Introducing Active Learning into Your Classroom

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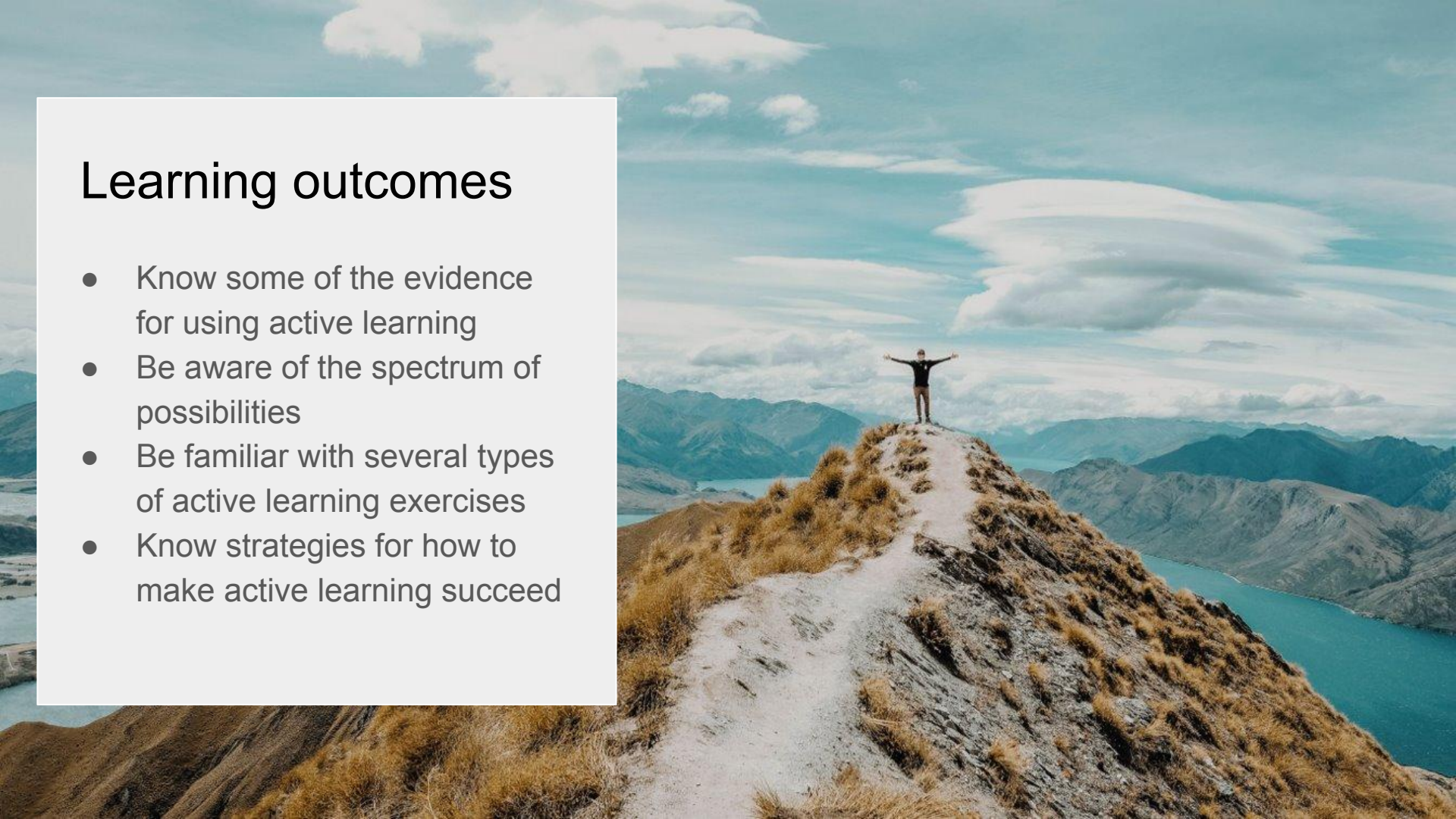
Hong Kong Polytechnic University

Learning outcomes

- Know some of the evidence for using active learning
- Be aware of the spectrum of possibilities
- Be familiar with several types of active learning exercises
- Know strategies for how to make active learning succeed



Agenda

Why use active learning

The active learning spectrum

Example activities

Tips for success

Questions & Discussion

Why Use Active Learning

Active Learning

“Active learning is generally defined as any instructional method that engages students in the learning process. In short, active learning requires students to do meaningful learning activities and think about what they are doing.” (Prince, 2004)

