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Instructions

MATH BOX 5

492.100

Objective:

The goal of Math box 5 is to teach children aged 3-7 how to play and work with 3 important developmental goals:

- Knowledge of concepts related to size.
- Ordering objects on the basis of one concept.
- Ordering objects on the basis of two concepts. There are size concepts such as length, thickness, height, width, and colour shades from light to dark. As a result, the child learns to order similar objects by size and colour shades. In some games, the child has to pay attention to the sizes and constant differences, whereas in other games, the child must pay attention to colour shades. Due to the cleverly designed materials, the colour shades do not help the child order the objects by size and vice versa. In other words, both characteristics are independent of one another. The child therefore learns to switch between the two characteristics.

These goals have important practical applications both at home and school, but they can also support children who are learning about mathematics.

Especially working with two characteristics is important for the development of reading and mathematical skills, because children have to work with multiple characteristics at the same time. This helps them to connect sounds to characters, for example.

Contents Math box 5:

- A box with a lid.
- 4 Sequences of objects increasing in length, thickness, height, or width. Every sequence consists of 10 objects and is divided into two sequences of 5 in different colours and shades of colour:
  - length: 10 rods: 5 green, 5 blue, in different colour shades.
  - thickness: 10 cylinders: 5 yellow, 5 blue, in different colour shades.
  - height: 10 blocks: 5 yellow, 5 red, in different colour shades.
  - width: 10 boards: 5 green, 5 red, in different colour shades.
- A box with 16 cards: 1 x long-short, 1 x short-long; 1 x thick-thin, 1 x thin-thick; 1 x high-low, 1 x low-high; 1 x wide-narrow, 1 x narrow-wide, 4 x dark-light, and 4 x light-dark.

Methods:

In our descriptions of the methods, we use the rods as an example.

The goal of Math box 5 is clear, yet it can be reached in many different ways. Math box 5 can be used as playing materials, developmental materials, and learning materials. In fact, there is no fixed order. There is a balance between the extent to which children can make their own choices and the support from the teacher. Make sure that the children always respect the materials. The materials should remain appealing and last a long time.

Playing materials

With these materials, the child can experiment freely and play in his or her own way. Math box 5 offers a variety of shapes, colours, and shades of colour. For children, these materials are appealing. Especially intriguing for them is switching between sequences based on size to sequences based on colour shades. Moreover, creating sequences can in itself be an artistic activity. **Support** the children by playing together with them, showing them how to play, or by setting a good example. The teacher can also introduce his or her own creative ideas in the game.

Developmental materials

The children can take the materials out of the cupboard and start playing by themselves. Try to limit your advice to a minimum.

The idea behind Math box 5 is to give children insight into size concepts and sequences from 1-5 and 1-10. Furthermore, it is important for children to gain insight into sequences based on colour shades. The crux of the matter is that the child learns to switch from size to colour shades and vice versa. The child must learn to discover that colour and shape are abstract concepts that we can apply to all possible objects. In other words, size is not just a concept related to this specific object, but it is in fact related to all objects. The same goes for colour shades. From an aesthetical point of view, it is also possible to create appealing sequences.

Below, the boards from short to long, in the middle the blocks from light to dark, and above the cylinders from thin to thick.

Children can try to create many variations while they pay attention to the two characteristics.

Support the child when necessary or when he or she asks for it. You can point out the characteristics related to size and colour shades, but particularly to the two different characteristics and switching between them. Later on, you can also point out the patterns behind sequences based on two characteristics. Especially with the sequences based on colour shades, the children will have to pay close attention, because these differences are harder to discern than those based on size. Additionally, children can switch from size to colour shade and vice versa. Articulate and check what the child did. Also ask the child to say out loud what he or she does or did.

Tip: To present Math box 5 in the classroom, you can put all the shapes and colours on a table, which simply looks appealing, and let the children react spontaneously. Ask one of the children to create a number of sequences and show how the materials are intended to be used. Then ask the children to switch roles.

