# Thinking Like a Physicist



**Aim of session:**

To recognise and understand some of the skills a physicist uses in their everyday life.

**Learning outcomes:**

By the end of this session, the learner will be able to…

* Identify at least 3 transferable skills learnt through doing physics.
* Explain how these skills can be used in everyday areas of life.
* Discuss the transferability of scientific skills.

## **Prepare in advance**

*Is there anything you need to set up before the session starts? Do you need to ask the teacher anything? Will the mentees need to prepare anything for the session beforehand?*

* Anything you have told your mentees to bring from previous sessions (e.g. activity results, follow-up questions).
* Post to the classroom channel:
  + Reminder of the date/time of the session
  + A list of things they may need access to:
    - Sound when watching videos
    - Pen/paper for working on activity
  + Upload the “Thinking Like a Physicist” video (**without graphics!**).
* If you choose to do activity option 1, you may want to prepare a scenario beforehand (see “Activities/TlaP Activity OPTION 1” below).

## **Timings**

|  |  |  |
| --- | --- | --- |
| 10 - 15 min |  | Introduction to session, aims and intro activity |
| 5 -10 min |  | Watch TLaP video |
| 15 - 20 min |  | TLaP activity and discussion |
| 5 min |  | Skills Bingo |
| 5 - 10 min |  | Summary and reflection |

## **Equipment needed**

*What do you need to run this session smoothly? Where will you get this?*

* The two “Thinking Like a Physicist” videos, one with and one without graphics.
  + You may want to have back-up saved versions of the videos somewhere in case they don’t work on the day!
* Mentee and mentor reflection forms.

## **Introduction**

*How will you introduce the aims, learning outcomes and activities to the students?*

Icebreaker

* Lead and co-mentor re-introduce themselves (name, pronouns, university, course).
* Ask mentees to write in the chat, without pressing send, the following (allow ~3-4 mins):
  + What skills do you think you can get from being a physicist? How would you use these in everyday life?
    - The mentees only need to list a couple - you could make this a competition.
* At the end of the time, ask the mentees to press send. Then the mentors can read the answers aloud. You can have some discussion, but we will be returning to this at the end of the session so there’s no need for an in-depth discussion yet.

Reminder of Ground Rules

* Remind mentees the ground rules you have been working with in our sessions.
  + If any have been particularly important/regularly broken then in particular draw attention to these. It can be useful to give examples of good behaviour you want to be seeing. If possible, you could illustrate with examples from previous sessions e.g. “Last week when we did X, you all did X – I’m excited to see that behaviour again this week!”
  + You may also want to invite the option to provide new ground rules if there is anything the mentees want to add.

## **Activities**

TLaP Video

It’s important not to let the mentees know you want them to list any skills before the video, so they have to use their memories! If you want, you can let them know that you will be asking them questions about the video afterward.

* Watch the video **with** the graphics with the mentees.
* Once you have finished the video, get the mentees to put all the skills they can remember seeing in the chat without pressing send (allow ~1 min max). Then ask them to press send and make a list of all the skills in the video. The list is below to help you.
* Ask mentees to write in the chat, without pressing send, the following (allow ~1 min for each question you choose to ask):
  + Choose a skill. Can you define it in your own words?
  + What does this skill mean to you?
  + Can you give an example of a time in your life you used this skill?
  + Are there any skills you haven’t heard of before? If so, what are they?
* At the end of the time, ask the mentees to press send. Then the mentors can read the answers aloud. Discuss the answers the mentees provide and thank them for their responses. Return to the introduction question. Are there any skills mentees listed that came up in the video?

**Full skills list:** motor skills, experimentation, analytical skills, data analysis, observation, creativity, contextualising, practical skills, researching, referencing, problem solving, communication, justifying, scientific reasoning, reaching conclusions, teamwork

TLaP Activity

* The mentor reads out a scenario (for example, “what happened on my way here”) to the mentees. You can make this as absurd as you like! Then ask the mentees to write in the chat, without pressing send, the following (allow ~2-3 min):
  + What skills (e.g. from the list of skills in the video) did I use in that scenario? Are they physics skills?
* At the end of the time, ask the mentees to press send. Then the mentors can read the answers aloud and lead a discussion with the mentees.
* Now ask the mentees to pick a physics skill and write in the chat, without pressing send, the following (allow ~2-3 mins):
  + Can you think of a time you used this skill as a physicist? (e.g. in their physics lessons)
  + What about in your everyday life?
  + When do you think a scientist might use this skill in their career? (e.g. someone from the WCPTM video)
* At the end of the time, ask the mentees to press send. Then the mentors can read the answers aloud and lead a discussion with the mentees. The goal here is to get the mentees to link themselves and their daily lives with science.
* Return to the introduction question. Are there any skills the mentees didn’t previously associate with science? Do they have a better understanding of how these skills are used in their daily lives?

