

Curriculum Materials Water resistance



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Learning Journey Water resistance

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Setting the Scene

Focus

The focus of this project was to develop children's curiosity to promote learner's abilities to make connections and develop their thinking skills, and their understanding of the purpose of specific materials. I wanted to explore possibilities to develop children's abilities to estimate and predict results, and to look for ways to let them make record of their findings.

Rationale

I want to teach children to be more aware of what happens around them, so they no longer let this pass by unnoticed. Sometimes their curiosity is provoked spontaneously, but if children don't act on it, this curiosity fades away.

By experimenting they learn more about the specific characteristics of the materials.

The implications for my planning and teaching

Content: Often unforeseen situations can seem uninteresting, but I want to use those moments as starting points for scientific experiments. Because of the spontaneous character of the situation, motivation of the children is very high to act on it.

Learning activities: experimenting and exploring are important factors to discover characteristics of materials.

Links to CLS Framework Learning activities:

- Designing or planning investigations
- Making connections
- Communicating explanations
- Gathering evidence

Creative dispositions:

- Ability to make connections
- Curiosity
- Thinking skills

Synergies:

- Play and exploration
- Questioning and curiosity
- Problem solving and agency

Contextual factors:

• Small groups of children explore materials

Background

School setting: rural area

Age group: 5-6 year olds (pre-school)

School policy for science: The school participated in several research projects (STEM, healthy food, technology ...), so they are very open to innovation. Profile of children: children are used to explore materials in small groups. The teacher regularly plans exploratory activities starting from questions the children ask.

Overview of Learning Activities

Day 1: (1) Group discussion about the torn leather, the wet stain and how it can be repaired.

Children suggest to look for a similar fabric to repair the shoe.

(5) Children apply their knowledge and understanding of water resistance; they try to make the cloths water resistant to repair the shoe. Children are motivated to explore the materials, and to find out if they are water resistant.

(2) Children collect materials similar to the leather.

(3) Children explore water resistance of all kinds of materials in an exploration corner. They make a record of what they discover (worksheet).

Children find out which materials are water resistant, and are curious to find out what makes them water resistant.

Children apply their knowledge to find a solution for the shoe.

Day 2: (4) Children built on their findings; they explore the water resistant materials.

Developing the Learning Journey: Starting Point

During circle time Henri is tinkering with his shoes. A piece of red leather comes off, and the more he plays with it, the more it loosens. Finally he tears off a part of the top layer of his shoe.

He doesn't mind the fact that a part of the red protective layer is missing, he only sees a stain.

After break he comes back in the classroom with wet shoes, because it rained. After 30 minutes his shoes are dry, but he notices that the stain is still wet, that it doesn't dry easily.

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Henri looks curious and fascinated. This can be an interesting starting point for a scientific activity = starting from an occasional moment. I can see a stain on my shoe!

I don't care that my shoe is torn. These are old shoes, my mom will buy new shoes anyway.

Teacher: What is the problem with your shoe?

My shoe is dry, but the stain isn't. How come the stain stays wet?

Teacher: would you like to repair your shoe? How would you do that?

Henri was curious and motivated to find out why the stain was still wet, even though the rest of the shoe was dry. I wanted to let him communicate his ideas with the other children, and start from their curiosity and questions to let them explore materials, making them feel ownership over the exploration process.

Activity: Group conversation The children discuss the problem Henri has with his shoe. Together they talk about possible solutions.

Rationale: The purpose of this activity was to let them communicate possible investigations, and to provoke their problem solving skills.

I could give him the answer, but decide to take a step back and let the children discuss why the stain is still wet.

Teacher: Yes, why do you think the stain is still wet?

The other children hear what is going on, and spontaneously they come to listen and to participate in the conversation.

I want to glue the missing part back on the stain. But I can not find it anywhere. Henri, you shouldn't have tinkered with your shoe! Miss, can you repair the shoe?

Do we have a similar fabric in our classroom?

Teacher: I don't think we have that kind of fabric.

I suggested the children to look for similar materials. Since we didn't have exactly the same fabric, I told them we would have to examine which materials were useful and which weren't. I felt it would support children's understanding and ability to make connections if they decided which materials they wanted to examine.

The children were interested to discuss possible solutions for the problem. My role was to stimulate them to think further, and not to be satisfied with one solution.

Activity: The children collected all kinds of materials, to find out which materials were suitable to repair the shoe.

Rationale: Originally I only wanted to let them explore fabrics. But the children were curious to find out the water resistance of other materials, so I wanted to foster their problem solving skills and see if they would find other ideas to repair the shoe.

Teacher: Look around in the classroom. You can collect anything you like.

