Panjango

connecting **learning** to **life**

A Guide to 4D Learning

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INTRODUCTION

The Education System

Our education system is currently one-dimensional, focusing too narrowly on the acquisition of knowledge in order to pass exams. When it comes to teaching the new generation, education is stuck to an outdated model. Young people are increasingly bored and disengaged with learning and too many are unable to see the true purpose of education.

- 84% of teachers believe school is only preparing young people for exams, but 75% wish this wasn't the main focus [1]
- 60% of all young people, and 50% of parents want schools to focus on more than just passing exams [1]
- 84% of teachers and 65% of children wish that education did more to help students learn about making a positive difference to society and the planet [1]
- 64% of teachers want schools to prioritise helping young people find what they are passionate about [1]
- Only 36% of young people believe they have developed the skills needed for the modern world of work [2]
- 88% of employers believe school leavers are not prepared for the workforce with 1 in 5 vacancies remaining unfilled due to lack of talent available [1]
- worldwide, only 13% of employees feel engaged at work [3]

Our UK education system is unfit for the 21st century. It is failing to equip young people with the practical knowledge, skills and experience they need for their future and we are wasting the potential of the new generation.

Sources: 1. Big Change and the Innovation Unit report 2. Deloitte Millennial Survey 2018 3. Gallup Poll

International Comparison

The current education system in the UK is falling behind its international counterparts. For years, successive governments have attempted to overhaul it, improve it, restructure it and attempt to keep up with better performing education systems across the world, such as in Finland, Singapore and Japan.

The UK is falling behind other OECD countries in international ranking tables. This is troubling not only when looking literacy and numeracy scores, but also when looking at other skills that are required in the world of work. Literacy proficiency scores among adults in the UK age 16-65 are among the worst of the OECD countries measured in the PIAAC Survey of Adult Skills, with 16.4% of adults scoring at the lowest levels in literacy and 19% scoring low in numeracy (putting the UK in 22nd position of 30 countries surveyed).

Alongside low scores in literacy and numeracy among adults in the UK, 10.1% of adults surveyed responded to the PIAAC Survey of Adult Skills saying that they had no prior experience with computers or lacked even very basic computing skills; this is a worrying trend that needs to be addressed to avoid any further widening of the already-existing skills

gap in the UK. 5.8% of adults failed the ICT core assessment, ranking the UK 9th of 30 states partaking in the survey, while 15.1% of adults scored below Level 1 in problem-solving skills in technology-rich environments.

Pupil Disengagement

Young people in the UK are increasingly distancing themselves from learning and failing to see how it will be of use to them in life after school. Between 20-30% of young people aged 14-16 say they have "given up" on school and are disengaging with the learning process. This therefore leads to poor prospects for these disengaged young people once they have left school, further disenfranchising them and placing a greater strain on society. The latest OECD report shines light on this with some alarming statistics:

- Young adults in England perform among the worst in the industrialised world in literacy and numeracy
- England ranks 22nd for literacy and 21st for numeracy out of 24 countries.
- In England, exam results are regressing with the older cohorts outscoring the younger
- 8.5 million adults in England and Northern Ireland have numeracy levels below that of a 10 year old
- 19.6% of adults in England are of an education standard below that of KS4

Teacher Disengagement

It is not just young people that are becoming disengaged. Many teachers feel disempowered, overworked and disrespected. As a result, teachers themselves are also becoming frustrated with school and the current education framework, with a quarter of teachers who have qualified since 2011 leaving the profession and nearly half of teachers planning to quit the profession within the next five years. The following statistics further illustrate why our education system being left behind, and the human cost this places on those who work within it:

- 84% of teachers feel demoralised at work, with 75% citing increased assessment as the primary generator of their excessive workload
- Over half of teachers cite a lack of pupil readiness to learn as one of the top causes of poor behaviour
- 62% of teachers believe that parents and governors have unrealistic expectations of what they can achieve
- Over 60% of teachers claim that decision-makers have a complete lack of understanding of the true nature of teaching

"Much education today is monumentally ineffective. All too often we are giving young people cut flowers when we should be teaching them to grow their own plants."
John W. Gardner

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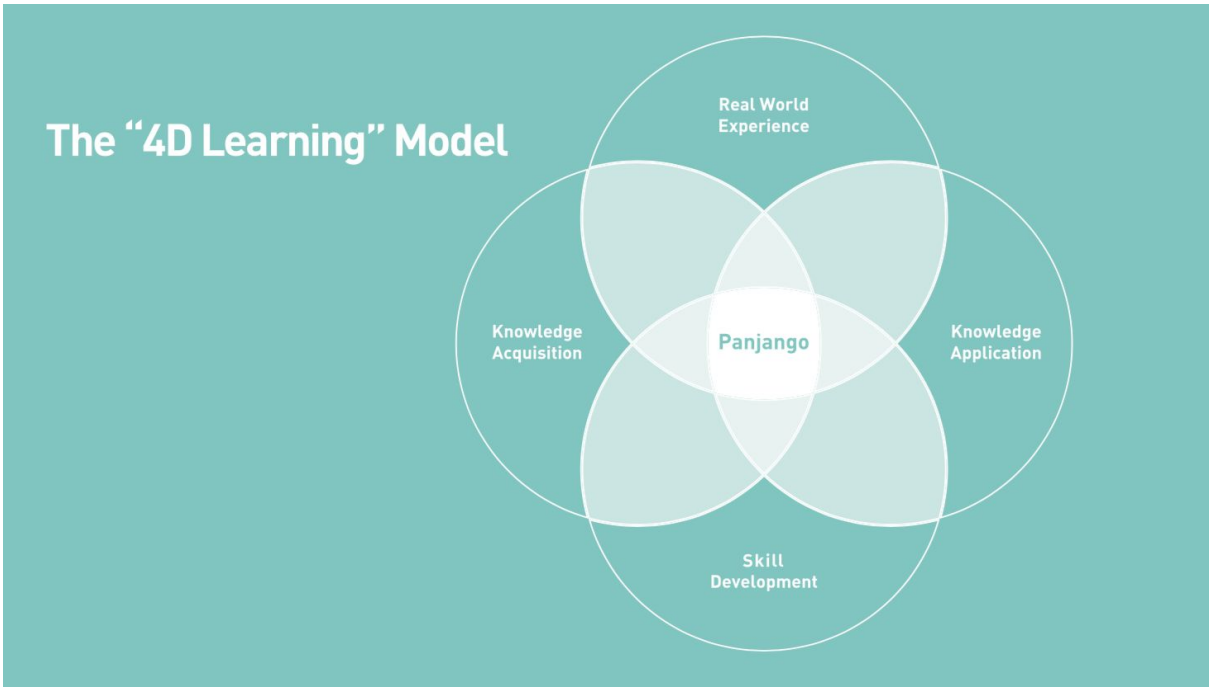
WHAT IS “4D LEARNING”?

Panjango’s “4D Learning” model combines contextual and experiential learning to equip young people with the practical knowledge, skills and experience to find their purpose and fulfil their potential.

The model enriches the 1-dimensional acquisition of knowledge with three new dimensions of learning: the application of knowledge, skill development, and real world experience.



“4D Learning” supports young people to apply their knowledge, skills and experience to real world problems or situations.

The methodology shows young people how their learning is applied in the wider world and equips them with the skills and experience to not just survive, but thrive in life after school.

The purpose of this guide is to demonstrate the potential of the “4D Learning” methodology and to enable educators to deliver exciting contextual and experiential learning activities with young people.

Our challenges help educators to connect careers to the curriculum and embed career-relating learning into core lessons, as well as make learning more engaging and meaningful and support young people to develop the skills needed to fulfil their potential.

“Tell me and I forget, teach me and I remember, involve me and I will learn.”
Benjamin Franklin

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KNOWLEDGE APPLICATION

The following section provides examples of curriculum topics applied to real world scenarios faced by a wide range of professionals on the world of work. The challenges cover every Maths, English and Science topic across the whole of the Key Stage 3 curriculum. Three examples are provided for each topic and more challenges can be found on the free Panjango Online platform at www.panjango.online.

MATHS

Algebra

Example 1: Computer Games Designer

You are tasked with designing a 'level up' system for a new computer game. The system should be based on experience points.

You decide that each level's required experience points can be worked out by doubling the previous level's experience points and then subtracting 100 times the level the user is currently on.

The first level requires 400 experience points before the user can progress to the second level.

How many experience points is the fifth level going to require?

