Walking...it's trickier than you think

Key Stage 4 Programme

Pupil Name	
Handbook Designed by	Dr Evangelopoulou

Timetable and Assignment Submission

Timetable – Tutorials

1			
2			
3			
4			
5			
6 (Feedback)			

Timetable – Homework Assignments

Tutorial 1		
Tutorial 2		
Tutorial 3		
Tutorial 4		
Tutorial 5		

Assignment Submission – Lateness and Plagiarism

Lateness	
Submission after midnight on	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

The Brilliant Club KS4 Programme – Pupil Feedback Report

Grade	Marks	What this means
1st	70+	Performing to an excellent standard at undergraduate level
2:1	60-69	Performing to a good standard at undergraduate level
2:2	50-59	Performing to an excellent standard at A-level
3rd	40-49	Performing to a good standard at A-level
Working towards a pass	0-39	Performing below a good standard at A-level
Did not submit	DNS	No assignment received by The Brilliant Club

Lateness	
Any lateness	10 marks deducted
Plagiarism	
Some plagiarism	10 marks deducted
Moderate plagiarism	20 marks deducted
Extreme plagiarism	Automatic fail

Name of PhD Tutor	Effy Evangelopoulou		
Title of Assignment			
Name of Pupil			
Name of School	Co-op Academy Failsworth		
ORIGINAL MARK / 100		FINAL MARK / 100	
DEDUCTED MARKS		FINAL GRADE	

If marks have been deducted (e.g. late submission, plagiarism) the PhD teacher should give an explanation in this section:

Learning Feedback Comment 1 - *Understand how the GRF moves with regard to lower limb joints in stance*	
What you did in relation to this Key Learning Priority	How you could improve in the future

Learning Feedback Comment 2 – *Understand what moment is, how it is calculated and moments at joints in stance*	
What you did in relation to this Key Learning Priority	How you could improve in the future

Learning Feedback Comment 3 – *Understand and be able to discuss the applications of motion analysis*	
What you did in relation to this Key Learning Priority	How you could improve in the future
Resilience Comment	
How you showed learning resilience during the course	How you could build learning resilience in the future

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Course Rationale

Biomechanics and analysis of the way humans walk is a major and quickly advancing area of research. We use motion analysis laboratories to check why people with pathology walk the way they walk, what it can tell us about their condition and how we can help them. It is used to understand why elite athletes are as good as they are and to find ways they can improve further; it is used by sports-shoe design companies like Nike and Adidas to make shoes that work better with our feet; by movie production teams to design characters like golum in "Lord of the Rings", and by researchers who are trying to design prosthetic limbs for amputees that allow them to walk as similarly to healthy people as possible. Understanding the physics mathematics and biology behind the motion of the human body is constantly driving change and has already helped many people do what they were once told they couldn't!

In this course you will learn the basics of analysis of human motion: the stages of walking, the forces and moments that our legs have to deal with and the important role our muscles play in allowing us to do something as simple as walking. You will also learn about the equipment used to collect this information. Finally we will discuss examples of where analysis of motion is used and who it is currently helping. When you complete the course you will have an understanding of the amazing things that mechanics and biology can do when used together and you will have a better grasp of force and circular motion which will make life easier when studying for your GCSEs. The course will also give you a chance to see what it is like to work with University level content *spoiler alert! - it's much easier than you think☺* and to discuss ideas and develop critical thinking skills. Finally you will learn to work as a team to present what you have learned to friends and family.

