CEYS
Creativity in Early Years Science Education

Curriculum Materials

Learning Journey

Oxygen

Erasmus+

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ΙΔΡΥΜΑ ΚΡΑΤΙΚΩΝ ΥΠΟΤΡΟΦΙΩΝ
ΙΚΥ

OXYGEN

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Creativity in Early Years Science Education

Setting the scene

Focus

This project focuses on the curiosity of children and the assessment of their own activities.

Rationale

I wanted to give them the opportunity to make their own decisions in preparing, executing and assessing the investigations.. I tried to let children take initiative, talk about and reflect on their observations, about what they did and why. In this discussion children could assess what they thought, what they did and what they experienced in various ways: a reflection on how they approached the activity. The difference I wanted to make was to have more children expressing their own ideas, and to have them talk about them in a discussion at end of the activities.

The implications for my planning

I tried to use more open ended questions, to encourage children to look for creative solutions and connections themselves. I provided more time to articulate observations, for reflection and reasoning. Grouping was also relevant to ensure children could be actively involved, could share their ideas and work together.

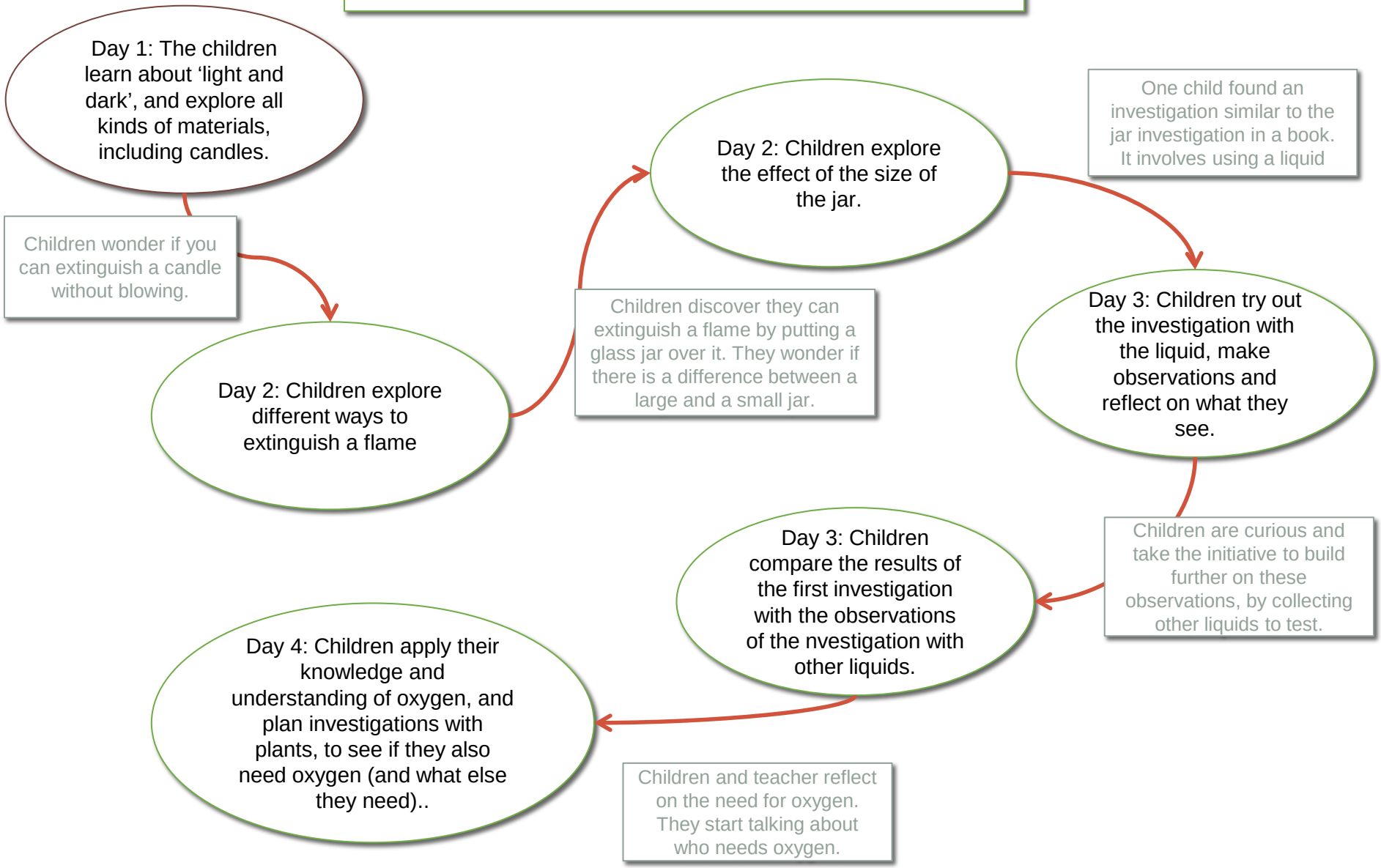
Links to CLS framework

Learning activities: planning of investigations, planning the research, collecting evidence
Creative dispositions: ability to come up with something new, thinking skills, sense of initiative
Synergies: problem solving & agency, reflection & reasoning

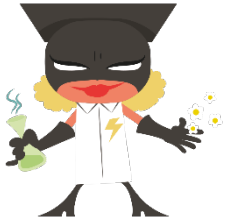
Background

School setting; in the centre of the city, with a diverse public.
Age group: 2nd grade of preschool - 5 year olds, a few children with a different native language..
School policy for science; all teachers are following courses in professional development on STEM and organise monthly STEM activities. Next year: Development of a new STEM-building with several research areas
Profile of children: children are used to explore and investigate in the monthly activities.

