EARLY YEARS MATHS

Subitising

What is it and how to help children learn essential mathematical / numeracy skills.

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What is Subitising?

Subitising is a term that was coined by the theorist Piaget and defined the ability to instantaneously recognise the number of objects in a small group without the need to count them. An example often used to explain this, is to think of a die – we immediately recognise the number of dots without having to count each one individually. Subitising is the ability to instantly recognise the amount of objects without actually counting them.

Studies have found that most adults can subitise groups of items up to five. This is known as perceptual subitising. Beyond five, other mental strategies come into play for identifying the number of items in a group without counting them individually. These require some understanding of grouping and basic mathematics. For instance, when we see six dots on a die, we actually break this down into two groups of three which, when combined, gives us six. This is known as conceptual subitising and is an essential element for developing mathematical skills.

The predominant focus of the early maths curriculum is development of an understanding of number. Subitising is an essential part of developing number sense in early years children by helping them to relate numbers to actual items or groups of items. This is known as number conservation. It is not uncommon that young children learn to count by rote but do not really understand the meaning behind what they are doing. By looking at groups of items, children can start to develop an understanding of how a number is made up: for example, seven dots could be a set of three dots and a set of four dots, or a set of six dots and one dot. This understanding of part-part-whole relationships helps children to separate and combine numbers and accelerates understanding of addition and subtraction.

Subitising helps children to discover essential properties of number. They learn important skills such as conservation, unitising, counting on, composing and decomposing number, addition, subtraction, and place value!

Including subitising in early number activities

Young children particularly enjoy the physical manipulation of objects. This gives early years practitioners / teachers the opportunity to develop a number of fun and engaging subitising activities that encourage children to be excited about mathematics. For instance, Ladybug Counting Stones are a wonderful addition to early years resources. Their colourful design naturally appeals to young children and, when coated with varnish / Mod Podge they are waterproof and can be used for both indoor and outdoor play activities, including sand and water.

We can assess children's developing understanding by asking key questions such as:
How many dots do you see?
How do you know how many dots there are?
Did anyone work out the number of dots differently? (Children will group in different ways)
How many dots to you need to make…?

Use Ladybug Counting Stones along with Number Pebbles and Sorting Stones to aid in the development of number sense and provide children with a range of games and activities that will keep them engaged with mathematics?

Help children to subitise, by inviting them to take a 'snapshot'. We do this by showing the children a collection of objects for a few seconds and then the children take a snapshot to develop a mental image of the set. Ask the children to recall the objects – how many, the position of specific objects, take one away and see if the child can identify which object is missing.

Teaching strategies that promote early number sense?

Learning to count with understanding is a crucial number skill, but other skills, such as perceiving subgroups, need to develop alongside counting to provide a firm foundation for number sense. By simply presenting objects (such as stamps on a flashcard) in various arrangements, different mental strategies can be prompted. For example, showing six stamps in a cluster of four and a pair prompts the combination of 'four and two makes six'. If the four is not subitised, it may be seen as 'two and two and two makes six'. This arrangement is obviously a little more complex than two groups of three. So different arrangements will prompt different strategies, and these strategies will vary from person to person.

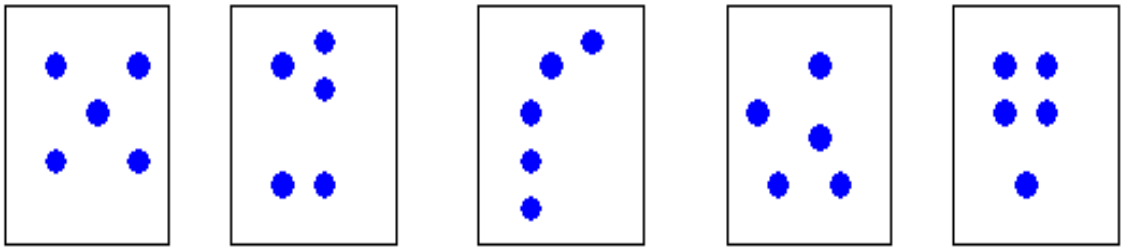
If mental strategies such as these are to be encouraged (and just counting discouraged) then an element of speed is necessary. Seeing the objects for only a few seconds challenges the mind to find strategies other than counting. It is also important to have children reflect on and share their strategies (Presmeg, 1986; Mason, 1992). This is helpful in three ways:

- verbalising a strategy brings the strategy to a conscious level and allows the person to learn about their own thinking;
- it provides other children with the opportunity to pick up new strategies;
- the teacher/practitioner can assess the type of thinking being used and adjust the type of arrangement, level of difficulty or speed of presentation accordingly.

