**Pedagogies to promote higher order thinking skills (i.e. Active Learning pedagogies)**

# Introduction

## Structure of the handout

The handout contains nine pedagogies that can be implemented in a range of settings. Each one is just a short quick start guide to help you get going. Lots more information on each of the approaches can be found online.

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## Recapping the “Why”

A reminder as to why we are taking this approach:

1. Engaging students’ Higher Order Thinking Skills (apply, analyse, evaluate, create)
	* Why: Engaging Higher Order Thinking Skills not only supports students in developing content knowledge, but to also improves engagement and enjoyment of learning, helps with retention of information, and students develop skills such as critical thinking and problem solving.
2. Interleaving - Utilising a variety of approaches to engage Higher Order Thinking Skills.
	* Why: It helps students with long-term learning as the brain has to ‘re-load’ to tackle a new problem each time the approach switches. As the brain has to figure out what kind of problem it is and how to solve it, it improves retention of learning.

## Implementation

The pedagogies do not need to be implemented individually, it is often very useful to combine more than one approach together to enhance the learning process.

When using any of the pedagogies in this handout, always keep checking whether the way they are being implemented is encouraging the students to engage with higher order thinking skills. E.g. an online multiple choice quiz could be used with the intention of the students thinking more broadly about a topic. However, if the students just randomly click on an answer to complete the task as quickly as possible, it is unlikely that they have applied higher order thinking skills to complete the task.

# Questioning

An excellent way to promote higher level thinking is through questioning. Providing opportunities for students to spend time exploring their answers to the questions enables them to make connections between current and prior learning, analyse the information they have encountered, evaluate their learning and create new ways of doing things.

Recommendation: Use the approaches later in the handbook as the ways to implement questioning.

**Questions to help prompt higher order thinking:**

* Is this the only way this could be done?
* If you were restricted by [criteria], how else could you achieve this?
* Something is wrong in this derivation. What is it and why?
* Where could this approach be useful to you in [another part of your degree]?
* What could be another way of representing what you have just done?
* Compare and contrast the approaches covered in today's session and then pitch one of them to your group as being the best one to use over the others (everything in your pitch has to be factually correct).

**How questions**

* How are X and Y similar?
* How are X and Y different?
* How will…?
* In what way….?
* In what manner…?
* By what means…?
* To what effect…?
* Explain how…

**Why questions**

* Why do you think that is?
* Why does X cause Y?
* Why is this true?
* Why is X true but not Y?
* Why does this work?
* Why might…?
* Explain why…

**What questions**

* What is the difference between X and Y?
* What does … mean?
* What is wrong with this derivation? Why?
* What are the strengths and weaknesses of X?

# Think-Pair-Share

Think-Pair-Share is an approach to encourage deeper thinking.

### The process

It takes place in three steps:

1. The students think independently.
2. The students split into pairs and exchange and discuss ideas. They discuss and rehearse with each other the shared response they wish to give to the wider group.
3. The students share back the thinking from their pair with the larger group.

To support implementation, the students should understand how to discuss ideas with one another, the approach encourages practice in the skills of collaboration, active listening and respect for the ideas of others. To make the approach as effective as possible, it is helpful if the students have received explicit instruction in these skill areas before undertaking the activity.

### Tips

* Be clear with the students on timeframes for each part of the activity.
* Make sure the question being posed is clear (write it on the board).
* Encourage the students to make notes during their individual thinking time.
* Encourage the students to ask clarification questions from each other and from you.
* Take the opportunity to make your way around the room to hear the discussion that is taking place.
* Support deeper thinking with prompt questions such as “what are your reasons for thinking that?”, “what assumptions are you making?”.
* Inform the students in advance as to how you will select the pairs to feedback to the room (random selection can be a helpful approach to increase engagement in the activity).

### Where to go for more information

Clark, J. (2024). *Teaching one-pagers: Evidence-informed summaries for busy educational professionals*. Hodder Education. p. 86

# Thinking Environment

The aim of the Thinking Environment is to provide an opportunity for students to do their best thinking in the presence of others. The process is best applied in small groups or pairs.

The three main components of the thinking environment are:

**Attention** - *Listening without interruption and with interest in where the person will go next in their thinking*. The quality of our attention determines the quality of other people’s thinking. Attention, driven by the promise of no interruption, and by respect and interest in where people will go with their thinking, is the key to a Thinking Environment. Attention is that powerful. It generates thinking. It is an act of creation.

