

**STEM: Course Design Guidance**

**The Scholars Programme**

2023-24

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# How to use this guidance

Welcome to the **STEM Course Design Guidance.** This guidance has been put together to complement the recorded training sessions that guide you through the process of designing your own course. It will help you plan a course for pupils in the middle stage of secondary schooling who are aged between 14-16 years old.

We strongly recommend that you complete the online course design template **within two weeks** of receiving your personalised Course Design link. Once you have submitted your course design,you will receive feedback from a qualified teacher or subject expert and can then begin designing your handbook.

This document will support you through the process by:

* Providing a step-by-step guide to completing and submitting your Course Design
* Breaking each tutorial plan down into key components
* Answering a series of commonly asked questions about course design in general
* Providing advice about pitching your materials and handbook at the right level
* Providing a bank of tutorial activities ([Appendix 2](#_Appendix_2:_Tutorial)) and further reading to prepare you for next steps in the planning process.

Before submitting your course design, you will be asked to return to this checklist to ensure that you have included all relevant information. Only by doing so will you enable us to give the most helpful feedback on your proposed course design.

# Course design checklist

Use the checklist below before submitting your course design template and when completing your handbook.

|  |  |  |
| --- | --- | --- |
| Section | Template | Handbook |
| Exciting course title |  |  |
| Course Rationale |  |  |
| Final Assignment title/question |  |  |
| Baseline Assignment title/question |  |  |
| Learning objectives and key questions |  |  |
| Initial activity/hook |  |  |
| Discussion topics/questions |  |  |
| Resources (links, readings, etc.) |  |  |
| Homework |  |  |

# Section A: Scholars Programme Overview

**Launch Event**

**Tutorials 1-5**

Usually once a week, delivering to two groups of six pupils

**Draft Assignment**

**Tutorial 6** (one-to-one feedback)

**Final Assignment**

You will mark the final assignments, then take part in national moderation process

**Tutorial 7** (one-to-one feedback)

**Graduation Event**

The Scholars Programme is delivered through a series of small-group tutorials. Pupils begin the programme by attending an in-school launch where you will get to know each other and look ahead to the exciting learning that is to come. We recommend that you do not use the **launch tutorial** to deliver your course’s content.

**Tutorials one to four** will be where you explore the content of your course.

**Tutorial five** should be reserved for **revising key content and setting up the final assignment**. Following tutorial five, pupils will complete a draft of their final assignment.

**Tutorial six** will be a series of one-to-one meetings with each pupil where you will give individual feedback on the pupils’ draft assignments. Further guidance and training will be given in **Module 3**. You do not need to plan any content for this tutorial at this stage.

Pupils then write and submit the **final assignment**. Once the marking and moderation process is complete, you will deliver final one-to-one feedback in **tutorial seven**. Again, guidance will be given on delivering this through tutor training.

The rest of this document will guide you through a step-by-step process to design your final assignment and the content of tutorials one to five of your course.

Curriculum Overview: Key Principles

The following key principles underpin good curriculum. As we work through the course design process, we’ll keep coming back to these main ideas.

Backwards Planning

Imagine you were building your city’s next great skyscraper. You’d likely start by drawing up plans and then thinking back from the finished product to decide what tradespeople you might need and when you will need them. You wouldn’t gather the concrete trucks, interior designers, electricians and plumbers all together at the very start and then sort things out. In pedagogical scholarship, this approach is called backwards design.

**Backward Design** or ‘**Backwards Planning**’ refers to the process of planning a course or sequence of learning, where the designer focuses on the desired **end result** of the project first. Rather than beginning the planning process with a focus on a specific subject area or a series of activities, the design process begins by asking what learners **should be able to understand and do** at the end of the course. Following that, we’ll consider the possible overviews of each tutorial, followed by thinking carefully about what the best resources and learning activities might be to guide scholars to their desired outcomes.

To help you pitch your course, take a look at the GCSE and A Level specifications in Appendix 5.

# Section B: Choosing your topic

Choosing the right topic for a new Scholars Programme course makes designing and delivering your course much easier and it is therefore worth spending some time carefully thinking about your topic before you get started. A Scholars Programme course is constrained by multiple factors, primarily:

* Contact time available with pupils
* Accessibility of topic

Scholars Programme courses are supra-curricular, which means they typically cover content not taught in schools. This does not mean that your subject cannot be something school-aged pupils learn about, but it should go into more depth than the school curriculum allows or approach a topic from a different perspective. For example, a history course could focus on the Reformation or Second World War but should go beyond the curriculum by introducing university-style academic theories and ideas (such as historiography). Conversely, a literature course could use poetry by an author outside the traditional curriculum, such as poets from the Global South, or apply feminist or post-colonial theory to an analysis of poems. In this way, you can use familiar curriculum themes to develop a supra-curricular course.

**Examples**

|  |  |  |
| --- | --- | --- |
| **PhD Research area** | **Scholars Programme course title** | **Topics included in the course** |
| ‘Molecular Biology of Neurodegenerative Diseases’ | The making and breaking of memories | * Basic brain anatomy * Neuron biology * Neurodegenerative disorders. |
| ‘Quantum Error Correction’ | Should we build a quantum computer? | * Boolean logic * Quantum computing * Ethics of quantum computing |
| ‘Cellular-resolution volumetric structural and functional imaging of tissue using fiber optic needle probes’ | Seeing the Small With the Small: Designing Miniature Microscopes for Medical Imaging | * Medical Imaging * Microscopy * Endoscopy |
| ‘Ultrasound mediated therapies for treatment of biofilms in chronic wounds’ | The bacterial biofilm: Misunderstood microbes or public health hazard? | * Antibiotic resistance * Public health * Microbiology |
| Finite Group Theory | Are some infinities bigger than others? | * Basic set operations * Functions * Cardinality |

Narrowing down your area of interest

* Backward Design or ‘Backwards Planning’ refers to the process of planning a course or sequence of learning, where the designer focuses on the desired end result of the project first.
* Rather than beginning the planning process with a focus on a specific subject area or a series of activities, the design process begins by asking what learners should be able*to understand and do* at the end of the course.
* Before deciding that, think about why studying your research area is important and exciting.

Use this space to consider the big whys of your research by thinking about the following questions:

|  |
| --- |
|  |

Concept Mapping

Use this space to begin concept mapping the main ideas that will form the basis of your course:

Reflection – Decolonising Questions

At The Brilliant Club, we are passionate about ensuring that our scholars can see themselves reflected in the curriculum that they study. Over the last few years, we have been working with our partners at The Black Curriculum to support us to ensure that our courses are inclusive. We ask that you consider your research from this perspective when designing your course.

For a full document examining the theory surrounding decolonizing curriculum and lots of examples to support you with this, please see this toolkit:

STEM: [STEM-Decolonisation-Toolkit.pdf (thebrilliantclub.org)](https://thebrilliantclub.org/wp-content/uploads/2022/02/STEM-Decolonisation-Toolkit.pdf)

The questions that we ask you to use to guide your reflections are below. You will return to these several times during the course design process.

A diagram of a diagram

Description automatically generatedUse this space to make any notes necessary to ensure that your course is as inclusive as possible:

|  |
| --- |
|  |

# Section C: Assessment

## What are the final assignment and baseline assessment?

|  |  |  |
| --- | --- | --- |
|  | **Baseline Assessment** | **Final Assignment** |
| **What is it for?** | Checks the level of **academic skills and prior knowledge** and allows you assess if you need to adjust your course content to effectively support pupils. | Provides a final grade for measuring pupil progress in **subject knowledge and academic skills** made during the programme and informs final feedback given to students. |
| **How long should it be?** | 400-500 words | 2,000 words |
| **What marks should I give?** | Marks submitted via The Hub, but **not given to students** | Marks submitted via The Hub and given to students in feedback tutorial |
| **When is it set?** | As Tutorial 1 Homework | In Tutorial 5 (so that a draft can be produced for Tutorial 6) |

## How are assignments assessed?

Both the final assignment and baseline assessment are marked against the standardised mark scheme, which can be found in [Appendix](#_Appendix_1:_Mark) 2. In order to effectively use this mark scheme, the baseline and final assignment should allow pupils to demonstrate all three skills from the mark scheme in some form.

**Subject Knowledge**

**Written Communication**

**Critical Thinking**

We use a standardised mark scheme for Humanities and Social Sciences and STEM placements – different versions of the mark scheme are available for Key Stages 2-3 and Key Stages 4-5.

The mark schemes were developed in collaboration with an assessment expert at the University of Cambridge, who specialises in improving the quality of exam questions and mark schemes.

Course Aims

NB: this can be directly added to your Course Design Template following the training.

|  |  |  |  |
| --- | --- | --- | --- |
| **Course Aims** | | | |
| **Course Aims:** | What will your scholars understand by the end of the programme (subject knowledge)? | What will your scholars be able to do by the end of the programme (skills)? | What language will your scholars be able to use by the end of the programme? |

# Section D: Final Assignment

Considering and planning the broad topic of your course, and breaking this down into key concepts, will allow you to establish which content and skills need to be focused on from your ideas. **The final assignment should be the first part of the course that you plan in detail.** This will allow you to work backwards and ensure that you cover all the key concepts and skills in your tutorials. The final assignment for your course should focus on, and be clearly linked to, one or more aspects of the topic on which you will base your course.

There is a range of different approaches to framing your final assignment. Your final assignment written task might take a synoptic look at the content of the whole course; the course might culminate in one key question that is built up to in the sequence of tutorials and set as a final assignment or you may decide to give pupils the chance to choose the focus for themselves. A successful final assignment written task usually has some links to all the tutorials, as well as the scope for pupils to research the topic independently.

However you phrase the final assignment initially, you may end up rewriting it completely several times before you are happy with it. This is normal and part of the challenge of designing a course.

