

Glasgow Counts in our Playrooms

Sorting, Matching and Handling Data



LPA Year 2



Aims



To discuss what data handling is



To explore the GCIP framework and highlight digital enhancements ???????



To consider developmental stages and progression in data handling



To explore the key concepts of data handling



To plan a learning story and next steps

Reflection



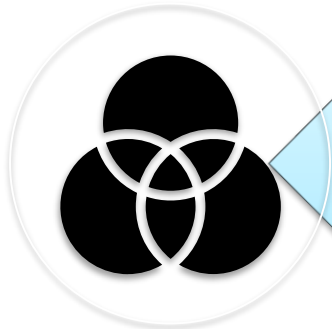
- What is handling data?
- How do you we represent data?
- How do we experience collecting data every day?
- What opportunities do you provide for handling data in your establishment?



What is Handling Data?



“Handling data is a crucial aspect of mathematics which relates to collecting, representing and analysing data in order to solve a problem or answer a question.”



“...to be able to make sense of any data, it is important to be able to sort and classify the data.”

Smith and Price (2018);
Mathematics in Early Years Education

How do we experience collecting data everyday?

Tidying up – sorting toys and play recourses into storage containers

Block play – returning blocks to correct shelving

Home corner – returning platers and crockery to cupboards

Register – identifying how many children are present each day

Meal times – identifying who has had snack/lunch

Shopping – creating list of what we need to buy

Smith and Price (2018);
Mathematics in Early Years Education



Glasgow Counts Framework



Properties of 2D and 3D Shape

Early Level E's and O's

I can collect objects and ask questions to gather information, organising and displaying my findings in different ways.

MNU 0-20a

I can match objects, and sort using my own and others' criteria, sharing my ideas with others.

MNU 0-20b

I can use the signs and charts around me for information, helping me plan and make choices and decisions in my daily life.

MNU 0-20c





<p>Ideas of Chance & Uncertainty</p>	<p>No experiences at this level</p>	<p>No experiences at this level</p>		
<p>Data Handling and Analysis</p>	<p>Uses knowledge of colour, shape, size and other properties to match and sort items in a variety of different ways</p> <p>Collects and organises objects for a specific purpose</p> <p>Asks simple questions to collect data for a specific purpose</p> <p>Contributes to a concrete or pictorial display where one object or drawing represents on data value, using digital technologies as appropriate</p> <p>With support interprets simple graphs, charts and signs and demonstrates how they support planning, choices and decision making</p> <p>With support applies counting skills to ask an answer questions and makes relevant choices and decisions based on the data</p>	<p>Apply counting skills to ask and answer different questions and make relevant choices and decisions based on the data.</p>	<p>Contribute to concrete or pictorial displays where one object or drawing represents one data value, using digital technologies as appropriate.</p>	<p>Interpret simple graphs, charts and signs and demonstrate how they support planning, choices and decision making.</p>
<p>Impact on the World</p>	<p>There are no experiences and outcomes at early level.</p>	<p>There are no experiences and outcomes at early level.</p>		





Money	Handles money and recognises a few coins up to the value of £2 through play and in real life and relevant contexts (using real and plastic money)			Identifies (names) 1p, 2p, 5p and 10p coins and pays the exact value for items to 10p e.g. if the price is 5p; can use a 5p coin to pay for it		
	Time	Links daily routines and personal events to time sequences and begins to use appropriate language including before, after, later, earlier	Recognises and where appropriate engages with everyday devices used to measure or display time e.g. clocks, calendars, sand timers and visual timetables	Identifies (names) the days of the week in sequence	Recognises the months of the year and describes features of the four seasons in relevant contexts	
Measurement	Length	Shares relevant experiences in which measurements of lengths, heights, mass and capacities are used, for example, in baking and other meaningful contexts		Describes and compares common objects' lengths, heights, mass and capacities using everyday language, including long/longer, short/shorter, tall/taller, heavy/heavier, light/lighter, more/less/same		Estimates, then measures, the length, height, mass and capacity of common objects using a range of appropriate non-standard units
	Mass					
	Capacity					
Patterns & Relationships	Copies simple patterns involving objects, shapes and numbers		Continues simple patterns involving objects, shapes and numbers		Creates simple patterns involving objects, shapes and numbers	
Shape	Recognise and describe common 2D shapes and 3D objects by attribute e.g. straight, round, flat and curved			Sort common 2D shapes and 3D objects according to attribute e.g. shape, colour, size		
Angles, Symmetry and Transformation	Correctly uses some of the language of position e.g. in front, behind, above, below	Begins to correctly use some of the language of direction e.g. left right, forwards and backwards to solve simple problems in relevant contexts		Identifies and describes basic symmetrical pictures with one line of symmetry		Creates basic symmetrical pictures with one line of symmetry
Data Handling and Analysis	Uses knowledge of colour, shape, size and other properties to match and sort items in a variety of different ways	Collects and organises objects for a specific purpose	Asks simple questions to collect data for a specific purpose	Contributes to a concrete or pictorial display where one object or drawing represents on data value, using digital technologies as appropriate	With support interprets simple graphs, charts and signs and demonstrates how they support planning, choices and decision making	With support applies counting skills to ask and answer questions. Makes relevant choices and decisions based on the data

Mathematical Language : count, sort, group, set, list, same, different, table, data, information, graph, tally marks, popular, altogether, most, least

CfE [MNU 0-20a](#)
[MNU0-20b](#)

Strategies and Approaches

Sorting, matching and data handling are integral to the daily routines and life of the nursery and practitioners should look for natural opportunities to build the children's skills and understanding. Children should take increasing levels of responsibility for organising resources, making choices and decisions, posing questions to be answered and collecting and displaying data.

