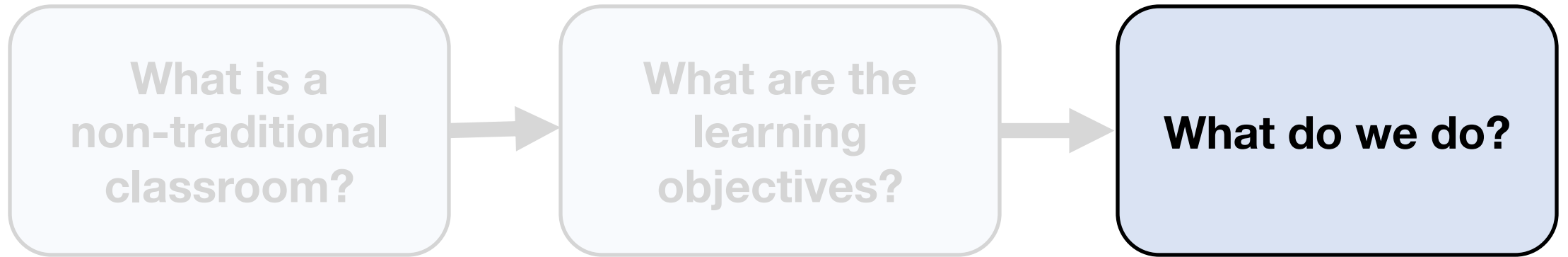

*In a **week-long** workshop*

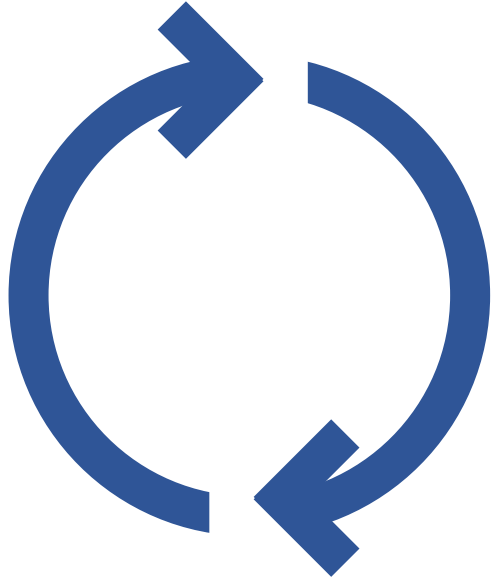**Write** a script that loads a .csv file and creates a scatterplot in R.

*In a **2-hour** tutorial*

Identify the parts of a script that create a scatterplot in R.

Road Map

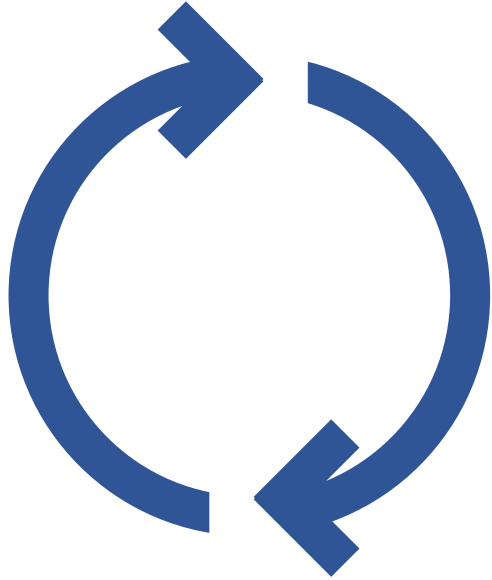|		
What is a non-traditional classroom?	→ What are the learning objectives?	→ **What do we do?**

What do we do?

Establish a **feedback-practice cycle**

Equip for **continued learning**

What do we do?