## Things to do when designing your final assignment:

* Be specific and clear with the final assignment question and what you are asking pupils to write about. Consider the ways in which pupils could misinterpret the final assignment and ensure you clarify these points.
* Students often benefit from the mark scheme being broken down – you can be explicit with what you expect from them. E.g. indicate that they should include, diagrams, independent reading and examples as part of their essay.
* You should spend at least part of tutorial 5 discussing the final assignment with students and supporting them to think about how they can make links in their assignment to other tutorials and their own independent research.
* The final assignment word count is 2000 words

## Things to avoid when designing your final assignment

* Asking pupils to design an experiment as part of their final assignment – whilst you may want to discuss experimental design in tutorials, it is difficult for pupils to display the assessed competencies if producing a final assignment based on experimental design. If this is something you’d like to include, consider making this part of a broader essay question.
* Very specific final assignment questions – your assignment question should allow pupils to include and link a range of topics from within the tutorials, as well as include their own independent reading and research.
* Expecting pupils to read and analyse primary scientific literature and produce a literature review for their final assignment. Supporting pupils to engage with scientific literature encouraged in The Scholars Programme, but this is something to include as part of the final assignment, rather than expecting them to produce a full literature review for the assignment.
* Asking pupils to generate a data set in their final assignment – if you are planning to include data analysis as part of your final assignment, we suggest including a pre-generated data set that pupils can use, rather than asking them to create a dataset themselves which can be easily misinterpreted and often leads to confusion with the final assignment.

## Breaking down the final assignment

For most people at university, essay-writing or completing a piece of written coursework is something that is expected. For pupils taking part in The Scholars Programme, writing a 2000-word essay may seem daunting. Pupils tend to produce a more thorough and confident piece of written work if this is first broken down into parts.

It is most useful when tutors provide additional information for pupils, outlining how they can best use the tutorials and the mark scheme, or detailing what is expected in the final assignment. See some examples below.

**Example final assignment**

|  |
| --- |
| An organisation with responsibility for a stately home and garden is interested in how they can supportand encourage wildlife. They are asking people for ideas but have already said they are very keen tohelp “save the bees” and they are interested in setting up honeybee hives. The garden is large, and allof its neighbours are farms growing various different food crops.  Using information covered in tutorials and recent academic research, write a letter to the organisation explaining what you think they should do to “save the bees”. In your essay please include:   * Why are pollinators so important? * Why bees are such good pollinators? * The challenges being faced by wild bees and how they are linked * What do you think the garden should do, bearing in mind its neighbours? * Analyse by providing evidence whether the introduction of honeybees is a good idea?   You may want to do some extra reading and research to help support your argument about how to save the bees. If so include a list of the books, websites or academic papers you use (see Appendix 1 in the handbook for more help on referencing). Some useful papers are included in the handbook. These are a good place to start.  ***Rosaline Hulse – Pollinator Protection: How Can We Save the Bees?*** |

**Example final assignment**

|  |
| --- |
| **Final assignment title**  Would you recommend taking a memory enhancing drug? |
| **Details of final assignment**  A brand new memory enhancing drug has come onto the market and many news outlets have jumped onto its discovery saying it can cure Alzheimer’s disease, amnesia and improve cognitive performance.  Write an opinion article for Nature Magazine about whether you think a single drug could realistically perform all the above function from a neuroscience perspective. State the pros and cons of memory enhancement and conclude with your recommendation on taking memory enhancing drugs.  In your essay, please include:   * An introduction to neuroscience and memory problems * The neuroscience of memory formation * How this drug might work on a neuron * Experimental means of testing memory using this drug * A balanced argument for and against using this drug to enhance memory in Alzheimer’s disease, amnesia and cognitive performance. * A conclusion summarising your recommendation, why you think this, and the future directions of memory enhancement.   Your article should be structured using appropriate subheadings, including introduction and conclusion.  Include diagrams when they help explain your point. These must be labelled or commented on in the text.  Your opinion is the most important part of this assignment. Think of your point of view before you write the essay and keep this in mind throughout!  Extra reading and research is encouraged. Search for information about the neuroscience of memory on the internet and look out for news articles and scientific websites. Make sure to comment on the reliability of these sources and reference them as stated below.  Referencing style: Harvard (Author Name, YEAR) or using a numbering system  ***Julia Ravey – The Making and Breaking of Memories*** |

Draft Assignments

NB: this can be directly added to your Course Design Template following the training.

|  |  |  |
| --- | --- | --- |
| **Assignments** | | |
| **Assignment Titles** | **Final Assignment Title (Session 2)** | **Baseline Assignment Title (Session 3)** |
| **What the assignment should include:** |  | \*Your baseline assignment should allow you test some of the subject knowledge and most, if not all, of the academic skills you have identified above. |

# Section E: Baseline Assignment

## What is a baseline assignment for?

Your first content tutorial should contain an introduction to some of the key foundational concepts of your course. Your baseline assignment should therefore test some of the concepts covered in tutorial 1 and assess the extent to which pupils understand the concepts and have the skills that will be used and tested throughout the programme. It also allows you assess if you need to adjust your course and what support you might need to give pupils to develop the academic skills outlined above.

Having designed your final assignment and determined the most vital academic skills and subject knowledge for success in the final assignment, the baseline assignment allows you to assess where pupils are starting from. Therefore, it is important that you continue the backwards planning process to ensure that you are starting from the most useful point to support your pupils towards the final assignment. Here is an example:

|  |  |
| --- | --- |
| **Final assignment title:** Assess the benefits of exercise for a condition of your choosing. Your essay title should be “The benefits of exercise in (insert condition name)”  The essay will need to include:   * An overview of the condition – Symptoms? Causes? Who does it affect? * The effect exercise can have upon this condition * An evaluation of any secondary complications * An assessment of the different types of exercise and whether they have all have the same impact on the condition? * You should also clearly state which type of exercise you would recommend to people with this condition and why you have chosen this. | |
| **Understand:**   * **Describe the main types of exercise** * **Evaluate the impact of exercise on different parts of the body/different body systems** * Explain inflammatory bowel disease and how scientists have used exercise to treat this | **Be able to do:**   * **Use scientific evidence to support claims and explain its value or significance** * **Use correct scientific language** * **Show independent thought and analysis and have a clear point of view throughout the essay** |
| **Baseline assignment:**  You have been selected to present at your local authority defending why your school should get more gym equipment. This will involve writing 500 words evaluating “the benefits of exercise in the general/healthy population”.  Firstly, you should evaluate the role exercise can play in benefitting people who are free from illness. Use the knowledge you gained from the first tutorial about to different activity types and the specific individual benefits these may have.  You should ten select one type of exercise we discussed in Tutorial 1 (aerobic, resistance, balance or flexibility) and discuss how this exercise benefits different systems in the body (e.g. circulatory, immune, muscular system etc.) and say why/how this exercise is important for maintaining people’s general health. | |

**\*Bolded text can be assessed in both the baseline and final assignment**

The assignment above allows pupils to *apply* ***knowledge learnt***in tutorial 1 about the importance of reading to pupils’ lives. It also allows them to ***show the skills*** expected for the final assignment by asking them to make their own judgements and conclusions about reading today and using resources from the tutorials to support their ideas. The baseline assignment also allows pupils to assess why their answer might be different in the 18th century. Thus, it tests relevant, but key knowledge, as well as allowing pupils to practise the key academic skills the tutor has identified are important to the final assignment.

**Key pointers for designing baseline assignments:**

* The baseline assignment is marked according to the same mark scheme as the final assignment and includes elements such as ‘Research and Evidence’ and ‘Developing an argument’.
* Therefore, it should allow pupils to use knowledge learnt in Tutorial 1 in a way that mirrors the final assignment in the sense that it is **testing the same skills**. Importantly, it does not need to assess all key subject knowledge as this is what they will learn with you throughout the course.
* Written assignments (for example 300-500 words mini-essay) often work well as this allows pupils to demonstrate all the key competencies.
* It should be written in a way that is approachable to pupils; you want to test **what they know and can do now, not assess how well they can determine what you might want them to discuss** **or to assess how well they can interpret a task.** It is unlikely pupils will know what is meant by ‘critically analyse’ without further support. Like the final assignment, pupils tend to produce a more thorough and confident piece of work if this is first broken down into parts, detailing what is expected in the baseline assignment.
* The baseline provides an indication of pupils’ knowledge and skills at the start of the programme and therefore we expect baseline marks to be relatively low.
* A written assignment can often provide the basis for the pupil’s final assignment introduction – this can be a good way of considering what to set as your baseline assignment.

**Baseline assignment – a measure of progress**

Remember, the baseline assignment is used as a measure of pupils’ progress throughout The Scholars Programme. The baselines assignments should be marked according to the same mark scheme, and to the same standard, as the final assignment. We therefore expect baseline assignments to be relatively low. If you find yourself giving multiple 1st class marks for your baseline assignment, consider if this pupil is already performing to an excellent standard at the key stage above.

# Section F: Tutorial Planning

## Tutorials 1- 4

Now that you have determined where pupils need to get to (the final assignment), you have identified the key academic skills and subject knowledge they need to be successful, and you have the ability to determine where pupils are starting from (the baseline assignment). As mentioned previously, **Tutorials 1-4** will allow you to introduce the core concepts of your course and engage pupils in thinking critically about these topics.

**When planning your tutorials, you should be able to directly connect how the purpose, key questions/concepts/case studies and homework assignments help pupils build the skills and knowledge necessary for their final assignment.**

The following questions and tutorial outline examples will guide you through the process of designing each tutorial. You do not need to have full sessions and activities planned. The Course Design Template will ask you to answer the questions below and you will receive feedback on these from a qualified teacher or subject expert within our team.

When planning each tutorial, you should remember the final assignment that your pupils will be working towards and consider how each tutorial will support them to complete it.

|  |  |
| --- | --- |
| **What is the main topic or concept covered?** | * Think about the main topic or concept for the tutorial. How does it fit the overall outcomes of the course and support pupils to complete the final assignment? * Have you considered how you have spread the course content across the tutorials? * What is the key message in the tutorial that you want them to remember? * Is this focused enough for pupils to cover in one tutorial? Remember, you should aim to cover **no more than one or two concepts** in each tutorial. |
| **What are the key questions and learning outcomes?** | * What will the main learning outcomes be? For example, what work will pupils produce? What discussions will they have? * What will pupils know about/be able to do at the end that they could not at the start? * How will you know that pupils have achieved these outcomes by the end of the tutorial? * You should consider including a **hinge-point question**, which is a question designed to help you check whether pupils have understood a concept. More information about hinge-point questions can be found in Appendix 3. |
| **What case studies, readings and activities will be included in this tutorial?** | * Think about what content the pupils will need to cover in the tutorial to meet your overall aim. * Consider the questions that you will use to guide the tutorial and how you will use these to assess pupil understanding, including how their responses to their questions will guide the next stages of learning. * Do you need to reconsider the amount in other tutorials to leave space to prepare for the final assignment? * Be as specific as you can regarding the content that your pupils will explore in this tutorial, giving an example of activity if you have one in mind. |
| **What are the key terms/words?** | * Learning the definition of key terms will help pupils learn new concepts and access the language of your subject. * Most tutorials will introduce new vocabulary; pupils should be clear about what new keywords mean and be confident in using these is unfamiliar situations. * Defining your key terms will help you think about how to introduce them and what activities you can use to help ensure that the pupils are confident in their use of new vocabulary. * Keep the amount of new words to a manageable amount (no more than three) and plan to give pupils plenty of opportunity to use them in speech and in writing. |
| **What homework assignment will you set?** | * The homework assignment you set each tutorial serves three purposes: to review your past tutorial and to prepare for the following tutorial. It also allows you to check pupils’ progress towards the key academic skills and knowledge vital for the final assignment. * The homework assignment should recap the key material set in the tutorial but also provide an introduction and basis for the discussions and activities that you plan for the following week. * Depending on your course content and final questions, the homework assignments could be structured to build up to the final assignment by dealing with a different aspect of it each week. |
| **TUTORIAL 5 ONLY: What form will the DRAFT ASSIGNMENT take?** | * You must set a draft assignment at the end of Tutorial 5. * This could be an introduction, a first paragraph and a plan, but it should be substantial enough to constitute at least half of their final assignment. * You will give one-to-one feedback in Tutorial 6 |

Backwards Planning: Tutorial Outcomes

NB: this can be directly added to your Course Design Template following the training.