Course Objectives

- To learn the phases of the walking cycle
- Understand how and why a force from the ground acts on us when we walk
- Understand how this force causes the ankle to rotate and what a moment is
- Learn the role our calf and shank muscles play in helping us walk
- Understand and be able to discuss some of uses of motion analysis in the real world and how they are making a difference
- Learn to summarise your work and collaborate with your fellow students to present it

Mark Scheme Table

	Skills	1st (70-100)	2:1 (60-69)	2:2 (50-59)
Subject knowledge	Knowledge and Understanding	○ All content included is relevant to the general topic and to the specific question/title ○ Good understanding of all the relevant topics. ○ Scientific terms are defined and used accurately throughout ○ Clear justification on how the content included is related to the specific issues that are the focus of the assignment	○ Most of the content included is relevant to the general topic and to the specific question/title ○ Good understanding of most the relevant topics ○ Scientific terms are used accurately but not always clearly defined. ○ Adequate justification on how the content included is related to the specific issues that are the focus of the assignment	○ Some of the content included is relevant to the general topic and to the specific question/title ○ Good understanding on some of the relevant topics but occasional confusion on others. ○ Scientific terms are used mostly accurately with occasional confusion and often not defined. ○ Some justification on how the content included is related to the specific issues that are the focus of the assignment
Critical thinking	Research and Evidence	○ Inclusion of rich sources of research findings, data, quotations or other sourced material as evidence for the claims/ ideas ○ Use evidence to support claims/assertions /ideas, consistently clearly and convincingly ○ Evidence of further reading beyond materials provided which were used in an appropriate context	○ Inclusion of adequate sources of research findings, data, quotations or other sourced material as evidence for the claims/ ideas ○ Use evidence to support claims/assertions/ideas, mostly clearly and convincingly ○ Evidence of further reading beyond materials provided	○ Inclusion of some sources of research findings, data, quotations or other sourced material as evidence for the claims/ ideas ○ Use evidence to support claims/assertions/ideas, at times clearly and convincingly ○ Limited evidence of further reading beyond materials provided ○
	Developing an Argument	○ A point of view or position in relation to the title or question is consistently clear ○ Argument/proof exceptionally well-developed and well-justified ○ A position is clearly	○ A point of view or position in relation to the title or question is adequately clear ○ Argument/proof clear and well-developed and position justified ○ A position is established in	○ A point of view or position in relation to the title or question is somewhat clear ○ Argument/proof clear but not well-developed ○ A position is established in relation to the

		established in relation to the question, and is developed effectively and consistently throughout the essay ○ Makes links effectively between subjects that have not previously been associated ○ Uses concepts from the tutorials in an unfamiliar context, and does so accurately and confidently. ○ Content is analysed effectively to support the argument	relation to the question, and is well-developed in most of the essay ○ Some evidence of linking subjects that have not previously been associated ○ Use some concepts from the tutorials in an unfamiliar context, but not always accurate ○ Analysis of content to support the argument	question, and is well-developed in parts of the essay ○ Limited evidence of linking subjects that have not previously been associated ○ Limited use of concepts from the tutorials in other contexts ○ Some analysis of content to support the argument
	Critical Evaluation	○ Moved beyond description to an assessment of the value or significance of what is described ○ Evaluative points are consistently explicit/systematic/reasoned/justified	○ Mostly description but some assessment of the value or significance of what is described ○ Evaluative points are mostly explicit/systematic/reasoned/justified	○ Only description with minimal assessment of the value or significance of what is described ○ Evaluative points are at times explicit/systematic/reasoned/justified
Written communication	Structure and Presentation	○ Ideas are presented in paragraphs and arranged in a logical structure that is appropriate for the assignment ○ The introduction clearly outlines how the essay/report will deal with the issues ○ The conclusion summarises all the main points clearly and concisely ○ All methods are clearly structured, clear to follow and correct ○ All sources are referenced correctly in an agreed format	○ Ideas are presented in paragraphs and arranged in a structure that is mostly appropriate for the assignment ○ The introduction adequately describes how the essay/report will deal with the issues ○ The conclusion summarises most of the main points clearly ○ Methods are mostly structured, clear to follow and correct ○ Most sources are referenced correctly in an agreed format	○ Ideas are presented in paragraphs and arranged in a structure ○ The introduction mentions how the essay/report will deal with the issues ○ The conclusion summarises some of the main points clearly ○ Methods are not always structured, clear to follow and correct. ○ Some sources are referenced correctly in the agreed format with occasional errors