Skills Bingo!

This activity can be dropped if there is not enough time after the main activity. It can also be altered to fit the amount of time you have left. For a 5 minute activity, choose 1 skill; for a longer period choose 2 or 3 skills.

* Get the mentees to pick a number of the listed skills from the video (dependent on the time you have left) and write them down on paper.
* Explain the rules of the bingo game:
  + You are going to watch the video **without** the skills listed.
  + Each time a mentee thinks they see one of their skills, they have to write down how the skill is used. Their skill has now been seen and can be crossed off.
  + The first mentee to see all of their skills has to write *“Bingo!”* in the chat.
  + The winner has to name each skill and how they saw it used in the video.

## **Reflection**

*What prompt questions will you use with the mentees to aid their reflection? What points are you trying to get the mentees to focus on? How will you get across to the mentees the skills they’ve been working on? Make sure both you and the mentees reflect and this is returned to the National Coordinator.*

Give the students the link to the Reflection form you have been using each week. You can remind them that:

* they will do it every week,
* you will use it to improve sessions and make sure that you include content that is fun and relevant to the mentees, and
* they should use it as an opportunity to think about what they have learnt in the session and discuss it with each other.

Encourage the mentees to think about what they learnt in the session, what they learnt about themselves, what they were surprised about, if they were confused about anything and what they did or didn’t enjoy.

You should have already seen some reflection from these students. If there are comments the mentees have made previously which have been particularly rich, then encourage them to continue doing this.

Share this week’s prompt questions:

* “Did you enjoy the TLaP video? What was your favourite/least favourite part?”
* “Are there any skills you didn’t previously know about/associate with physics? What surprised you about them?”
* “Did you enjoy today’s session? What would you have changed if you were the mentor?”
* “Which physics skill do you think you use the most often/is the most important? Why?”

## **Extension ideas**

*What will you do if the session ends sooner than you expected? What if some students finish before others?*

The Skills Bingo activity is designed to be expandable, so this can easily be used to extend the session. Other ideas include:

* Getting the mentees to write their own stories like the mentor’s about a scenario in which they used physics skills (these can be fictional or non-fictional).
  + Use the same prompts for the discussion of the mentor’s story.
* If any mentees finish their answers before the time is up during the activities, you can prompt them with further questions, such as:
  + Can you think of a time in your life where you used all (or as many as possible) of the skills from the video?
  + Are there any skills you would like to know more about? (e.g. data analysis is not always something pupils will be actively learning at GCSE)

## **Skills used and possible relevant careers**

*Think about the skills the mentees have been using in this session – make the mentees aware of these somehow. Do they like using those skills? What are some careers that need people with these skills? Think outside of the box and try and relate to roles that the students do and don’t know already.*

The skills used in the video and the session include:

* Motor skills, experimentation, data analysis, practical skills, researching, referencing, scientific reasoning, and reaching conclusions are all used in the video.
* Analytical skills: used in the video. Mentees also need this skill to be able to discuss the different ways in which scientific skills can be used in daily life, and to complete the video task.
* Observation: used in the video. Mentees use this skill when completing the video activity to remember the different skills, as well as later in the skill bingo to identify the skills being used.
* Creativity: used in the video. The mentor will be using creativity to create their story, and mentees will need to use it to link the skills to their own lives (and if the extension story writing task is used).
* Contextualising: used in the video. The mentees have to contextualise when linking skills to their own and scientists’ lives.
* Problem solving: used in the video. The mentees use this throughout the session when trying to remember all the skills, identifying the skills used in the mentor’s story, and linking the skills to their own lives and scientific careers.
* Communication: used in the video. The mentees use this throughout the session during discussions with each other and the mentors, and to create the list of skills in the first activity.
* Justifying: used in the video. This is specifically used in the skills bingo activity, since the mentees have to explain how their chosen skill is being used in the video. They also have to do this later when linking the skills to their daily lives.
* Teamwork: used in the video. The mentees will need to work together to remember all the skills in the video activity.

The key point of this session is to get the mentees to link physics skills to their own lives and help them understand the transferability of these skills.