I stimulated them to think further than just fabric as a possible solution. I let them experience that they could be as curious as they wanted, and that they could collect everything they wanted to test.

I want to examine other materials. Can I test this cork?

I think this fabric will be useful. I think the water can not run through, so the shoe will stay dry if we use this one. The children were very curious, and motivated to explore the materials, and to find out if they were water resistant. They started designing and planning their investigations, which they could carry out in the following activity.

Activity: Exploring the water resistance of materials in the 'exploration corner' In this activity several children start playing and exploring the water resistance of the fabrics and other materials. Soon a lot of other children come to the corner to see what happens. The children want to start testing the materials right away.

Materials:

a large and smaller water tank, plastic cups, a large variety of fabrics and other materials to be tested (collected by the children and by me), rubber bands to attach the fabric to the plastic cup, water syringes.

Rationale:

The children are used to play in the exploration corner. They know they can explore and experiment there, and that they may look for answers to questions they ask themselves. They are always very curious and highly motivated. I let them take initiative, design and plan investigations, and gather evidence.

> It is funny to see that every child wants to test every piece of fabric himself, even though they can see the result of the experiments if they look at what other children do. They like exploring the fabrics so much, they just can't get enough of it. My role was to let them explore whatever they wanted, and to ask a lot of questions like: what do you think will happen?

When you're finished, can I test it then?

I want to test this

fabric!

Sometimes they spray water on the materials after attaching it on a plastic cup. Some children first fill the cup with water, and turn it over after attaching the material to the cup.

Teacher: What do you think? Will the water run through?

I think the water will be able to run through. Look, I can see small wholes in the fabric.

Look, I can see the water running through. This fabric is not water resistant.

> The children learn to make predictions. Will this material be permeable for water or not?

Teacher to other children: Do you agree? What do you think about this fabric? Do you predict the same outcome? Why?

My fabric is very soft, so the water will probably run through.

The children can play in the water tank all day. Because of this longer period of exploration, they can discover that the effect of the water on the materials changes over time. Some materials look water resistant in the beginning, but turn out not to be.



Miss, this cork is water resistant, look!

(after a while) I cannot see the drop of water anymore. It's in the cork now!

Teacher: (sees that 2 children test the same piece of leather, but on the other side). What did you both discover? Did you discover the same thing? What's the difference?

Teacher: If I wanted to make a shoe out of this material, how can I use this fabric? Which side should be on the outside?'

I ask a lot of questions, to make sure they look closely, that they compare and discover the characteristics of the materials. I foster their problem solving skills.

By asking them why they make a specific prediction, I promote their thinking and communication skills.



Miss, how is it possible that the water doesn't run through this fabric? The children discovered that certain fabrics were water resistant, in contrast to what they expected. The fabric didn't look special to them, so they were curious to know how it retained the water. This led to the following activity: exploring waterproof materials, making connections and trying to make materials waterproof

Activity: investigation of waterproof fabric + can you make non-waterproof fabrics waterproof?

Rationale: During the previous activity the children found out that there is only one fabric where water doesn't pass through. After a while I take this specific piece of fabric, and repeat that it is weird indeed that this is the only fabric that is completely water resistant

Teacher: Could they have done something special with this fabric?

They made it like this in the factory!

Teacher: Maybe we can do something with our cloths, to make them water resistant?

We can cover the fabric with tin foil!

But it doesn't stick, it loosens!

Miss, we need that stuff that sticks, like on our folders.

The fabrics that are already wet, don't stick to the foil. But the dry cloths stick, and the water can no longer pass through it!

At the start they couldn't find a useful solution. Until I referred back to the worksheet. Referring back to previous findings seems to be an important part of my role, to promote their thinking skills and to help them make connections. A couple of children came up with the idea to combine fabrics with other material.

I give them the adhesive foil he refers to, and they start testing it. They find out it works only on the dry clothes.

The children gathered evidence, and now they could make connections between what they had observed and the problem they wanted to solve. They could gather all their findings now and share them with each other (communicating explanations)

Activity: group conversation. The children communicate their findings with the whole group.

Rationale: In the previous activities children used their curiosity and problem solving skills to plan investigations. They explored all kinds of materials, made connections between findings and previous knowledge, and gathered evidence. In this group conversation they could communicate their findings with each other. They described what they explored and what they found out, and discussed what would be the best solution for this problem.

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Teacher: What did you discover? How would you solve the problem?

I provoked the children to look back at their findings and exchange their ideas. Agency was very high, since they all explored the materials they were interested in.