Establish a **feedback-practice cycle**

Equip for **continued learning**
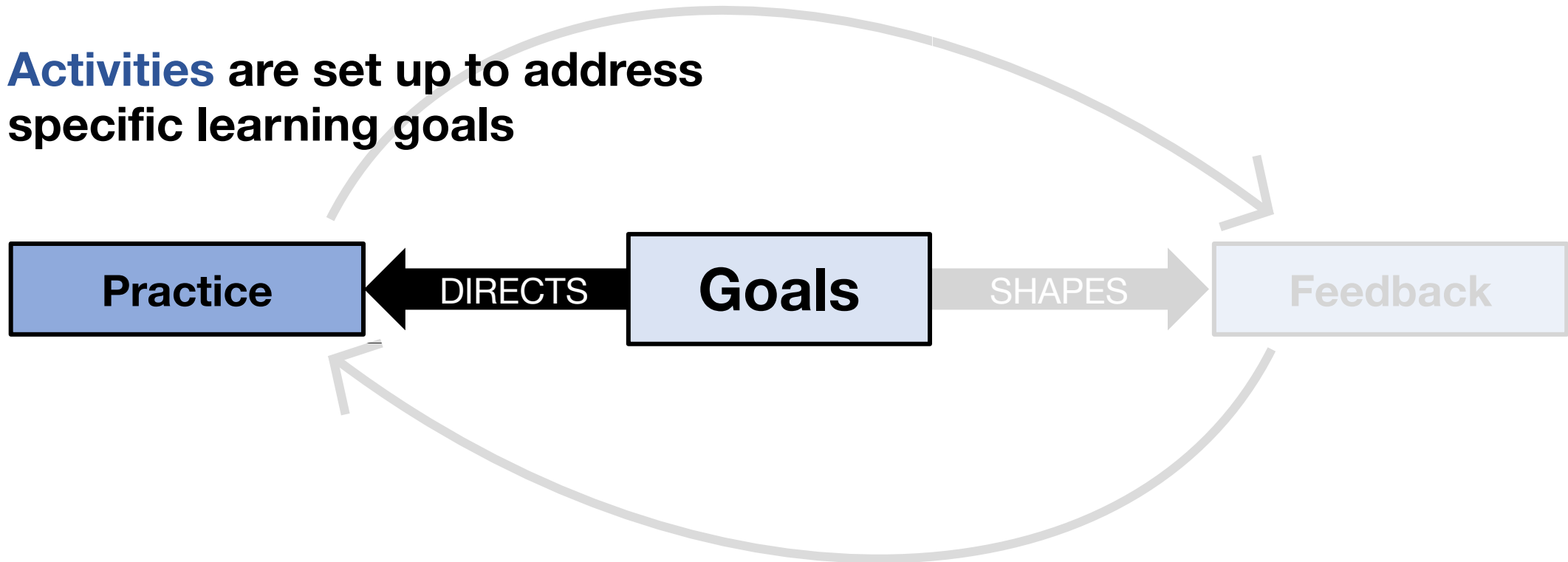
Feedback-Practice Cycle

Practice

Feedback

Ambrose et al. (2010)

Feedback-Practice Cycle

Practice ← DIRECTS — Goals — SHAPES → Feedback

Ambrose et al. (2010)