Answer = 2300 experience points

Example 2: Gardener

A potential customer says they have a budget of £3000 for a garden renovation. Having priced everything else up you have £1200 left from this budget to provide a patio area.

Flagstones cost £25 each and measure 50cm by 50cm. The customer wants the width of their patio to be 4m.

How long can the patio be using as much of the budget as possible?

Answer = 3m

Example 3: Systems Analyst

You are working on a piece of computer code. The code has a process that takes a numeric input, adds six to it and then multiplies the result by 4, before finally subtracting 7. This process involves three separate calculations. In order to optimise the process you must reduce the number of calculations. What two calculations could be done with the input to achieve the same answer as the current three stage process?

Answer = Multiply by 4 and then add 17.

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Geometry and measures

Example 1: Ship/Boat Captain

As a boat captain, your knowledge of maths can be life saving. You and your crew have travelled due north from harbour for 6 nautical miles before turning and travelling due west for 5 nautical miles.

However, you have been informed by the coastguard that a massive storm will hit the area in 3 hours. You therefore immediately plot a course directly for the harbour. You want to calculate whether you and your crew will make it safely back to the harbour before the storm hits.

1. Use Pythagoras' Theorem to calculate your distance from the harbour.

2. If the top speed of the boat is 3 nautical miles per hour, will you make it back to the harbour before the storm hits?

Quickly! Time is of the essence! Get both questions right to earn your point.

Answer = 1 = 7.8 nautical miles 2 = Yes. Phew!

Example 2: Armed Forces Officer

You are planning an aid drop. Each air freight pallet that you are using has a length of 2.1m by a width of 1.6m.

Items can be safely stacked to a height of 0.8m on the pallet. The aid drop is delivering first aid kits on the first flight. These kits each measure 35cm by 40cm by 10cm.

In order to plan how many flights will be required to deliver the necessary aid, you need to know how many first aid kits can fit on each pallet.

How many first aid kits can fit on one air freight pallet?

Answer = 192

Example 3: Oil & Gas Engineer

You are installing a gas supply line with a circular pipe that has a diameter of 15mm. The gas in the pipe will be flowing at a speed of 4.5m per second.

You need to know the volume of gas that is entering the system per hour. This is calculated by multiplying the area of the cross-section of the pipe by the speed of the gas flow in the pipe.

What is the volume of the gas entering the system per hour?

Answer = 2.86 cubic metres

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Number

Example 1: Design Engineer

You are required to produce a gearing system for a project. A smaller gear must turn a larger gear.

A large gear has 36 teeth and a smaller gear engaged to it has 15 teeth.

The gears start out with specific teeth touching.

How many rotations will each gear have done by the next time the two gears have the same teeth in contact with each other?

Answer = Large gear: 5 ;Small gear: 12

Example 2: Librarian

A local journalist is writing an article about the history of your library. They have asked you how many books are in the library so you quickly want to try to estimate the total number.

You count up that there are 20 bookcases in total. Each bookshelf has 5 shelves. You also know that each shelf holds 150 books on average.

Without using a calculator, what would you estimate to be the total number of books in the library?

Answer = 15,000

Example 3: Web Content Manager

You have to monitor the success of an online advertising campaign that you have run.

A report informs you that 7560 people viewed your advert and 462 people clicked the link in the advert.

In order to measure the success of this advert, you need to be able to simplify these figures into a single number measuring the 'hit rate' of your advert.

As a fraction in its simplest form, what proportion of people clicked the link?

Answer = 11/180

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Probability

Example 1: Stockbroker

You are advising a client about investing in a particular stock.

You have estimated that it will make them a quick profit with a probability of two-fifths.

You think the probability of it remaining stable and hence not making a profit or a loss is one-quarter.

What is the estimated probability of the stock making a loss?

Answer = 7/20

Example 2: Town Planner

You are considering the planning application for a new sports stadium. The proposed site includes no provision for parking.

You have decided to deny planning permission on this basis but want to liaise with the applicant over what changes they could make to gain permission.

The proposed stadium holds 35,000 people. The probability that any individual drives to an event at a stadium of this type is approximately 1/7 (allowing for groups travelling in a single vehicle).

You must advise the applicant on what parking provision they should allow for.

How many parking spaces do you estimate are needed on average for a sell-out event at this stadium?

Answer = 5000

Example 3: Crime Scene Investigator

You have been asked to give evidence in court. Your testimony is about the accuracy of a test that you performed on a blood sample.

You know the test results are 95% accurate. You need to explain what this probability means to a jury.

Which of the following is the best description of how likely it is that the test results are incorrect?

A. If you collected 20 test results of a similar type to this on average 5 would be wrong.
B. If you collected 50 test results of a similar type to this on average 5 would be wrong.
C. If you collected 20 test results of a similar type to this on average 1 would be wrong.
D. If you collected 50 test results of a similar type to this on average 1 would be wrong.

Answer = C

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Ratio, proportion and rates of change

Example 1: Fire Officer

The water tank of a fire engine you are in is cuboid with a length of 4m, width of 2m and a height of 1.5m.

It is essential to know how much water is left in order to best contain a fire.

You have been at a fire for 30 minutes spraying water at a rate of 3000 litres an hour.

If it was full when you arrived, how long until the water in the tank runs out?

Answer = 3 hours and 30 minutes

Example 2: Retail Store Manager

You are overseeing a reorganisation of the warehouse in a supermarket in order to make room for some new product lines you are expecting to be delivered.

The supermarket's own brand beans currently occupy racking space for 36 boxes. You want to make room for a new premium brand of beans.

The own brand beans should outnumber the new premium brand beans by a ratio of 3 : 1.

How many boxes of premium beans should you make room to fit on the racking?

Answer = 9

Example 3: Sports Nutritionist

The daily recommended calorie intake for an adult male is approximately 2500Kcal.

For each hour of heavy exercise that a sports person does they need additional calorie intake.

The amount extra they need is directly proportional to the hours of exercise they do.

You are advising a male marathon runner. You know that running a 4-hour marathon consumes an additional 2400Kcal of energy.

How much extra intake should you recommend to the runner if they are planning to do a 7-hour ultra-marathon?

Answer = 4200kcal

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Statistics

Example 1: Sales Assistant

You are a sales assistant in TV store. You have been given a questionnaire by your manager to ask customers who come in to your store. She wants to use the results for a website article profiling the store's customers.

The questionnaire ask the following question: How much television do you watch?

It then offers the following response options: Not much / A little / A lot

You are concerned that the question won't lead to any useful results for the store manager.

How could you improve the question or the response options to produce more useful data?

Answer = Use data ranges e.g. 0-5 hours per week, 6-15 hours per week, 16-25 hours per week etc

Example 2: Estate Agent

You currently have three properties to sell on behalf of your clients.

Your manager has asked you to calculate the range of the prices of the properties.

The three prices are £200,000, £300,000 and £1,000,000.

What is the range of the prices?

Answer = £800,000

Example 3: Community Worker

You are conducting research into population trends around the world on behalf of an international development charity.

The population of poorer countries was 1200 million in 1930, 2200 in 1970 and 4800 in 2010.

The population of richer industrial countries was 250 million in 1930, 700 million in 1970 and 900 in 2010.

Plot the data onto a rough graph. What trends do you notice about the population growth rates of poorer and richer countries?

Answer = Population growth rate is increasing in poorer countries and slowing in richer countries. Growth rate is also faster in poorer countries.

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ENGLISH

Grammar and vocabulary

Example 1: Chief Executive Officer (CEO)

At a board meeting, a shareholder in your company describes you as, "altruistic and magnanimous".

Should you be pleased or upset? Give a reason for your answer.

Answer = Pleased - these are synonyms for generous and selfless.

Example 2: Surveyor

As a Quantity Surveyor, you would have to evaluate whether or not a project is financially viable.

What does the phrase, 'financially viable' mean?

Answer = Able to be completed at a reasonable cost.

Example 3: Translator

You have been asked to transcribe an interview from German into English.

Should your transcription be written using Standard English? Give a reason for your answer.

Answer = No. The transcription should accurately reflect the spoken language used which will be non-standard.

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Reading

Example 1: Marine Biologist

Whilst conducting some research, you find an article entitled, 'The Great Barrier Reef: Diminishing in Front of our Eyes'.

From the title, what can you infer the author thinks is happening to The Great Barrier Reef?

Answer = They think the reef is slowly being destroyed.

Example 2: Dentist

You have decided to promote your new teeth~whitening service with the slogan, “It's Smiles Better”.