## **Catering for inclusion**

*Have you made sure your session is fully inclusive? Make sure you are not disregarding mentees from certain backgrounds or genders. Make sure everyone has been involved – in a way that they are comfortable with. How will you make sure this happens in your session?*

Ethos

This planned session links to the second half of the Physics Mentoring ethos:

“*Physics is also key to unlocking transferable skills, such as problem-solving, critical reasoning and numeracy, which can increase a person's enjoyment, safety and belonging in society and increase economic benefit. Physics skills can lead to an immeasurable number of careers and jobs, in a wide variety of fields.*”

Through the session, we are aiming to highlight that the skills learned through physics are transferable across all aspects of life. We want to help the mentees understand these skills and link them to physics in order to increase their science capital and begin to see themselves as scientists (if they don’t already). We also want the mentees to realise the benefits they can get from learning and using these skills in physics lessons, regardless of whether they move into a physics career or not.

Physical Environment

Access to devices - this is dependent upon the set-up of the sessions: if the sessions are being streamed into the classroom, all mentees will have the same access to the devices provided by their school. If the sessions are being streamed into homes, the mentor needs to remain mindful of the availability of devices in the mentees’ homes and that they may not be accessing the session on a computer/laptop. Communication around this is encouraged - be sure to check in every session as mentees may not be using the same device every time.

Expectations and Opportunities

Growing your group dynamic - You will have gained some knowledge about the group dynamics in your sessions so far but be aware not to make assumptions on how different mentees will act. Ensure you are not allowing the same students to dominate.

Confidence in a group/opportunity to ask questions - A virtual mentor means that every interaction from the mentees is intentional, relatively public and recorded (to ask a question, they need to say it in front of everyone or put it into a permanent group chat, which they may not like if they think it is a silly question…) and they can’t message you privately. The process for asking questions should be considered and there should be many opportunities to ask questions and make contributions through different mediums. If some students are consistently not interacting, think of ways you can encourage them to do so in a way which feels safe to them – this could include asking teachers for advice on encouraging interaction from particular mentees.

Learners’ skills and abilities

Understanding content and specialist equipment used - mentees may not be familiar with some of the skills in the video (e.g. motor skills or referencing). This may require you to give some background information and define any skills the mentees are unsure of. Ensure you link these skills as you are explaining (e.g. give examples from your own daily life) to ensure science capital growth.

Sensory attitudes

Utilising different mediums (e.g. videos, online forms, discussion, research) in this session will hopefully encompass all learning preferences. If required, the discussion could be turned into a report-writing style activity.

*The above is by no means exhaustive but a starting point for consideration!*

## **Measuring success**

*What does success look like in this context? How will you measure the success against the aim/learning objectives? What will you do to make sure the session is successful? What will you do if it is not?*

* Did the mentees engage with the icebreaker activity? Are they comfortable giving their own ideas of the skills gained from physics?
* Did the mentees watch the video and engage with the skill listing activity? Were the students disengaged or confused? If they were confused, did they ask for clarification?
* Can all mentees better identify scientific skills after the activity? Can they explain the importance of these skills, either in day-to-day life or in a science job?
* Did all mentees take part in the discussions? Did anyone take over or get left out?
* How rich is the reflection? Does it illustrate an understanding of the benefits of reflecting? Did they use opinions, or just state what happened?
* Did they provide any gauge of their interest/excitement/surprise in the reflection sheets?

## **Increasing Science Capital Dimensions**

*What can the students take home from this session? Is there relevant extra reading they can do? Programmes they can watch? Events they can attend? Can they apply a concept to their lives?*

Science literacy

The TLaP video lists scientific skills gained through physics, increasing the mentees’ scientific vocabulary. You could expand on this by giving more in-depth definitions if mentees are unsure on what the skills are.

Science-related attitudes, values and dispositions

The key development in this session is the understanding of the transferability of physics skills and how they are used in a wide range of activities across all walks of life. Seeing that these are skills used in physics as well as elsewhere will increase the relevance that mentees see physics having to their day-to-day life. Getting the mentees to give their own examples of using the skills themselves will further strengthen this relevance.

Knowledge about the transferability of science

The mentees are learning more about the “soft” skills learned when doing physics, which will increase their perception that scientific skills are transferable to lots of other things.

Family science skills, knowledge and qualifications/Knowing people in science-related roles/Talking about science in everyday life

The TLaP video shows people working in different settings - a music student and an engineering student, as well as both of them playing DnD. Mentees might like to reflect on people that they know who might be in a science-related job e.g. do they know someone who works in music, but had previously not connected that to science? Do they/people they know like to play boardgames/DnD? Mentees could be encouraged to have conversations about the skills in the video with friends and family. Do they know whether their family members use these skills in their jobs?