\*remember to review your course aims to ensure your outcomes and assignments supports pupil progress towards these aims

|  |  |
| --- | --- |
| **Tutorial 1** | |
| **Secondary Concept from concept map covered in this tutorial** | **Tutorial Outcomes** |
| **Tutorial 2** | |
| **Secondary Concept from concept map covered in this tutorial** | **Tutorial Outcomes** |
| **Tutorial 3** | |
| **Secondary Concept from concept map covered in this tutorial** | **Tutorial Outcomes** |
| **Tutorial 4** | |
| **Secondary Concept from concept map covered in this tutorial** | **Tutorial Outcomes** |

Backwards Planning: Tutorial Planning

On the next page is a suggested planning template for your tutorials. Please feel free to copy this as many times as you need to plan your tutorials.

The Course Design Template will ask you to outline the main case studies/sources and activities each tutorial will include. This can be directly added to your Course Design Template following the training.

When outlining your tutorials, ensure you include resources and plan to incorporate the following:

* Checking pupils’ understanding
* Letting pupils participate – can you build in pupil-led discussion?
* Practising and building key academic skills
* Developing the skills of analysis and evaluation
* Using key subject specific terminology in speech and in writing

It is important to provide ample opportunities for pupils to **apply and use** the knowledge they’ve gained through activities or strategies like the ones outlined above. In university this often takes the form of writing notes or reading a journal article, and while these will be useful skills for your pupils to develop, they will also need interactive opportunities to apply the knowledge they’ve gained. You should plan carefully for activities that allow pupils to explore their thoughts and ideas, such as applying new information to a scenario, coordinating a debate or conducting a discussion in pairs or as a group. For ideas on how to build discussion and activities into your tutorial, see Appendix 2.

You may need to cover some complex concepts and theories in order for pupils to access some of the higher-order elements of your course. To ensure that topics can be grasped by students, they need to be broken down and made accessible. This can be done in a variety of ways, including using activities, metaphors, or simply breaking the concepts down into bite-sized chunks.

**Metaphors and imagery** – illustrate the point with something students will be familiar with. We learn by hooking new information on to pre-existing concepts. Metaphors, analogies and imagery can work really well for getting pupils to ‘see’ what you are explaining and to understand new ideas in relation to ones they are already familiar with.

**Activities first -** Explaining a complex concept or theory can be challenging, and it’s really hard to know if students have understood. By using a well-planned activity first, students can understand a concept without the jargon and complexity, and then are thinking along the right lines when the activity is explained. It’s important to plan such activities well bear the following in mind:

1. Keep it simple

2. Ensure pupils are given the chance to relate this back to the topic in question.

**Link it back** - Explanations can be hard to follow when it’s not clear how the information being given fits in to the course. You will need to facilitate this as, especially with younger pupils, students will not always be practiced in doing this themselves. Ask students to explain how new information links to information previously covered. Review previous tutorials at the beginning of a session and ask students to discuss how new information can be used in the final assignment

**Break it down** - Break down your explanation into its key concepts and build in an opportunity to check all pupils’ understanding or for them to do an activity to apply, evaluate or analyse the information learnt. That way the explanation becomes a series of shorter ladders with platforms for pupils to pause at.

**Tutorial Planning Template**

**Tutorial Number:**

**Tutorial Objectives:**

**Starter**

* Hook students’ interest
* Check what they’ve retained from the previous tutorial

**Learning Activities**

* Deliver the key concepts of the tutorial
* Consider how students can experience independent or university-style learning

**Application Activities**

* Plan opportunities for students to actively engage with the content
* Encourage student-led and university-style learning

**Plenary**

* Allow students to demonstrate that they have met the tutorial objectives
* Plan opportunities to assess students’ understanding

**Checking Understanding Question**

* Are they ready to learn new content?

**Resources**

**Hinge Point Activity**

* How can students demonstrate an understanding of the key concepts?

**Resources**

**Checking Understanding Question**

* How can students demonstrate an understanding of the key concepts?

**Resources**

**Checking Understanding Question**

* How successfully have students met the tutorial objectives?

**Resources**

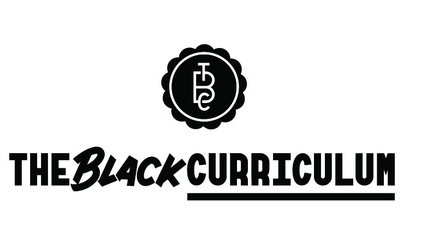
**Homework**

* What activity can pupils do unaided to reinforce the key knowledge or skills that they have acquired during the tutorial. How can they begin to build the stamina for extended academic writing?

**A note on academic journal articles:** Reading and using academic journal articles to inform one’s argument is undoubtedly an important skill for students a university and can introduce complex ideas and evidence to readers. However, your pupils will be entirely new to academic literature like this and will need support from you to engage with it successfully. If you wish to include academic journal articles, you can support pupil engagement with these resources by selecting the most pertinent sections from the article, aiming for **no more than 1-2 pages in a tutorial, and 3-4 pages for homework**. You could also supplement pupils’ learning by

* modelling how you would approach and engage with the first paragraph, particularly how you approach unfamiliar vocabulary or complex ideas
* physically highlighting or circling the most essential passages
* including a handful of questions that pupils can use to guide their reading.

Please avoid including an unabridged article with no specific guidance to support pupil engagement with this text, as pupils will likely read each individual word for understanding rather than having the existing skills to take any broader meaning or learning from an article.



**Planning for inclusive teaching**

As we work with pupils from backgrounds that are under-represented at highly selective universities, it is important to consider designing your course in a way that reflects the diversity of contributions and actors within your subject area. This also provides a unique opportunity to design a truly supra-curricular course by encouraging pupils to consider why certain ideas or viewpoints may be unfamiliar to them or to support them to view a subject from a new vantage point.

In thinking about what tutorial outcomes, aims and activities you wish to include in your course, we encourage you to select the most important and productive examples, even if they may not be the most seminal or canon examples within your discipline. Of course, there will be times when these sources are the most appropriate, but in planning your course, we encourage you to think critically about what voices are, or are not, included in your course and how you might prompt pupils’ critical thinking about different perspectives. Increasingly, this sort of thinking is linked into calls to decolonise curricula and we have created an additional resource to support with how this relates to your subject, which you can access using the links below:

**STEM:** [STEM-Decolonisation-Toolkit.pdf (thebrilliantclub.org)](https://thebrilliantclub.org/wp-content/uploads/2022/02/STEM-Decolonisation-Toolkit.pdf)

## Tutorial 5

Tutorial 5 should focus on revising the concepts covered in Tutorial 1-4 as well as introducing the final assignment. For homework, pupils should complete a **draft assignment task**. As an academic essay of this length will be an entirely new task for pupils, they will benefit greatly from this dedicated time to review and prepare for the final assignment. Specifically, pupils will benefit from guidance on how to structure an academic essay, what they might want to include, support in understanding the difference between description and evaluation, the use of evidence and the importance of developing their own argument/position in relation to the final assignment. As a result, it is nearly impossible to cover new content meaningfully in this tutorial and support pupils effectively towards the final assignment, so please do consider this in your planning.

**Some Revision Strategies**

* **Present Day Problem/Issue** – if there is a relevant present-day situation that relates to the themes of your course, you can support pupils to revise by asking them to apply what they’ve learnt to this new context
* **Concept mapping** – provide pupils with a blank concept map and as them to make connections between the ideas they’ve learnt about
* **Adapt an activity** – activities that were productive in getting pupils to engage with new content can also be helpful in revision.
* **Character profiles** – as pupils to create “identity cards” for individuals, countries, stakeholders etc. relevant to your course which include their name, purpose or motivations and any arguments or perspectives that will be important for pupils to recall.
* **Mini-debate** – divide your tutorial group in two for a quick debate around a big question relevant to the aims of your course. After giving pupils a few minutes to plan, and clear instructions about how the debate should proceed, ask them to speak from their assigned perspective and provide evidence to support their ideas.

**Suggested Draft Assignment Tasks**

* **Complete an outline** – provide pupils with an outline template or structure and ask them to complete this with the points and evidence they will include in their final assignment
* **Make a start** –ask pupils to write the first 2-3 paragraphs of their final assignment and outline what the remaining paragraphs will be about
* **Break it down** – ask pupils to answer a simplified version of your final assignment question to collect and articulate their thoughts in a shortened word count. It will be important to make clear that this prompt is central to their final assignment task and will be one they’ll expand and adapt for the final assignment.

**Remember, referencing will also be new to pupils, so you will need to devote time in this tutorial or in earlier tutorials to introduce the purpose of referencing, explain how and what part of their essays will need a reference and allow pupils time to practise this skill.**

## Tutorial 6 and 7

Tutorials 6 and 7 will be opportunities to provide pupils with feedback on their draft and final assignments. Further information about these tutorials and strategies for giving effective feedback are covered in tutor training sessions, but as these are based around feedback, the structure of these tutorials does not require any further planning for your handbook.

# Section H: Homework

Homework assignments are a useful way to have pupils cover important content and prepare for the following tutorial. With all homework assignments it is crucial to find time in the tutorial to carefully explain what they need to do and to share success criteria with them. Likewise, at the start of the following tutorial, you should aim to make time to review the assignment, allowing pupils to receive feedback and reflect on what they have learned.