Sorting

- **Attributes:** Sorting and grouping based on size, shape, colour, pattern, habitat, texture; initially one attribute and then two. E.g. red and circular.
- **Tidying up:** organising resources into their correct boxes, baskets and containers, sets into correct places e.g. wild animals, farm animals
- **Home corner:** matching items that go together e.g. plates, forks, knives and napkins sitting in front of the chair and the kitchen table
- **Shop or similar:** organising the items on the shelf, money in till.

Matching

- **Items based on attributes** e.g. size, shape, colour, pattern, habitat, texture
- **Pairs of items** that go together: socks, shoes, animal baby and parent

Data Handling

- **Daily data:** on attendance, favourite lunch that day, most popular breakfast, how many birds have been at the bird feeder, transport to nursery
- **Favourites/most common/most popular data:** nursery rhyme, story, song, food, birthdays etc.

Digital Learning:

[Resources](#)

Questions to Enable Higher Order Thinking Skills

- Can you tell me something about your...?
- Can you find something the same shape/size/colour as...
- Why are these items the same? Different?
- Why are all these items in your set/not in your set?
- Which set has the fewest/most? How do you know?
- Can you match these objects?
- Why have you matched them like that?
- Which set has the most/fewest items? How can we check?
- What is the favourite nursery rhyme in our nursery?
- How can we find out?
- How will we show other people our data?
- What is the most common/popular story?
- Is your favourite food the most popular?

Barriers to Learning

- Pupils who have difficulty in understanding and handling data skills usually have gaps in their general mathematics understanding that, in turn, can prevent them developing an understanding within handling data activities. Problems may be due to:
 - poor calculation skills;
 - lack of strategies or alternative approaches;
 - data not in a meaningful context for them;
 - not making connections with everyday examples

On Track at Transition Statement

- With support applies counting skills to ask and answer questions and makes relevant choices and decisions based on the data
- With support interprets simple graphs, charts and signs and demonstrates how they support planning, choices and decision making

Resources – Data Handling and Analysis

Common Learning Resources

- Labelled boxes, baskets and containers with sets
- **Home corner:** plates, forks, knives, napkins
- **Imaginative role play area** with resources to organise
- **Matching Items/photographs based on attributes e.g.** size, shape, colour, pattern, habitat, texture
- **Pairs of items** : socks, shoes, animal baby and parent
- **Favourites/most common/most popular data:** nursery rhyme, story, song, food, birthdays etc.
- **Daily data displayed:** on attendance, favourite lunch that day, most popular breakfast, how many birds have been at the bird feeder, transport to nursery



Online Resources



Nrich Activity – Sticky Data

<https://nrich.maths.org/7687/note>

Stories/Books

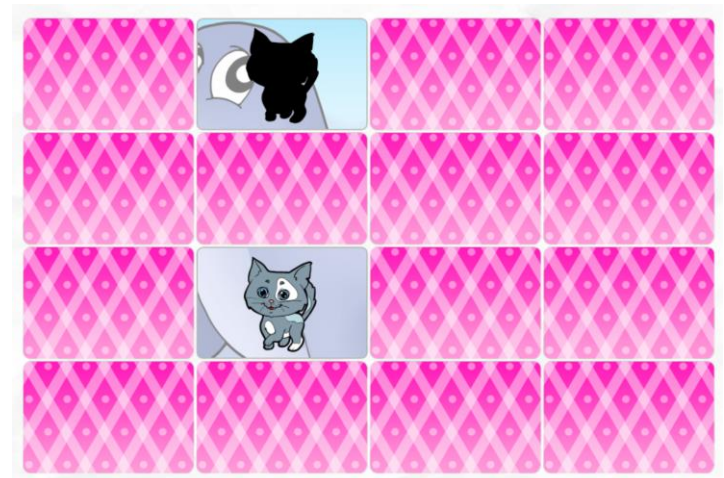
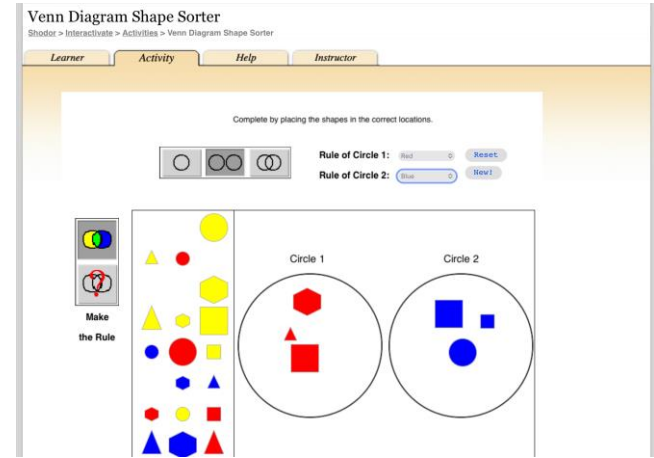
- *Above and Below* by Patricia Hegarty and Hanako Clulow
- *We are going on a Bear Hunt* by Michael Rosen
- *Don't forget the Bacon* by Pat Hutchins
- *The Bouncing Ball* by Deborah Kelly
- *Up and Down* by Britta Teckentrup
- *Rosies Walk* by Pat Hutchins

Digital Enhancements





Digital Literacy	Using digital products and services in a variety of contexts to achieve a purposeful outcome	Recognises different types of digital technology	Uses digital technologies in a responsible way with appropriate care	Identifies different applications and programs by icon	Logs on to devices with a password/ passcode	Opens and closes a pre-saved file	Identifies and consistently uses the close icon
	Searching, processing and managing information responsibly	Identifies and uses images and key words when searching for specific information		Demonstrates an understanding of how information can be found on a website (text, audio, images, video)		Understands they should not use materials that belong to others without permission	
	Cyber resilience and internet safety	Demonstrates understanding of appropriate behaviour and language in the digital environment	Some awareness of what to do and who to ask for help if something inappropriate happens while using a device		Identifies where passwords and passcodes are used in school and at home		Understands the importance of having passwords and passcodes
Computing Science	Understanding the world through computational thinking	Classifies objects, and groups using simple categories	Identifies similarities and differences between objects	Begins to identify patterns (objects and information)		Identifies beginning and end of an everyday process and recognises there are steps in between	Can give a set of instructions or directions in correct sequence
	Understanding and analysing computing technology	Understands that computers follow a process and need precise instructions	Follows a simple set of instructions using visual representation (e.g. arrows)	Understands that devices can be controlled and respond to commands	Predicts what a device (or person) will do when given a simple set of instructions	Follows and designs simple algorithms for a programmable device (or person) to carry out a task (e.g. directions to a goal)	Identifies computing devices and everyday technology in the world around them and the impact it has on their daily life
	Designing, building and testing computing solutions	Uses directional language (e.g. forwards, backwards, turn)		Identifies and corrects errors in a simple set of instructions or algorithm			Uses key language of computational thinking