Feedback-Practice Cycle

Activities are set up to address specific learning goals
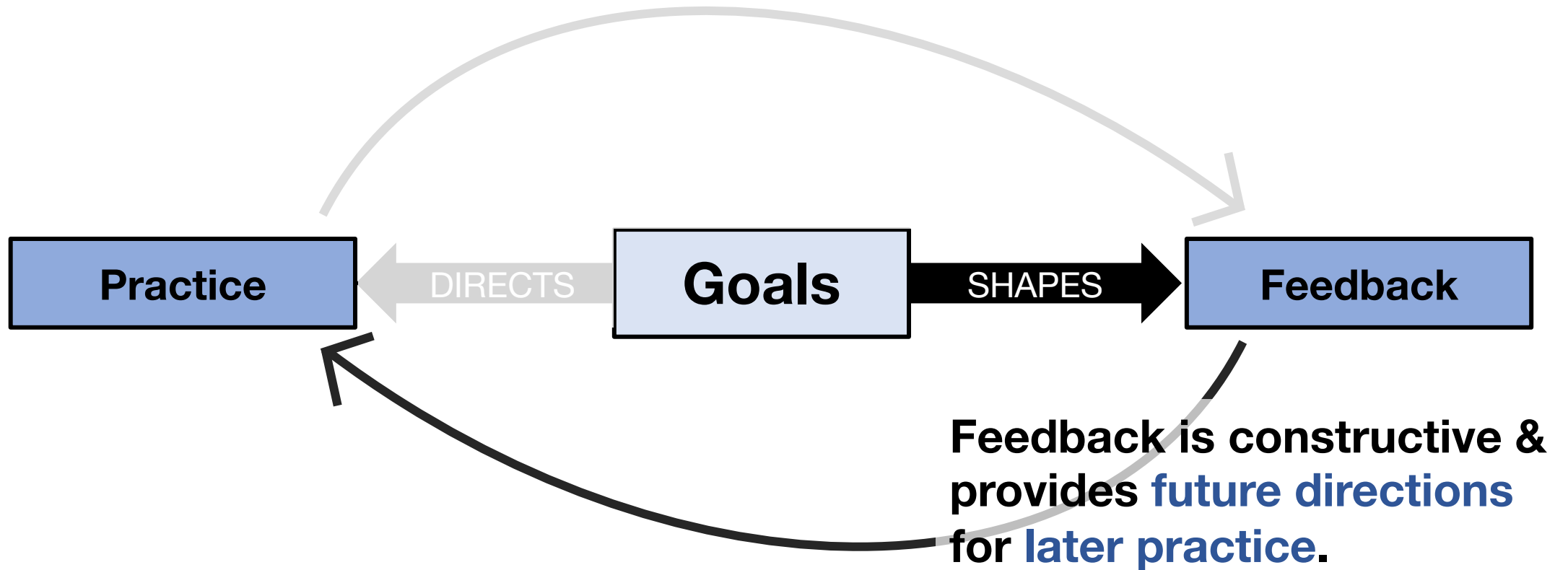
Practice ← DIRECTS ← Goals → SHAPES → Feedback

Ambrose et al. (2010)

Feedback-Practice Cycle

Practice ← DIRECTS — Goals — SHAPES → Feedback

Feedback is constructive & provides future directions for later practice.

Ambrose et al. (2010)

Goal-Driven Practice

Identify the parts of a script that create a scatterplot in R.
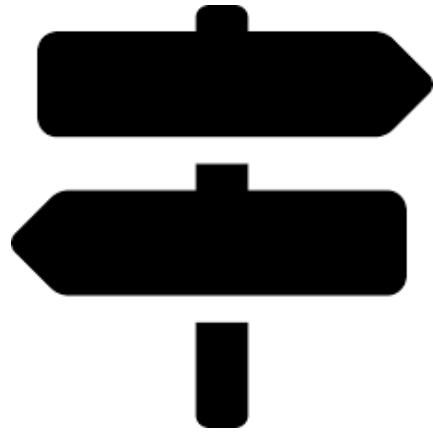
```
ggplot(iris,
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        colour=Species)) +
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Goal-Driven Practice

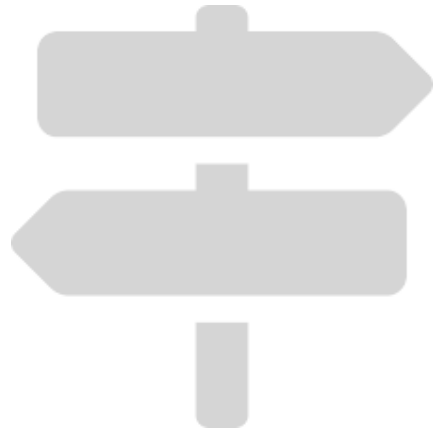Identify the parts of a script that create a scatterplot in R.