**Equality** - *Regarding each other as thinking peers, giving equal time to think.* In a Thinking Environment everyone is valued equally as a thinker. Everyone gets a turn to think out loud and a turn to give attention. To know you will get your turn to speak makes your attention more genuine and relaxed. It also makes your speaking more succinct. Equality keeps the talkative people from silencing the quiet ones. And it requires the quiet ones to contribute their own thinking. The result is high quality ideas and decisions.

**Ease** - Discarding internal urgency. Ease creates; urgency destroys. Ease, an internal state free from rush or urgency, creates the best conditions for thinking.

### The process

* The students should sit in a circle, ideally with no table in between them.
* There should be no electronic devices present and no note taking (unless someone is designated as a scribe).
* The teacher should pose the question to the group (write it on the board if possible).
* Starting from whoever is happy to think out loud first, go around each person in the group in a clockwise order.
* Each person thinks for 1 to 2 minutes, thinking out loud about the question that has been posed. Everyone else should be an attentive listener. The thinker should feel unhurried and free to use their whole two minutes.
* Thinking does not always have to happen out loud. Periods of silence whilst the thinker develops their thoughts are absolutely fine. The listeners should maintain their attention on the thinker even if they are not speaking.
* A person can choose to pass if they feel they have nothing to share. At the end of going around everyone in the group, come back to anyone that passed and ask them if they have any thoughts they would like to share at that point. They can still choose to pass.
* A useful prompt to encourage a fresh wave of thinking is “what more do you think, feel, or want to say?”
* Using a timer can be a helpful way to make everyone feel at ease as they will know that it is not possible to talk for too long and also to know how long they have been thinking for.
* Include as many rounds as would be beneficial (e.g. once everyone has heard each other think they often may wish to build on their own thinking in a second round).
* Finally, at the end of the round(s), the students should be encouraged to appreciate something about the way that the person to their left carried out their thinking. It should not be about the content of their thinking, but the way they did their thinking. Ending on a positive note, helps students to feel appreciated and builds confidence.

Tips:

* Make sure that the process is held to. Do not let people start to interrupt each other.
* Thinking does not have to be done in English. A student is welcome to do their thinking out loud in their native language if this is not English – the thinking time is for them, and is not primarily for the benefit of the listeners.
* Try to encourage the thinker to think for their full time. Fresh waves of thinking usually come even when you think there is nothing more to say. Deeper thinking happens when you go beyond the first initial thought.

More information is available at Time to Think© <https://www.timetothink.com/thinking-environment/the-ten-components/>

# Open responses - Mini whiteboards / online answers

This approach aims to supporting deeper thinking across the whole class by encouraging responses from all students.

Students may well have encountered this approach at school using physical mini whiteboards that they write on and then wipe clean. The approach can be adapted for large lecture teaching by moving to using online software to gather students’ responses, rather than using the whiteboards. For small group teaching, you could choose to stick with the physical whiteboard approach.

The approach has the benefit of engaging a high number of students and giving instant feedback to the teacher about the understanding of the class.

Because of the low stakes nature of the approach and anonymous means of submitting responses online, it provides a safe space for making mistakes and developing learning.

### The process

* The teacher poses a question to the class and the students write their individual answers either on the whiteboard or enter their answer into the online software (e.g. padlet, poll everywhere).
* Give live feedback based on the responses you are seeing on the whiteboards or online software.

### Tips

* Engagement with the online software can sometimes be low, and so explaining the reason for its use to the students to encourage deeper thinking is an important part of the process.
* Ideally, design questions that are seeking short answers. Online submissions may be beneficial for slightly longer responses.
* This approach could be useful for checking that students are able to apply their learning from previous sessions before moving on to new content.

### Where to go for more information

Clark, J. (2024). *Teaching one-pagers: Evidence-informed summaries for busy educational professionals*. Hodder Education. p. 88

# Multiple choice questions

Multiple choice questions can be used to help students consider the information they have been learning, and also to act as a diagnostic tool for how well students are understanding the content. They can be asked in a variety of ways including as quizzes, voting, polls, and exit tickets (a question students answer on a slip of paper or online as they exit the classroom).