Developmental Stages



Realising the Ambition

When I am a baby...

- Provide a range of richly illustrated books for me. Discuss the illustrations with me using language such as bigger, smaller, up, down, under, over.
- Involve me in simple counting songs with repetition of rhyme and rhythm.
- Encourage me to notice how numbers are evident in my environment.
- Give me time and space to explore toys and materials from different angles and move around freely to investigate my surroundings in terms of position and how my body works.
- Water and sand play are important for me, model pouring and measuring for me to experiment with.
- Provide materials such as paint and clay for me to explore, discussing with me categorising concepts such as hard, soft, wet, dry.
- Encourage me to sort and recognise and make patterns, supporting me to notice differences.
- Encourage my awareness of shape within natural contexts and environments.
- Enable me to play outdoors every day which includes discussing, for example, how the wind blows, the features of natural materials, exploring the textures, weight and size of items such as stones, twigs and plants.

When I am a toddler...

- Provide richly illustrated books with representations of number, shape and pattern to support conversations with me around these concepts.
- Sing and recite counting songs and rhymes with me, linking to visual representations using rhyme and rhythm.
- Encourage me to notice and use numbers as I explore my environment.
- Encourage me to have fun and play with numbers; investigating and experimenting with quantity, through comparing and contrasting a variety of objects using mathematical language such as less than, more than, same as.
- Continue to give time and space for me to explore toys and materials from different angles.
- Encourage me to move around freely to investigate my surroundings in terms of position and how my body works.
- Ensure my water and sand play is developing more specific language around pouring, measuring, volume, and capacity.
- Provide a variety of materials for me to explore, discussing with me categorising and sorting concepts such as hard, soft, wet and dry.
- Encourage me to sorting and play with patterns, supporting me to identify the characteristics of different objects.
- Encourage me to identify and explore shape within natural contexts and environments.
- Enable daily outdoor play which encourages me to explore natural materials through movement and to gain an understanding of textures, weights and sizes of items.



When I am a young child...

- Continue to provide me with richly illustrated story books with representations of number, shape and pattern to support conversations around these concepts.
- Continue to sing and recite counting songs and rhymes linking to visual representations of numbers that involve counting, ordering and recognising number.
- Encourage me to notice how numbers are evident in my environment and to enjoy using and writing numbers for a purpose.
- Continue to encourage me to play with numbers, having fun investigating and experimenting with quantity, through comparing and contrasting a variety of objects using mathematical language such as less than, more than, same as.
- Support my understanding and use of positional language within everyday experiences and through activities such as role-play, board games, digital technologies and programmable toys.
- Continue to include water and sand play to encourage me to explore, experiment, test and extend ideas developing more specific language and understanding around pouring, measuring, volume, and capacity.
- Provide a variety of materials which encourage my reasoning through experimentation, trial and error and prediction based on my developing understanding of mathematical concepts.
- Encourage me to create my own patterns and sets of objects, identifying and talking about the characteristics we notice together.
- Encourage me to identify and explore shape and symmetry, developing an understanding of characteristics within natural contexts and environments.
- Enable daily outdoor play which encourages me to explore size and perspective through my movements and by seeing familiar objects from a different angle, height or distance.





Babies – categorise from 3 months old



12 months – choose objects belonging to a group



18 months – pick out objects and form a group



2 - 3 years - move objects from one group to another to sort according to their criterion



4 – 6 years: Sorting by one attribute
Sorting by more than one attribute
Stating the rule



Smith and Price (2018);
Mathematics in Early Years Education



Understanding Handling Data



“Our brains process and make sense of information through associations: categorising and classifying what we see, hear, feel, taste and smell.”

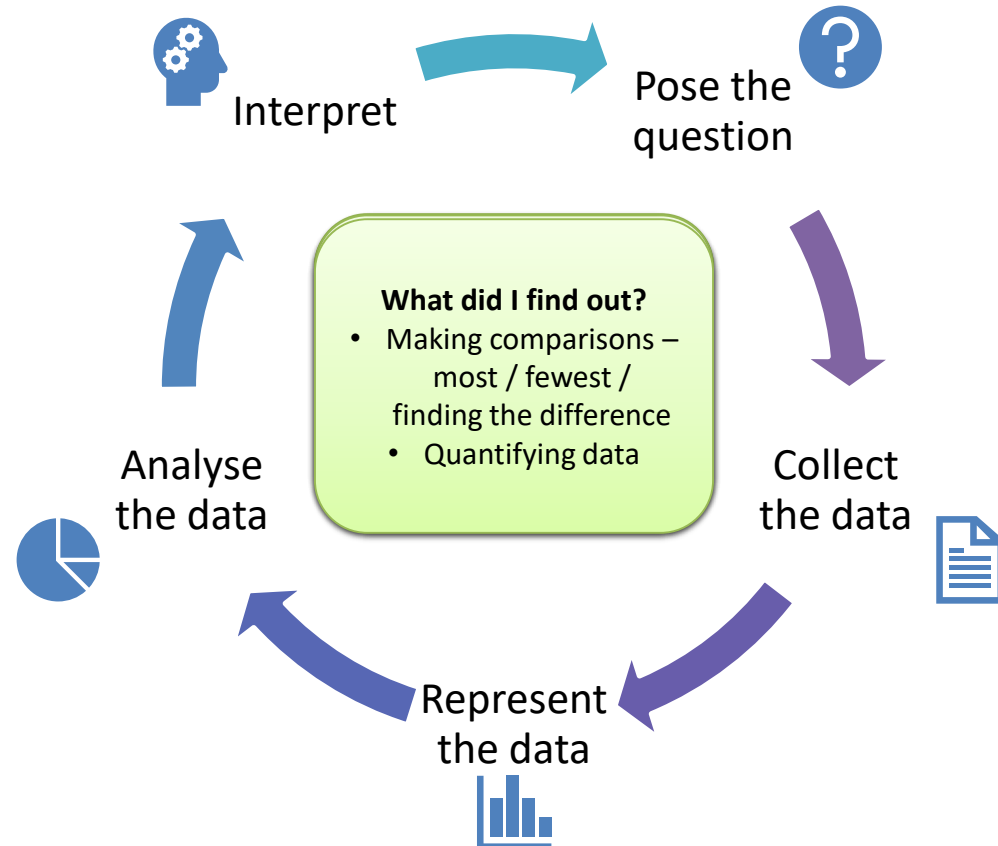
Robertson, 2017;