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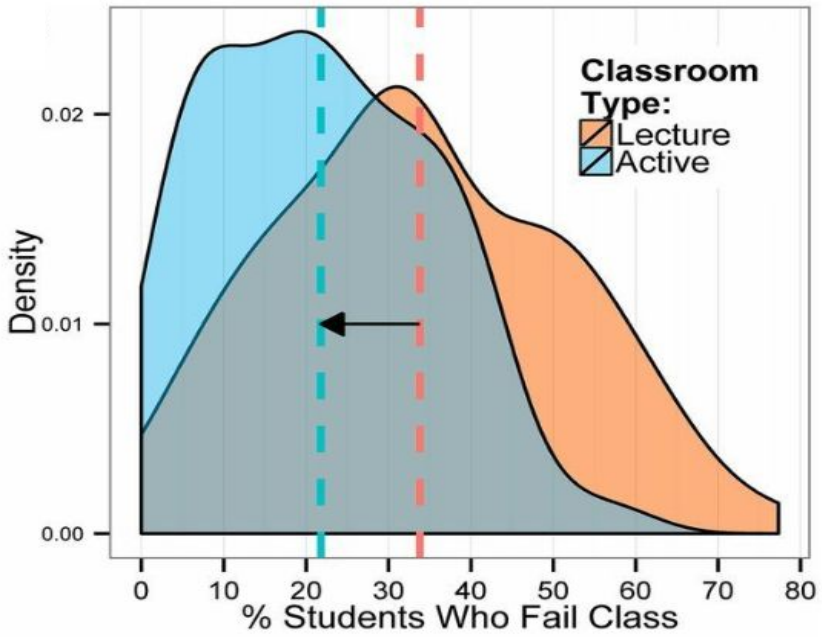
Benefits of Active Learning: Improved Learning

In classes with significant active learning, studies have shown **improved student learning** (Prince, 2004).

Active learning can help **clarify misconceptions** and **increase mastery of problem solving skills** (Michael, 2006).

According to a meta-analysis of 225 studies, average **examination scores improved** by about 6% in active learning courses (Freeman et al., 2014).

Benefits of Active Learning: Decreased failure rates



(Freeman et al., 2014)

Why we use active learning in our classrooms

For instructors:

- Exposes gaps in students' skills and understanding
- Allows for just-in-time teaching and clarification in the moment

For students:

- Helps students assess their understanding
- Support is available from instructors and peers when they are stuck

Active learning helps build community

In our own research, we found improved learning outcomes

The Active Learning Spectrum

Flipped Classroom

Before class, students:

- Learn the new material on their own
- Through readings, videos, etc.

During class, students:

- Engage in active learning activities
- Have the support of the instructor, their peers, and possibly teaching assistants.

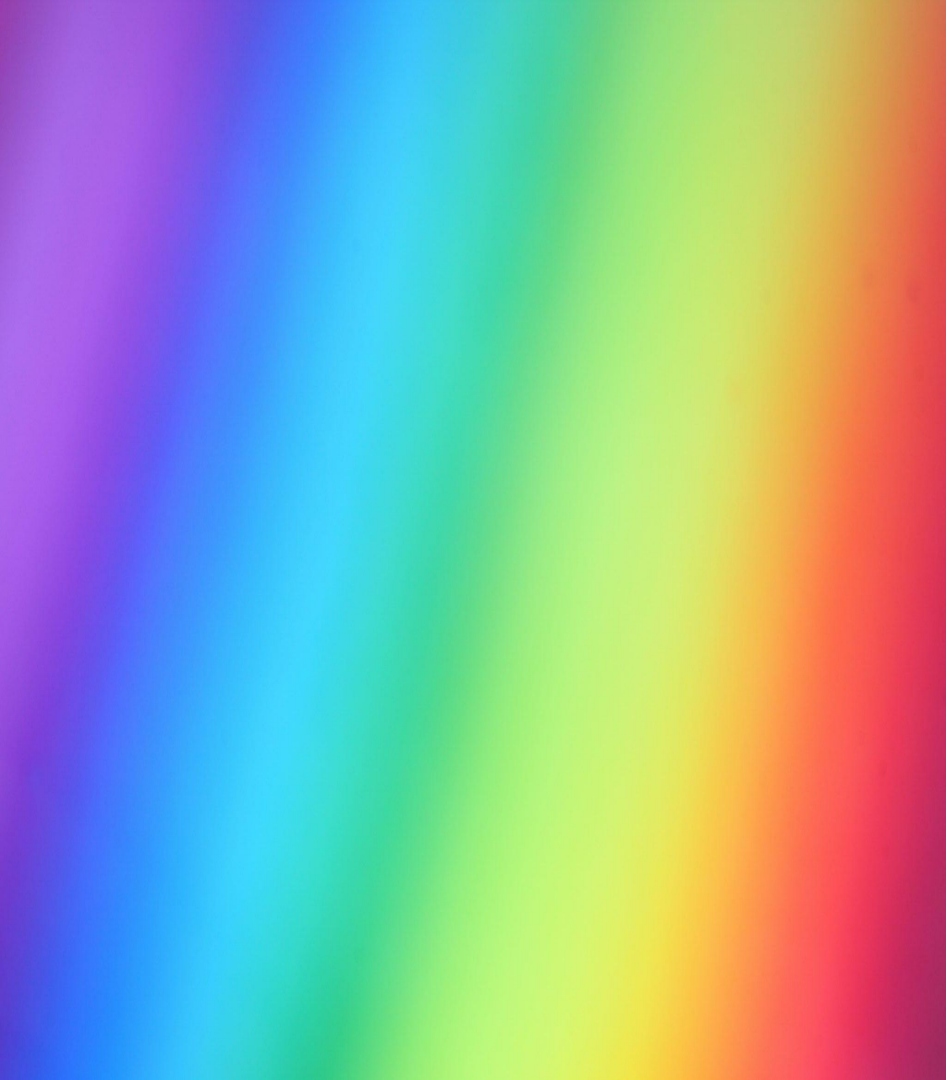
In a flipped design . . .