What literary technique have you used, and why is it effective?

Answer = A pun (play on words) because it is humorous and may make patients smile!

Example 3: Pest Controller

A product you have bought to kill vermin is described as being of, 'industrial strength'.

Why might it not be a good idea to use this in someone's home?

Answer = It will be too strong and, therefore, potentially dangerous.

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Spoken English

Example 1: Politician
You are about to appear on 'Question Time' to discuss the impact of immigration.

Which of the following would be more useful to support your argument and why?

A: emotive language
B: facts and statistics

Answer B: facts and statistics - they can validate your opinion and make your argument seem stronger.

Example 2: Armed Forces

You are taking part in a training exercise that has to be undertaken in complete silence.

How could you still communicate effectively with your team?

Answer = Hand signals, gestures, written notes. Other good suggestions acceptable.

Example 3: Sports Coach

A school has requested that you give their students a presentation about keeping fit.

What could you use to help you remember the structure of your presentation?

Answers include: prompt cards, brief notes that are bullet pointed, powerpoint slides etc

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Writing

Example 1: Travel Agent

You have been asked to write an advert for a popular travel magazine.

Use your persuasive writing to advertise a holiday to an English seaside town of your choice.

Your advert should be 30 words or less.

Work in your team to write a persuasive advert for your seaside town.

The referee should award a point to the team which produces the advert which would be most likely to make people want to visit their chosen seaside town.

Example 2: Ship/Boat Captain

After navigating a route through some tricky waters, you want to record this information for future reference.

Which structural devices would make the directions easier to follow?

Tables, charts and diagrams.

Example 3: Graphic Designer

You have created an advert utilising the colour red for the slogan.

Produce a list of at least 5 connotations of the colour red.

The referee should award any team which successfully completes the challenge.

Examples include: passion, danger, love, blood, anger.

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SCIENCE - BIOLOGY

Genetics and evolution

Example 1: Countryside Ranger

You are looking after a national park to ensure all animal populations remain in balance.

Competition between rabbits and foxes is important to achieve this balance.

Why does competition help to keep the rabbit and fox populations stable?

Answer = Foxes controls rabbit population by hunting them; rabbits control fox population by competing for space and food.

Example 2: Marine Biologist

As a marine biologist, you would study the behaviour and genetics of marine plants and animals. Some of the animals you are studying have adapted to vary their food.

How does this help the animals to survive?

Answer = The animals are more adaptable to changes in the environment i.e. has more sources of food.

Example 3: Childcare Worker

You care for a set of identical twins, Bill and Ben.

Which of the following attributes are caused by their genes (rather than their environment)?

A: Their blue eyes
B: Their love of football
C: The scars on their knees
D: Their blonde hair
E: Bill being better at French

Answer = A and D

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Interactions and interdependencies

Example 1: Food Scientist
As a food scientist, you may be required to run tests on animals to see if they are fit for human consumption.

Today you have been asked to test a salmon population as there has been a number of seagull deaths in the same ecosystem.

Why do we need to test the salmon species?

Answer = Bioaccumulation of toxic chemicals, or parasites in the salmon, could cause illness.

Example 2: Gardener

You have been having issues with pests affecting your vegetable crop yield.

You decided to use a pesticide to help control the pest problem.

But the pesticide did not work immediately and it took several weeks before you begun to notice any difference.

Why was there a delay in the pesticide working to solve the pest problem?

Answer = The pesticide has to build up to a level in the organism to become toxic. This is called bioaccumulation.

Example 3: Pest Controller

As a pest controller, you must understand the food webs surrounding a pest animal.

You have been asked by a client to remove mice from their house.

How does understanding food webs and what mice eat help remove the mice?

Answer = Knowing what mice eat allows you to set suitable traps.

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Material cycles and energy

Example 1: Sports Coach

You are coaching an intensive football training session.

One of your players, Jane Mooney, has to stop and rest for five minutes because her muscles are hurting.

You tell her that her muscles are hurting because of a build up of lactic acid.

She wants to know how the lactic acid has built up in her body and when the pain will stop.

What would you tell her?

Answer = Lactic acid is produced when you respire anaerobically. It builds up causing pain and tiredness. Lactic acid breaks down when aerobic respiration begins again.

Example 2: Chef

As a chef, you need to understand what happens to food as it is cooked.

You are making bread for the lunchtime menu. As you bake the bread it rises.

Why does this happen?

Answer = Yeast respires aerobically releasing carbon dioxide which is trapped in the dough causing it to rise.

Example 3: Armed Forces

As a diver in the Royal Navy, it is important to understand the respiration process that take place in your body so you can maximise your diving fitness.

There are two respiration processes which take place in humans; aerobic and anaerobic.

What is the difference between these processes?

Answer = Aerobic respiration is more efficient with less waste products. Anaerobic respiration only has one reactant (glucose) and produces lactic acid which is toxic to the body.

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Structure and function of living organisms

Example 1: Crime Scene Investigator

As a crime scene investigator, you would need to be able to identify the position of parts of the skeleton so you can analyse crime scenes involving human bodies.

Can you locate these three different body parts?

a) sternum
b) tibia
c) ulna

Correctly locate all three body parts to earn a point.

Answer = a) breast bone b) lower leg c) forearm

Example 2: Horse Riding Instructor

As part of your job as a horse riding instructor, you must ensure the horses on the yard are given a balanced diet.

What are the five nutrient types you must ensure the horses are receiving?

Carbohydrates, proteins, vitamins, water and fats.

Example 3: Police Officer

It is very important that you are physically fit to be a police officer, and have knowledge of how your body responds under physical strain.

You have just chased and caught a fugitive. Congratulations!

Unfortunately, you now have cramp in your calf muscle.

What is the reason for this cramp?

Answer = Muscle fatigue caused by lack of glucose or oxygen.

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SCIENCE - CHEMISTRY

Atoms, elements and compounds

Example 1: Nuclear Engineer

As part of your role as a nuclear engineer, you will work with different types of atoms.

What are the three subatomic particles that make up an atom?

Answer = Proton, neutron, electron

Example 2: Gardener

You are using a fertiliser in a garden. You know potassium nitrate (KNO_3) is a commonly used fertiliser.

What are the three elements present in potassium nitrate?

Answer = Potassium, nitrogen and oxygen.

Example 3: Astronaut

You have been stationed on the International Space Station and are carrying out research about chemical reactions in space.

Chemicals react due to their electrons and you therefore need to examine the electrons under a powerful electron microscope.

Where in the atom would you find the electrons?

Answer = In shells around the nucleus of the atom

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Chemical reactions

Example 1: Food Scientist
You are developing a new fertiliser that will help farmers increase their crop yields.

One ingredient you will be using in your new fertiliser is calcium oxide.

Calcium oxide is made by heating calcium carbonate strongly.

Write a balanced chemical equation for this process.

Answer = CaCO3 -----> CAO + CO2

Example 2: Mechanic

As part of your job you will have to work with catalytic converters in exhaust systems.

Catalytic converters are honeycomb structures coated with platinum and rhodium.

But what is the function of a catalytic converter and which gases are involved?

Answer = Reduces toxic gases leaving exhaust by converting carbon monoxide into carbon dioxide, and nitrogen oxides into nitrogen and oxygen.

Example 3: Farmer

You have tested the soil at your farm and found that the pH is too acidic to grow crops well.

What could you use to neutralise the acidity of your soil?

A: Sulphur
B: Lime (calcium oxide)
C: Baking soda

Answer = B - Lime

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Earth and atmosphere

Example 1: Countryside Ranger

You are a countryside ranger in the Yorkshire Dales National Park.

In the Yorkshire Dales, there are large limestone cliffs and it is important for you to understand how these are formed so that you can educate the public and help to preserve the cliffs.

Limestone is an example of a sedimentary rock. Can you name the two processes which explain how sedimentary rocks are formed?

Answer = Deposition and cementation.

Example 2: Architect

You have been asked to design a new entrance to a large office block.

You have decided to decorate the lobby with marble (a metamorphic rock) due to both its luxurious appearance and hardwearing properties.

The owner of the building would also like you to create a plaque in the lobby with information about the materials you have used.

How would you explain how marble is formed?

Answer = The mineral content of other rocks is changed chemically by immense heat and pressure.

Example 3: Hairdresser

As a hairdresser, you will use heated appliances, such as hair straighteners, every day.

You are refitting your salon and are choosing a suitable material for your work surfaces.

A friend in the building trade recommends you use an intrusive igneous rock as this would be very resistant to heat so you could put hot appliances on it without damaging the work surface.