To begin with, early number activities are best done with moveable objects such as counters, blocks and small toys. Most children will need the concrete experience of physically manipulating groups of objects into sub-groups and combining small groups to make a larger group. After these essential experiences more static materials such as 'dot cards' become very useful.

Dot cards are simply cards with dot stickers of a single colour stuck on one side. (However, any markings can be used. Self-inking stamps are fast when making a lot of cards). The important factors in the design of the cards are the number of dots and the arrangement of these dots. The various combinations of these factors determine the mathematical structure of each card, and hence the types of number relations and mental strategies prompted by them.

Consider each of the following arrangements of dots before reading further. What mental strategies are likely to be prompted by each card? What order would you place them in according to level of difficulty?



Card A is the classic symmetrical dice and playing card arrangement of five and so is often instantly recognised without engaging other mental strategies. It is perhaps the easiest arrangement of five to deal with.

Card B presents clear sub-groups of two and three, each of which can be instantly recognised. With practice, the number fact of 'two and three makes five' can be recalled almost instantly.

Card C: A linear arrangement is the one most likely to prompt counting. However, many people will mentally separate the dots into groups of two and three, as in the previous card. Other strategies such as seeing two then counting '3, 4, 5' might also be used.

Card D could be called a random arrangement, though in reality it has been quite

deliberately organised to prompt the mental activity of sub-grouping. There are a variety of ways to form the sub-groups, with no prompt in any particular direction, so this card could be considered to be the most difficult one in the set.

Card E shows another sub-group arrangement that encourages the use (or discovery) of the 'four and one makes five' number relation.

Obviously, using fewer than five dots would develop the most basic number sense skills, and using more than five dots would provide opportunities for more advanced strategies. However, it is probably not useful to use more than ten dots. Cards such as these can be shown briefly to children, then the children asked how many dots they saw. The children should be asked to explain how they perceived the arrangement, and hence what strategies they employed.

Games that can assist development of early number sense.

Games can be very useful for reinforcing and developing ideas and procedures previously introduced to children. Although a suggested age group is given for each of the following games, it is the children's level of experience that should determine the suitability of the game. Several demonstration games should be played, until the children become comfortable with the rules and procedures of the games.

Deal and Copy **(4-5 years) 3-4 players**

Materials: 15 dot cards with a variety of dot patterns representing the numbers from one to five and a plentiful supply of counters or buttons.

Rules: One child deals out one card face up to each other player. Each child then uses the counters to replicate the arrangement of dots on his/her card and says the number aloud. The dealer checks each result, then deals out a new card to each player, placing it on top of the previous card. The children then rearrange their counters to match the new card. This continues until all the cards have been used.

Variations/Extensions
Each child can predict aloud whether the new card has more, less or the same number of dots as the previous card. The prediction is checked by the dealer, by observing whether counters need to be taken away or added.
Increase the number of dots on the cards.

Memory Match **(5-7 years) 2 players**
Materials: 12 dot cards, consisting of six pairs of cards showing two different arrangements of a particular number of dots, from 1 to 6 dots. (For example, a pair for 5 might be Card A and Card B from the set above).

Rules: Spread all the cards out face down. The first player turns over any two cards. If they are a pair (i.e. have the same number of dots), the player removes the cards and scores a point. If they are not a pair, both cards are turned back down in their places. The second player then turns over two cards and so on. When all the cards have been matched, the player with more pairs wins.

Variations/Extensions
Increase the number of pairs of cards used.
Use a greater number of dots on the cards.
Pair a dot card with a numeral card.