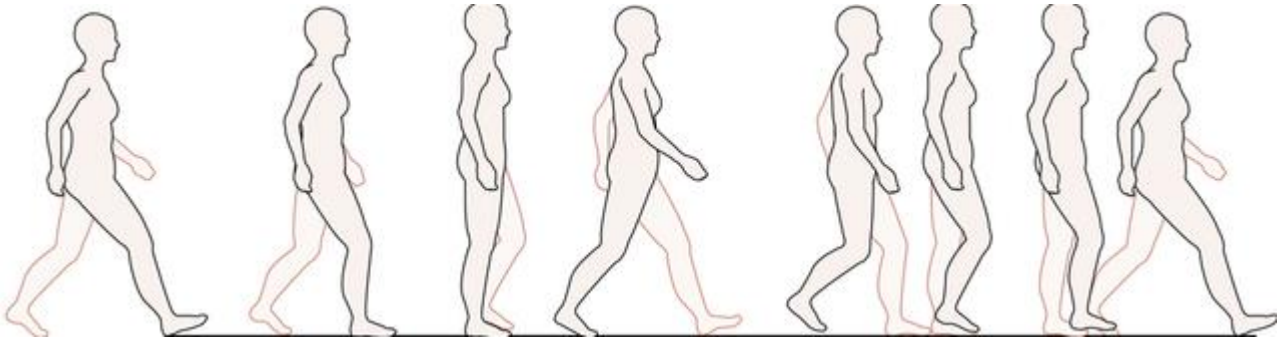
	Language and Style	○ No spelling, grammar or punctuation errors ○ Units and significant figures are presented accurately throughout ○ Writing style consistently clear, appropriate for scientific documents and easy to follow ○ Accurate and consistent use of technical language and vocabulary	○ Minimal spelling, grammar or punctuation errors ○ Units and significant figures are presented accurately throughout ○ Writing style mostly clear, appropriate for scientific documents and easy to follow ○ Some attempts of using technical language and vocab alary, but not always accurate	○ Some spelling, grammar or punctuation errors ○ Units and significant figures are presented accurately throughout with occasional errors ○ Writing style moderately clear, appropriate for scientific documents and easy to follow ○ Use of simple language and vocabulary effectively but struggles to use technical language

Glossary of Keywords

Word	Definition	In a sentence
Gait	walking	He walked with a slow stiff gait.
Gait cycle	The period of gait from the time one foot makes contact with the ground until the same foot makes contact with the ground again	In the basic gait cycle the movements are divided into the times when the foot is on the ground (the stance phase which takes up 62% of the full gait cycle) and when the foot is off the ground.
Stance phase	The period of the gait cycle when the leg we are focusing on is in contact with the ground	The stance phase of gait, in people with pathology, is usually longer than that of healthy individuals.
Swing phase	The period of the gait cycle when the leg when are focusing on is not in contact with the ground	The motion of the ankle in important in swing phase to ensure that the foot clears the ground
Spacial	Of or relating to physical space	This task is designed to test children's spatial awareness (= their understanding of where things are in relation to other things).
Temporal	Of or relating to time	The geological time scale maps this history, for fossils provide our chief criterion in fixing the *temporal* order of rocks
Ground reaction force	The force the ground applies on the human body which is equal in magnitude and opposite in direction to the force exerted by the body to the ground due to weight.	The reaction force supplied by the ground is specifically called the ground reaction force (GRF)
plantarflexion	The movement of the ankle that points the foot away from the leg	Plantarflexion is the movement used to press the accelerator pedal in a car.
dorsiflexion	The movement of the ankle that points the foot toward the leg	Sinuses form, and the whole foot becomes greatly swollen and distorted by flattening of the sole and dorsiflexion of the toes.
moment	A moment is the turning effect of a force around a fixed point called a pivot	The moment of a force is a measure of its tendency to cause a body to rotate about a specific point or axis
Concentric contraction	A concentric muscle contraction is a type of muscle activation that increases the tension on a muscle as it shortens	The concentric contraction of the tibialis anterior muscle causes the toes to lift
Eccentric contraction	An eccentric muscle contraction is a type of muscle activation that	The eccentric contraction of the tibialis anterior muscle controls the lowering of the toes to the ground (like a drawbridge slowly being lowered)

	increases the tension on a muscle as it lengthens	

Tutorial 1 – How do we walk?