Can you think of a suitable material you could use which is an example of an intrusive igneous rock?

Answer = Granite

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Energetics

Example 1: Metal Worker

When working with metals, you need to understand the chemical reactions that are taking place.

You have been working with iron, and have been having issues with rusting.

You know rusting is an oxidation reaction between iron and oxygen.

a) In terms of energy changes, what type of reaction is rusting?

b) What is the word equation for this reaction?

Answer = a) exothermic b) iron + water + oxygen → hydrated iron(III) oxide.

Example 2: Teacher

You are teaching a lesson to Year 9 pupils about energy changes in chemical reactions.

You need to explain the difference between two types of reactions: endothermic and exothermic.

How would you describe these to your pupils?

Answer = Endothermic reaction gains energy from the surroundings. Exothermic reactions give out energy to their surroundings.

Example 3: Oil & Gas Engineer

You work at a cracking plant and need to have detailed knowledge of the chemical reactions that take place.

Your work involves overseeing a process which takes long chain molecules and breaks them down to make more useful products using heat.

Is this process exothermic or endothermic?

Answer = Endothermic - a reaction that gains energy from its surroundings.

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Materials

Example 1: Armed Forces

You are a Combat Engineer in the army and your unit in areas such as demolitions, mine warfare, bridging and water supply.

You are cut off behind enemy lines and it will be several weeks until new supplies will reach you so you need to improvise and use the materials around you.

You are planning to build a clean water supply system using copper pipes but first you need to extract the copper from its ore using carbon.

You need to write instructions for this chemical reaction for the other engineers in your team to follow.

Write the word and balanced symbol equation for this reaction.

Answer = Copper oxide + carbon → copper + carbon dioxide ($2CuO + C \rightarrow 2Cu + CO$)

Example 2: Fashion Designer

As a fashion designer, you will need to have an understanding of the wide variety of materials that you use.

Two man-made fabrics you may use are lycra and nylon. These fabrics are examples of polymers.

What is a polymer?

Answer = Polymers are made by chemical reactions that join lots of small molecules together to make long molecules.

Example 3: Sports Coach

As a sports coach, you not only have to train your team but you will have to carry out other duties such as selecting the team kit.

A good material to use for sports kit is a polymer called Lycra.

Can you name three properties which make Lycra a good choice of materials for a sports kit?

Answer = It can be made into fibres, it is elastic and it is tough.

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Pure and impure substances

Example 1: Plumber

You are called by a client whose washing machine has broken down.

When you inspect the washing machine you find a white build up in the pipes and on the heating element.

You know this white build up is what is causing the issues with their machine.

How would you explain this to the customer?

Answer = The white build up is limescale - mineral deposits left behind when water is heated. This is because water is not pure.

Example 2: Childcare Worker

You are working with some pre-school children and are teaching them about separating mixtures.

You want the children to separate sand and water.

What equipment would you give them and why?

Answer = A sieve as it will trap the sand particles and the water will filter through.

Example 3: Biomedical Scientist

You are being funded by the World Health Organisation (WHO) to find a cure for the Ebola virus.

You have been using chromatography to determine which antibodies are the most effective in neutralising the disease.

A representative from the WHO is visiting your laboratory and asks you to report on what you have been doing.

How would you describe the technique of chromatography to them?

Answer = It separates dissolved substances from one another. Some of the coloured substances dissolve in the solvent better than others, so they travel further.

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The particulate nature of matter

Example 1: Fashion Designer

As a fashion designer, you would use different materials for different designs.

You are designing a new rain coat. You have chosen to use a plastic fabric called PVC.

Name two properties that make PVC a good choice of material for a raincoat?

Answer = Any two from: water resistant, strong, easy to mould, can be coloured

Example 2: Metal Worker

A customer has asked you to make a large, flat roof for their garage.

You plan to use sheet metal for the roof.

Name two properties that metal has that makes it a good material to use for a garage roof?

Answer = Any two from: strong, water resistant, can be made into large thin sheets.

Example 3: Chef

You put a pan of water on the stove to boil. You get distracted and forget about the pan. When you return it is empty.

Where has the water gone?

Answer = When the water reaches its boiling point (100*C) the particles gain enough energy to escape into the air as a gas (as the water turns into steam)

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The periodic table

Example 1: Mechanic

As a mechanic, you need to have an understanding of the exhaust gases that are discharged into the atmosphere through the exhaust pipe.

Exhaust gases are produced as a result of the combustion of fuels such as gasoline, petrol or diesel.

The majority of exhaust gas is comprised of N_2, H_2O and CO_2.

What are the full names of these gases?

Answer = Nitrogen, water vapour and carbon dioxide.

Example 2: Farrier

The owner of the famous race horse, Shadowfax, has reminded you to put on aluminium plates rather than a traditional steel shoe.

Why do you think they have asked you to use aluminium plates?

Answer = Aluminium is lighter than steel so the horse can run faster.

Example 3: Metal Worker

Metal workers need to have a detailed knowledge of the properties of various metals.

You are working with magnesium.

Which of the following statements is not true?

A: Magnesium is brittle
B: Magnesium is a poor conductor
C: Magnesium is shiny when freshly cut

Answer = A

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SCIENCE - PHYSICS

Electricity and electromagnetism

Example 1: Aerospace Engineer

You are designing a new robot for use in space.

The robot will help astronauts lift and carry items on space expeditions.

You intend to use electromagnets in the robot.

What use will electromagnets be in the robot?

Answer = The electromagnets create an electric current to power the robotics to make the motor spin and cause the robot to move.

Example 2: Paramedic

In emergency situations, it may be necessary to use a defibrillator to save a person's life. Defibrillators use static electricity.

How would you use a defibrillator to help restart a person's heart?

Answer = Pads with insulated handles are charged from a high voltage supply. The charge is then passed onto the chest to make the heart contract.

Example 3: Recycling Officer
As a recycling officer, you could use electromagnets to help you with your daily work.

How could an electromagnet be used to sort recycling?

Answer = The recycling is passed through an electromagnet and anything magnetic is attracted to the magnet making it easier to sort.

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Energy

Example 1: Fire Officer

As a fire officer it is essential that you understand how and why things become hot. The knowledge could save your life!

You have entered a building where there is believed to be a fire. The location of the fire is unknown and if you open a door with a fire on the other side you could be caught in a backdraft.

You therefore feel each door or door handle is hot to know whether there is a fire on the other side.

By what heat transfer process would a fire make the door or door handle become hot?

Answer = Conduction

Example 2: Mechanic

You are testing a car for its MOT. You discover that the rear lights are not working.

On investigating the problem, you discover that a wire has become loose from the circuit.

Explain why this will stop the lights from working.

Answer = The loose wire will make the circuit incomplete so the electricity cannot flow to the bulbs.

Example 3: Plumber

As a plumber you would need to have a detailed understanding of the heating systems within a house and how objects or areas heat up.

State whether the following three statements are examples of conduction, convection or radiation:

A: A radiator heating a room
B: A metal pipe heating up as hot water passes through it
C: The water high up in a tank boiling even though only the water at the bottom is being heated

Answer = A: Radiation B: Conduction C: Convection

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Matter

Example 1: Chef

As head chef, you are training some new kitchen assistants. You want your new assistants to understand the science behind cooking to nurture their love of food.

You explain that they will use their sense of smell to help decide when food is cooked. They smell food because of particles in the air.

Gas particles move around 500m/s at room temperature. However, the smell of food does not travel this fast.

How would you explain why smell travels more slowly using Brownian motion?

Answer = Particles collide with each other and with particles of air frequently. The collision changes the particle's direction thereby taking them longer to travel.

Example 2: Food Counter Assistant

As a food counter assistant, it is important that you understand the relationship between temperature and food so that you can ensure that food is always hot before serving.

A burger has been resting on an unheated metal counter for several minutes.

What impact will this have had on the burger and why?

Answer = The burger will have cooled down as its temperature is greater than the temperature of its surroundings.

Example 3: Armed Forces - Officer

As an armed forces officer, it is important that you have a thorough knowledge of buoyancy and floatation.

You are leading your team on a training exercise which involves building a raft.

You need to work out the density of the raft in order to calculate whether it will float.

You know that objects float in water if their density is less than 1.00 kg/m³.

If the mass of the raft is 160kgs and its volume is 10m³, calculate the density of the raft and whether it will float or sink?

Answer = 1.6 kg/m³ (density = mass / volume). It would sink.