In order to stretch pupils, tutors may require pupils to read complex literature. It is crucial that with all reading activities pupils are supported to access the material and that they have a clear purpose. Pupils should never be given a text just to read. Don’t forget that pupils will not be familiar with accessing and understanding academic literature. If you would like pupils to use published research (which is a great skill to learn), it is be worth providing small sections of important papers for them and spending some time in the tutorials discussing how to get the relevant information from papers.

It is also important that your homework tasks build up towards your final assignment. We recommend you vary the style of homework tasks throughout your tutorials, for example setting some written work, some research-based work, and possibly some presentation or debate preparation.

We expect pupils to spend **approximately 30 minutes** completing their homework assignments, so please do keep this in mind when setting a task.

**Ideas for homework tasks:**

* **Summaries.** Pupils write a summary of the text they have read. Set clear minimum/maximum word limits for these tasks. You should also ask pupils to do something with this summary – this could be asking them how whatever they’ve summarised influences their understanding of a concept, or to apply it to one of the key questions from the tutorial.
* Prepare for a **debate** – pupils will benefit from specific structure on how to do this (i.e. write an opening statement or prepare arguments as if you were [insert role/identity/perspective])
* **Source analysis** – looks at images/data/written sources and write a summary of their interpretation and evaluate how the source helps them answer a question/understand a concept. Remember to give pupils specific support in how to approach reading the source.
* **Creating questions** –Pupils draw up questions about the text and then pose them to other pupils. (Pupils must be able to answer their own questions).
* **Role play a scenario** – Set a homework question that asks pupils to apply key knowledge and concepts from the tutorial to a real-life scenario. For example, they may write a letter to an influential figure, evaluate a set of data and share their conclusions for a local authority or other influential body or argue in favour for or against a school policy.
* **Please see the note on journal articles page 24**.

# Section I: Course Title

The title does not have to be the same as the final assignment title, although in some cases it is the same. You may choose to phrase your title as a question, a statement or some of the specific concepts that will be studied.

**Review:** It can excite pupils when there are highly specialised words in the title as this is an instant indication of the university-style approach that your course will take. However, as a golden rule, the best titles are “***low access, high challenge***”, in other words they indicate problems that are easy to understand, but difficult to resolve.

It can be helpful to think of your course title as similar to the title of an undergraduate module where part of the aim is to “sell” the course to students, as this will similarly get your pupils excited about the course. We encourage you to avoid considering course titles that are more similar to academic paper titles, as these are less approachable for non-academic audiences.

**Examples:**

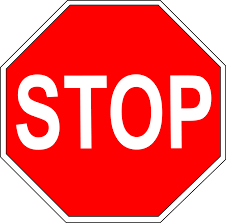
* Theatre for the People: A Taste of Honey Then and Now
* Apocalypse Now and Then (ancient and modern disasters)
* Should Human Rights be Sacrificed in Order to Protect National Security?
* On Track or Off the Rails?: An Introduction to the Procurement of Trains
* Gorillas and Guerrillas: Animal conservation in warzones
* Masks, Marble and Magic Public and Private in Roman Religion
* Stonehenge – just a pile of old rocks?: Exploring Heritage and Conservation

# Section J: Course Rationale

The course rationale will serve as an introduction to the course. This should not be designed as an abstract, but should instead provide a ‘hook’ for the course that gets pupils excited about what they will be learning. It should be written to be clear, succinct and easily understood by a non-specialist audience, including parents, teachers in schools, and the pupils who will be taking part in the course.

**Action:** Write your course rationale in the section provided. Please write in full sentences and avoid bullet points and other types of non-standard formatting. Your course rationale should be around two paragraphs and could include the following:

* A summary of the key content, ideas and debates that pupils will study through the course
* A brief explanation of how the course fits into the wider context of the field and the subject
* A summary of the key skills that pupils will develop through the course

****Please note that it may also be useful to have a brief introduction to each of the tutorials.

**and Check**

Once you have written your course rationale, it is worth checking the pitch of your rationale by considering the following questions:

* Does this make my topic sound exciting to someone who has never studied it before?
* Have I explained why this topic is important and worth studying regardless of pupils’ academic interests?
* Will this be understood by parents, non-specialist teachers and the pupils themselves?

It would be worth asking someone who is not doing a PhD to read through your course rationale and get their opinions on the questions above.

**Example:**

The phenomenon now known as the Harlem Renaissance saw an unprecedented explosion of African American art and culture; after World War I, black writers, artists, musicians and intellectuals sought a new identity and a new way of life through art. A century on from the first stirrings of the Harlem Renaissance, it is largely remembered either as a golden period in African American cultural history or as a disappointing venture that ultimately failed to change the situation for the black population in racially segregated America.

This course invites pupils to examine both sides of this argument, to consider the paradoxes and discrepancies that mark this fascinating moment in history, and to reflect upon its enduring legacy. Particularly, the course invites pupils to interrogate and challenge existing narratives about the Harlem Renaissance, examining its lesser-known and more controversial aspects, including the contributions of women and LGBT writers and intellectuals, the involvement of white patrons and portrayals, and reactions to 'racial passing'.

More widely, the course asks pupils to reflect upon the real-world change that art can (or indeed cannot) effect in the world. It prompts students to compare the Harlem Renaissance with examples from contemporary culture, from Beyoncé to Black Lives Matter, and from Rachel Dolezal to Luke Cage. Analysing a range of poetry, prose and essays alongside examples of Harlem Renaissance art and music, this course encourages pupils to consider the intersection between art and politics, to think critically about how historical and political contexts inform and form all aspects of literary texts and to forge connections with present-day cultural movements in order to consider the efficacy of literature today as an agent for political and societal change.

**Laura Ryan – Shaking Up the Harlem Renaissance**

**Appendices**

Appendix 1: Pitching your course at the right level

## Pitching your course at the right level

Pitching your course to the appropriate level for 13-16 year old pupils can be one of the most daunting parts of designing a new Scholars Programme course. This section aims to provide some guidance on how to pitch your course at the appropriate level and includes some pointers and places to find further information about the level of science your pupils will have studied.

**Key information**:

* For The Scholars Programme, you should plan to deliver your course to pupils ages13-16 years old.
* The course should be tailored to your PhD research so that the pupils are learning about something beyond the curriculum. However, it is often more appropriate to use your general area of research as a starting point for the course and include specifics of your research as examples given how specialised your own research is likely to be.
* Use the information in [Appendix 5](#_Appendix_5:_School_1) to give you an idea of the level of the work you should be setting, based on pupils’ prior knowledge.

Whilst pupils are often able to grasp surprisingly complex topics in tutorials and their own work, they need to be supported to build up both the subject knowledge and relevant skills in order to do this.

## Pitching for skills

There are some skills, for example, reading scientific literature and analysing scientific data, that pupils need to be supported with in order to be able gain and access more complex concepts.

Reading scientific papers is a skill and is not something generally covered in school. Most pupils will be unaware what primary literature or reviews are, let alone how to read them. If you are keen to get pupils to engage with scientific literature in your tutorials (which is a great way of showing them what research is like, as well as providing them with the means to do independent research), try the following:

* Provide pupils with a graph/figure from a paper. Don’t expect them to be able to analyse it straight away. You could turn this into an activity where pupils can work together to understand the information.
* Include images/data from your PhD and unpick this with pupils in tutorials to build up their confidence in analysing data. Then they can apply similar skills to other data in published papers.
* Avoid asking pupils to digest whole papers or reviews alone – you could provide a section, figure or abstract to make the research more accessible.
* If you are including whole research papers in your handbook (e.g. if they are hard to access online), put these as appendices rather than in the tutorial section.

## Pitching for content

Complex topics can be grasped by students if they are able to build up to them, link to pre-existing knowledge or relate new ideas to more familiar situations. Sometimes, you will need to explain a complex idea, concept or process. This can feel like climbing up a very long ladder; if pupils miss one rung, they’ll be stuck and won’t be able to carry on. See section F for some ways of supporting pupils to grasp complex STEM concepts in an interactive way, including how to use metaphors, imagery and activities to help break down complex scientific ideas.

*Think along the lines of explaining the topic to a grandparent or member of the public…. people can grasp complex topics, but only when broken down into chunks!*

Before finalising your course’s focus, you may find it helpful to write out the core question or theory you wish to look at. Then map out all the related concepts that you could cover in each tutorial. This will help you ensure you have enough material so that pupils can complete the course while also giving you the opportunity to cut out material that is not essential. You should aim to cover no more than one or two concepts in each tutorial. See below for an example of this using the topic of ‘Antibiotics – Importance and testing’.

Remember, pupils on The Scholars Programme should be **stretched and challenged** to work at a key stage above their current learning level. The subject specific content and skills tables ([Appendix 5](#_Appendix_5:_School)) give examples of the type of content and skills pupils should be demonstrating at pupils’ current learning level, and at the level at which your course should be pitched and should provide you with an idea of the level of the work you should be setting.

**Example of breaking a topic down into key concepts:**

Farming

Medicine

Evolution

Ethics, cost and timings

Drug trials

Genetic modification

Good and bad

Need for antibiotics

Types

Specificity

Proteins

Biochemistry

**Antibiotics – making and importance**

In pitching content, it is also important to consider the needs of pupils based on their age, as we have a duty of care to safeguard pupils. Remember that your course should be pitched at pupils 14-16 years old, which may have the following implications:

* Carefully consider which topics may be sensitive for pupils. In doing research on sensitive topics, sometimes researchers can develop a blindness for what may be sensitive or triggering to people outside their field. While these topics can have clear pedagogical purposes, it is important to consider how they will be received by pupils with a diverse range of experiences. For example, topics such as animal testing, medical details of injuries, survival rates of diseases, trauma or medical ethics may be sensitive for 14-16 year olds. In pitching your content, we encourage you to carefully consider if any the concepts you’ve identified may be sensitive for young people, and how you will present them to pupils.
* The above is not an extensive list, but a good sense check would be to consider if you would explain a topic in an equivalent level of detail to a grandparent or to a non-academic layperson. If you would adapt some of the details or resources for this audience, consider how you could do the same for your pupils. If it is important to discuss a sensitive topic in detail, please use your course design template to suggest how you would approach this in a tutorial, and the Brilliant Club staff member providing feedback on your plans will help you continue to solidify your approach further.
* This applies to topics, but also the images and learning resources you choose to include in your handbook. For example, consider the age rating of any film clips as these should not be rated over PG-13 or 12A. You should also consider the content in any readings you choose to include in your handbook and avoid any overtly graphic descriptions of potentially sensitive topics. Where a topic might be sensitive, we encourage you to include a content warning so that pupils can be prepared for the upcoming material.