What is the Purpose of Tutorial 1?

- Learn about the 3 planes of motion
- Understand what we mean by gait and gait cycle
- Learn the phases of the gait cycle
- Understand what temporal and spacial parameters are and why they are important in gait

A gait cycle is.....
.....

Paste a picture of step length & define it

Paste a picture of step width and define it

Stride length is.....
Cadence is.....

Flexion

Extension

Flexion is.....
Extension is.....

Homework

- Name the planes of motion
- Glue in the pictures and name the stages of the gait cycle and the percentage they take up.
- Research and write a 150 word paragraph on: what is motion analysis?

Plane 1	Plane 2	Plane 3

Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle
Phase of gait	Phase of gait	Phase of gait	Phase of gait

What is motion analysis? (100-150 words)

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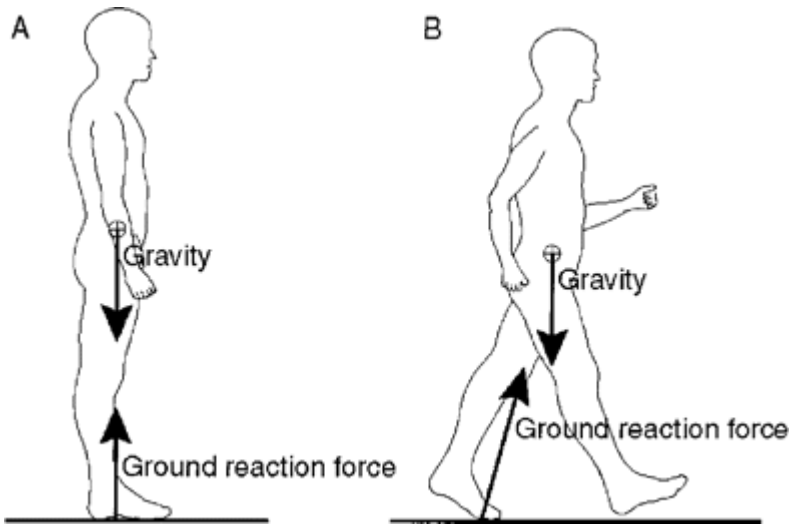
Tutorial 2 – Ground reaction force (GRF) – friend or foe?



What is the Purpose of Tutorial 2?

- Understand what we mean by ground reaction force
- Learn where the ground reaction force acts during the gait cycle
- Be able to draw and interpret a ground reaction force graph
- How do we measure ground reaction force in the lab? –a brief introduction

Ground reaction force is.....
.....

Homework

- Draw where the ground reaction force acts at different stages of the gait cycle
- Draw the ground reaction force graph and explain what the peaks and troughs represent

Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle
Phase of gait	Phase of gait	Phase of gait	Phase of gait

Ground Reaction Force

Explain what the peaks and troths represent.

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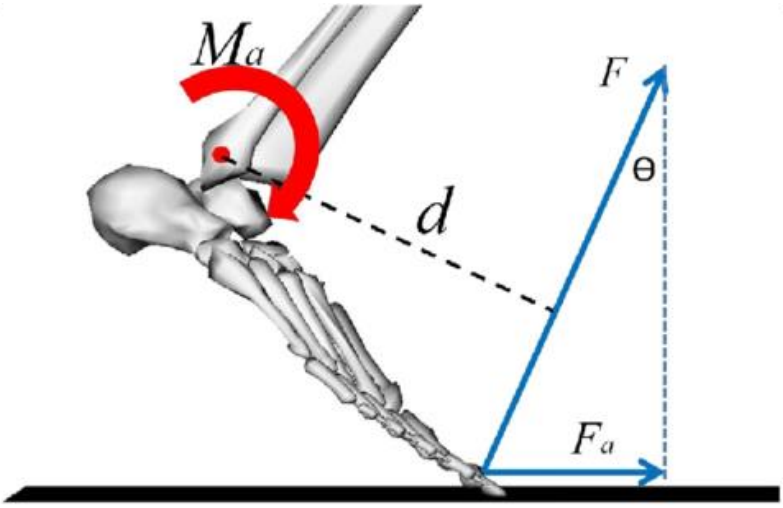
Tutorial 3 – You spin me right round...but how?