***What's the Difference?* (7-8 years) 2-4 players**
Materials: A pack of 20 to 30 dot cards (1 to 10 dots in dice and regular patterns), counters.
Rules: Spread out 10 cards face down and place the rest of the cards in a pile face down. The first player turns over the top pile card and places beside the pile. He/she then turns over one of the spread cards. The player works out the difference between the number of dots on each card, and takes that number of counters. (E.g. If one card showed 3 dots and the other 8, the player would take 5 counters.) The spread card is turned face down again in its place and the next player turns the top pile card and so on. Play continues until all the pile cards have been used. The winner is the player with the most counters; therefore the strategy is to remember the value of the spread cards so the one that gives the maximum difference can be chosen.

Variations/Extensions
Try to turn the spread cards that give the minimum difference, so the winner is the player with the fewest counters.
Roll a die instead of using pile cards. Start with a set number of counters (say 20), so that when all the counters have been claimed the game ends.
Use dot cards with random arrangements of dots.

OTHER EASY WAYS TO TEACH SUBITISING 3-5 YEAR OLDS

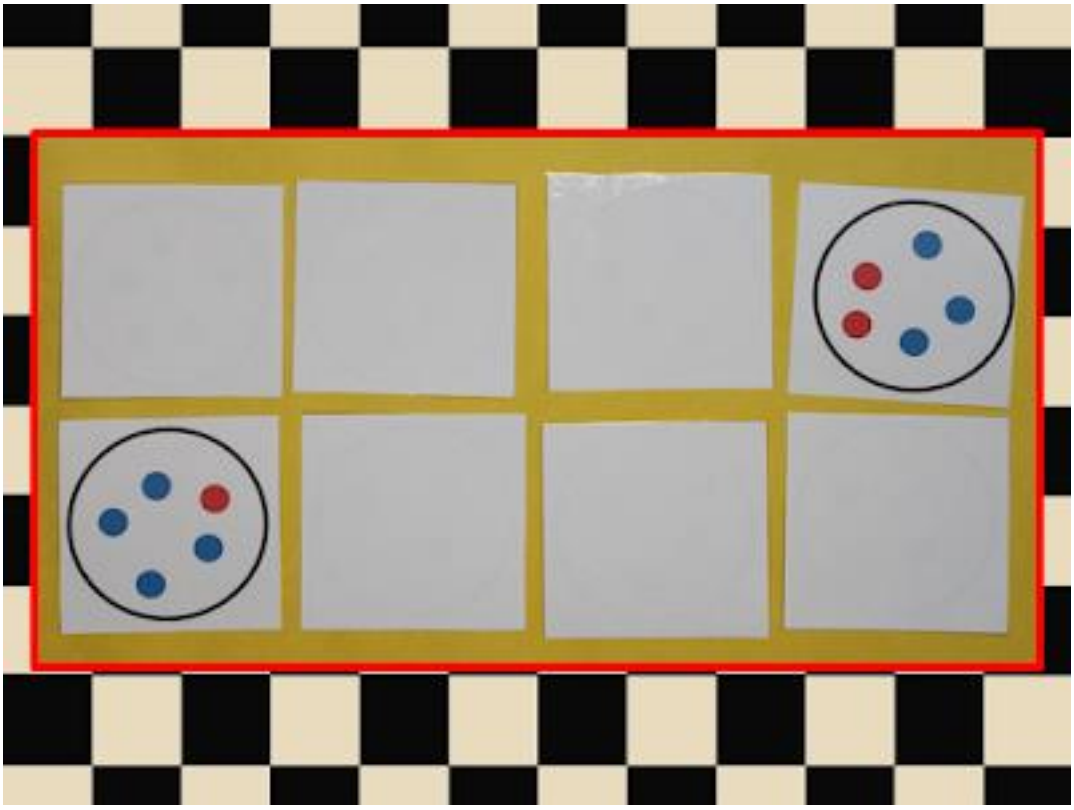
1.Build It!

- Give children a set of manipulatives (1-6).
- Ask the children to arrange their set of manipulatives into a configuration.
- Ask, "How many? How do you know?"
- Now, using the same manipulatives, invite the children to show you another arrangement for that same number.

- This conceptual game scaffolds the children to show you multiple representations of the same number.
- The whole lesson focuses on that one number! Next time you play, you can pick a new number.