Appendix 2: Competency Framework and Mark Scheme

The Brilliant Club has identified six skills – cognitive and non-cognitive – that we believe will be effective in developing the knowledge, skills and ambition needed to progress to a highly-selective university. We refer to these as our ‘competencies’.

|  |  |
| --- | --- |
| 1 | Written and verbal communication |
| 2 | Subject Knowledge |
| 3 | University Knowledge |
| 4 | Motivation and Self-Efficacy |
| 5 | Meta-cognition |
| 6 | Critical Thinking |

The competency framework has been informed by academic research and consultation with our school and university partners. It focuses on outcomes that are known to be valid, reliable and measurable.

As the academic strand of The Scholars Programme, each course will explicitly develop the following skills: written communication, subject knowledge and critical thinking. As such, these competencies underpin the mark schemes. Information on each of these three competencies is provided below.

|  |
| --- |
| Written and Verbal Communication |
| What does this term mean in the context of The Brilliant Club? Written and verbal communication relates to how pupils acquire and demonstrate knowledge, skills and ambition through written and spoken language. |
| Why is it important? Written and spoken communication is the medium through which most attainment is assessed. A child’s ability to communicate at an early age is considered the most important predictor of school performance and future cognitive skills (National Literacy Trust, 2005; Rosetti, 1996). This implies that children who are unable to communicate effectively will go on to underperform academically. Children from under-represented backgrounds typically have poorer communication skills than their peers, with particular delays found in language development (Law et al, 2011). Therefore, a greater emphasis needs to be placed on developing communication skills from an early age (Lawton & Warren, 2015; Locke et al, 2002). |
| How can it be assessed? Our programmes assess written communication using pupils’ final assignments. These are pieces of academic work based on cutting-edge research and completed after a series of university-style tutorials. Final assignments are marked at a key stage above pupils’ current level of attainment, with marks being awarded for structure and clarity of communication. A pupil’s performance on the final assignment is compared with their performance on the baseline test completed at the beginning of a programme. Going forward, the charity will also explore ways of assessing verbal communication. One way this can be done is by inviting pupils to subjectively rate their levels of confidence before and after taking part in the programme. This will enable pupils to self-report their levels of confidence in their verbal communication. These confidence ratings can then be further supplemented by feedback from their classroom teacher, as well as their tutor. |
| Subject Knowledge |
| What does this term mean in the context of The Brilliant Club? Subject knowledge relates to the academic strand of our programmes, in which pupils are taught new knowledge based on cutting-edge research. |
| Why is it important? Bloom (1956) argues that subject knowledge is a key building block needed for learners to be able to develop higher-order thinking skills, such as analysis and evaluation. Inter-dependence between subject knowledge and higher-order thinking has been highlighted in more recent theoretical models as well (e.g. Anderson & Krathwohl, 2001; Dwyer et al, 2014; Marzano, 2001). It has been argued that it is impossible to use higher-order thinking skills without having the associated subject knowledge about which to think critically (Dwyer et al, 2014; Krathwohl, 2002). The idea that subject knowledge is key to learning is widely accepted amongst academics and educators, with this often being at the core of academic assessments (e.g. Momsen et al, 2010). |
| How can it be assessed? Our programmes assess subject knowledge using course-specific multiple-choice tests, as well as the final assignments referenced above. These two assessment methods allow for both open-ended and close-ended responses to be measured. |
| Critical Thinking |
| What does this term mean in the context of The Brilliant Club? Critical thinking is linked to a range of cognate skills, including: intelligence, problem-solving and higher-order thinking (Bangert-Drowns & Bankert, 1990). Definitions of critical thinking include: purposeful reflection and logical reasoning (e.g. Brookfield, 1987; Ennis, 1989; Paul, 1992); the ability to construct and evaluate arguments (Facione, 1986); and engaging in reflective scepticism (McPeck, 1981). Critical thinking has also been defined in relation to other skills, including meta-cognition (Flavell, 1979; Kuhn, 1999; Gelder, 2005).  A number of cognitive skills underpin critical thinking, including interpretation, analysis, evaluation, inference and explanation (Facione, 1990a; Facione, 2015; Giancarlo & Facione, 2001; Watson & Glaser, 1980). Critical thinking can be assessed at either a subject-specific or at a general level (i.e. content-independent). However, the literature shows that improvements in critical thinking are more likely to occur when activities focus on content related to a specific course (McMillan, 1987; Renaud & Murray, 2008; Terenzini et al, 1995).  As well as skills, critical thinking dispositions have also been identified. Critical thinking dispositions refer to personal attributes and behavioural tendencies linked to critical thinking, such as open-mindedness and inquisitiveness (Facione, 1990a; Facione, 2000; Facione, & Giancarlo, 1996; Facione et al, 1995). While there is some debate regarding the malleability of critical thinking dispositions, there is evidence to suggest that with appropriate instruction and teaching critical thinking skills can be developed (Abrami et al, 2008). |
| Why is it important? Critical thinking is widely recognised as a central aim of education, and one of the key skills needed for higher education and the workplace (American Association of Colleges and Universities, 2005; Ku. 2009; Lai, 2011; Pellegrino & Hilton, 2012). The ability to think critically is important within subject disciplines but also when thinking about challenges in daily life, including social, economic and political issues (Abrami et al, 2008). Despite its importance, developing critical thinking is challenging and schools tends lack explicit critical thinking instruction (Pithers & Sodden, 2000). Research has also indicated that a pupil’s background is an important factor contributing to critical thinking, and that individuals from poor or less affluent backgrounds are less likely to increase their critical thinking whilst at university (Cheung et al, 2001). |
| How can it be assessed? Various assessments are available to assess university students’ critical thinking both at a subject-specific and at a general level (Ku, 2009). Subject-specific critical thinking tests exist for certain subjects including biology, psychology and statistics. Several standardised measures also exist for general critical thinking. The response format of general critical thinking tests tends to be multiple-choice, as found in the Watson-Glaser Critical Thinking Appraisal (WGCTA; Watson & Glaser, 1980), California Critical Thinking Skills Test (CCTST; Facione, 1990b), and the Cornell Critical Thinking Test (CCTT; Ennis, Millman & Tomko, 1985). Some tests use an open-ended format which requires individuals to write an essay. An example of this is The Ennis–Weir Critical Thinking Essay Test, (Ennis &Weir, 1985). The standardised tests discussed above typically have been used for commercial purposes.  The Brilliant Club’s programmes assess subject-specific critical thinking in a number of ways, particularly the final assignments that pupils complete. The assignments assess analysis, the construction of arguments and evaluation. As outlined above, critical thinking and meta-cognitive skills overlap, and critical thinking can also be assessed using meta-cognitive self-report inventories and assessing pupils’ monitoring accuracy (Kuhn, 1999). |

## Mark Scheme

This is the **standard STEM 14-16 mark scheme** and will be used for your baseline and final assignment.

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Subject Knowledge** | **Critical Thinking** | **Written Communication** |
| **1st** | The work shows a depth of knowledge and understanding of key concepts and scientific methods, through engaging with relevant sources.  Knowledge is used to build and support highly effective scientific arguments and explanations. | Analyses key scientific evidence, arguments, and reasoning. Interprets meaning and makes connections.  Identifies and critically evaluates key scientific arguments and evidence, deciding on their credibility, strength, and relative significance, drawing convincing conclusions. | The work has a coherent flow and is well structured.  The writing style is appropriate; scientific language and key scientific terms are used accurately and effectively to support the arguments and explanations made.  There are no, or very few, errors in spelling or grammar.  Consistent referencing, appropriate paragraphing and use of correctly labelled tables and graphs matching the style taught in the course. |
| **2:1** | The work shows an understanding of key concepts and scientific methods, drawing on relevant sources.  Knowledge is used to build and support effective scientific arguments and explanations. | Analyses relevant scientific evidence, arguments, and reasoning.  Identifies and critically evaluates relevant scientific arguments and evidence, deciding on their credibility and strength, drawing reasonable conclusions.  Shows some understanding of the relative value of evidence and arguments. | The work is well-structured.  The writing style is appropriate; scientific language and key terms are used correctly.  There are few errors in spelling or grammar.  Mostly consistent referencing and use of tables and figures; matching the style taught in the course. |
| **2:2** | The work shows an understanding of key concepts and scientific methods, with no major misconceptions.  Beginning to apply this knowledge to build and support effective scientific arguments and explanations. | Identifies and uses basic scientific evidence, arguments, and reasoning.  Showing some understanding of the quality of scientific arguments and evidence.  Not yet showing understanding of the relative value of evidence and arguments. | The work has some structure.  The writing style can sometimes be informal; occasionally scientific language and key terms are not used when it would be appropriate to do so.  There are some errors in grammar and spelling do not get in the way of communicating the content.  Referencing has some consistency; matching the style taught in the course  Limited use of tables and graphs. |
| **3rd** | Shows a developing understanding of key concepts and scientific methods, with some misconceptions.  Does not yet apply this knowledge to build and support scientific arguments and explanations. | Beginning to analyse scientific evidence, arguments, and reasoning.  Describes evidence and arguments, while not yet evaluating them. | The grammar, spelling, style, and structure of the work need improving in order to communicate ideas to the reader.  Scientific language, key terms and references are not always used correctly.  Limited, or no use of tables and graphs. |

**What marks should I give for the final assignment and baseline assessment?**

We will ask you to submit a mark out of 100 for each of the three skills on the mark scheme and an overall mark out of 100 as an average of these three skills.

**What type of grade should I give the pupils?**

For the final assignment pupils will receive marks that are graded using a university-style system as follows:

|  |  |  |
| --- | --- | --- |
| **Grade** | **England, Northern Ireland and Wales** | **Scotland\*** |
| **1st** | Performing very well at Key Stage 5 | Performing very well at Senior Phase of CfE (National 5/Highers) |
| **2.1** | Performing well at Key Stage 5 | Performing well at Senior Phase of CfE (National 5/Highers) |
| **2.2** | Performing very well at Key Stage 4 | Performing very well at Third/Fourth Level of CfE |
| **3rd** | Performing satisfactorily at Key Stage 4 | Performing to a good standard at Third/Fourth Level of CfE |

**\*NB: The Scottish system does not map directly onto the Key Stage system in England, Northern Ireland and Wales. Tutors should aim to design a course that is challenging for S3 and S4 pupils.**

The level descriptors should be treated like success criteria: if a pupil produces work that falls mainly in the 1st descriptors they should be awarded a 1st overall; if the work does not usually achieve a 1st but is above a 2.2 they should be awarded a 2.1. You will also provide your students with written feedback on their performance in the final assignment.