What is the Purpose of Tutorial 3?

- Understand what we mean by moment
- Learn the formula for calculating moment
- Understand what moments the ground reaction force causes at the ankle
- Be able to draw and interpret an ankle moment graph

Moment is .....

.....

Moment =

In the sagittal plane there are ..... types of moments and moments.

Homework

- Draw and write the moments that the GRF causes at the ankle joint in different stages of stance phase

Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle
Phase of gait	Phase of gait	Phase of gait	Phase of gait

Ankle moment Graph

Explain what the peaks and troths represent.

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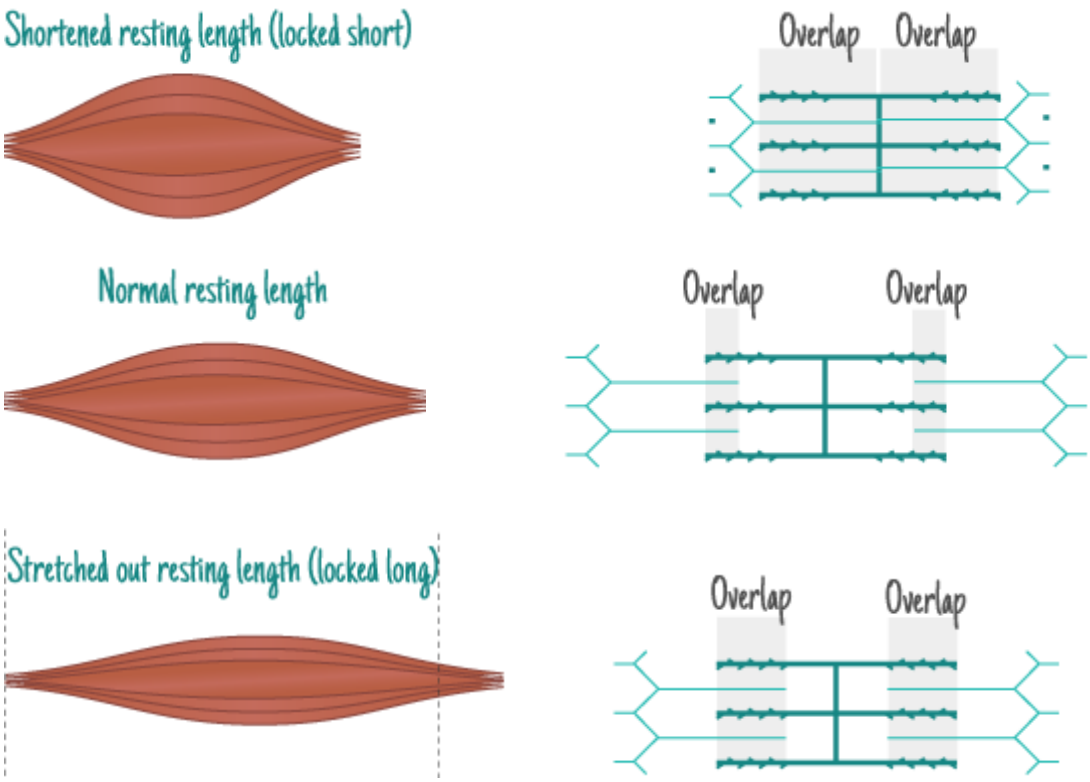
Tutorial 4 – Muscles & how they help us walk…the love-hate relationship with GRF

What is the Purpose of Tutorial 4?