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Motion and forces

Example 1: Youth Worker

You have planned a fun evening of team games for the children that attend a local youth club. You want the activities to relate to a physics project that the children are undertaking.

You plan a tug of war to illustrate the idea of force arrows. The children are split into two teams - red and blue. The blue team pull to the left with less force than the red team pull to the right.

How would you describe to the children what is happening during the tug of war by using force arrows?

Answer = The red team are pulling with more force so the arrow to the right will be larger than the left arrow.

Example 2: Retail Merchandiser

You are preparing the new Christmas window display for your store. You wish to hang up large boxes to represent presents from the ceiling.

You need to consider the forces acting on the boxes to make sure they are safe and do not fall on customers.

The boxes will hang when the forces are balanced. The tension on the rope pulls is one direction.

What is the name of the force that acts in the opposite direction?

Answer = Weight

Example 3: Armed Forces

Working in the navy, you will work on many different vessels and you will need to have knowledge of how they operate.

All vessels will be different but they will all stay afloat because of the same force.

What is the name of this force?

Answer = Upthrust

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Waves

Example 1: Doctor

A patient attends your clinic saying that he is having difficulty hearing. After a discussion with the patient, you discover that he works in a noisy environment with very loud sounds.

What part of the ear could have been damaged and how does this part enable the man to hear?

Answer = The ear drum. This passes vibrations further into the ear to allow them to be interpreted as sound.

Example 2: Astronaut

You have been stationed on the International Space Station to carry out scientific research on sounds in different environments.

If you were to carry out a sound experiment in space outside the ISS, would you be able to hear it and why?

Answer = No - sound waves only travel through a solid, liquid or gas. They cannot travel through empty space (a vacuum).

Example 3: Jeweller

As a jewellery maker, you may use ultrasound to clean your jewellery before to sell it to clients.

How does ultrasound help you to clean your jewellery?

Answer = The jewellery is placed in an ultrasonic bath where the rapid vibrations shake the dirt loose.

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SKILL DEVELOPMENT

The third dimension in Panjango's "4D Learning" model is skills development. We have carried out research to identify the skills required in the modern world of work and produced the following Skills Framework:

Character	Resilience, Adaptability, Risk Taking
Communication	Written Communication, Spoken Communication, Listening
Confidence	Self-Esteem, Assertiveness, Public Speaking
Creativity	Innovation, Enterprise, Lateral Thinking
Leadership	Planning, Organising, Inspiring
Negotiation	Reasoning, Persuasion, Compromise
Problem Solving	Analysing, Decision Making, Critical Thinking
Teamworking	Encouraging, Facilitation, Managing Conflict
Values	Empathy, Ethics, Social Responsibility
Work Ethic	Motivation, Initiative, Determination

The Skills challenges focus on fun, interactive exercises which help young people develop the skills and competencies needed in the modern workplace and task them with *doing* an element of a particular career.

The following section provides three examples of Skills challenges for each of the ten areas of our Skills Framework. More challenges can be found on the Panjango Online platform at www.panjango.online.

Character

Example 1: Sports Coach

You are coaching a talented young gymnast called Jessica. You believe Jessica is talented enough to compete at the Olympics for Team GB one day.

If she is to achieve her dream, Jessica will need to be extremely determined and work very hard at her training.

What could you do, in your role as her coach, to help Jessica achieve her dream of competing at the Olympics?

Example 2: Stockbroker

As a stockbroker, you would need to be able to handle pressure and hold your nerve as you wait for the right time to sell shares.

You have received a tip-off that a share price will peak in precisely 60 seconds time!

You must sell immediately when the share price reaches its peak to maximise the money you will make from the trade.

All players must close their eyes and, in silence, count out 60 seconds. Then raise your hand in the air and open your eyes when you believe 60 seconds has elapsed.

Remember: remain silent at all times and keep your eyes closed.

The referee must secretly time 60 seconds. They should then award a point to the player who is first to raise their hand once 60 seconds has elapsed.

Example 3: Farrier

As a farrier, you would need to work fast in shoeing horses. The more you shoe the more you earn.

Each team should select one player to be the farrier. The rest will be the horses!

Using a ruler to simulate the hammer, the farrier must race to "shoe" each of the horses by tapping four times on the bottom of each of the horses shoes.

If the teams have uneven numbers then each farrier should continue to shoe until five horses are shoed. A point is awarded to the team which completes the challenge quickest.

To signal your team has finished the challenge all the horses should 'neigh' together upon completion.

Ready. Steady. Shoe!

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Communication

Example 1: Nurse

As a nurse you would need to be very confident to deal with patients and their family in a hospital.

A patient's husband has become aggressive after hearing some bad news about his wife's health.

Each team should select one person to act out how they would respond to calm this situation.

The referee should award a point to the team which provides the most confident and calming response.

Example 2: Paramedic

There has been an accident on a building site. Some scaffolding has collapsed and injured two people.

You arrive at the scene and find two people are not breathing. You ask the site manager to assist you in giving CPR to one of the patients while you give it to the other.

How would you describe the process of CPR for another person to follow?

Have a discussion in your life about this life-saving challenge. Then select one player to talk through the steps of giving CPR to the class.

The referee should award a point to the team which delivers the best explanation of how to give CPR.

Example 3: Recycling Officer

You are responsible for helping households to recycle more. You want to produce a leaflet to distribute to households in your area.

Think of five points you could put on the leaflet to persuade households to recycle more.

Have a discussion with your team about this challenge. Then select one player to present your list of points to the class.

The referee should award a point to the team which has produced the most persuasive leaflet.

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Confidence

Example 1: Politician

You are the leader of a political party and the election is looming! You want to record a 30 second television advert to promote your campaign and encourage people to vote for you.

Think about three important problems in your country. Then think about of at least one policy you could introduce to help solve each of these problems.

Have a discussion with your team about this challenge and summarise your policies in a 30-second speech. One player should then deliver the speech to the class.

The referee should award a point to the team whose advert is most likely to convince people to vote for them.

Example 2: Journalist

Journalists are often required to interview people on camera to get their thoughts about a story. These are called 'vox pops'.

Select one player to be the interviewer. The remaining team players will be the interviewees.

Decide on a news story as a team. The interviewer should then carry out a vox pop.

Practice asking interesting questions and giving interesting responses to your chosen news story.

Each team should then deliver a 'live' vox pop in front of the class.

The referee should award a point to the team which delivers the most interesting and well-performed vox pop.

Example 3: Sports Nutritionist

You've just helped to create a fantastic new super food for runners!

You've managed to get a meeting with the local millionaire, Mr Moneybags, to sell him your product.

You have 5 minutes to come up with a winning argument (elevator pitch) to convince them to invest.

Think of a name for your product and then practice a 30 second elevator pitch.

The team should then select one player to deliver this pitch in front of the class.

The referee should award a point to the team with the best elevator pitch.

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Creativity

Example 1: Holiday Representative

As a holiday representative, you would need to have excellent sales skills to sell trips to tourist sites.

You are working in Egypt. You have just greeted a new group of tourists at the airport and taken them to their hotel.

You now want to try and sell them a trip to see the Great Pyramid of Giza.

In your teams, think about how you could persuade the tourists to purchase your organised trip to the pyramids.

Select one or more players to deliver your sales pitch to the class.

The referee should award a point to the team which delivers the most appealing sales pitch.

Example 2: Astronaut

While you are on Earth, you deliver regular talks to children in schools to educate them about space.

You would often use a funny mnemonic to help the children remember the order of the planets.

You have always used: My Very Easy Method Just Speeds Up Naming Planets.

But after Pluto was downgraded to a dwarf planet, you need to create a new mnemonic without a 'P' at the end.

In your teams, create a brand new planets mnemonic to help children remember the order of the planets.

Have a discussion about this challenge in your team. Then select one player to read out your mnemonic to the class.

The referee should award a point to the team which creates the best new mnemonic.

Example 3: Graphic Designer

A charity is rebranding and has asked for your advice regarding their tagline. A tagline is a very short sentence that helps give meaning to a brand and it often appears underneath the logo e.g. Nike "Just Do It".

A charity called The Long Well Walk is raising money to build wells across Africa through a record breaking fundraising walk from Sheffield to Cape Town.

Work as a team to think of a tagline of between 3 and 6 words to help The Long Well Walk bring their brand to life.

The referee should award a point to the team which comes up with the tagline that best reflects the charity's purpose.

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Leadership

Example 1: Chief Executive Officer (CEO)

You are interviewing candidates for the role of Office Manager within your company.