Please use the same mark scheme (found in [Appendix 1](#_Appendix_1:_Mark)) and criteria for the baseline assessment and final assignment. You should give students feedback on how they performed in the baseline assessment in line with the mark scheme, with clear instructions for how to improve their work. However, please **do not share** baseline marks with students.

**What about checking understanding at other times in the programme?**

Tutors should check pupils’ understanding throughout the programme and adjust the delivery of their course as necessary. Pupils’ contributions in tutorials and their homework are good opportunities for doing this.

It can be helpful to plan specific questions to ask pupils in order to check they have understood key information before continuing with the planned content of a tutorial. Examples of how to do this will be discussed at the training weekend.

# **Appendix 3: Tutorial activities**

This section will hopefully give you plenty of ideas for activities that could be included in your tutorials. You are not expected to produce a final and comprehensive list of activities for each tutorial plan for us to check, but when putting together your course handbook, thought should be given to which activities will be best suited to help your pupils meet each objective.

## Starter activities

Starter activities are short, sharp activities delivered at the beginning of the tutorial to grab the pupils’ interest and to get them thinking about the topic or concept that will be covered in the tutorial. In some cases, this might mean using them to recap the key learning points from the previous tutorial or to review the homework assignment they have just completed. Overall, starter activities are an effective way to create a purposeful learning environment from the moment pupils walk through the door.

The activities listed below are suggestions for starter activities but are by no means an exhaustive list and tutors are encouraged to think creatively! The activities below could also be adapted to be used to check for learning at any point throughout the tutorial. Indeed, tutors could return to the starter activity at the end of the tutorial to check to see how pupils’ initial ideas had changed.

**Starter Activities**

**Odd one out.** Pupils are given a group of words and/or pictures and have to justify which is the odd one out based on what they have been studying.

**What’s the question?** Tutor gives an answer, pupils write a list of questions that could be answered by the answer given.

**What questions do you want to ask?** Based on the content of the forthcoming tutorial (or previous learning), pupils write a list of questions that they would like to have answered.

**Peer assessment of homework.** Pupils assess the homework of their peers and give feedback.

**What is being said?** Tutor shows a picture and pupils write down what they think is being said by the people in the picture.

**Ridiculous arguments.** Tutor puts forward a ridiculous argument (e.g. all 5 year olds should be allowed to drive cars) and pupils try to justify this argument.

**1 minute.** Pupils try to summarise a topic in 60 seconds.

**Picture.** Tutor shows pupils a picture and they describe what they think happened before/after the picture was taken.

**Hot seating.** One pupil is chosen, the tutor and other pupils to ask the pupil in the hot seat questions.

**Questions and post-it notes.** Tutor writes a number of questions on big paper, all pupils given post-it notes to use to answer the questions on the paper.

**Describe and draw.** Two pupils sit back to back, one of the pupils is given an image and they have to describe it to the other pupil, this pupil then draws what the first pupil is describing.

**Picture analogy.** Tutor shows a random picture and the pupils to explain why this is an analogy for what they are studying.

**The most difficult question.** Tutor sets 3-5 different questions, pupils choose one and answer it as best they can.

**Mr Wrong.** Tutors write a number of statements, pupils say which ones are wrong and justify why.

**Keyword Activities**

**Taboo.** One pupil describes a keyword without using it and other pupils guess what the word is. (This is a good activity for reviewing complex concepts and content learned in previous tutorials.)

**Match the definition.** Pupils match keywords to definitions.

**Pictionary.** Tutor gives a keyword and pupils draw a picture to represent this. Alternatively, pupils draw something to represent a keyword and other pupils guess the keyword.

**10 words**. Pupils write down 10 keywords on bits of paper. Pupils choose two of these words and describe the relationship between them.

**My word**. One pupil is given (or chooses) a keyword, they point at another pupil who must then give the definition of the keyword, this pupil then gets to choose the next keyword and pupil.

**A-Z of the topic**. Pupils try to write keywords for the topic using all the letters in the alphabet.

**Splat.** Tutor writes ten keywords on a large piece of paper and then chooses two pupils who stand in front of the whiteboard. Tutor then reads out the definition and the first pupil to tap the correct key word with their hand wins.

## Discussion activities

Discussion activities are an excellent opportunity for pupils to exchange ideas, to challenge each other and to help formulate their own views and arguments. Indeed, it is an integral part of small group tutorial style learning. While pupils might be eager to participate in the tutorial and to voice their views, they may not always have the skills required to interact in high level discussion without support or scaffolding. Therefore, tutors initially may have to provide structure for discussions and may have to avoid asking pupils to discuss without first having time to think through and prepare.

The following tips and suggested activities give some suggestions to help tutors plan for effective tutorial discussions:

**Discussion top-tips**

|  |  |
| --- | --- |
| 1 | Create a suitable environment for discussion. Think about how you set up the chairs, position yourself and where you stand. |
| 2 | Establish an explicit culture of respect and participation early on. Make it clear in your expectations that all pupils will need to contribute and listen to each other. |
| 3 | Ensure that every discussion has a clear purpose and that this is clearly shared with the pupils before the discussion begins. |
| 4 | Give clear instructions and expectations about how you want the discussion to take place. |
| 5 | Ensure the pupils are prepared for the discussion. Allow them thinking time; for example, a short written activity, quiz or reading before the discussion. |
| 6 | Be creative! Discussion does not always need to be verbal. Think about using ‘silent debates’, annotating and responding to comments on pictures as a form of preparation for a verbal discussion. |
| 7 | Don’t allow pupils to contribute unsupported ideas. Challenge pupils to develop their answers. If necessary, return to pupils later. |
| 8 | Make yourself the facilitator and not the lead in the discussion. Deflect questions to other pupils to respond to and encourage pupils to talk to each other and not at you. |
| 9 | Don’t be afraid of silence! Allow pupils time to think and respond to each other rather than offering your thoughts and feedback straight away. Think about the amount of wait time you are giving. |
| 10 | Encourage pupils to respond to the previous comment rather than suggest ideas in isolation. |

**Think, pair, share.** After posing a question, give pupils a minute to think of their response in silence, then get them to share their idea with the person next to them, then ask the pairs of pupils to feedback their answers to the rest of the group.

**Guiding questions**. Create a list of questions to keep in mind as pupils engage with a resource or reading. These can then be used to prompt and build discussion in pairs or with the whole group around a larger question. For example, if reading a text, you might ask pupils to consider: “who has the power in this source and how do you know?” Then the whole group can use the information they’ve identified to feed into a broader discussion about power dynamics in society.

**Simultaneous round robin**. The tutor poses a question, all pupils write down what they think. After a set amount of time, pupils pass on their thoughts to the next pupil for them to build on and develop.

**Snowballing.** First, pupils have to individually produce an answer to a question. They then share it with a partner and turn their two answers into one agreed upon answer. The pair then joins up with another pair and repeats the process. This way, four answers are synthesised into one. **For example, pupils decide on the three most significant historical events. Pupils pair up, discuss and synthesise their 6 ideas down to 3. Two pairs join to make four pairs and repeat the process again.**

**Jigsawing.** The tutor divides pupils into pairs. The pairs are given the same picture/text/problem. The tutor gives each pair a *different* question or focus to analyse the picture/text/problem. Next, the tutor allocates pupils into two new groups, ensuring that the pupils originally paired together are in different groups. The pupils in the new group will have approached the picture/text/problem from a different perspective. The tutor then poses a new question (or questions) for pupils to discuss and answer.

**Value continuum.** You can use this activity to get pupils to respond to a thought provoking statement by saying to what extent they agree with it. There are a number of ways this can be used: pupils could be asked to come and stand at the point on the continuum (e.g. an imaginary line from one wall to another) that represents their individual opinion. Alternatively, they could first be asked to discuss a statement in groups and then one of the groups comes up to the front and places their marker somewhere along the line, explaining the position their group have taken as they do so. This is an excellent format for comparing responses to different questions and finding out contradictions in their thinking.

**Circle of voices.** You can use this method to get pupils to feedback on homework readings at the beginning of the tutorial. Pupils form circles of four or five. Tutors give groups a topic and allow them a few minutes to organise their thoughts on it. Then the discussion begins, with each pupil having up to one minute (or choose a different length) of uninterrupted time to speak. During this time, no one else is allowed to say anything. After everyone has spoken once, open the floor within the sub-group for general discussion. Tutors should specify that pupils should only build on what someone else has said, not on their own ideas.

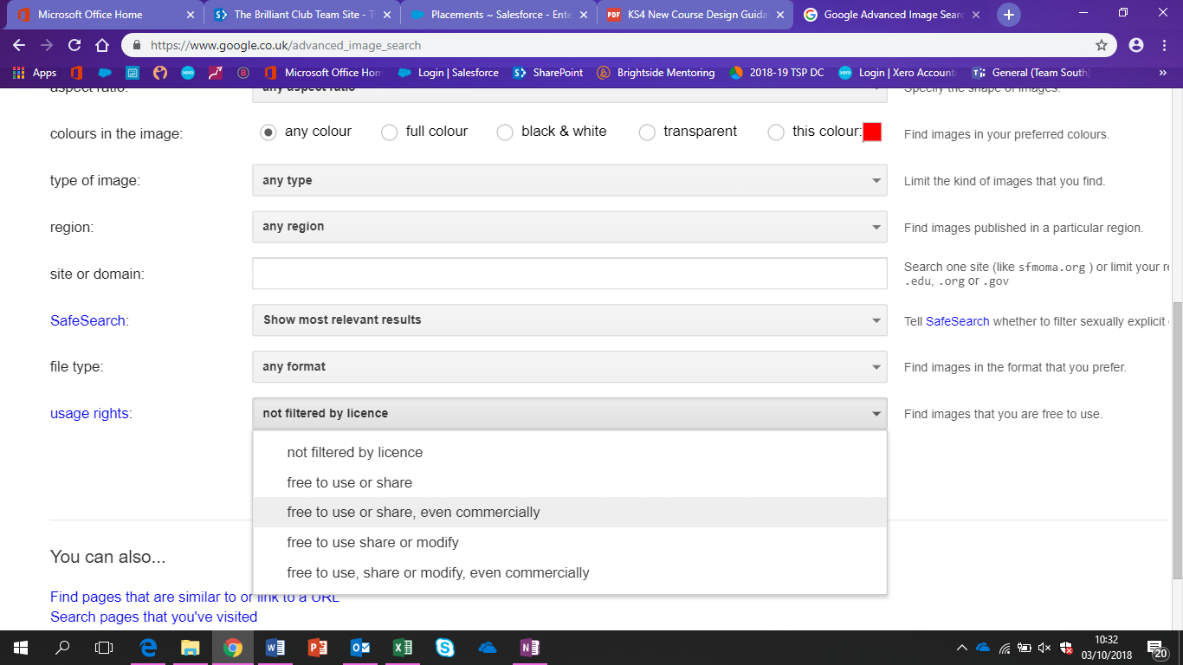
Appendix 4: What images can I include in my handbook?