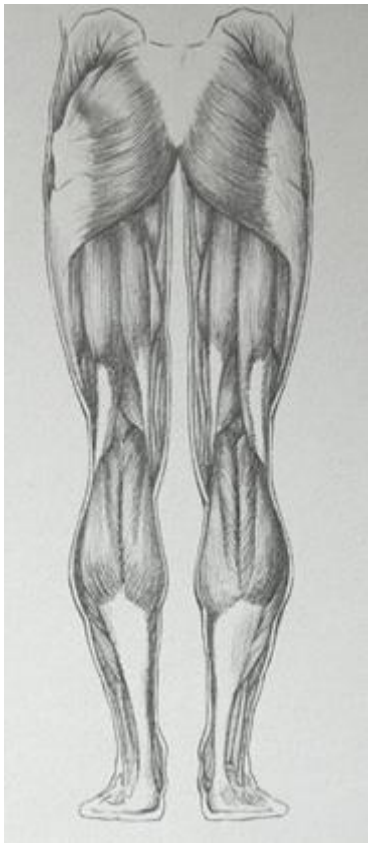
- Understand that muscles can shorten and lengthen to produce force
- Learn the names of major muscles of the calf and shank
- Understand when these muscles are used during the gait cycle and what moments they cause at the ankle
- Understand how we measure muscles in the lab – brief introduction

Draw a line connecting each muscle state to what the muscle fibres are



Draw in and label:

- The medial gastrocnemius
- The lateral gastrocnemius
- The soleus
- The tibialis anterior



Homework

- Describe the type of contraction that the calf muscles perform at different stages of stance phase and what moments these contractions cause

Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle	Image of leg in gait cycle
Phase of gait	Phase of gait	Phase of gait	Phase of gait

Describe the type of contraction that the calf muscles perform at different stages of stance phase and what moments these contractions cause.

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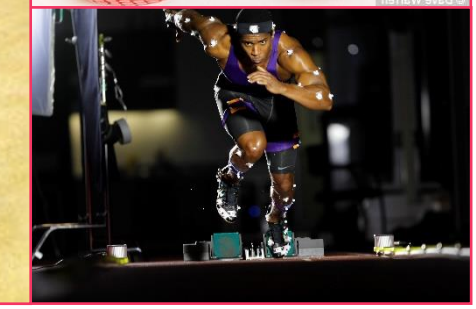
Tutorial 5 – Motion analysis – why we bother!



What is the Purpose of Tutorial 5?

- Understand where motion analysis is used today and in which areas it is helping to make a difference
- Q&A about the assignment content and tips for the preparation of the presentation

Equipment used in the lab:

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

How is it used?

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Assignment:

1. Describe the stance phase of the gait cycle with respect to the knee joint: i.e. where the GRF is with

3. Presentation: (20 marks)

You will need to collaborate with your fellow students to build a **6-7 slide** presentation. This will be presented by you to your parents, fellow students from other schools and relevant University staff. It is your opportunity to show what you've learned, promote motion analysis and talk about what applications you found interesting. You will also get a chance to feel what it is like to work/study in a University environment and hear from lecturers who teach there.

The presentation should include: **1-2 slides on what motion analysis is, and what it measures** (remember many of the people there will never have heard of it before, so it is up to you to explain what it is and why it is used (TIP: you knew nothing about this a few weeks ago, how would you have taught yourselves?)

1 slide each to present the application you wrote about in your assignment
Keep in mind the questions you worked toward in the assignment (TIP: the slide does not and should not be full of words – if you can, keep it visual with only key words, equations and definitions – you can add the rest verbally, this way they focus on what **you** have to say, and it is easier for them to follow)
1 slide conclusion – this can be anything from a quick summary to final thoughts or reflections on motion analysis, to what you (hopefully ☺) gained from the experience of Uni-pathways

Tutorial 6 – Feedback tutorial

What is the Purpose of Tutorial 6?

- To receive feedback on final assignments.
- To share examples of best practice with the other pupils in your group.
- To write targets for improvement in school lessons.
- To reflect on the programme including what was enjoyed and what was challenging.