	Learn new material	Use new material
Easy	On your own	In class
Hard		

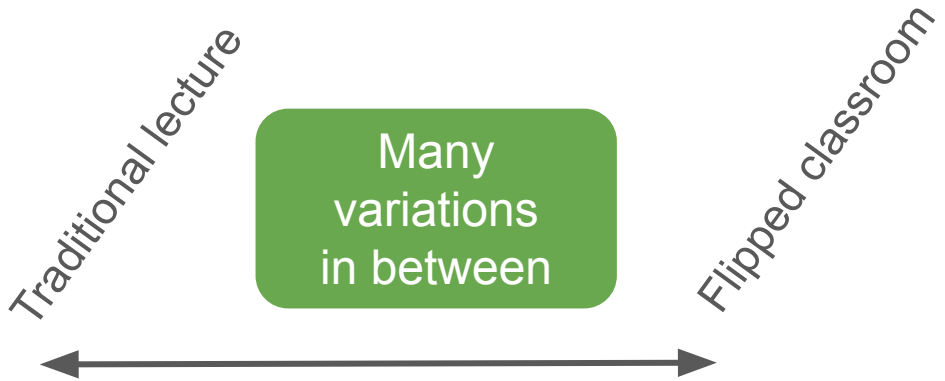
	Learn new material	Use new material
Easy	On your own	
Hard	In class	

What I like about semi-flipped

- Embed yourself in the learning
- Adapt the teaching to the learning
- Can use iterative techniques



Wide spectrum of options

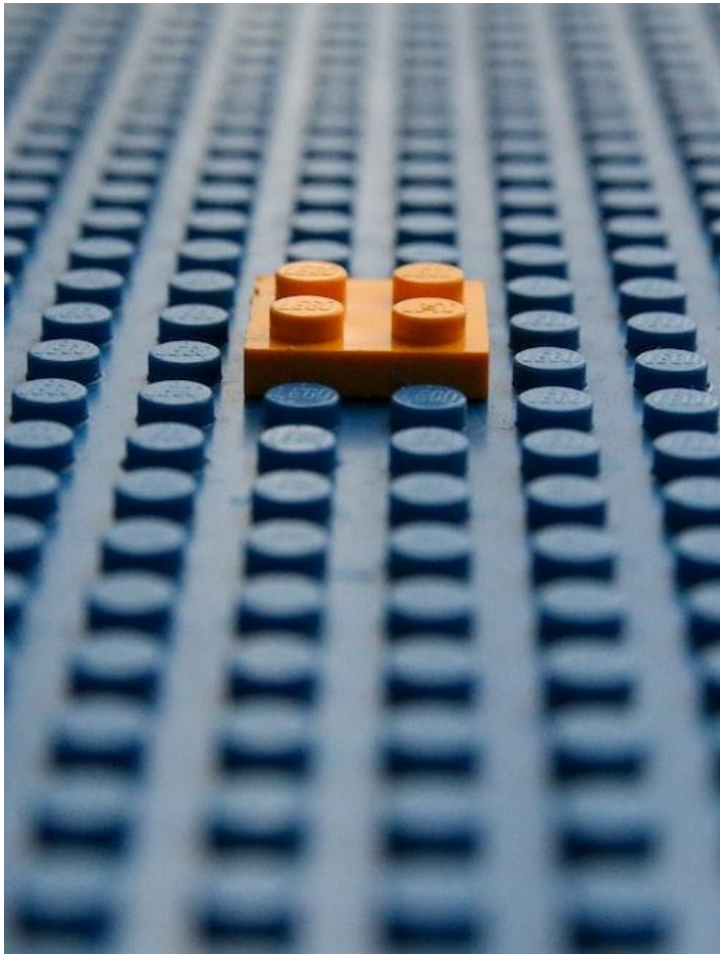


Getting started with active learning

Active learning can be added regularly throughout an entire course.