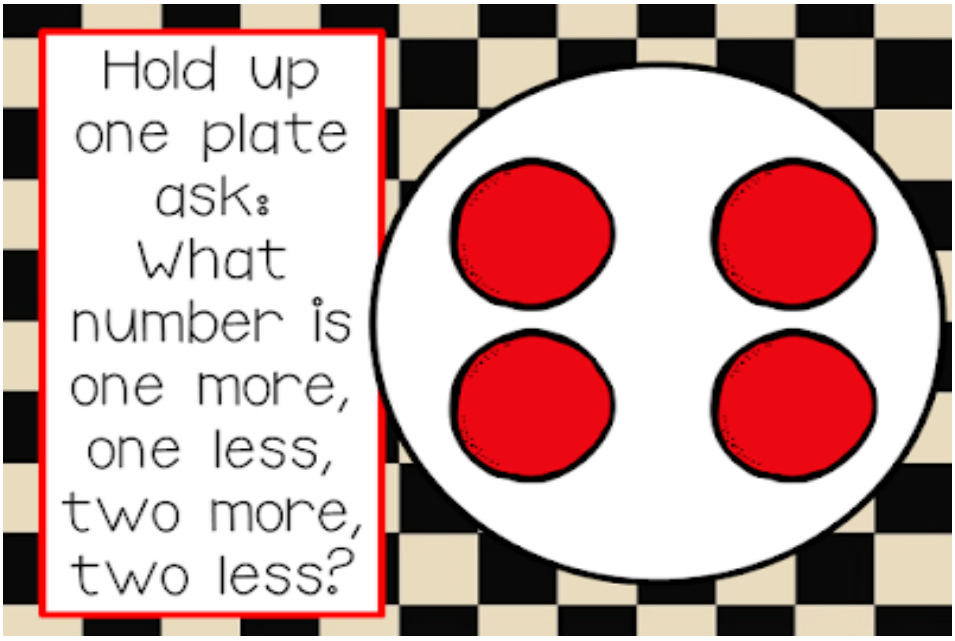
2. Concentration

- Play concentration games and match different configurations for the same number.
- To play the first time, make a set of dot cards for numerals 1-6 using the traditional configuration of dots (like the dice). Reproduce 2 sets of the cards.
- Lay the cards face down, invite the children to turn over two cards. Do they match? Do they have the same number of dots?
- Once they master this, make two sets of dot cards for numerals 1-6 with DIFFERENT configurations.
- Lay the cards face down and invite the children to turn over two cards. Do they have the same number of dots? How do you know?
- Once they master this, make two sets of dot cards for numerals 1-6 with DIFFERENT configurations and different colours of dots. For example, one set might have 3 red dots and 2 blue dot. The matching card might have 1 red dot and 4 blue dots.
- Lay the cards face down and invite the children to turn over two cards. Do they have the same number of dots? How do you know?



3. More and Less

- Give the children a card with a set of dots. Invite them to add one more dot. Ask, "How Many?"
- Once they master this game, show the children the card with the set of dots. Ask, "What number is one more? How do you know." This requires them to have a mental image of the new set.



4. Going on a Number Hunt

- Hide dot indoors / outdoors. Say a number. See how quickly children can find the number.
- Begin with the traditional configuration of dots for each number.
- Then, move to a nontraditional configuration of dots.
- Finally, use a nontraditional configuration of dots and different colours of dots.

5. Dice Games

- Any games that use a dice are great for teaching subitising.
- Consider using a blank cube to make the dots in a nonstandard configuration.

6. Domino Games

- Dominoes are another great, cheap resource for teaching subitising.
- Consider making dominoes with the children.

7. Card Games

- Cards! What a gold mine!
- You might want to consider cutting the numerals in the corner of the cards. This forces the children look at the configuration instead of the numeral.

Why is Subitising important?

Subitising is essential for children's mathematical development for many reasons:

- Subitising helps children to understand what numbers mean or how many 'things' a number refers to.
- It can develop children's pattern recognition.
- Children can over-rely on counting.
- Subitising is an alternative strategy which is more efficient when dealing with smaller numbers. It helps children to see how numbers are made up. For example, you can make the number eight using many pairs: 1 + 7, 2 + 6, 3 + 5 and 4 + 4. By separating and combining numbers through subitising, children lay the foundations for addition and subtraction.
- Children also learn an important mathematical law through subitising: it doesn't matter in what order you add numbers together – you always get the same answer! For example, 2 + 3 = 5 and 3 + 2 = 5.

References and resources

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