It is a low stakes approach to supporting students to engage with thinking more deeply about what they have been learning. If students are not overly worried about the response they give, but are invested in submitting and finding out the answer, then they are more likely to engage and build their confidence.

Multiple choice questions can also be a good way to help the teacher to understand where they may want to focus their teaching if certain misconceptions are being highlighted.

Multiple choice questions enable students to self-assess how they are doing with their learning and can highlight areas for improvement.

The questions need to be designed to include the correct answer and a set of plausible distractors that will encourage the students to encounter common misconceptions and think more deeply about what they are learning.

Design each question to address one common misconception.

Try to craft the questions so that they are not based only on factual recall. Design questions that promote students to engage higher order thinking skills.

The approach can be used with online software (e.g. poll everywhere, slido, mentimeter) for large lecture format or whiteboards for smaller group sizes.

### The process

* Identify what the crucial concept or skill is that you have been addressing in the learning.
* Create a question that will ask students to apply, analyse or evaluate this learning.
* Create a set of answers that contains one correct answer and two or three plausible incorrect answers (that are based on common misconceptions).
* Post the question on the board (or online software).
* Ask the students to discuss their thoughts before submitting a response e.g. by using Think-Pair-Share. Be explicit about the expectation that they discuss their thoughts before submitting.
* Assess the responses as they come in. Are there any trends in the responses (e.g. is one particular distractor being selected instead of/as well as the correct answer).
* Give live feedback to address any misconceptions (if needed). It can be useful to gather feedback from students about why they chose the response they did, before sharing the correct answer.

### Tips

* Always reflect on how well your questions worked. Adapt them for future use if necessary.
* Make sure that questions do address higher order thinking skills and are not only focussing on factual recall.
* Using a quiz directly after learning content and then revisiting the content with another quiz on the same topic later in the course can help enhance learning through delayed retrieval.
* The approach can struggle to elicit deep thinking from the students if they do not engage with thinking about their answer before they submit a response. Facilitating the thinking stage is therefore crucial to ensuring the approach operates to enable higher order thinking.

### Where to go for more information

Clark, J. (2024). *Teaching one-pagers: Evidence-informed summaries for busy educational professionals*. Hodder Education. p. 90, 108

# Visual or symbolic representation

Visual representation can be used to support students in processing information in a different way.

There are a large range of ways to visually represent information e.g. concept maps, mind maps, graphic organisers, flow charts. The key to using these for active learning, is making sure that they are promoting higher order thinking skills. The best way to do this is by using them to answer a given scenario or to answer a well designed question that challenges the student to develop their learning beyond what they have already covered in class. If the scenario can link to a real-world situation, this has been shown to enhance student engagement with tasks.

e.g.

* Create a concept map that shows how the different aspects we have covered so far this term relate to one another.
* Design a flow diagram that would support decision making about when Technique A should or should not be used within different contexts.
* You could also present an incorrect flow diagram and ask the students to unpick what is within it and why.

The approach could be combined with techniques such as Think-Pair-Share or the Thinking Environment to gather a range of perspectives to support the creation of the visual representation.

## The process

* Craft a scenario or question that needs to be solved using a visual representation.
* Decide on whether the activity is to be completed individually or in a group.
* Share the scenario or question with the students, give the opportunity for asking clarification questions.
* Be explicit with the time available for the activity.
* Take the opportunity to move around the room to see the activity in action. Ask prompt questions whilst moving around the room e.g. “what assumptions are you making?”, “is that true in every situation?”
* Ask some of the students if they would be willing to share and talk through their visual representation. Provide live feedback on their representations or provide a model answer which you also discuss and give feedback.

## Tips

* Make sure to have told the students what materials to bring to the session e.g. will you provide colour pencils and paper.
* Make sure to provide sufficient time for completing the activity.
* Be explicit with the students about the purpose of the activity. If it is crucial for them to have an accurate representation at the end of the process, you could provide them with this after the session so that they know that they can be completely free to explore their responses during the session.

### Where to go for more information

Clark, J. (2024). *Teaching one-pagers: Evidence-informed summaries for busy educational professionals*. Hodder Education. p. 62, 83

Lucas, B., & Spencer, E. (2017). *Teaching Creative Thinking: Developing learners who generate ideas and can think critically*. Crown House Publishing. p. 108

# Problem Based Learning

Problem based learning is when students learn by working to solve an open-ended problem, usually in groups.