I Math box 5 with cards

Ordering rods of one colour by length
- Ask the child to order five green rods by length.
- Then let the child order five blue rods by length.
- Although both sequences are ordered by length, they are not the same.

Ordering rods by length and finding the matching card
- Order the five green rods from long to short and add the correct card, namely 'long-short'. Idem for short to long.
- Play the same game with the blue rods.

Switching from length to colour
- Show the child how to switch from length to colour. First, create a blue sequence from short to long. Then, show the child how to order the objects from light to dark.
- Order the sequence from short to long again and ask the child to change it to light-dark.
- Play the same game with the green rods.

Adding the light-dark and dark-light cards
- Ask the child to create a sequence of five green or blue rods, either from light to dark or from dark to light. Can the child find the corresponding card?

Sequence of ten rods by length
- Show the child how to make a sequence of 10 rods. You will have to use the rods of both colours. All the child has to do, is to pay attention to the length of the rods.

Sequence of ten rods by colour shade
- Show the child how to make a sequence of 10 rods sorted by colour shade. There are two ways to go about this. First, you can put down the two darkest rods, then search for the second-darkest rods and place them next to the prior rods, and continue until you have five pairs from dark to light. Second, you can sort the five green rods first and then the blue rods, or vice versa. Let the child search for the corresponding card, namely light-dark or dark-light.

Switching with the sequence of 10 objects
- When the objects have been sorted by length, then switch to colour shade. Let the child find the matching cards.
- Play the same game with the cylinders, the blocks, and the boards. Do not forget to search for the corresponding cards.

Creating vertical sequences
- Ask the child to stack the cylinders from thick to thin (Can you also stack them the other way around?). Now stack them from dark to light.
- Let the child stack the blocks based on height or colour shade.
- You can play the same game with the boards.

Stacking sequences
- Let the child create a sequence based on height. Build a sequence based on thickness on top of the first sequence.
- Ask the child to create a sequence based on width. Now build a sequence based on height on top of it, and stack another sequence based on thickness on top of that.
- Ask the child to switch to colour shades and then back to width, height, and thickness.

Creating sequences with cards
- Place the size and colour shade cards on the table. Ask the child to create sequences of five objects, such as long-short, high-low, wide-narrow, thick-thin, short-long, low-high, narrow-wide, and thin-thick.
- Then try to copy all the sequences from either the dark-light or light-dark card.

2 Math box 4 and 5 with cards

Discovering concepts

- Place the complete Math box 4 set in front of the child. Then create a number of sequences, such as long-short, thick-thin, low-high, and narrow-wide.
- Let the child try to figure out which cards reflect the sequences and in what direction.
- Now place the complete Math box 5 set in front of the child again. Ask the child to create a number of sequences on the basis of the cards that are ordered by size or colour shade. Vary the direction.
- Create a sequence with a few errors. For example, an error in length or an error in the colour shade of the boards. Can the child find the erroneous objects in the sequence? Let the child correct the error and search for the corresponding card.
- Come up with variations on these instructions in order to create your own game.

Combining the materials of Math box 4 and 5

- Ask the child to find all objects that are the same size or colour. Let him or her articulate the concepts: equally long, equally short, equally dark, and equally light.
- From Math box 5, take a rod, block, cylinder, and board. Can the child find a rod, block, cylinder, and board from Seriant 1 that are one size larger, one size smaller, two sizes larger, and two sizes smaller? Play the same game with thickness, height, and width.

Application:

Create a sequence of objects in the classroom or home that differ in height, width, length, or thickness. Generally, none of these objects will be exactly the same size. As such, the objects will differ from each other on at least two dimensions.

- Sort a number of books by length to create a sequence. Can the child also sort the books by thickness or width?
- Ask the child to sort cans or jars by height and also by thickness.
- Search for, or even create, objects and sort them on different characteristics. For example, you can use strips of cardboard and sort them on length or width. Alternatively, you can sort pieces of rope by length or thickness.
- When possible, let the child search for the corresponding card.