But it can also be introduced into one unit of a course, or even a single lesson.

Start small and build up a set of build up to a set of active learning exercises that work well for your course.



Example activity: Think-pair-share

Think-pair-share

Format

- Students think about a question individually
- They discuss in pairs or small groups
- One or more groups share their answers with the class

Benefits

- Students more comfortable discussing after they've had time to think first
- Discussion quality improves
- Students feel safer sharing with the class because it is a group answer

Think-pair-share Example

1. Individually, write down three answers to this question:

   What are some benefits of active learning?

2. Next, discuss your thoughts with your partner and debate your ideas.
3. Then, when prompted by the instructor, share one of your group's answers with the class.

Goals of this Exercise

To have students reflect on and recall the benefits of active learning.

We find Think-pair-share is good for

Checking understanding at any point in class

Checking understanding of prerequisite material from previous class or a reading

Identifying and clearing up misconceptions

Building community

Example activity: Peer Instruction

Peer Instruction

Based on the notion of a ”concepTest” question:

- Multiple choice
- Intended to generate many wrong answers

1. Each student answers the question individually.
2. Students pair up to discuss their answers.
3. Each student answers the question again, individually.
4. If strong consensus is not reached, discuss as a class.

Peer Instruction Example

Context:

- large Earth Science course at a US university
- Students have learned about the layers of the Earth's atmosphere

Which statement is the best analogy? An umbrella is to rain as…

A. the stratosphere is to solar radiation.
B. the stratosphere is to ultraviolet radiation.
C. the ozone layer is to solar radiation.
D. the ozone layer is to ultraviolet radiation.

Source: *Pedagogy in Action: the SERC portal for Educators*

Peer Instruction Example

Context:

- large Earth Science course at a US university
- students have learned about the layers of the Earth's atmosphere

Which statement is the best analogy? An umbrella is to rain as…

A. the stratosphere is to solar radiation.	12%
B. the stratosphere is to ultraviolet radiation.	18%
C. the ozone layer is to solar radiation.	26%
D. the ozone layer is to ultraviolet radiation.	44%

1st attempt (before PI)

Source: *Pedagogy in Action: the SERC portal for Educators*

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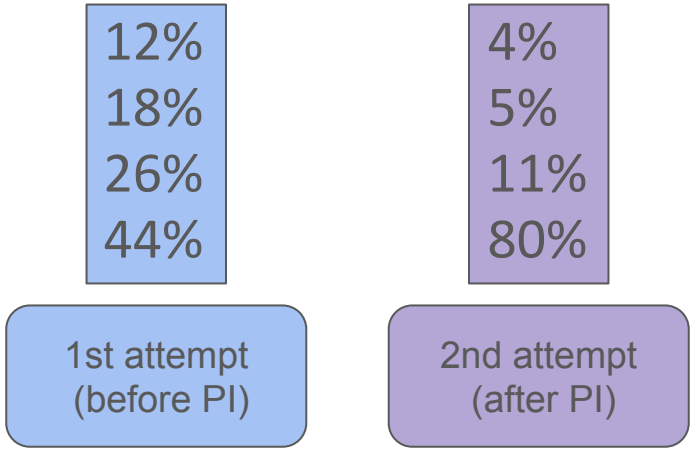

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Goals of this exercise

To clear up misconceptions about:

- Which part of the stratosphere protects from ultraviolet radiation
- Which part of the solar radiation spectrum the ozone layer protects from

A Peer Instruction example from my class

Before class, students learn to understand this notation to describe tables:

Student(ID, name)

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14291556	Diane Horton
90056121	Jennifer Campbell

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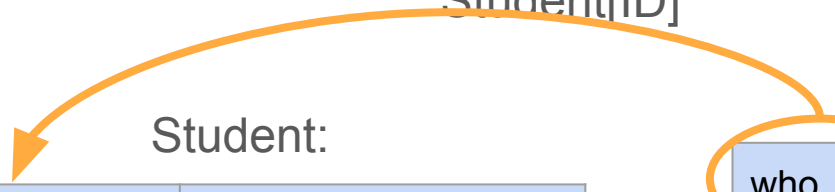

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At the start of class, I ask a question that depends on that understanding:

Consider this schema:

Hare(queen, knave)

Turtle(alice, hatter)

Turtle[hatter] $\subseteq$ Hare[queen]

Suppose relation *Hare* has 15 tuples. What do we know about the number of tuples in *Turtle*? Circle the one statement below that is the strongest thing we can be certain of.

(a) The number of tuples in relation *Turtle* must be >= 15.
(b) The number of tuples in relation *Turtle* must be <= 15.
(c) The number of tuples in relation *Turtle* must be 15.
(d) The number of tuples in relation *Turtle* must be >= 1.
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New tables, defined with the same notation

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Deceptively "simple" question

A Peer Instruction example from my class

It’s a very simple counting question.