Messy Maths. A Playful, Outdoor Approach for Early Years



PCRAI Cycle

When engaging in handling data experiences children should be supported through each of the following stages:



How Children Develop Understanding; Research Findings

Concept Formation

“To sort and match objects, children need to have a concept of the attribute they are using for comparison.”



Concrete to Abstract Representation

“...children move from manipulation of the real objects as they do when sorting, to understanding that the data can be represented by other objects or pictures which still have a one-to-one correspondence with the original...”

Mathematical Mark Making

Worthington and Carruthers (2006)

Five
categories
of marks:

Dynamic – lively, suggestive of
action, spontaneity

Pictographic – represent
something they can see

Iconic – mark to represent 1-1
counting

Written – letter-like

Symbolic – numerals / symbols



@PenileeNursery





What opportunities are provided in your setting for children to engage in PCRAI cycle?

Give examples of data that has been collected, sorted and represented with children in your setting?



Key Concepts of Handling Data



Key concepts in sorting, matching and handling data



Recognising the attributes of familiar objects and using these to compare and match



Creating purposeful groups



Creating a set of all objects with a given criterion



Representing and interpreting data using concrete materials



Representing and interpreting data using pictographic and iconic materials

Smith and Price (2018);
Mathematics in Early Years Education

Recognising the attributes of familiar objects and using these to compare and match



Shape

Size

Colour

Features

Natural world – plants, rocks, people, animals

Abstract concepts – favourite food, things needed for cooking



Creating purposeful groups

Set of objects that are chosen for a particular purpose.



Schemas relating to sorting and purposeful groups:

Transporting

- Attribute – ‘things I have brought here’

Containing/Enveloping

- Make collections by wrapping or containing in bag/boxes etc.



Creating a set of all objects with a given criterion

- More challenging than creating a purposeful set.
- Attribute(s) set by someone else.
- Child must understand attribute.

Everyday opportunities:

Sorting fruit for snack

Tiding up art materials – collect
scissors / pens / glue sticks

Returning blocks - collect unit blocks /
hollow blocks

Structured experience:

Compare Bears – sort colour / size

Natural found objects – sort
leaves, stones, conkers etc.