```
ggplot(iris,
        aes(x=Petal.Length,
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geom_point(size=2)
```

Informative Feedback

Emphasize the process, not the end product.
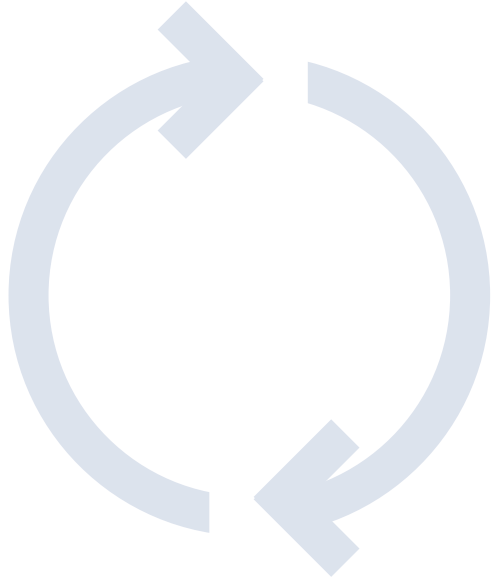
Informative Feedback

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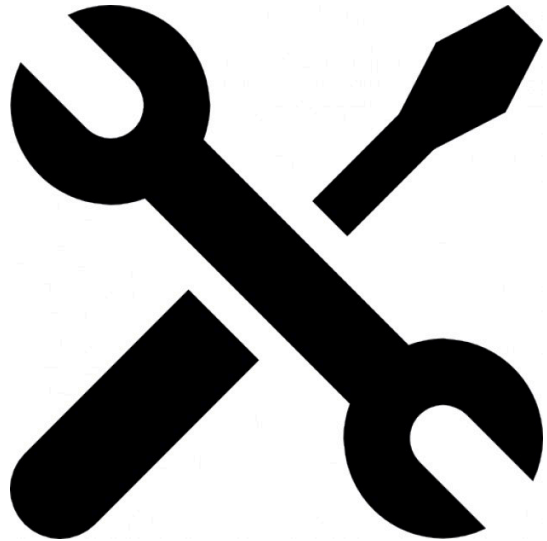**Connect** feedback with your learning experience.

What do we do?
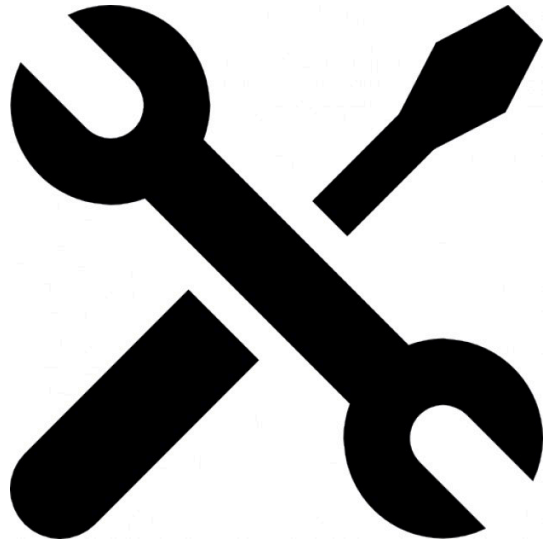

Establish a **feedback-practice cycle**

Equip for **continued learning**

Encourage continued learning

Introduce learners to **open-source resources** for further learning.

Encourage continued learning

Introduce learners to **open-source resources** for further learning.

Show learners how *you* use these resources.