But to answer it, students must

- Understand the concepts in the readings
- Apply them to a new structure
- Draw somewhat tricky inferences from them

Goals of this exercise

Make sure students

- **Understand** the concepts from the reading
- Can **apply** them to a new structure
- Can draw **inferences** from them

Uncover misunderstandings

Ensure everyone is ready for the new ideas coming in lecture

We find Peer Instruction is good for

Surfacing and clearing up misconceptions

Generating rich discussion

Deepening understanding

Generating excitement in the classroom!

Research shows improved learning in a PI course.

Example activity: Worksheet

Worksheets

Format

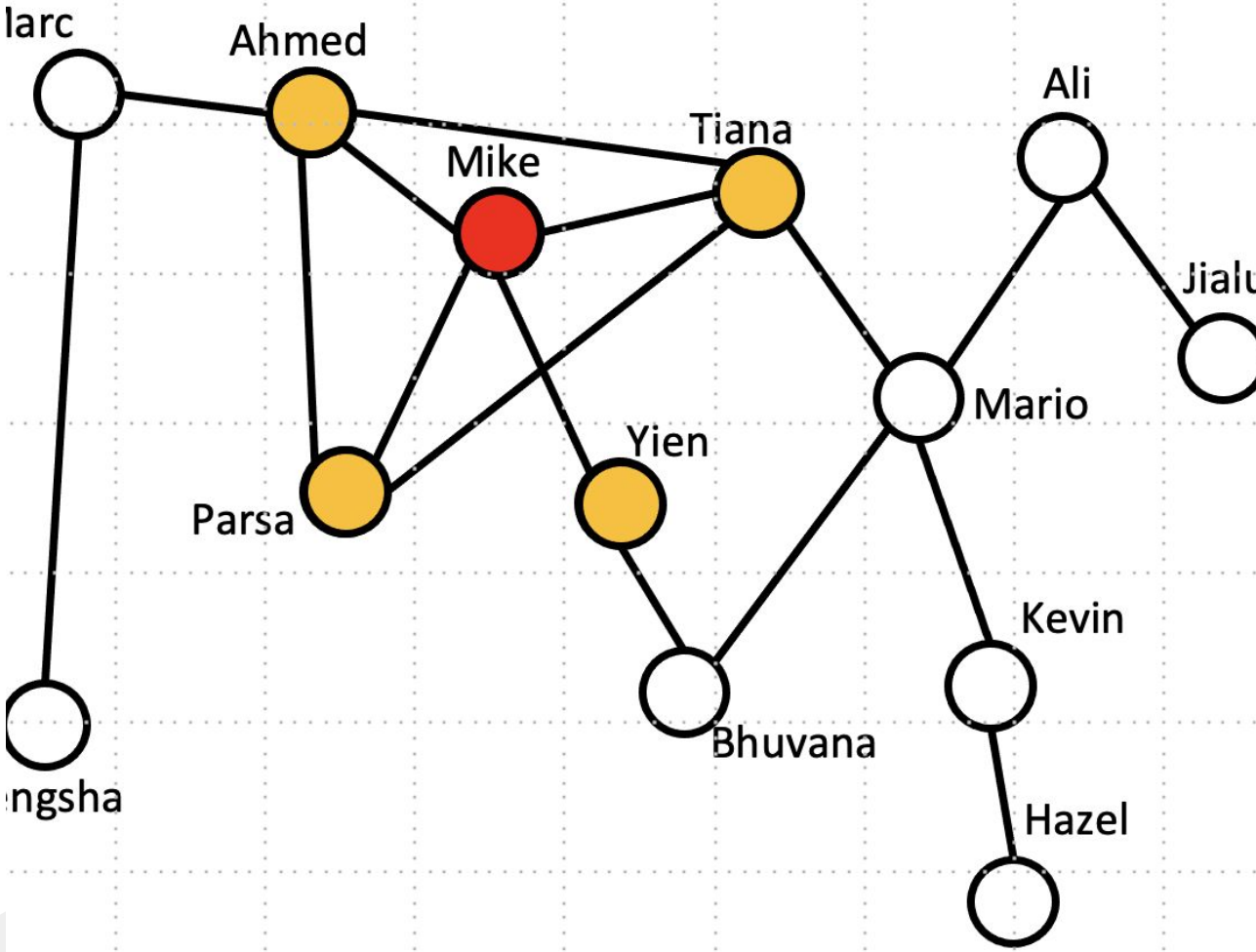
- Students work [alone or in groups] to answer questions

Benefits

- You can provide necessary reference material (text, definitions, formulas, data, etc.)
- Blank spaces can induce writing

Worksheet Example

Context: Students are designing an app for contact tracing.