It is very important you ask the right questions in the interviews so you are more likely to choose the best candidate for the role.

In your teams, think of 5 interview questions you could ask to gain an understand of the candidate's suitability for the role.

Discuss this challenge in your team. Then select one player to read out your 5 interview questions to the class.

The referee should award a point to the team who thought of the list of questions most likely to gain a thorough understanding of each candidate's suitability for the role.

Example 2: Chef

As a chef you would need to have excellent leadership and coordination skills to manage the duties of your kitchen staff while working under a high degree of pressure.

Select one player to be the head chef. The other players are all kitchen assistants.

The head chef must then assign duties to the kitchen assistants in order to carry out the following tasks, all within 2 minutes:

1. Find an item you may find in a kitchen and return it to the table

2. Draw a picture of three different kitchen utensils
3. Write down a simple recipe for a meal
4. Find out your teacher's favourite meal
5. Write a list of 10 different fruits
6. Walk around the table five times

The referee should award a point to all of the teams who successfully complete the challenge.

Example 3: Software Developer

As a software developer, you would advise clients about how they can improve the running of their business or organisation by using software.

Software can include email, databases, antivirus, games, spreadsheets or word processors etc.

Your school have asked you to advise them on how they could use software to improve the running of the school, or the quality of the lessons.

What advice would you offer your school?

Have a discussion with your team about this challenge. Each team should then select one player to summarise your ideas to the class.

The referee should award a point to the team which offers the best ideas.

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Negotiation

Example 1: Mechanic

You are unhappy that one of your main suppliers of car parts has increased their prices by 20% without warning. This will mean is it far more difficult for your garage to make a profit, and for you to earn a living.

In your teams, think about the arguments you could make to negotiate lower prices from the supplier. Then select one player from your team to act as negotiator.

The negotiator should then role play a phone conversation with the supplier to try and negotiate a price reduction.

The referee should play the role of the supplier in the conversation. They should try their best to keep their 20% price increase without risking losing the customer to another supplier.

The referee should then award a point to the team whose negotiator offers the arguments most likely to convince them to reduce their prices.

Example 2: Farrier

One of your customers has written an email to complain about the recent price increase for your service. This is the first time you have increased your price in over two years so you have had no choice but to do it.

Write a list of three counter arguments to justify your price increase.

Each team should select one player to act out phoning the customer and talking them through your counter arguments.

The referee should award a point to the team whose respond is most likely to make the customer understand the need for your price increase. Each team should select one player to present their list of counter arguments to the class.

The referee should award a point to the team which offers the most compelling justification of their price increase.

Example 3: Armed Forces Officer

Conflict management is an important part of the role of an army officer. While on a peacekeeping mission, you witness an argument between a civilian and one of your soldiers.

The civilian is shouting at the soldier to go away and they think you have invaded their town.

The soldier has become defensive and a little hostile because they believe they are helping the town by keeping the peace.

How would you respond to calm this situation?

Have a discussion in your team about this question. Then select one player to act out your chosen response to the class.

The referee should award a point to the team whose response is most likely to ease the tension.

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Problem Solving

Example 1: Crime Scene Investigator

A terrible crime has been committed in your classroom! The class hamster, Errol, has been kidnapped!

Your teacher came in this morning to find the cage door open and no sign of poor Errol. As an expert crime scene investigator, you have been asked to search for clues that could lead to Errol's rescue.

What evidence would you look for at the crime scene?

Work together as a team to write a list of evidence you might find at the crime scene. One player should then summarise the team's response to the class.

The referee should award a point to the team whose investigative skills are most likely to lead to the rescue of Errol the Hamster!

Examples of evidence you might find: Blood, hair, fingerprints, footwear tracks, fibers, tool marks on doors/windows etc - or hamster droppings in the classroom if Errol only escaped ;)

Example 2: Retail Store Merchandiser

You are working for a large supermarket and responsible for setting up new sales displays.

It is Easter in a few weeks so you want to set up a themed stand to promote Easter products.

What products could you promote on the stand? Make a list of ten Easter themed products.

Discuss this challenge in your team and write your list of products to could promote. Then select one player to read out your list to the class.

The referee should award a point to the team with the most creative Easter-themed list.

Example 3: Sports Scientist

You are a sports scientist at a top football team and one of the club's star players has ruptured a ligament in their knee.

The player has had an operation and their doctor says the knee has healed enough for them to begin a programme of rehabilitation (exercise and training).

It is now up to you to design this rehabilitation programme to help them regain their fitness and strength in their knee.

In your teams, write an overview of a six-month rehabilitation programme for the player.

Have a discussion with your team about this challenge. Each team should then select one player to summarise your rehabilitation programme to the class.

The referee should award a point to the team whose rehabilitation programme is most likely to help the player regain fitness and strength in their knee.

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Teamworking

Example 1: Air Traffic Controller

As an air traffic controller, you would need to give advice to pilots about the weather conditions at the airport that may affect their take off or landing.

In your teams, think of five weather hazards that might affect the aircraft's ability to land or take off safely?

Race the other teams to complete the challenge. Then raise your hands when you have finished.

The referee should award a point to the quickest team (after checking all suggested weather hazards are valid).

Example 2: Transport Planner

You have been asked to give a presentation to the government on innovative new forms of transport.

You have heard of a new transport system proposed by Elon Musk called the 'Hyperloop'.

In your teams, quickly research the Hyperloop. Then prepare a 30-second presentation to explain this transport system to the class.

The referee should award a point to the team which gives the most informative and well-delivered presentation.

Example 3: Journalist

Your editor has asked you to submit a news story for tomorrow's newspaper. They have said the choice of story is entirely up to you.

Your challenge is to write the opening paragraph of a news story of your choice. Like all good news stories, the opening paragraph must cover the six key questions:

Who? What? Where? When? Why? How much?

In your teams, decide on the facts about your story and then work together to write your opening paragraph. Make sure you've covered each of the six key questions.

Each team should then select one player to read out their opening paragraph to the class.

The referee should award a point to the team which produced the most newsworthy story which covers the six questions.

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Values

Example 1: Solicitor

As a solicitor, you can charge very high hourly rates for your work. However, some solicitors offer to work for free for some clients who may not be able to afford legal representation. This is called 'pro bono' work.

Why might you offer pro bono work?

Example 2: Housekeeper

You are a housekeeper on a children's ward in a hospital. You would need to make sure the hospital ward is clean and safe for patients.

But, as you are working around children who are often feeling sad or worried, you want to try and give the children some fun and excitement as you do your evening rounds.

Think of three things you could do to bring a smile to the faces of the children as you pass through their ward each evening?

Brainstorm ideas in your teams. Then select one player to present your ideas to the class.

The referee should award a point to the team whose ideas are most likely to make the children smile each evening.

Example 3: Social Worker

You are supporting 14-year-old Jack who hasn't been going to school and is hanging around with older children who have been encouraging him to drink alcohol.

You need to carry out a risk assessment so that you can ensure that Jack's circumstances are as safe as possible.

In your teams, think of five different risks that could affect Jack's safety.

Work in your team to identify five risks. Then select one player to read your list of possible risks out to the class.

The referee should award a point to the team which offers the most thoughtful and well-considered response.

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Work Ethic

Example 1: Prison Instructor

As a prison instructor, you need to understand what makes people employable.

Aside from academic qualifications, what other life skills and knowledge would you need to make sure the prisoners have developed before they leave prison to maximise their chances of getting a job?

Write a list of 10 things that you would help your inmates to learn and develop.

Work as a team to complete this challenge. Then select one player to present your list to the class.

The referee should award a point to the team which has produced the list of life skills and knowledge most likely to help an inmate get a job.

Example 2: Administrator

As an administrator, you would often have to work quickly and under pressure. You have been asked to do some sorting of files and have an urgent deadline.

Write the following 10 words in alphabetical order as quickly as you can.

The referee should award a point to the team which completes the task quickest.

meeting
database
office
computer
spreadsheet
email
manager
calculator
memo
letter

Example 3: Journalist

As a journalist, you would often work under immense pressure to meet a deadline.

Your editor has discovered that there is some space remaining in tomorrow's newspaper. But it goes to print in only 3 minutes!

Your challenge is to work as team to write a short article in 3 minutes before the paper goes to print!

Work as a team to complete the challenge. Then select one player to read your short story to the class.

The referee should award a point to the team which has created the most exciting and well-written news story.