3 Variations

There are many additional variations. Below, we give some examples. The aforementioned games also provide inspiration.

- **Playing and learning together**
  Create a sequence from short to long. Another child then creates a sequence from dark to light. Try to do the same, but now with blocks sorted from low to high, cylinders from thin to thick, and boards from narrow to wide. Make sure to switch roles. Are the sequences similar to each other? And how about the colour shades? Ask the children to make alterations to the sequence. For example, they can remove the darkest and lightest objects. After removing the objects, can the children also place them back again? Once the children have learned to create sequences and switch between size and colour shade, then they can try to increase the speed of their games. Other children can even clap their hands every time an object is added to the sequence. When children are able to count, then they can also count while clapping. Finally, take the lightest block. What would be the position of this block in a sequence from high to low? Endless variations are possible. Also allow the children to come up with their own problems. Can children solve these problems together?

- **Competitions**
  Four children sit next to each other. Every child has 2 x 5 objects of the same shape. Who is the first to complete a sequence from large to small and vice versa? And who is the first to complete two sequences from light to dark? Now remove an object from every sequence. Which child can put it back quickest? The ten objects are now sorted from large to small. With these objects, the children must try to create a sequence from dark to light as fast as possible. Play the same game the other way around. You can also record the time.

- **Combining the cards with Math box 6**
  Use the cards with dots or numbers from Math box 4 or 5. Come up with your own challenges. For example, you can choose the card "thick-thin" and the card with the number 7 on it. Can the child "read" what it has to do, namely sort 7 cylinders in a row from thick to thin? Again, many variations are possible.
  If you want a more challenging game, then you can take dark-light and long-short cards and combine them with a card from Comparant 1 with the number 10 on it. Can the child sort 10 rods from dark to light? That is, can he or she create a sequence on the basis of colour shade?
  Also play this game the other way around. That is, let the child create a sequence of 5 boards from light to dark. Now add the corresponding cards. Children can also learn to play the game together. One child places a thin-thick card on the table and adds the number 7. The other child now tries to carry out the assignment. The same game can be played with two objects, of which one wide and one narrow, and a number card such as 10. The second child tries to sort 10 boards from wide to narrow and subsequently on the basis of colour shade. The children check whether the answer is correct together.

- **Verbalising**
  The cards are useful tools to verbalise the activities with. You can not only use them to give assignments to the children, but also to check whether their answers are correct. When children play and learn together, then they can support each other by checking and communicating with each other.

- **Challenging assignments**
  Children can create sequences on the basis of colour and size, but they can also try to discern the underlying patterns. As a result, children can learn to combine sequences and see how they have been ordered. Take a look at the photo above. It shows an example of how children can create sequences in creative ways. They'll have to think hard about the underlying patterns. Children can also come up with new variations themselves. Additionally, children can discuss how the objects are ordered and whether that is correct. Can they find the ordering principle, namely on the basis of size or colour shade? Children can also work with the cards and check their answers afterwards. Are there other creative ways to create a sequence?

Learning materials

The teacher teaches the child directly about the characteristics of the material and how it is organized. For example, the teacher can discuss the size concepts and sequences. The latter is especially important for children who find it difficult to work independently and take initiative.

- Place the materials in front of the child. Use the correct terms, although the child does not have to know these him or herself: 'This is a sequence from long to short. The sequence consists of 5 objects.'
- 'Can you copy my row?'
- 'Now I'll do something special. Pay close attention: I make a row based on the shade of colour. Can you do that too? How will you start? Shall I show you again? Is this sequence different?' Let the child copy your actions: 'Can you make this row?' Verbalise what the child does: 'This one is high, this one lower, and this one even lower…' This one is dark, lighter, lighter, and this one is the lightest.'
- 'Let's check your answer together. Are all of the objects ordered correctly?'
- Ensure repetition and variation.

Support: Show how an activity can be done, possibly even do it together with one of the children, and articulate what the child does and what you do yourself.

Content

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