The learning is focussed around the problem to be solved, ideally, the problem is real-world orientated.

### The process

* The teacher should identify the problem to be given to the students (ideally a real-world problem if possible).
* Students should then work together to define the problem in more detail.
* They should explore what is already known about the problem.
* They should then identify what needs to be learned to solve the problem and how they will go about doing this.
* The students should then use the allotted time to work towards solving the problem.
* The students should then report on their findings using the format specified by the teacher.

### Tips

* Be explicit with the aims and learning outcomes for the activity.
* Be clear with what is or is not allowed as part of the activity.
* Be clear on how you would like the students to present their learning to the rest of the class.
* To make the approach as effective as possible, it is helpful if the students have received explicit instruction in skills such as collaboration and communication skills before undertaking the activity.
* It can be uncomfortable not knowing where the students will go with an open-ended activity. The uncertainty can be managed by being clear about the learning objectives and scaffolding the activity to ensure that these are achieved, whilst still giving the students freedom within the activity.

### Where to go for more information

<https://teaching.cornell.edu/problem-based-learning>

# Peer feedback

Peer feedback or peer-to-peer critique is an approach that helps students to secure their learning and aids in long-term retrieval.

Students need to understand the success criteria for the activity and then are expected to give “kind, specific and helpful feedback to their peers”. The process helps the students to “internalise success criteria to make subsequent improvements”. Using this process to critique the work of others, then helps students to apply the process to their own work.

In addition to the approach below, other techniques that can be used to support students in giving feedback include the “two stars and a wish” framework.

### The process

(The information below is from Teaching One Pagers, p94)

The students should aim to respond to the following questions within the three areas of the framework:

**Be kind – give thoughtful praise**

* What did the student whose work they are reviewing do particularly well?
* What success criteria was achieved?

**Be specific – give precise feedback**

* What parts need improvement?
* What is the work missing?

**Be helpful – give actionable guidance**

* How would the reviewer suggest improving this work?
* What steps does the reviewer suggest?

The way the feedback is written should be positive and encouraging, honest and precise, clear and constructive. Training should be given to the students on how to give feedback in this way.

### Tips

* Be very clear with the expectations of the task.
* Be explicit with the framework the students should use to give feedback to one another.
* Show examples in advance of what good and bad feedback looks like.
* Provide an opportunity for the students to discuss the feedback with one another or with you.
* To make the approach as effective as possible, it is helpful if the students have received explicit instruction in skills such as how to give feedback and have the opportunity to undertake the process several times to improve their technique.

### Where to go for more information

Clark, J. (2024). *Teaching one-pagers: Evidence-informed summaries for busy educational professionals*. Hodder Education. p. 94

# Socratic Seminars

Socratic seminars are another way of supporting students to engage with questioning. Socratic seminars are formal discussions, usually based on a text that the students have read, where the teacher or one of the students poses an open-ended question to be discussed. The students then listen carefully to one another, think critically for themselves and share their own views or respond to the views of others. The aim is not to answer the question, but is in the thinking that the discussion promotes.

Ideally, the question that is posed should relate to the lives of the learners as this can help them bring their own experiences to the discussion.

### The process

(From Teaching for Creative Thinking, p 102)

The text should be set for the students to read in advance.

A question should then be posed at the start of the seminar that ideally has some relation to the lives of the learners.

To support students to be part of the discussion, it can be helpful to share a phrase bank with them, that will help them to be polite and more articulate in sharing their views (see below).

Questions to help:

**Checking understanding**

* So, I think you are saying that…
* What I am hearing is…

**Supporting others**

* I like what <Person> is suggestions and…
* I see what you mean and…

**Building on others**

* That’s a good idea and I…
* I agree with what you are saying and would add that…

**Taking a different line**

* I can understand where you are coming from, but…
* That’s an interesting idea but I really can’t agree…

### Tips

* Be explicit about the process. Do not expect students to know how the process works unless it is explained to them.
* Be strict with requiring respect in the way that the students respond to one another.

### Where to go for more information

Lucas, B., & Spencer, E. (2017). *Teaching Creative Thinking: Developing learners who generate ideas and can think critically*. Crown House Publishing. p. 102