Representing and interpreting data using concrete materials



Reordering

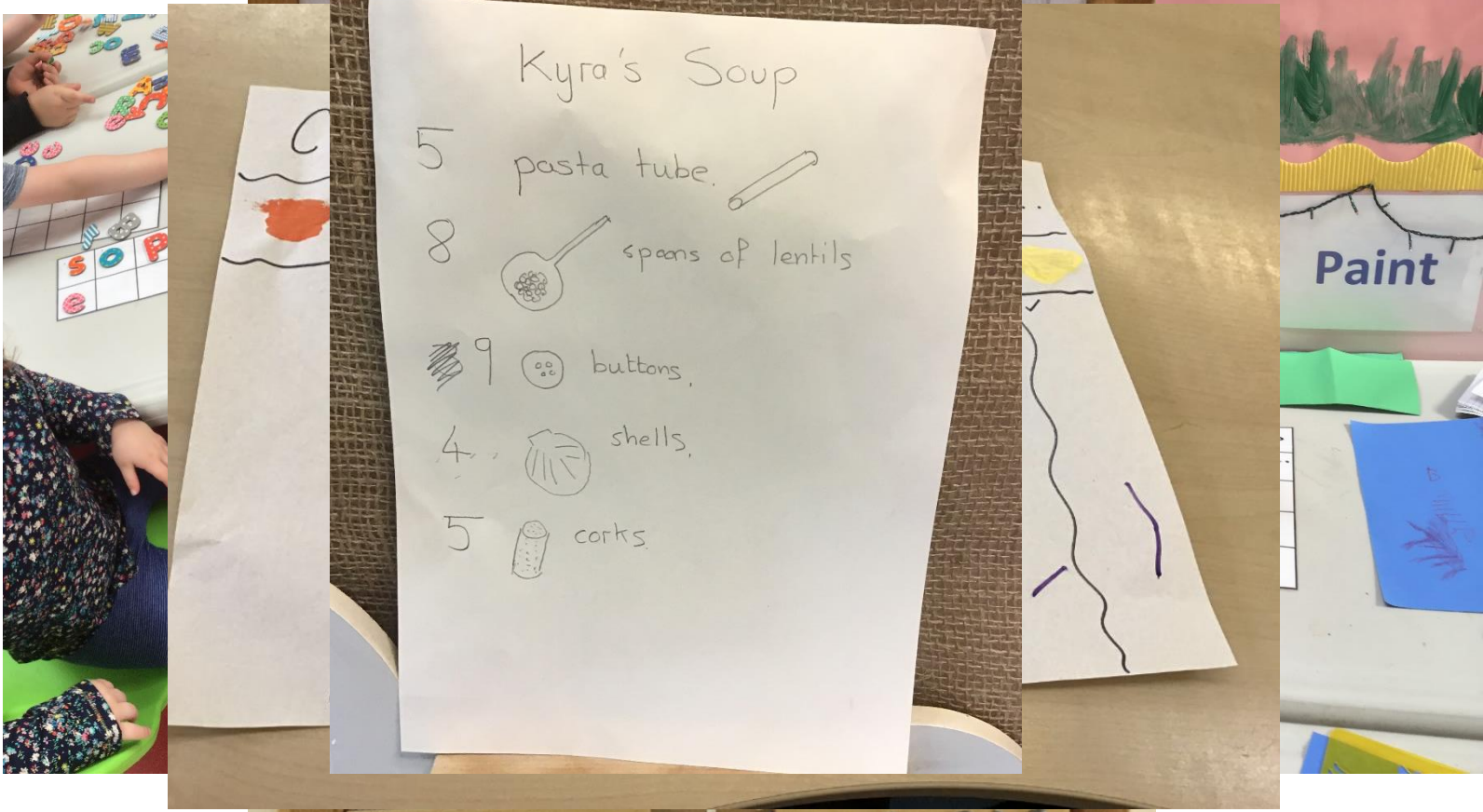


Comparing

Objects need to be same sized or evenly spaced to enable visual comparison.

Using a substitute object or picture of the same size may support this.

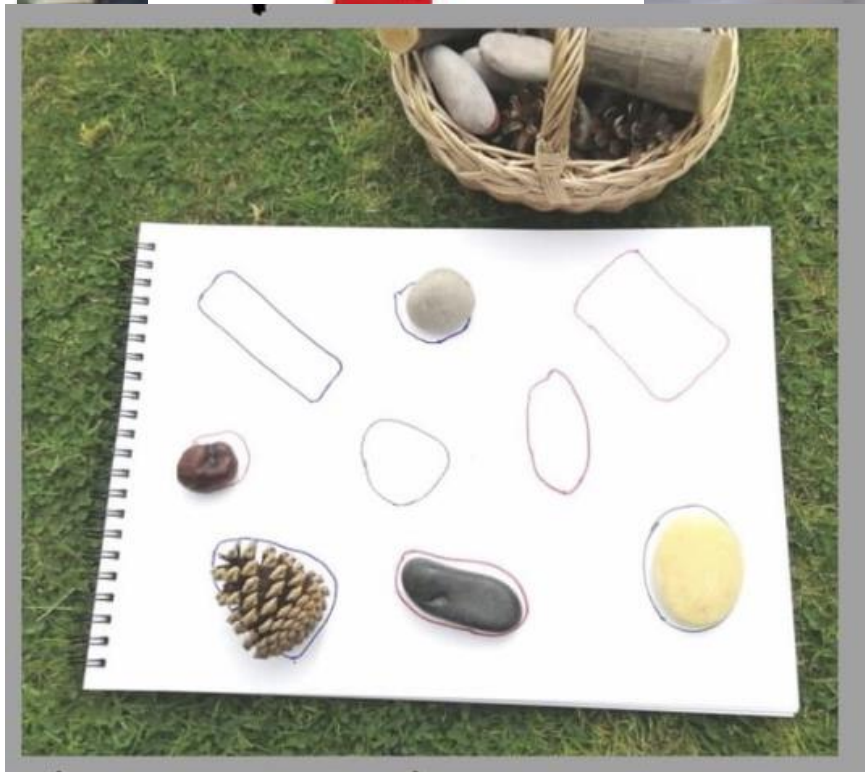
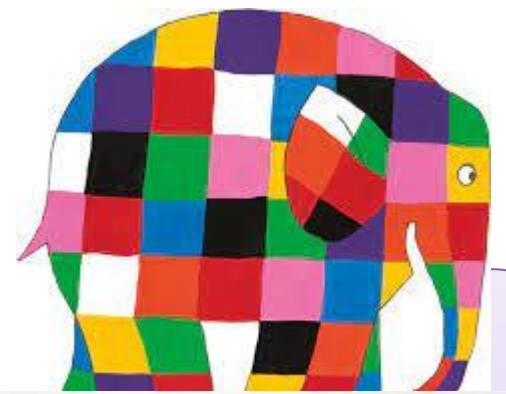
Representing and interpreting data using pictographic and iconic materials



