



# Derwent Vale Primary and Nursery School



## \*Science skills progression document.

SLS Science Planning & Assessment Board	Knowledge & Understanding			Working Scientifically					
	Explaining Science		Classification	Designing Experiments		Data, Tables & Graphs	Making Conclusions		
	EYFS -----> KS1		Secure	LKS2 -----> Secure		UKS2 -----> Secure		Year 6	Year 6+
	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 6+	
Explaining Science	I remember simple science facts within an activity	I remember simple science facts within a topic	I remember a range of <b>science facts</b> within a topic	I am using pre-learning to build connected knowledge	I <b>connect</b> knowledge within a topic & from <b>pre-learning</b>	I connect knowledge between topics & from pre-learning	I <b>connect</b> knowledge across science & the <b>wider curriculum</b>	I connect knowledge fluently across science & curriculum	
	I use science words during an activity	I use & remember relevant science words during activity	I use & <b>remember</b> science words over time (short term)	I remember science words I have used before (longer term)	I <b>remember &amp; use</b> science words correctly (apply)	I begin to use complex science words correctly	I use <b>complex</b> science words correctly ( <b>fluency</b> )	I use complex science words accurately & fluently	
	I describe what is happening using words & actions	I describe what is happening using science	I use <b>science</b> to describe & <b>recall</b> what I have seen	I begin to use science models to describe (sequence)	I use <b>science models</b> to <b>describe</b> (what, where)	I use science models to describe & begin to explain (why, how)	I use <b>science models</b> to describe & <b>explain</b> (why, how, logical)	I begin to apply science models to explain new events	
	I match appropriate pictures & words to label diagrams	I add science word labels to diagrams	I <b>add science labels</b> & information (help) to diagrams	I add science labels & information to diagrams	I <b>annotate</b> diagrams to help describe & explain	I begin to create & annotate my own 2D/3D diagrams	I create & annotate my <b>own</b> 2D/3D <b>diagrams</b>	I create & annotate my own complex 2D/3D diagrams	
	I begin to use science facts to explain my answer	I select science facts to use in an answer	I <b>select</b> relevant science facts to use in an answer	I link relevant facts together in an answer	I <b>'cluster'</b> related facts together into points (recalled)	I select & prioritise facts to create an argument/answer	I present a <b>clear &amp; logical</b> argument / answer	I present an extended & logical argument / answer	
Classification	I sort using pictures or instructions	I sort using simple yes/no statements	I use simple spider keys with <b>obvious differences</b>	I use large spider keys with obvious differences	I use a range of spider keys with <b>fine differences</b>	I construct spider & use number keys	I <b>construct</b> both spider & number keys	I construct both spider & number keys (complex)	
	I group by familiar features (size, colour, shape, etc)	I group by difference or similarity	I <b>group</b> by difference, similarity or change	I create groups for sorting (create criteria)	I <b>create</b> appropriate groups for sorting (create criteria)	I group & sub-group by easily observation (create criteria)	I group & <b>sub-group</b> by fine observation (create criteria)	I group & re-group using combinations of criteria	
	I use my senses to identify properties of materials	I link properties of materials to an application (help)	I <b>link properties</b> of materials to an application	I combine properties required for an application (help)	I <b>describe combined properties</b> required for an application	I explain how properties suit an application	I <b>explain the science</b> behind a range of properties	I describe how material properties can change	