Build a community

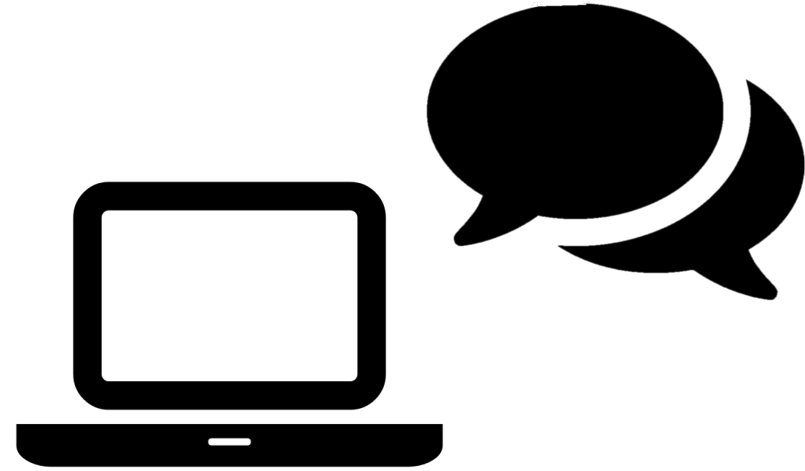Take advantage of local
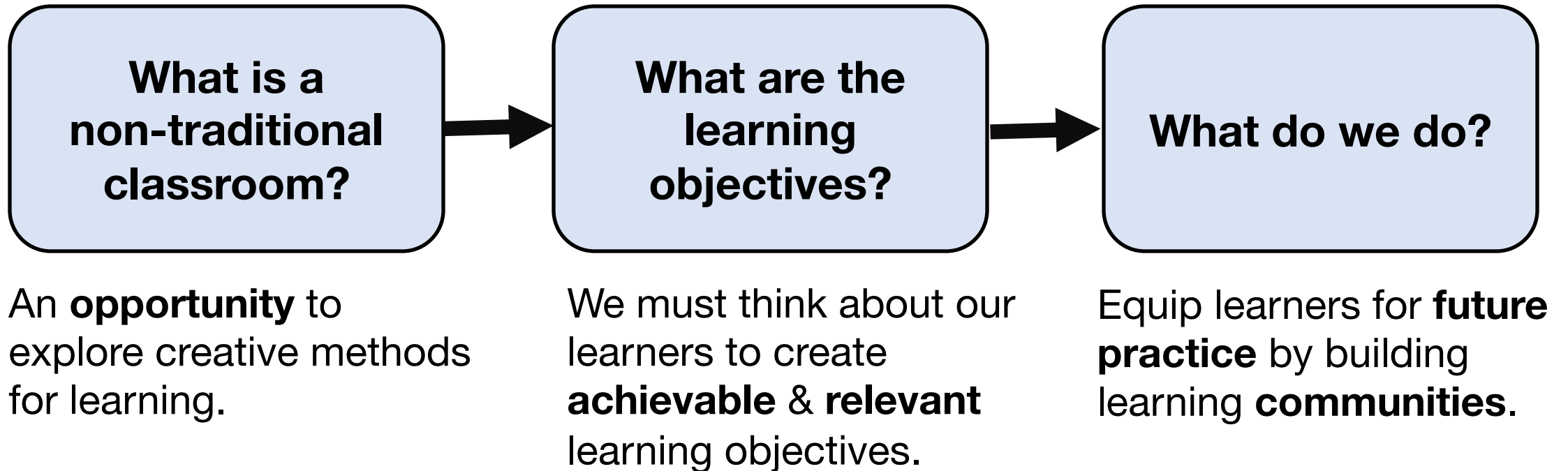**learning communities**.

Build a community

THE CARPENTRIES

R-Ladies

Meetup

Take advantage of local **learning communities.**

Create a space for people to continue learning together.

Takeaways

What is a non-traditional classroom?

→

What are the learning objectives?

→

What do we do?

An **opportunity** to explore creative methods for learning.

We must think about our learners to create **achievable** & **relevant** learning objectives.

Equip learners for **future practice** by building learning **communities**.

Thanks!

Find me at:

💻 KatherineSimeon.github.io

🐦 kitkatbar429

On Slack at **#csv5-qna**