Sorting



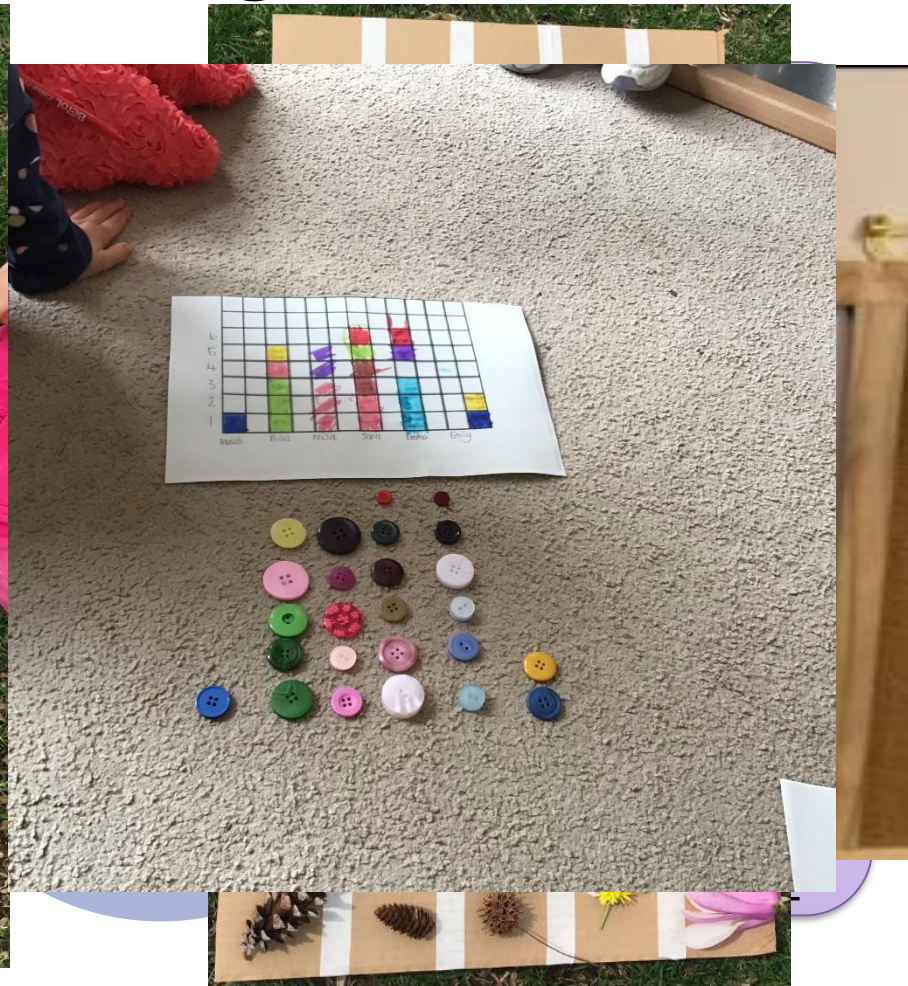
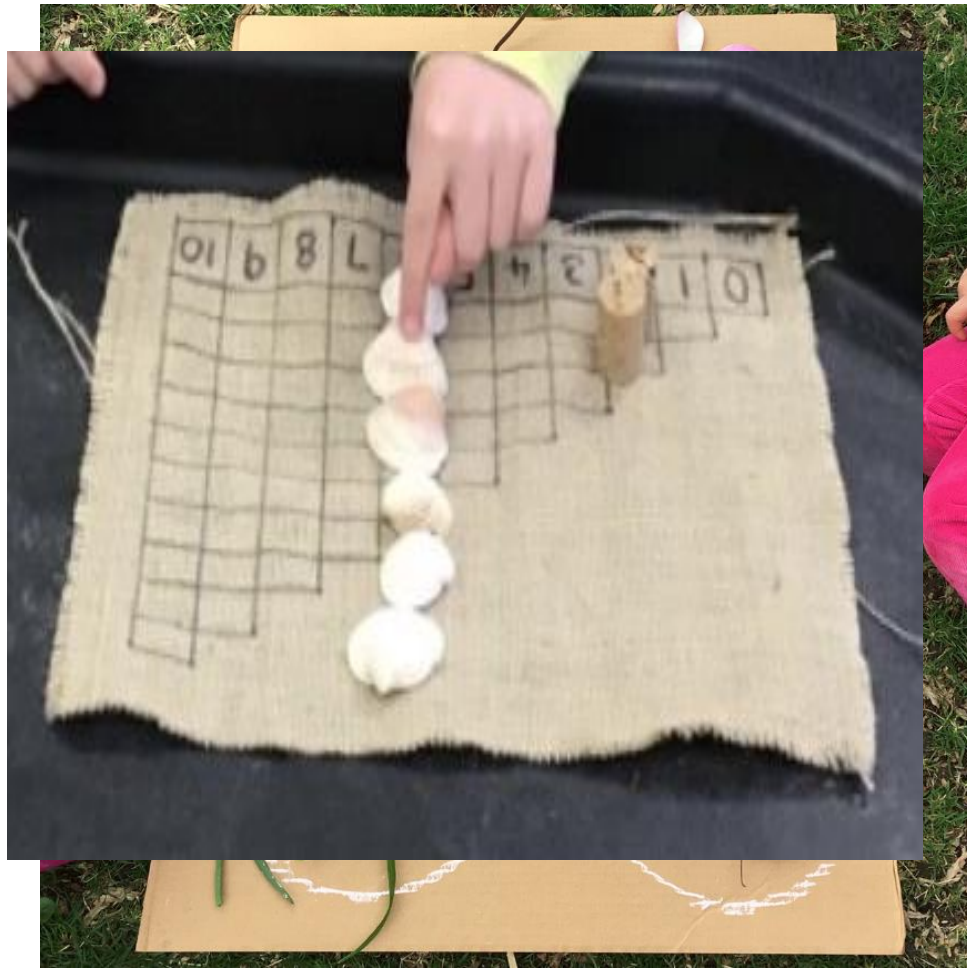
Matching