**Selecting your images**

You should use public domain images in your handbook. All images on the following sites are free to use:

* Wikipedia
* Pixabay.com
* Unsplash.com
* Wellcomeimages.org (excellent for Science and Arts!)

**Using advanced searches in Google**

When you do a Google search, you can filter your results to find sources which you have permission to use and share.

1. Go to Google Advanced Image Search
2. In the “all these words” box type the key words for the images you want to find
3. In the “Usage rights” section, use the drop-down box and select the ‘free to use or share, even commercially’ option, and then ‘Search’

**Quotes and Extracts**

The final thing to remember is quotes and extracts (e.g. from scientific literature) need to be properly referenced at the back of your handbook.

You may also be able to include some of your own data or images in your course handbook – this is often a really nice resource to use to allow pupils to engage with the concept of research.

Appendix 5: School curriculum resources

The content of your tutorial should be tailored to your research so that the pupils are learning about something beyond the curriculum and have the opportunity to experience university style learning. Therefore, we do not offer guidance on the content that your programme should include, however you can use the information in this appendix to give you an idea of the level of the work you should be setting.

Remember, pupils on The Scholars Programme should be stretched and challenged to work at a key stage above their current learning level. Specific curricular guidance depends on the location of your placement school.

* For pupils in year 9-10 pupils in **England and Wales** the current learning level is GCSE standard and pupils should be stretched and challenged to A level
* For pupils in **Scotland** in S2-4, the current learning level is National 4 and 5 and pupils should be stretched and challenged to Higher and Advanced Highers
* For pupils in **Northern Ireland** the current learning level is GCSE standard and pupils should be stretched and challenged to A level

Below, you can access the curriculum that will be most relevant to your planning. The learning standards and curriculums give examples of the type of content and skills pupils should be demonstrating at the pupils’ current learning level, and at the level at which your course should be pitched and should provide you with an idea of the level of the work you should be setting. It is important not to assume prior knowledge of the pupils based on these examples but to use them in conjunction with the skills descriptions in the mark scheme. In your course, you should include a task that allows you to check for pupils understanding of any concepts or processes they may have covered in previous lessons. The curriculums are here to help ensure that you pitch your course at an appropriate level that is both accessible and challenging.

It is important to note that these documents contain a lot of information, so don’t be overwhelmed by the content; as pupils are learning about something beyond the curriculum, **you are not expected to be well versed in national curriculums**. Instead, use these to get a sense of your current pupils’ level and feedback you receive on your course design will help you adjust your course to an appropriate pitch

NB: These are not intended to be a template for what you should deliver – it is designed as a guide to help you pitch your programme at the appropriate level.

**Appendix 5A: England and Wales**

**NB: GCSE qualifications are undertaken by pupils ages 14-16 and A Levels are undertaken by Post-16s. There are some differences in the way GCSEs and A levels are administered and marked between the two nations and some qualifications offered in England are not offered in Wales and vice versa.**

|  |  |
| --- | --- |
| **Subject** | **Resources and Details** |
| Economics | GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/485240/Economics_GCSE.pdf)  A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302106/A_level_economics_subject_content.pdf) |
| English Literature | GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/254498/GCSE_English_literature.pdf)  A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302110/A_level_English_literature_content.pdf)  A Level English Language and Literature [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302108/A_level_English_language_and_literature_content.pdf) |
| English Language | GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/254497/GCSE_English_language.pdf)  A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302109/A_level_English_language_subject_content.pdf) |
| Geography | GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/301253/GCSE_geography.pdf)  A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/388857/GCE_AS_and_A_level_subject_content_for_geography.pdf) |
| Government and Politics | Citizenship Studies GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/438602/GCSE_subject_content_for_citizenship_studies.pdf)  A Level Subject Content [here](https://www.gov.uk/government/publications/gce-as-and-a-level-politics) |
| History | Ancient History   * GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/496447/Ancient_History_GCSE_subject_content.pdf) * A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/497229/Ancient_History_AS_A_level_subject_content.pdf)   History   * GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/310549/history_GCSE_formatted.pdf) * A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302102/A_level_history_subject_content.pdf) |
| Philosophy | No GCSE option  A Level Subject Content [here](https://www.gov.uk/government/publications/gce-as-and-a-level-philosophy) |
| Psychology (included in Science A Level) | GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/485228/Psychology_GCSE_final.pdf)  A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/593849/Science_AS_and_level_formatted.pdf); Appendix 4 & 6d |
| Sociology | GCSE Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/504013/Sociology_GCSE_content.pdf)  A Level Subject Content [here](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/302111/A_level_sociology_subject_content.pdf) |

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**Appendix 5B: Scotland**

**NB: For the Arts and Humanities and Social Sciences, the National 3 and 4 curriculums are mostly embodied in the Curriculum for Excellence Benchmarks, which focuses on the key skills pupils will be developing. National 5 (the stretch for S3 pupils) and Higher Course specifications (the stretch for S4 pupils) have greater details on specific content in a wider range of subject areas and key skills learnt.**

|  |  |
| --- | --- |
| **Subject** | **Resources and Details** |
| Curriculum for Excellence Benchmarks | [Social Studies](https://education.gov.scot/nih/Documents/Social%20StudiesBenchmarksPDF.pdf) – pages 14 – 24  [English and Literacy](https://education.gov.scot/nih/Documents/LiteracyEnglishBenchmarks.pdf) – pages 28 - 48 |
| Economics | [National 5 Course Specification](https://www.sqa.org.uk/files_ccc/EconomicsCourseSpecN5.pdf) – pages 2-6  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecEconomics.pdf) – pages 2-6 |
| English Literature | [National 5 Course Specification](https://www.sqa.org.uk/files_ccc/EnglishCourseSpecN5.pdf) – pages 2-7  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecEnglish.pdf) – pages 2-7 |
| Geography | [National 5 Course Specification](https://www.sqa.org.uk/sqa/files_ccc/RNQCourseSpecGeographyNational5.pdf) – pages 2-10  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecGeography.pdf) – pages 2-9 |
| Politics | No National 5 Course Specification  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecPolitics.pdf) – pages 2-9 |
| History | [National 5 Course Specification](https://www.sqa.org.uk/files_ccc/HistoryCourseSpecN5.pdf) – pages 2-24  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecHistory.pdf) – pages 2-26 |
| Philosophy | [National 5 Course Specification](https://www.sqa.org.uk/files_ccc/PhilosophyCourseSpecN5.pdf) – pages 2-9  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecPhilosophy.pdf) – pages 3-11 |
| Psychology | [National 5 Course Specification](https://www.sqa.org.uk/files_ccc/PsychologyCourseSpecN5.pdf) – pages 2-8  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecPsychology.pdf) – pages 2-11 |
| Sociology | [National 5 Course Specification](https://www.sqa.org.uk/files_ccc/SociologyCourseSpecN5.pdf) – pages 2-6  [Higher Course Specification](https://www.sqa.org.uk/files_ccc/HigherCourseSpecSociology.pdf) – pages 2-7 |
| General Lists of Other Specifications | Curriculum for Excellence Benchmarks [here](https://education.gov.scot/improvement/learning-resources/curriculum-for-excellence-benchmarks/)  National Qualifications subjects [here](https://www.sqa.org.uk/sqa/45625.3728.html)  Summary of National Qualifications [here](https://www.planitplus.net/Nationals/) |

**Appendix 5C: Northern Ireland**

**NB: GCSE qualifications are undertaken by pupils ages 14-16 and GCE qualifications are undertaken by Post-16s**

|  |  |
| --- | --- |
| **Subject** | **Resources and Details** |
| Key Stage 3 Curriculum | Pupils participating The Scholars Programme will be at the final year of these standards if they are 13 years old.  Standards for ages 11-14 is [here](https://ccea.org.uk/downloads/docs/ccea-asset/Curriculum/The%20Statutory%20Curriculum%20at%20Key%20Stage%203.pdf); Specific curriculums begin on page 30 |
| Economics | GCSE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCSE/GCSE%20Economics%20%282017%29/GCSE%20Economics%20%282017%29-specification-Standard.pdf); Section 1.1 and 3  GCE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCE/GCE%20Economics%20%282016%29/GCE%20Economics%20%282016%29-specification-Standard.pdf); Section 1.1 and 3 |
| English Literature | GCSE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCSE/GCSE%20English%20Literature%20%282017%29/GCSE%20English%20Literature%20%282017%29-specification-Standard.pdf); Section 1.1 and 3  GCE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCE/GCE%20English%20Literature%20%282016%29/GCE%20English%20Literature%20%282016%29-specification-Standard_0.pdf); Section 1.1 and 3 |
| English Language | GCSE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCSE/GCSE%20English%20Language%20%282017%29/GCSE%20English%20Language%20%282017%29-specification-Standard.pdf); Section 1.1 and 3  No GCE Specification |
| Geography | GCSE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCSE/GCSE%20Geography%20%282017%29/GCSE%20Geography%20%282017%29-specification-Standard.pdf); Section 1.1 and 3  GCE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCE/GCE%20Geography%20%282018%29/GCE%20Geography%20%282018%29-specification-Standard.pdf); Section 1.1 and 3 |
| Government and Politics | GCSE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCSE/GCSE%20Government%20and%20Politics%20%282017%29/GCSE%20Government%20and%20Politics%20%282017%29-specification-Standard.pdf); Section 1.1 and 3  GCE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCE/GCE%20Government%20and%20Politics%20%282016%29/GCE%20Government%20and%20Politics%20%282016%29-specification-Standard.pdf); Section 1.1 and 3 |
| History | GCSE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCSE/GCSE%20History%20%282017%29/GCSE%20History%20%282017%29-specification-Standard.pdf); Section 1.1 and 3  GCE Specification [here](https://ccea.org.uk/downloads/docs/Specifications/GCE/GCE%20History%20%282019%29/GCE%20History%20%282019%29-specification-Standard.pdf); Section 1.1 and 3 |
| General Lists of Other Specifications | Other GCSE qualifications [here](https://ccea.org.uk/key-stage-4/gcse)  Other GCE (post-16) [here](https://ccea.org.uk/post-16/gce) |

# Appendix 6: Examples

## STEM

**Example 1 – Computer Science with Problem Set**

**Final Assignment Question:** Should we build a quantum computer?

Introduction: (250 words)

* This section should include some background information about quantum computers. What are they? How do they work? How much progress has been made towards building a powerful quantum computer? (See Appendix 4)
* You should also express an opinion on the essay question

Main Body (500 words)

* In this section, you should talk about the potential applications of quantum computers. Will quantum computers help solve the world’s problems? Or will they create more problems? How big an effect would a quantum computer have on our world?
* Remember to critically analyse your sources. Are your sources from reliable publications? Do the authors have vested interests which means they are biased in favour of (or against) quantum computers? Have any claims been exaggerated?