Name	Location	Start Time	End Time
Mike	A	Feb 14th, 9:12 PM	Feb 15th, 1:35 AM
Parsa	A	Feb 14th, 9:37 PM	Feb 15th, 1:15 AM
Tiana	A	Feb 14th, 10:06 PM	Feb 15th, 1:35 AM
Mike	B	Feb 14th, 1:57 AM	Feb 15th, 7:30 AM
Tiana	B	Feb 14th, 1:57 AM	Feb 15th, 9:30 AM
Ahmed	A	Feb 14th, 6:08 PM	Feb 15th, 8:30 AM
Mike	C	Feb 15th, 8:00 AM	Feb 15th, 4:00 PM
Yien	C	Feb 15th, 8:30 AM	Feb 15th, 4:30 PM

Using the information in the table, try to answer the following questions.

1. Where is Mike's home?
2. Where is Mike's workplace?
3. Did Mike attend a gathering?
4. If so, how many people were at the gathering?

04:00

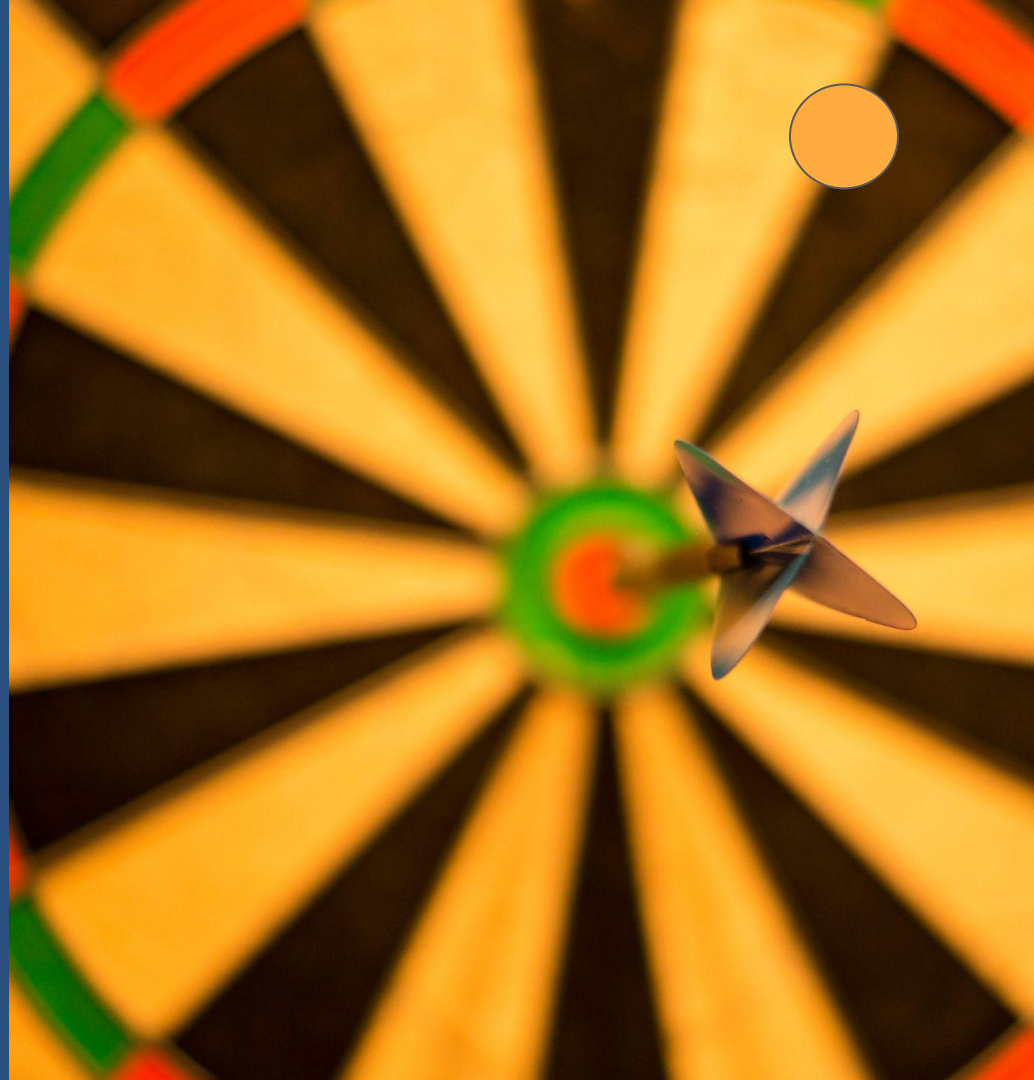
Goal of this worksheet

Have fun figuring things out about these people

An “ah-ha” moment:
Discover that much can be inferred from very little information

Evoke a "creepy" feeling

Motivate students to care about privacy



We find worksheets are good for

Applying a definition to confirm understanding

Practicing a problem-solving skill

Discovering a problem or a trade-off

Anticipating a concept

Inferring an implication

Realizing a connection between concepts

Etc.