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REAL WORLD EXPERIENCE

The fourth dimension in Panjango's "4D Learning" model is Real World Experience. While this is difficult to achieve in a classroom or online setting, we have tackled this by challenging young people with reflective exercises requiring them to debate and discuss how they would respond to and solve work-related problems or ethical dilemmas.

Many of these challenges also help with the development of skills, and there is therefore considerable crossover with the attributes outlined in our Skills Framework in this context.

Here are 15 examples of Experience challenges:

Example 1: Accountant

The owner of a small business wants you to help them minimise their tax bill. You aware of some tax avoidance schemes the business could exploit to pay less tax. Although the tax avoidance scheme is legal it is widely considered to be morally questionable.

Why might you advise the business owner against using such tax avoidance schemes?

Have a discussion with your team about this question. One player should then summarise the team's views to the class.

The referee should award a point to the team that provides the best response.

Example 2: Civil Engineer

You have been tasked with the design of a new dam. You have been told it is very important the dam can be built within budget. However, you know the budget you have been given is too small to build the dam safely.

How would you respond in this situation?

Have a discussion with your team about this question. One player should then summarise the team's views to the class.

The referee should award a point to the team that provides the best response.

Example 3: Architect

The local council has contracted you to design a brand new office building. The site they intend to use currently has a beautiful old building still standing on it.

The building is empty and unused and the council would rather knock it down and build something modern.

How could you persuade the council to refurbish the historic building rather than knocking it down?

Have a discussion about this scenario in your teams. Then select one player to summarise your response to the class.

The referee should award a point to the team that offers the most thoughtful and well-considered response.

Example 4: Electrician

You are advising a business about the costs they could save if they switch to energy efficient appliances.

The upfront cost to switch to energy efficient appliances will be around £2000. The business would then save around £400 a year on their electricity bills.

The chief executive, Mr Moneybags, is famously tight when it comes to money. He hates spending money.

How would you persuade Mr Moneybags it would be worth switching to energy efficient appliances?

Have a discussion about this scenario in your teams. Then select one player to act out how you would persuade Mr Moneybags to go energy efficient.

The referee should award a point to the most persuasive team.

Example 5: Civil Engineer

You have been tasked with the design of a new dam. You have been told it is very important the dam can be built within budget. However, you know the budget you have been given is too small to build the dam safely.

How would you respond in this situation?

Have a discussion with your team about this question. One player should then summarise the team's views to the class.

The referee should award a point to the team that provides the best response.

Example 6: Driver

You are a taxi driver waiting outside a train station when couple with suitcases rush into the back of your taxi. They say they've missed their train and if they don't get to the airport in 30 minutes then they'll miss their flight.

They offer to pay you double if you can get them to the airport on time but you know it's a 45 minute journey so this would involve you speeding.

How would you respond in this situation?

Have a discussion with your team about this question. One player should then summarise the team's views to the class.

The referee should award a point to the team that provides the most thoughtful response.

Example 7: Economist

The idea of basic income is the latest hot topic amongst economists and you have been invited to take part in a debate on the topic.

A basic income is cash payment given to all citizens, regardless of whether they are in work or not. It's not designed to replace work, but to help lift people out of poverty and give them extra financial security.

A figure of around £70 per week has been proposed by some British political parties.

In your teams, think of three reasons why a basic income may be a good idea, and three reasons why it may not.

Decide as a team whether you are for or against the introduction of a basic income. One player should then summarise the team's views to the class.

The referee should award a point to the team that offers the most intelligent and well-considered response.

Example 8: Fashion Designer

The fashion critics have slammed your latest collection. They say your design work is unimaginative and old-fashioned.

They are calling you a "dinosaur" of the fashion world and your reputation lies in tatters.

In this scenario, how would you pick yourself up and carry on with your fashion design work?

Have a discussion about this scenario in your teams. Then select one player to summarise your approach to the class.

The referee should award a point to the team which offers the most thoughtful and well-considered response.

Example 9: Food Scientist

You have received job offers from two different companies.

Company A produces food which is often high is fat, sugar and salt and they want you to help them promote the company as a healthy food company. They will pay you £50,000 per year.

Company B is a small, new start company that produces organic, locally sourced and healthy fruit drinks. They want you to help the company develop new products but can only pay you £30,000 per year.

Which job offer would you accept and why?

Have a discussion with your team about this question. Each team should then select one player to summarise your response to the class.

Example 10: Nuclear Engineer

You work for the world's largest oil company, Big Oil Inc. Your role is to help the company find new oil deposits in the ground.

You have found a huge oil deposit but it is located in the frozen Arctic.

The deposit could produce many billions of barrels of oil but you have concerns over whether it is right to start drilling for oil in the Arctic.

Why might you recommend that the company should not start drilling in the Arctic?

Have a discussion with your team about this question. Each team should then select one player to summarise your response to the class.

The referee should award a point to the team which offers the most thoughtful and well-considered response.

Example 11: Transport Manager

You are working on the High Speed 2 rail project in the UK. The likely cost of this high speed railway between London and Leeds is around £55bn. That's a lot of money!

Can you think of any other ways to improve the transport infrastructure of the country that might benefit more people with the same amount of money?

Have a discussion with your team about this challenge. Each team should then select one player to present your ideas to the class.

The referee should award a point to the team which offers the most creative and well-considered ideas.

Example 12: Security Guard

You are working as a security guard in a prison. Your role involves you regularly interacting with the prisoners and, as a result, you learn about their personality and character.

One prisoner, Jim Crook, has always shown himself to well-behaved and respectful towards the guards and his fellow prisoners. He often talks to you about his family and can't wait to be released so he can be with them again.

One day, Jim acts out of character and starts a fight with another prisoner. The prison operates a 'zero tolerance' policy to fighting and this incident could result in Jim's release date being put back. You are the only security guard to witness the fight so you have to decide whether to report the incident to your superior.

In your teams, discuss how you would respond in this scenario. Each team should then select one player to summarise your response. The referee should then award a point to the team which provides the most well considered and thoughtful response.

Example 13: Artist

Over the past few years, graffiti art has become an increasingly common sight on our streets. Graffiti art is proper art, rather than mindless tagging etc, but is often created without permission of the building's owner.

The local council has organised a debate to discuss the pros and cons of graffiti art to help them decide whether they should embrace or eradicate it on their streets. You are keen to attend the debate and want to prepare by considering both sides of the argument.

Can you think of three arguments for and three arguments against graffiti art?

Have a discussion with your team about this question. Then select one player to summarise your pros and cons to the class.

The referee should award a point to the team which offers the most thoughtful and well-considered response.

Example 14: Antiques Dealer

You are hunting for bargain antiques at a car boot sale. An old gentleman seems to have all of his worldly possessions on his stall. You can tell the man is desperate for cash as he is selling his old war medals.

But one of his paintings catches your eye. You know straight away that it is worth thousands but he's only selling it for £10.

How would you respond it this scenario?

Have a discussion about this scenario in your team. Then select one player to summarise your response to the class.

The referee should award a point to the team which offers the most thoughtful and well-considered response.

Example 15: Photographer

A newspaper editor asks you to follow a famous person and take photos of them and their family while they are on holiday.

Why might you feel uncomfortable about taking on this assignment?

Have a discussion with your group about this question. One player should then summarise the team's views to the class.

The referee should award a point to the team that provides the best response.

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OTHER GAMES & EXERCISES

This area provides some suggestions for educators in delivering fun games and activities that give learning real world context and help young people to think about their future as they develop a range of important skills.

Quick Games & Exercises

What's My Career?

Divide the class into pairs. On a sticky note, each pupil writes the name of a career and, without revealing it, sticks it to their opponent's forehead. The pupils then take it in turns to ask questions about their mystery career. The winner is the first to correctly guess their career.

To make the challenge more difficult you could restrict the pupils to 'Yes' or 'No' answers to the questions or you could expand the career selection to also include careers which are not on the Career Cards.

A variation to this game is '20 Questions' which can be played in pairs, groups or as a whole class. One pupil is chosen to be the answerer. That pupil chooses a career but does not reveal this to the others. All other players are questioners. The questioners each take turns asking a question which can be answered with a simple "Yes" or "No". Lying is not allowed, as it would ruin the game. If a questioner correctly guesses the mystery career, that questioner wins and becomes the answerer for the next round. If 20 questions are asked without a correct guess, then the answerer has stumped the questioners and gets to be the answerer for another round.

Career Hangman

Can be played in pairs, groups or as a whole class activity. The word to guess is represented by a row of dashes and the pupil must declare the category of the word at the start of the game. Categories could include careers, places of work, pieces of equipment or skills needed.