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Data Handling



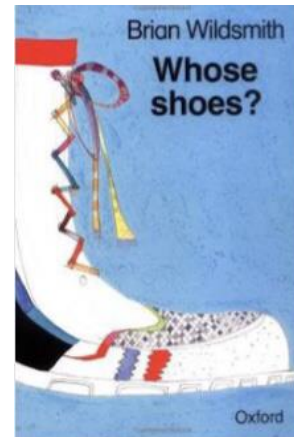
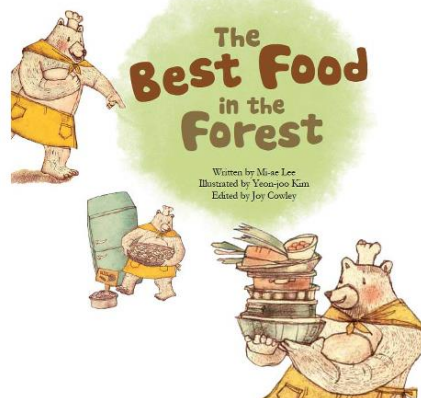
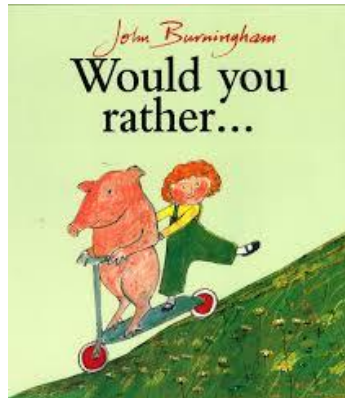
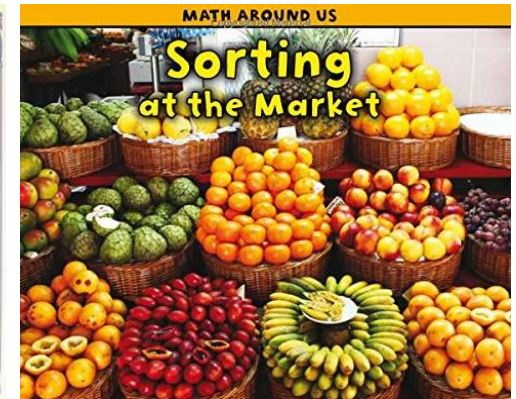
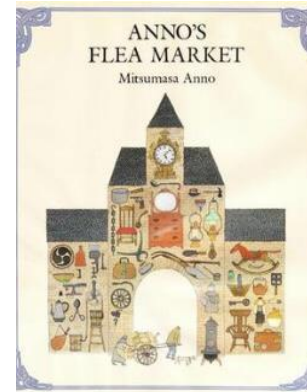
Mathematical Stories



Which Would You Rather Be?



BY WILLIAM STEIG • PICTURES BY HARRY BLISS



Adults
need
to
ensure
that:

Child initiated opportunities are supported

Numerical and graphical representations are supported

Links are made between concrete experiences and pictorial and iconic representations

Children are support to create tables, charts etc.

Children are encouraged to develop their own ways of recording data



Problem Solving



“If children already know or are told the method to use, then they are not problem solving.”

Gifford (2005) cited in, DfCSF, 2009;

Children thinking mathematically: PSRN essential knowledge for Early Years Practitioners



Problem Solving

There are potential problems to be solved daily:

- Tidy up time – labelled shelving and containers helps solve a messy problem
- Questions that arise from children themselves is best e.g. whose birthday is next? I have a dog, what pets do other people have?
- Provision – consultation with children – what resources will we add to this area? What shall we transform the den into?



Sustained Shared Thinking

tuning in

suggesting

reminding

recapping

offering
alternative

clarifying

modelling
thinking

asking
open-
ended
questions

Sustained Shared Thinking

How do you know?

Can you tell me more?

What could you do next?

So you think that...

Maybe you could try this.

I wonder what would happen if...



Top 10 skills of 2025

Type of skill

- Problem-solving
- Self-management
- Working with people
- Technology use and development



Analytical thinking and innovation



Active learning and learning strategies



Complex problem-solving



Critical thinking and analysis



Creativity, originality and initiative



Leadership and social influence



Technology use, monitoring and control



Technology design and programming



Resilience, stress tolerance and flexibility



Reasoning, problem-solving and ideation

“...creativity is basically an attitude, one that comes easily to young children, but must be sustained and strengthened lest it be sacrificed in our too logical world.”

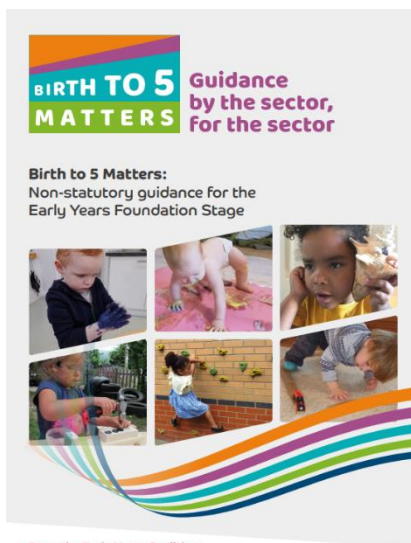
Marzollo and Lloyd, 1972 cited in Moyles, 2011;

Shared by Dr Marion Burns, Weans not Widgets Conference 2022



Thinking Creatively and Critically

Birth to 5 Matters



From the Early Years Coalition
www.birthto5matters.org.uk

A Unique Child: how a child is learning

Having their own ideas (creative thinking)

- Thinking of ideas that are new and meaningful to the child
- Playing with possibilities (*what if? what else?*)
- Visualising and imagining options
- Finding new ways to do things

Making links (building theories)

- Making links and noticing patterns in their experience
- Making predictions
- Testing their ideas
- Developing ideas of grouping, sequences, cause and effect

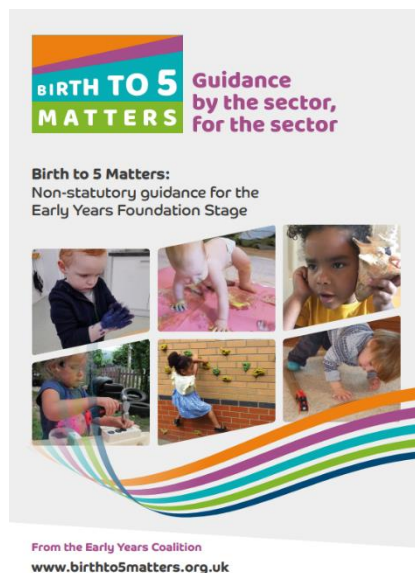
Working with ideas (critical thinking)

- Planning, making decisions about how to approach a task, solve a problem and reach a goal
- Checking how well their activities are going
- Flexibly changing strategy as needed
- Reviewing how well the approach worked