**Explaining Science**

**Classification**



	Observed Variables Categoric Data (words) - Charts			Design	Measured Variables Continuous Data (numbers) - Graphs			
Prediction	I use experience to suggest what might happen next	I suggest what might happen in an investigation	I suggest what might happen (simple prediction)	I predict cause & effect (science prediction)	I predict a trend (relationship prediction)	I use K&U to explain my relationship	I reason K&U to make a hypothesis (relationship)	I reason K&U to generate a testable hypothesis
Equipment	I use a range of everyday items to investigate	I use a limited range of science equipment correctly (help)	I use a range of science equipment correctly	I select suitable equipment for the task	I select & use suitable equipment for the task	I select equipment with the right scale for the task (help)	I select & use equipment with right scale for the task	I select & use equipment for increased precision
	I begin to know what it means to investigate safely	I notice risk (help) & can list some common dangers	I notice risk in my investigation & know common dangers	I predict obvious risk & act on safety suggestions	I predict obvious risk & work safely (mostly)	I begin to plan to minimise risk & work safely (consistently)	I plan to minimise risk & describe safe use of equipment	I predict & control a range of risks independently
Design	I use experience to suggest an idea to investigate	I suggest an idea to investigate & ask questions	I suggest an idea to investigate from observations	I identify cause & effect in my investigation	I plan investigations by selecting variables to change	I plan investigations & ensure controlled variables kept same	I plan reliable investigations (use of variable terminology)	I plan a reliable investigations with increased precision
	I'm aware that variables change in an investigation	I begin to identify the cause variable in an investigation	I identify the cause variable correctly (label & range)	I suggest a suitable data range for a cause variable	I suggest a data range & interval for a cause variable	I suggest a data range, interval & sufficient readings	I plan to collect repeat readings (>3) & calculate mean	I plan to reduce error by care of measurement
	I follow short demo & spoken instruction with multiple parts	I follow short demo, spoken & picture instructions	I follow short spoken & written instructions in order	I follow written instructions & write a simple method	I design & write a simple ordered method (from plan)	I design & write an ordered method (controls variables)	I design & write an ordered reliable method (repeats)	I design & write a reliable method (repeats; precision)



**Researching & communicating:**  
Use secondary sources to find & organise relevant information



**Observing & measuring over time:**  
Over short (seconds / minutes) or long (days / months) periods of time



**Comparative & Fair testing:**  
One variable changed; others are kept the same. Use words or numbers



**Identification & classification:**  
Sorting into groups based upon criteria



**Finding patterns:**  
Patterns emerge from observation



**Problem solving:**  
Applying science knowledge to find answers

WS Skills are taught & practised through a range of Enquiry Type investigation

# Designing Experiments



**Data**

I position numbers on a number track to 10 & beyond  
 I position numbers on a number track to 20 & beyond  
 I measure **labelled** divisions on a number line (inc. in steps)  
 I measure unlabelled divisions on a number line (+ve values)  
 I measure **unmarked** divisions on a number line (+ve values)  
 I measure divisions on a number line past zero (-ve values)  
 I **scale up/down** a number line (axis) & decide on limits  
 I scale up/down a number line (axis) confidently

I use non-standard units to measure & compare  
 I measure in non-standard & compare e.g. heavier/lighter  
 I measure **standard units** (inc. length, mass, capacity)  
 I measure/compare values in standard units  
 I **measure/convert** values in standard units (inc. time)  
 I measure/convert values in standard units (inc. area)  
 I **measure/calculate** with standard units (inc. area & volume)  
 I calculate compound units (e.g. acceleration)

**Tables**

I use a simple table by recording in pictures & words  
 I use a simple table by recording in words and numbers  
 I **use** a simple table recording in words & numbers (inc. tally)  
 I use a frame to construct a simple table of results  
 I **construct a simple table** to compare cause & effect  
 I use a frame to construct a complex table of results  
 I **construct a complex table** to show repeated data  
 I construct complex tables to include calculations

**Graphs**

I add to pictograms with help  
 I use a frame to add to pictograms & block charts  
 I **construct** simple pictograms & **block charts**  
 I use a frame to construct a bar chart (help)  
 I **construct bar charts** correctly (inc. numerical axis)  
 I use a frame to construct a graph & can scale axes (help)  
 I **construct graphs** & can scale at least one axis independently  
 I construct graphs & can scale each axis confidently

I represent groups using resources, marks & numbers  
 I add to block charts by counting up  
 I **use scale** on block chart (coordinate) to add correct blocks  
 I draw bars on a bar chart (one axis coordinate)  
 I **plot coordinates** on a graph in the first quadrant  
 I join plotted coordinates with straight lines  
 I plot mean values & draw a **trend line** for linear data  
 I plot mean values & draw a trend line for non-linear data