Some teachers may prefer not to use the image of a hanging man, so a common alternative is to draw an apple tree with ten apples, crossing out the apples as the guesses are used up.

Career Charades

Working in pairs, groups or as a whole class, a pupil selects a secret career. The pupil then mimes actions for the other players to guess. Hand signals can be used to indicate how many letters a word may contain. The cupping of the ear gesture may also be used to indicate the word 'sounds like' what they are about to mime. Game variations could include miming places of work, equipment or skills.

Career Articulate

Working in groups, a pupil selects a career without telling the rest of the group. The pupil then gives the group brief descriptions of the place of work, equipment, skills and/or activities relating to that career. The first player to guess the correct career then takes a turn at articulating a career.

Career Bluff

This exercise can be carried out in pairs, groups or as a whole class activity. A pupil says one true and two false statements about a particular career. The other players then have to guess which one is correct. The player who guesses correctly then takes a turn to be the bluffer.

Alternatively you could use objects or pictures of equipment with pupils stating three careers in which the equipment may be used. The other players would then have to try and correctly identify the correct career in which it is used.

Creative Development and Role Play

Creative Writing

Many of the games detailed above, and the challenges in Panjango, can provide settings for creative writing and could easily be extended to storyboarding an opening setting for a piece of fiction. Characters can be created out of roles given to players in, for example, Career Charades or What's My Career? Description of background and lifestyle can be deduced or created based on the information and challenges within Panjango or the income and lifestyle that one imagines might go with a given job.

The pupils could look at their own environment and consider public buildings or urban and rural environments from the perspective of work and careers. They could consider how work is shaping the immediate environment around the school or the street on which they live. Discussions could lead to geography work or a study of a particular locale near the school and the historical/social/demographic changes that have occurred due to development in careers and work patterns.

Workplace Detectives

The teacher or a pupil names a random place of work and the pupils then brainstorm careers that belong in that workplace. As a challenge the class could try to find the workplace with the highest number of associated careers. A discussion could also be held about how the careers work together within a workplace.

Variations could include the teacher or a pupil naming or drawing items that belong in a place of work with the rest of the group/class discussing who might use the object and what workplace it might belong in.

This exercise can easily be developed into creative writing work. For example, pupils could write about encounters between a surgeon, a paramedic and a cleaner, or could develop a storyboard of a person's journey through the hospital and all the different people who they meet on that journey.

Job Interviews

Select several candidates and an interview panel. Run a drama exercise where the panel interview candidates for a pre-selected job. Prior to the interview, the candidates and interview panel should research the job so they are prepared for the interview. In particular they should make sure they have an understanding of:

- the skills are needed for the job
- what tasks they would do in the job
- who they may work with in their job
- why they think they would be good at the job

The interview panel should also write a list of questions to ask each candidate in turn. Once the interviews have been completed the panel discusses which candidate would be best for the job and then gives brief feedback (positive) feedback to the candidates. If the drama takes place in front of the rest of the class rather than in groups then the class could be asked to vote on which candidate they thought performed best in the interview.

Dream Teams

This exercise involves working in small groups. Each group must select a product they wish to manufacture or a service they wish to deliver. The group must then decide on a job role for each team member which will be useful in manufacturing the product / delivering the service.

Once the 'dream team' has been assembled, the group should then give a short presentation to the class possibly considering:

- why they selected their 'dream team' roles
- how the team will work together to manufacture the product / deliver the service
- which role would be the leader in the team and why
- what other job roles were considered but not included
-

Variations to the exercise could include creating a fictitious product or service or using fictitious job roles. You could provide them with a theme, e.g. space exploration or time travel, to help them come up with ideas.

Further follow-on work could include designing a marketing campaign, design and construction of product packaging or customer survey work involving other year groups or at home.

This activity encourages discussion and application of teamwork and cooperation. All skills are valid in the process of production. This is potentially quite difficult but can be made easier by being run as a whole class activity with the teacher making the initial choices.

To extend the activity, pupils could write their own job description and design an advert to attract people to that particular career. I.T. could also be used, for example, using PowerPoint to prepare the presentation or demonstrate the production / service delivery process.

Desert Island Survival

Scenario: 10 professionals have crash landed on a desert island and have caught the terrible disease turns-you-into-a-chicken-itis. You only have enough vaccines to save six of the survivors from turning into a chicken! Which of the survivors should receive a vaccine? Without hope of rescue, who will be most useful in helping the group survive and maybe even escape from the island?

After the class has been presented with the scenario a list of ten professionals should be written on the board. An example list is as follows, however, feel free to amend as you see fit:

- Blacksmith
- Chef
- Company Director
- Countryside Ranger
- Engineer
- Nurse
- Pilot
- Police Officer
- Politician
- Teacher

Select 10 pupils to take on the role of one of the professionals. They must then make a short presentation to the rest of the class as to why they deserve to receive a vaccine.

Once all the presentations have been delivered you should lead the class in a discussion about the useful skills each role may bring to the group (including how skills may be adapted to the scenario). A vote is then taken to determine which of the 10 professionals receive the six vaccines.

This exercise, of building a social group based on need, can be used as a stimulus for further discussion into PHSE. In particular, it can be a useful exercise to discuss the concept of stereotyping. Furthermore, it could be an excellent starting point for creative writing work and further investigation into the skills and attributes of different professionals.

My Dream Career

Each pupil picks their dream career. You may want to consider restricting the selection of jobs to not include, for example, footballer or pop star. An open debate in class follows where participants have the chance to argue why their chosen career is the best one to have. They may be given the opportunity to give a short presentation about their chosen career. You may want to help the class come up with a list of requirements which are important when choosing a career. These could include:

- salary
- job satisfaction
- hours worked
- physical effort
- difficulty in securing employment
- perks e.g. travel, working from home etc
- social impact

At the end of the discussion, the class could vote on which career is best although it is important to say that it will always depend on an individual's own preferences. Alternatively, each career could be scored according to the agreed criteria and then the 'dream career' could be worked out mathematically. Data handling exercises could also then be carried using the data generated. A discussion could also be held on why some jobs are paid more than others, and whether this is fair.

Write a Letter to an Employer

Each pupil selects a career. They then write a letter to an employer who has a vacancy for this position. As part of the creative writing exercise they would need to consider, for example, what type of company they are writing to, why they want the job and why they would be good at the job.

You could print off some actual job vacancies from online or perhaps build a link with a local company so the pupils can investigate the jobs that exist within a real business.

Links across the Curriculum

Literacy, numeracy and science challenges feature extensively within Panjango, but here are some more suggested exercises for careers-themed activities across other subjects of the curriculum.

Technology

1. Research tools and equipment used by particular careers and find out how technology has changed the work of people in those careers.
2. Imagine what the jobs would be like if they existed a hundred years ago (or a hundred years in the future).
3. Examine whether such careers would be possible without technological change.

Art and Design

1. Create marketing materials for products e.g. a billboard poster, information leaflet or TV advert.
2. Design a new product and its packaging or re-design an existing product for people to use a hundred years in the future.
3. Create a job advert or an advert promoting a company, perhaps following on from the ‘My Dream Career’ exercise.

Geography

1. Work and the urban environment – investigate how work influences the kinds of buildings we find in an area or how the careers of the pupil’s parents influence housing, transport and urban infrastructure in their community.
2. Contrast work undertaken in varying environments e.g. rural or agricultural settings in Africa with urban environments in Africa.
3. Run a debate where jobs and work patterns come into conflict with each other e.g. a commercial tourist development in a fishing community, or an industrial development planned to take place in rural Britain.

History

1. Examine how the changing role of work and changing careers built the urban environment around the school? Access online documentary and archive materials to carry out a field study.
2. Contrast contemporary work with jobs that might have been done in an area 100 or 1000 years ago.

3. Use an artefact from a job of the past and play a ‘Career Bluff’ game to explore new words and historical careers.

Music

1. Create pieces of music, or a sound collage, to convey the different soundscapes and aural environments associated with different rural and urban environments, jobs or activities. Consider taking field recordings to inspire the music creation.
2. Research the careers that may exist specifically within the music industry and examine the process of producing a chart hit.
3. Research classical and contemporary composers who have created pastoral or industrial pieces of music.

All the above activities will enable the use of I.C.T to enhance presentation and to allow more in-depth research.

We are sure that teachers will be able to think of many more ways to use the elements of Panjango and embed the learning outcomes across the curriculum.

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