Conclusion (200 words)

* In this section you should summarise your argument and give a conclusion which answers the essay question. Remember to cite the evidence you have collected in support of your conclusion.

[Part 2 of the Final Assignment is a Problem Set of quantum logic problems]

|  |  |
| --- | --- |
| Subject Knowledge (Understand) | Academic Skills (Be able to do) |
| * **Explain key algorithms and evaluate their importance** * Assess the possibilities of a quantum computer (both its applications and limitations) * Identify the differences between quantum computing and regular (classical) computing * Explore the relationship between the H-box and quantum computing | * **Select the most relevant scientific evidence to support claims** * **Use correct scientific language** * **Explain the value or significance of selected evidence** * **Highlight and evaluate competing points of view** * **Showcase independent thought** |

**\*Bolded text can be assessed in both baseline and final assignment**

**Baseline Assignment Question:** What is the most important algorithm in the modern world?

In your essay of 300 words, I want you to compare two algorithms from the three case studies from the tutorial. Your essay should include the following:

* A brief description of each algorithm (what problem does it solve, how does it work, who invented it) [200 words]
* A discussion of which algorithm you think is more important and why. What would the world be like without this algorithm? [200 words]
* You should have enough information from the case studies to do your essay, but I encourage you to do some additional research.

[Part 2 of Baseline assignment is a problem set of logic problems]

**Example 2 – Biological Sciences – Ages 17-18**

**Final Assignment Question:** For a cancer of your choice describe the development, current research and future outlook for patients developing the disease. Your response should also include an assessment of which research you think will be most effective or most promising and why.

|  |  |
| --- | --- |
| Subject Knowledge | Academic Skills |
| * **Apply biological knowledge to anticipate outcomes** * **Assess the role of mutations in cancer and cancer research** * Evaluate possible scientific outcomes and existing research in cancer treatments * Explore potential treatments for cancer and apply scientific knowledge to the problem. | * **Select scientific evidence to support claims** * **Use correct scientific language** * **Explain the value or significance of selected evidence** * **Showcase independent thought and make point of view clear** * Highlight competing points of view |

**\*Bolded text can be assessed in both baseline and final assignment**

**Baseline Assignment Question:** Write a paragraph of 300 words describing how mutations in cell division in the human might lead to disease. What implications might this have for society if scientists could identify and fix all mutations – are all mutations a bad thing?

**Example 3 – Neuroscience – Ages 17-18**

**Final Assignment Question:** Would you recommend taking a memory enhancing drug?

A brand new memory enhancing drug has come on the market and many news outlets have jumped onto its discovery saying it can cure Alzheimer’s disease, amnesia and improve cognitive performance. Write an opinion article for Nature Magazine about whether you think a single drug could realistically perform all the above functions from a neuroscience perspective. State the pros and cons of memory enhancement and conclude with your recommendation on taking memory enhancing drugs.

In your essay, please include:

* An introduction to neuroscience and memory problems
* The neuroscience of memory formation
* How this drug might work on a neuron
* Experimental means of testing memory using this drug
* A balanced argument for and against using this drug to enhance memory in Alzheimer’s disease, amnesia and cognitive performance.
* A conclusion summarising your recommendation, why you think this and the future directions of memory enhancement

Your article should be structured using appropriate subheadings, including introduction and conclusion. Include diagrams when they will help explain your point. These must be labeled or commented on in the text. Your opinion is the most important part of this assignment. Think of your point of view before you write the essay and keep this in mind throughout!

Extra reading and research is encouraged. Search for information about the neuroscience of memory on the internet and look out for news articles and scientific websites. Make sure to comment on the reliability of these sources and reference them as stated below.

|  |  |
| --- | --- |
| Subject Knowledge | Academic Skills |
| * **Identify the regions of the brain and define the functions of brain cells** * Describe the process of signal transmission and assess its implications for human function * Evaluate the changes in synaptic processes and their influence on memory/memory disorders | * **Select scientific evidence to support claims** * **Use correct scientific language** * **Explain the value or significance of selected evidence** * **Highlight competing points of view** * **Showcase independent thought and make point of view clear** |

**\*Bolded text can be assessed in both baseline and final assignment**

**Baseline Assignment Question**: Which region of the brain is the most important for human function and why?

In this assignment, you should:

* Introduce the reader to the brain, describing some of its anatomical features
* Using at least 3 brain regions, argue for and against why they could be considered the most important
* Conclude with a definitive answer and reason (‘The most important region is … because …’)
* Please look over the mark scheme on page 6 whilst writing this assignment as this will be used to give you your grade.

In this assignment, you could:

* Include diagrams supporting your essay to aid the reader’s understanding.
* Include extra reading from the internet to support your argument

**Example 4 – Engineering/Biomedical Sciences**

**Final Assignment Question:** How can 3D printing be used to replicate human tissue?

|  |  |
| --- | --- |
| Subject Knowledge | Academic Skills |
| * **Describe the nature of 3D printing, its uses and its limitations** * Explain the relevant biological concepts, particularly around cell composition * Infer what aspects of biology need to be considered in the context of 3D printing * Evaluate the uses and limitations of 3D printing | * **Use scientific evidence to support claims** * **Use correct scientific language** * **Explain the value or significance of selected evidence** * **Showcase independent thought** * **Highlight competing points of view** |

**\*Bolded text can be assessed in both baseline and final assignment**

**Baseline Assignment Question:** Write a paragraph of 300 words that explains the concept of 3D Printing. You should define the process, but also discuss the benefits, as well as some of the limitations of 3D printing.

**Example 5 – Exercise Science**

**Final Assignment Question:** Assess the benefits of exercise for a condition of your choosing. Your essay title should be “The benefits of exercise in (insert condition name)”

The essay will need to include:

* An overview of the condition – Symptoms? Causes? Who does it affect?
* The effect exercise can have upon this condition
* An evaluation of any secondary complications
* An assessment of the different types of exercise and whether they have all have the same impact on the condition?
* You should also clearly state which type of exercise you would recommend to people with this condition and why you have chosen this.

|  |  |
| --- | --- |
| Subject Knowledge | Academic Skills |
| * **Describe the main types of exercise** * **Evaluate the impact of exercise on different parts of the body/different body systems** * Explain inflammatory bowel disease and how scientists have used exercise to treat this disease | * **Use scientific evidence to support claims** * **Use correct scientific language** * **Explain the value or significance of selected evidence** * **Showcase independent thought and have a clear point of view consistently argued throughout the essay** * **Highlight competing points of view** |

**\*Bolded text can be assessed in both baseline and final assignment**

**Baseline Assignment Question:**

You have been selected to present at your local authority defending why your school should get more gym equipment. This will involve writing 500 words evaluating “the benefits of exercise in the general/healthy population”.

Firstly, you should evaluate the role exercise can play in benefitting people who are free from illness. Use the knowledge you gained from the first tutorial about to different activity types and the specific individual benefits these may have.

You should ten select one type of exercise we discussed in Tutorial 1 (aerobic, resistance, balance or flexibility) and discuss how this exercise benefits different systems in the body (e.g. circulatory, immune, muscular system etc.) and say why/how this exercise is important for maintaining people’s general health.

**Example 6 – Environmental Science – Ages 17-18**

**Final Assignment Question:** An organisation with responsibility for a stately home and garden is interested in how they can supportand encourage wildlife. They are asking people for ideas but have already said they are very keen tohelp “save the bees” and they are interested in setting up honeybee hives. The garden is large, and allof its neighbours are farms growing various different food crops.

Using information covered in tutorials and recent academic research, write a letter to the organisation explaining what you think they should do to “save the bees”. In your essay please include:

* Why are pollinators so important?
* Why bees are such good pollinators?
* The challenges being faced by wild bees and how they are linked
* What do you think the garden should do, bearing in mind its neighbours?
* Analyse by providing evidence whether the introduction of honeybees is a good idea?

You may want to do some extra reading and research to help support your argument about how to save the bees. If so include a list of the books, websites or academic papers you use (see Appendix 1 in the handbook for more help on referencing). Some useful papers are included in the handbook. These are a good place to start.

|  |  |
| --- | --- |
| Subject Knowledge | Academic Skills |
| * **Describe the process of pollination** * **Evaluate the importance of pollination for ecology, evolution and the economy** * Describe and assess the role of bees in pollination * Identify and prioritise interventions to protect pollinators | * **Select scientific evidence to support claims** * **Use correct scientific language** * **Explain the value or significance of selected evidence** * **Highlight competing points of view** * **Showcase independent thought and make point of view clear** * **Written work has a clear structure** |

**\*Bolded text can be assessed in both baseline and final assignment**

**Baseline Assignment Question:** Explain the biology of pollination and why it is so fundamental to plant andpollinator biodiversity. Which aspect of pollination do you think is most important to protect?

Think about including the following:

* What is pollination?
* How does it happen in nature?
* Why is it important for plants, pollinators and the environment?
* Why is it important for evolution?
* Why is it important for farming and the economy?

Your word count is 500 words, you can use images or diagrams to help you explain, but if you do you should say where you found them (see Appendix 1 in the handbook for more help on referencing). All homework and assignments, including the baseline and the final assignment are marked using the mark scheme in the front of the handbook (pages 7-8). You get a mark out of 100 for each of the five sections based on how many of the bullet points your work matches. So make sure you check your work against the mark scheme to see if you can improve.