I compare groups using comparative language

	EYFS -----> KS1 -----> Secure			LKS2 -----> Secure		UKS2 -----> Secure ----->		
	EYFS	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 6+
Patterns	I recognise, create & describe simple patterns (e.g. size) -----	I recognise, create & describe simple number patterns	I describe simple features & patterns in data & charts	I describe simple patterns in data, charts & graphs	I describe simple patterns, trends & relationships in data	I describe patterns, trends & relationships in data	I describe changing patterns, trends & relationships	I compare changing patterns, trends & relationships
	I begin to use 'more or less' to compare observations	I use 'more or less' to compare numbers	I see obvious differences in sets of numbers	I see subtle differences in sets of numbers	I see differences (error) in repeated data	I spot anomalous data that doesn't fit the pattern	I spot anomalous data & explain from the method	I deal with anomalous data to increase reliability
Conclusions	I talk about changes through my senses during activities	I describe the changes that are happening	I describe the changes that have happened	I describe my results by linking cause & effect	I describe trends & begin to use science models to explain	I use data in my conclusion & science models to explain	I use primary & secondary data in my conclusions	I use a range of data in conclusions to support validity
	I explore 'what if ...' questions through talk & play	I explore different ways to do things through play	I suggest a different way to do things with help	I suggest improvements to my method	I suggest sensible improvements to my method	I identify strengths & weaknesses & improvements	I suggest limitations (data) & practical improvements	I suggest limitations (use data) & justify improvements

## Working Scientifically - word lists

### KS1

**Axis** = reference line drawn on a graph to show the range of data for each variable (shows values)

**Block chart** = visual tool to show data/counts as bars built up by adding component blocks. Used to compare data visually

**Cause** = the variable we chose to change in an investigation

**Data** = a measured or counted outcome for a variable (numbers)

**Effect** = the variable that changes when we change the cause

**Experiment** = investigation that looks for a link between variables (fair or comparative test)

**Observation** = sensed outcome for a variable (described in words)

**Pictogram** = chart that uses pictures to represent data

**Prediction** = suggests what might happen based upon prior knowledge or experience (not a guess)

**Results table** = way of presenting data from an investigation

**Risk** = dangers when doing an investigation, using equipment or working in an area

**Standard units** = a quantity of a variable that is used as a standard measure (e.g. litre, meter, gram, etc)

**Variable** = a factor that can change

### LKS2 (plus KS1)

**Bar chart/graph** = visual tool that uses bars to compare discrete data

**Comparative test** = fair test comparing discrete differences

**Conclusion** = the answer you give to a question (based upon data)

**Continuous data** = values are numbers (result from counting/measuring)

**Coordinate** = used to plot data (x/y) on a graph

**Data interval** = numerical gap between data points for a variable

**Data point** = a coordinate for a variable

**Data range** = maximum & minimum values for a variable

**Discrete data** = values are distinct/separate (e.g. male/female; counts)

**Fair test** = an investigation where only one variable is changed (cause); all others are kept the same and at their best value

**Line graph** = visual tool that shows a relationship trend between two continuous variables (it is essentially a scatter graph)

**Method** = ordered sequence of steps taken during an investigation. It can be written or in diagram form

**Prediction (correlation/relationship)** = describes the expected trend for two variables (cause & effect) that are linked

**Prediction (scientific/causal)** = suggestion as to what might happen based upon prior knowledge, experience or observation. Links the cause with the predicted effect. Does not have to describe the trend

**Spider key** = branching classification key where each branch has a yes/no choice (dichotomous key) leading to further choices

**Trend** = the outcome when two variables (cause & effect) are linked

### UKS2 (plus KS1/LKS2)

**Anomalous data** = data that does not fit a pattern

**Controlled variable** = variables kept at the same value so they do not influence the dependent variable in a fair test

## Making Conclusions

**Data set** = values for repeated data

**Data spread** = variation of the data away from a mean (often due to imprecise measuring or when the controlled variable have not been kept the same)

**Dependent variable** = changed (effect) as a result of changing another. This is observed or measured and demonstrates a relationship in a fair test

**Hypothesis** = a reasoned prediction based upon theory, experience or direct observation

**Independent variable** = chosen variable (cause) changed in a fair test.

**Mean** = 'average' value from a data set

**Number key** = classification key that is a written, condensed version of a spider key

**Precision** = how similar your repeated data is (good technique & equipment choice)

**Primary data** = your experimental data or observations from an investigation

**Reliability** = if your data can be repeated (i.e. no error). Can be improved through collecting repeated values and calculating a mean

**Results table (complex)** = Table that contains multiple columns to show repeated data, calculations or a variety of features of a variable

**Risk assessment** = formal assessment of risk leading to improved safety recommendations or change in practice

**Secondary data** = researched data or observations. It can also be data gathered from others doing a similar experiment. Used to compare/support

**Trend line** = line drawn roughly between coordinates to show the trend (does not have to go through all data points)

**Valid data** = reliable, accurate & no bias or error (we are measuring what is expected)