Many uses that are far beyond simple, rote work

Example activity: Give One Get One

Give One Get One

Working solo, students record their answers to a series of questions

Students stand up and find someone to trade answers with for one question

Then they find someone else to trade with for another question

And so on …

The instructor can emphasize:

- completing the sheet and meeting many different people, or
- having fewer, more meaningful conversations

Give One Get One Example

Context: Teaching Assistant (TA) training session at the start of a course

Give One, Get One

One thing you are very proud to have learned

Your answer:

Their name:
Their answer:

A time when you struggled to learn something

Your answer:

Their name:
Their answer:

Something a teacher can do that you appreciate as a learner

Your answer:

Their name:
Their answer:

A teacher who was out of the ordinary

Your answer:

Their name:
Their answer:

Goal of this exercise

Help the TAs remember what it was like to be a student

Shift their perspective to that of their students

Encourage TAs to interact with students in a supportive way

Using a Give One Get One activity in your discipline

The questions can be about *anything.* For instance, …

About a reading:

What is an assumption the author makes?
What is something you agree with?
What is something you disagree with?

About a technical skill practised in an assignment:

What technique did you use to solve the problem?
Describe a kind of problem where the technique you used may not work.
What techniques did you rule out using, and why?

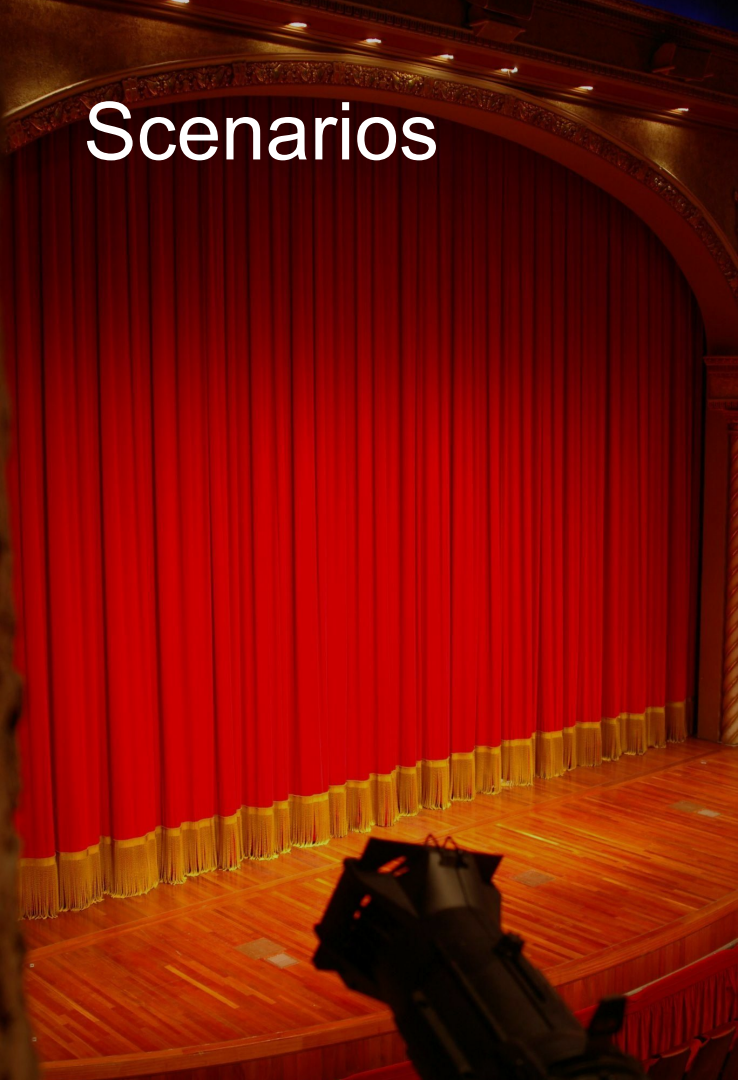
We find Give One Get One is good for

Sharing ideas

Building community

Changing the energy in the room by getting people up and moving

Example activity: Scenarios



Scenarios

Done in small groups of perhaps 4 or 5.

Groups work through several scenarios, discussing how they would handle each.

Some instructors turn it into a game.

Afterwards, the whole class discusses the ideas that emerged.

Scenarios Example

Context: training TAs who will be doing classroom support.

For each scenario, pick a different person to be the leader.

1. The leader reads the scenario to the group.
2. The leader invites each of the others, one at a time, to respond to the scenario.
3. The group discusses the responses.

If the conversation is going very well, it's fine to discuss only one or two scenarios.