Final assignment feedback

What I did well…	What I could have improved on…
•	•
•	•
•	•

My target for future work is…

Reflecting on Uni Pathways

What did you most enjoy about Uni Pathways?
•   •   •

What did you find challenging about the programme?	How did you overcome these challenges?
• • •	• • •

Appendix 1 – Referencing correctly

When you get to university, you will need to include references in the assignments that you write, so we would like you to start getting into the habit of referencing in your Brilliant Club assignment. This is really important, because it will help you to avoid plagiarism. Plagiarism is when you take someone else's work or ideas and pass them off as your own. Whether plagiarism is deliberate or accidental, the consequences can be severe. In order to avoid losing marks in your final assignment, or even failing, you must be careful to reference your sources correctly.

What is a reference?

A reference is just a note in your assignment which says if you have referred to or been influenced by another source such as book, website or article. For example, if you use the internet to research a particular subject, and you want to include a specific piece of information from this website, you will need to reference it.

Why should I reference?

Referencing is important in your work for the following reasons:

- It gives credit to the authors of any sources you have referred to or been influenced by.
- It supports the arguments you make in your assignments.
- It demonstrates the variety of sources you have used.
- It helps to prevent you losing marks, or failing, due to plagiarism.

When should I use a reference?

You should use a reference when you:

- Quote directly from another source.
- Summarise or rephrase another piece of work.
- Include a specific statistic or fact from a source.

How do I reference?

There are a number of different ways of referencing, and these often vary depending on what subject you are studying. The most important to thing is to be consistent. This means that you need to stick to the same system throughout your whole assignment. Here is a basic system of referencing that you can use, which consists of the following two parts:

1. **A marker in your assignment**: After you have used a reference in your assignment (you have read something and included it in your work as a quote, or re-written it your own words) you should mark this is in your text with a number, e.g. [1]. The next time you use a reference you should use the next number, e.g. [2].
2. **Bibliography**: This is just a list of the references you have used in your assignment. In the bibliography, you list your references by the numbers you have used, and include as much information as you have about the reference. The list below gives what should be included for different sources.

    a. **Websites** – Author (if possible), title of the web page, website address, [date you accessed it, in square brackets].

    E.g. Dan Snow, 'How did so many soldiers survive the trenches?', http://www.bbc.co.uk/guides/z3kgjxs#zg2dtfr [11 July 2014].

    b. **Books** – Author, date published, title of book (in italics), pages where the information came from.

    E.g. S. Dubner and S. Levitt, (2006) *Freakonomics*, 7-9.

    c. **Articles** – Author, 'title of the article' (with quotation marks), *where the article comes from* (newspaper, journal etc.), date of the article.

    E.g. Maev Kennedy, 'The lights to go out across the UK to mark First World War's centenary', Guardian, 10 July 2014.

Appendix 2 – Using the VLE

VLE username	
VLE password	

Please remember the following key details…

- You are able log into the VLE either through the link on our website (www.thebrilliantclub.org) or going directly to the VLE site at (https://portal.thebrilliantclub.org/sign-in).
- Please update your profile with your full name and email address- this will allow you to retrieve forgotten passwords or usernames
- If you forget your log-in details you can request them to be emailed to you by clicking the link on the VLE home page. (If you are still having problems you can email: schools@thebrilliantclub.org)

What is the VLE?

The VLE is a virtual learning environment for all pupils on Uni Pathways it is used for:

- messaging your Uni-Pathways teacher
- submitting homework
- submitting your final assignment
- accessing resources for your tutorials
- finding out more information about university and careers

How should I use the VLE?

The VLE is a professional academic environment in which pupils are able to message their PhD Tutor. Here are a few things to consider:

- Ensure you keep a professional tone in the messages you send to your Uni-Pathways teachers
- Ensure you always reply to your teacher in a timely manner.
- Thank your teacher for the effort they are putting in to give you your feedback etc.
- Submit all homework to your teacher on time.

IMPORTANT: Final assignment

- When you submit your final assignment, please remember that you need to do so through the 'My Activities' tab and not as an attachment to a message.

Notes

LESSON 1

Notes

LESSON 2

Notes

LESSON 3

Notes

LESSON 4

Walking...it's trickier than you think

Key Stage 4 Programme

researchersinschools.org