Unexpected outcome: I thought all children were going to choose the leather right away. I knew in advance it was water resistant, and it looked a lot like the fabric of the shoe. I would never have thought of using the adhesive foil. I was pleasantly surprised that someone came up with this idea. I thought they would have chosen materials like tin foil or clingfilm (more day-today materials). I experienced the 'eureka-feeling' together with the children. (Henri) I will colour the stain with a red marker. And then I will use a piece of adhesive foil to make it water resistant.

Henri applied this knowledge, based on his play and explorations (and those of the other children), to repair his shoe.

This activity shows that the exchange of ideas is an important phase in explorations. It also shows that agency is an important aspect: starting from real-life situations and questions children ask, makes the exploration relevant to children, provokes the use of problem-solving skills and increases motivation.

Children's progress

The fabrics that are already wet, don't stick to the foil. But the dry cloths stick, and the water can no longer pass through it!



Some children wanted to examine the same material over and over again. Even when other children told them the result of some explorations, they still wanted to repeat the same exploration themselves.

A couple of inquisitive children examined all kinds of fabrics and other materials. Those children didn't take the same material twice, because they already knew its characteristics (and remembered it).





Children were very enthusiastic. Days after the activity, they kept asking for the water tank, because they wanted to keep on exploring.

Because of the real problem, the fact that the answer was not so easy to find and the fact that the children could explore all kinds of materials they chose, curiosity, agency and motivation were very high. Henri was curious and motivated to find a solution for his shoe. At the end of the series of activities, he could make the connection between the results of the explorations and his problem, and chose a solution based on evidence. He used his thinking skills during and after the exploration activities and group conversations.

(Henri) I will colour the stain with a red marker. And then I will use a piece of adhesive foil to make it water resistant.

Assessment for Learning

Review of children's progress

- Curiosity was high because we started from a real-life problem one of the children had. It also helped that children could think about what materials they wanted to explore: they could choose themselves, so they chose materials that made them curious: would those materials be water resistant?
- Because of the large variety of materials children could test all kinds of things, there were a lot of possibilities for exploration.
- Children were provoked to think about and analyse what they experienced, because of the questions I asked. This way they made connections and developed their thinking skills. I kept on asking, so they started to explore more in depth, instead of just 'playing' with the water.
- Children could communicate their expectations and findings. Communication was very strong in these activities, both at the start (predicting outcomes) and during the explorations (discussing their findings).
- The children themselves didn't ask that many questions, it was mainly the teacher herself that asked the questions. That didn't mean there was no enthusiasm, on the contrary.
- Children learned to note down their findings on the worksheet.
- The children did more than just 'playing with water'. They profoundly explored the materials, and were curious to find out the characteristics of the materials. They were amazed every time.
- They spontaneously communicated with each other.

Reflections

Teacher role

- Questioning and curiosity, teacher scaffolding and involvement: I had to keep asking questions and keep on communicating the whole time. It was very intensive. But I succeeded in asking questions, in response to what children said, discovered, asked,...
 This way they kept being motivated to try out new things and explore more in depth.
- Creativity: I had to provide a large variety of materials, because the children came up with lots of ideas or materials to be tested. Practically, the materials needed time to dry after the first tests, so there had to be enough materials as a challenge for the other children, who came after the first group.

Next steps for learning and teaching:

- Based on evidence of learning I will continue to discover alongside the children following their curiosity, interests and questioning to promote deeper thinking and inquiry.
- I will make sure agency is high by letting them decide what materials to explore, and by letting them design and plan their investigations.
- The more starting from questions of children and letting children communicate their findings and explanations has increased children's ability to use their thinking skills and to make connections.
- I want to keep on fostering problem solving skills. I want to make sure children keep on looking for answers until they discover what they were curious about.

Reflections

- Time: A lot of time was provided for this activity. The children could choose to play in the exploration corner the whole day. Everyone took his turn.
 Meanwhile they heard other children talk about their discoveries, or saw what happened when other children explored the materials.
- Content: Although I used the worksheet of a manual (*), I did more than was suggested in this manual. I used it as a support. However, it opened up the activity. I tried to use unexpected situations in the classroom as a starting point. This approach assures that children were highly motivated, and remember their findings after a longer time.





Reflections on following exploration activities

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Children are always very enthusiastic when they can do explorations. It motivates me to try out new scientific activities. I begin to see more possibilities and more interesting starting points that spontaneously occur. I find it less difficult to see opportunities now. In the beginning I thought I had to provide complicated scientific activities, but now I know I can start from day-to-day situations. I can pick up interesting situations more easily, and use situations that occur unexpectedly.

Reflection questions for the reader

- In what ways do you build on children's questions and curiosity?
- How do you help children make connections between different experiences?
- In what ways do you connect unforeseen situations to science?





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