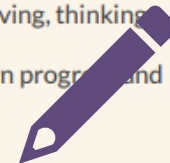
Thinking Creatively and Critically

Birth to 5 Matters



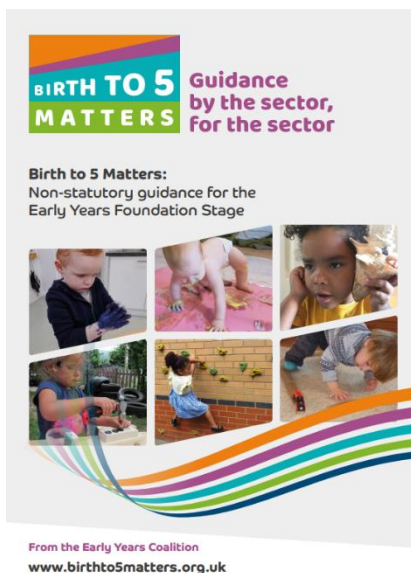
Positive Relationships: what adults might do

- Use the language of thinking and learning: *think, know, remember, forget, idea, makes sense, plan, learn, find out, confused, figure out, trying to do.*
- Model being a thinker, showing that you do not always know, are curious and sometimes puzzled, and can think and find out. *I wonder?*
- Give children time to talk and think. Make time to actively listen to children's ideas.
- Encourage open-ended thinking, generating more alternative ideas or solutions, by not settling on the first suggestions: *What else is possible?*
- Always respect children's efforts and ideas, so they feel safe to take a risk with a new idea and feel comfortable with mistakes.
- Encourage children to question and challenge assumptions.
- Help children to make links to what they already know.
- Support children's interests over time, reminding them of previous approaches and encouraging them to make connections between their experiences.
- Help children to become aware of their own goals, make plans, and to review their own progress and successes. Describe what you see them trying to do, and encourage children to talk about what they are doing, how they plan to do it, what worked well and what they would change next time.
- Talking aloud helps children to think and control what they do. Model self-talk, describing your actions in play.
- Value questions, talk, and many possible responses, without rushing toward answers too quickly.
- Sustained shared thinking helps children to explore ideas and make links. Follow children's lead in conversation, and think about things together.
- Encourage children to choose personally meaningful ways to represent and clarify their thinking through graphics.
- Take an interest in what the children say about their marks and signs, talk to them about their meanings and value what they do and say.
- Encourage children to describe problems they encounter, and to suggest ways to solve the problem.
- Show and talk about strategies - how to do things - including problem-solving, thinking and learning.
- Encourage children to reflect and evaluate their work and review their own progress and learning.
- Model the plan-do-review process yourself.



Thinking Creatively and Critically

Birth to 5 Matters



Enabling Environments: what adults might provide

- In planning activities, ask yourself: *Is this an opportunity for children to find their own ways to represent and develop their own ideas?* Avoid children just reproducing someone else's ideas.
- Build in opportunities for children to play with materials before using them in planned tasks.
- Play is a key opportunity for children to think creatively and flexibly, solve problems and link ideas. Establish the enabling conditions for rich play: space, time, flexible resources, choice, control, warm and supportive relationships.
- Recognisable and predictable routines help children to predict and make connections in their experiences.
- Routines can be flexible, while still basically orderly.
- Provide extended periods of uninterrupted time so that children can develop their activities.
- Keep significant activities out instead of routinely tidying them away, so that there are opportunities to revisit what they have been doing to explore possible further lines of enquiry.
- Plan linked experiences that follow the ideas children are really thinking about.
- Represent thinking visually, such as mind-maps to represent thinking together, finding out what children know and want to know.
- Develop a learning community which focuses on **how** and not just what we are learning.
- Setting leaders should give staff time to think about children's needs, to make links between their knowledge and practice.



Observation and Assessment





Assessment

Observations of children engagement in spontaneous and intended experiences relating to sorting, matching and handling data may indicate whether a child can:

Show an interest in the attributes of objects

Begin to make purposeful collections

Describe the attribute of objects

Explain why two or more things are the same/different

Create a group according to a given attribute

Explain why the things in the group go together

Represent their own data or choice using a concrete object

Interpret data

Take Away Task

Conduct a learning story observation of children's engagement in sorting, matching or handling data through child-initiated play.

In addition to noticing and naming learning consider what dispositions to learning are being demonstrated by the child.

Be prepared to share your learning stories at the next session.





successful learners

with

- › enthusiasm and motivation for learning
- › determination to reach high standards of achievement
- › openness to new thinking and ideas

and able to

- › use literacy, communication and numeracy skills
- › use technology for learning
- › think creatively and independently
- › learn independently and as part of a group
- › make reasoned evaluations
- › link and apply different kinds of learning in new situations

confident individuals

with

- › self-respect
- › a sense of physical, mental and emotional wellbeing
- › secure values and belief
- › ambition

and able to

- › relate to others and manage themselves
- › pursue a healthy and active lifestyle
- › be self-aware
- › develop and communicate their own beliefs and view of the world
- › live as independently as they can
- › assess risk and take informed decisions
- › achieve success in different areas of activity

To enable all young people to become

responsible citizens

with

- › respect for others
- › commitment to participate responsibly in political, economic, social and cultural life

and able to

- › develop knowledge and understanding of the world and Scotland's place in it
- › understand different beliefs and cultures
- › make informed choices and decisions
- › evaluate environmental, scientific and technological issues
- › develop informed, ethical views of complex issues

effective contributors

with

- › an enterprising attitude
- › resilience
- › self-reliance

and able to

- › communicate in different ways and in different settings
- › work in partnership and in teams
- › take the initiative and lead
- › apply critical thinking in new contexts
- › create and develop
- › solve problems



Why data handling is important for children?

*Data handling allows children to **make sense of information**, to **identify patterns and trends** and to **predict and plan for the future***

(Griffiths, 2001)



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Glasgow Counts in our Playrooms

Sorting, Matching and Handling Data



LPA Year 2