The scenarios to discuss

1. All students at a table are working in isolation. There is no conversation at all.

2. There are dozens of hands up and you can’t keep up with the questions. Many students are asking basic questions and unable to get a good start on the exercise.

3. The whole class is working steadily, and you’ve had no questions for 5 minutes.

4. You have spent 5 minutes with a student, who is trying to understand the ideas from two weeks ago and still has questions. There are others waiting for help.

Goal of this exercise

Help the classroom TAs feel prepared and confident

Increase their effectiveness in the classroom

Using a Scenarios activity in your discipline

The scenarios can be about *anything,* for instance …

In a course with labs:

> How would you write the lab report if the results were inconsistent?

In a course about bioethics:

> A patient who is having a heart attack has a tattoo saying “do not resuscitate.” Should the medical team carry out these instructions or act to save his life?

We find scenarios are good for

Brainstorming challenging situations

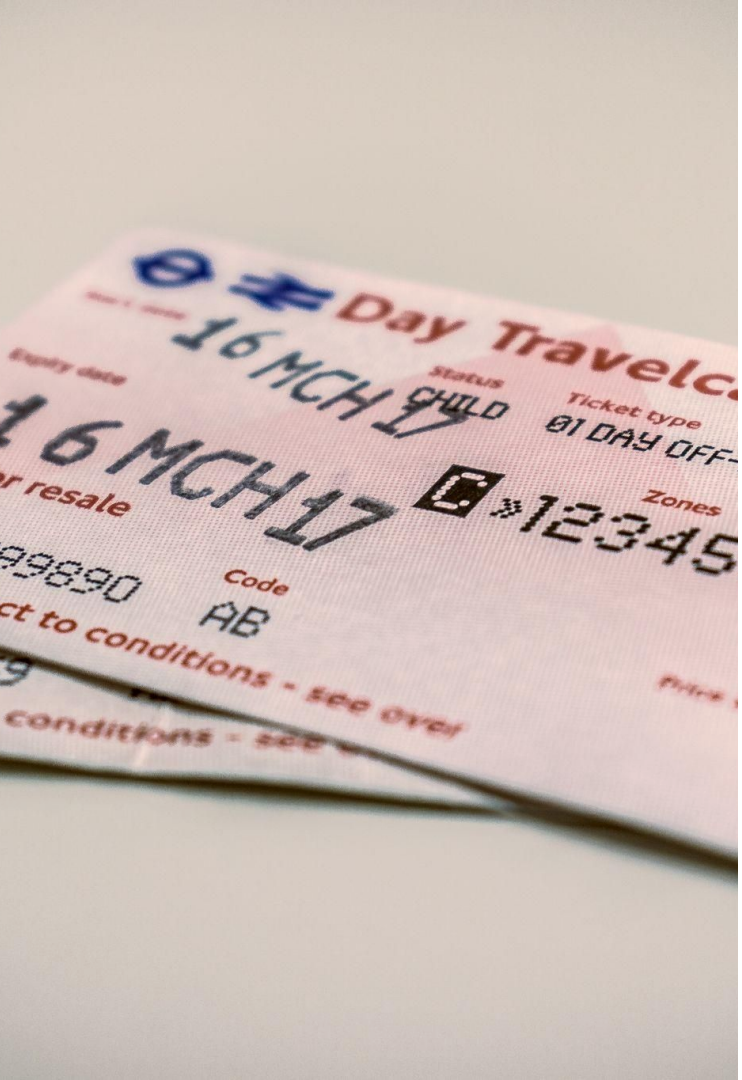
Seeing the perspectives of others

Building students' confidence in their own problem-solving

Example activity: Ticket Out

Ticket Out

Before students leave, they complete and submit a short reflection



Ticket Out Example

What is one new thing you learned today?

Which type of active learning activity would you most like to try in your teaching and why?

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Goals of this exercise

Have everyone leave with a starting point in mind for introducing active learning

We find out about your classrooms

We learn what activities you'd like to try

We find Ticket Out is good for

Getting feedback from students

For example: "What was the most difficult concept today?"

Helping students reflect on their learning

For example: “What is one important concept you learned today?”

Supporting next steps for students

For example: “What can you do this week to get started on your essay?”

Tips for Success

Some classrooms are ideal for active learning…

… but active learning can still work well even in spaces that are less than ideal!

Teaching assistants (TA) can be helpful in large classes, but require training.

Getting Buy-in from Students

Help students understand why they are being asked to work in class

Be transparent about why you are using active learning

Reference the literature

Students need to:

…know they won’t be put on the spot or made to feel stupid

…know that mistakes are part of the process

… be encouraged to create a positive and respectful environment

Summary

Active learning improves outcomes

As teachers, we find it is very rewarding

Our students respond to it well

Fully flipping a course is a big task, but any amount of active learning is good

… and we hope we have sparked some ideas for using it in your course

Questions and Discussion