Overview of Learning Activities



Developing the learning journey: starting point 1



Activity: The children learn about ‘light and dark’, and explore all kinds of materials, including candles.
The children looked for solutions how to extinguish the candle without blowing.
They react curiously, ask all kinds of questions and come up with a lot of ideas.

We can wave with a piece of paper. Or we could pour a little bit of water over the burning candle.

Miss, some candles are a bit black, the other ‘sticks’ are still white.

Why would that be?

It’s because the black candle already burned before.

We can use a cloth. But maybe it will catch fire!

How will we solve this?

We can moisten the cloth.

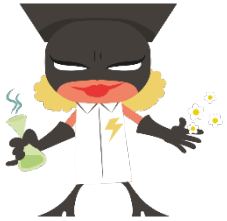
Rationale: the purpose of this activity was to foster curiosity. In this activity children could learn about oxygen and air pressure in a problem solving way.

How can we extinguish the candle without blowing?

Miss, maybe you could wave your hand…

The children were very curious and came with a lot of creative ideas, often other ideas then I had in mind.

Developing the learning journey: Activity 1



The children choose how to extinguish the flame. They have all kinds of ideas, so they look for the materials they need, and then they try to extinguish the flame in a way they think will work.

I want to try with a wet cloth.

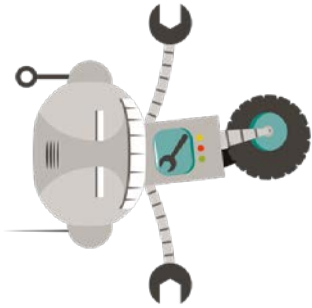
We can pour a glass of water over it...

Rationale: the purpose of this activity was to involve children in exploring creative solutions, and to let them come up with own ideas. They can take initiative, and talk and reflect during and after the exploration.

Tristan has an idea… to extinguish the candle by waving with a piece of paper…

The children explored what happened. They reflected on their explorations, discussed them and tried to decide what worked best to extinguish the flame. They discovered they could extinguish a flame by putting a glass jar over it. They wonder if there is a difference between a large and a small jar.

Developing the learning journey: Activity 2



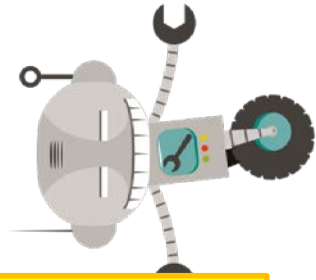
The children explored the impact of the size of the jar on the flame. They used jars of several sizes, put them over the candles at the same time, and looked what happened with the flame of the candle.

I want to test the biggest jar.

Rationale: the purpose of this activity was to build on children's ideas. They wondered if the size of the jar had and impact, so we investigated the impact of the size of the jar to the extinguishing of the candle.

The children reacted curiously and asked all kinds of questions. They started to sort the jars from small to big. They came up with an idea for a new investigation: testing the different jars at the same time.

Children's predictions, starting from the teacher's questions about the investigations with the jars:



How can we make sure a candle extinguishes fast/slowly?

We sort the jars from the smallest to the biggest one and place them over the candles. Then we do the same thing but in the opposite order.
Does it have the same effect??

What will happen if we place another (bigger/smaller) jar over the candle?

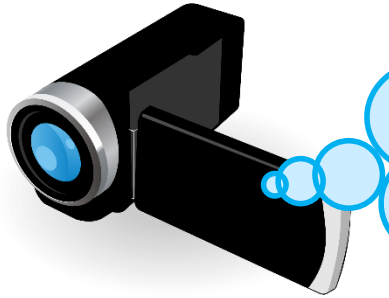
The air will still be there, at the top.

Yes/no, we should wait until they are all together…

What will happen if we do the same investigation with various jars at the same time?

They will extinguish… The first one (smallest jar) is already extinguished!

Assessment for learning: children get the chance to talk about their experiences on film (a 'babbelbox'). This way they learn how to express their ideas and findings, share these with others, and they can look back at them later.



The use of video didn't work very well. I need to find other ways to assess the process.

Developing the learning journey: Activity 3

The children found an investigation similar to the jar investigation in a book: a burning candle in lemonade. They wanted to test it and looked what happened with the flame of the candle.

The glass jar slowly becomes opaque.
The jar "*is getting misty*".
If you look closely, you can see small drops on the inside of the glass.
That's vapour, the glass becomes wet.

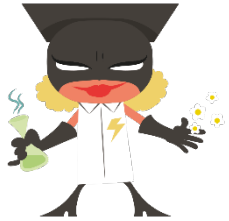
The lemonade under the jar is higher than the lemonade outside the jar.

The children were fascinated by the investigation, but it also prompted a lot of new questions. They took initiative in suggesting further investigations, so I allowed them to explore further.

Rationale: the purpose of this activity was to build on children's ideas and foster their sense of initiative. They planned and preformed this investigation, which fostered their agency.

The children reacted with surprise. They built on their prior knowledge and knew it had to do with air pressure. They wanted to test if the same happened with other liquids, so they planned further investigations.

Developing the learning journey: Activity 4



The children planned the investigation with the candle with other liquids. They wrote down their findings in a research record.

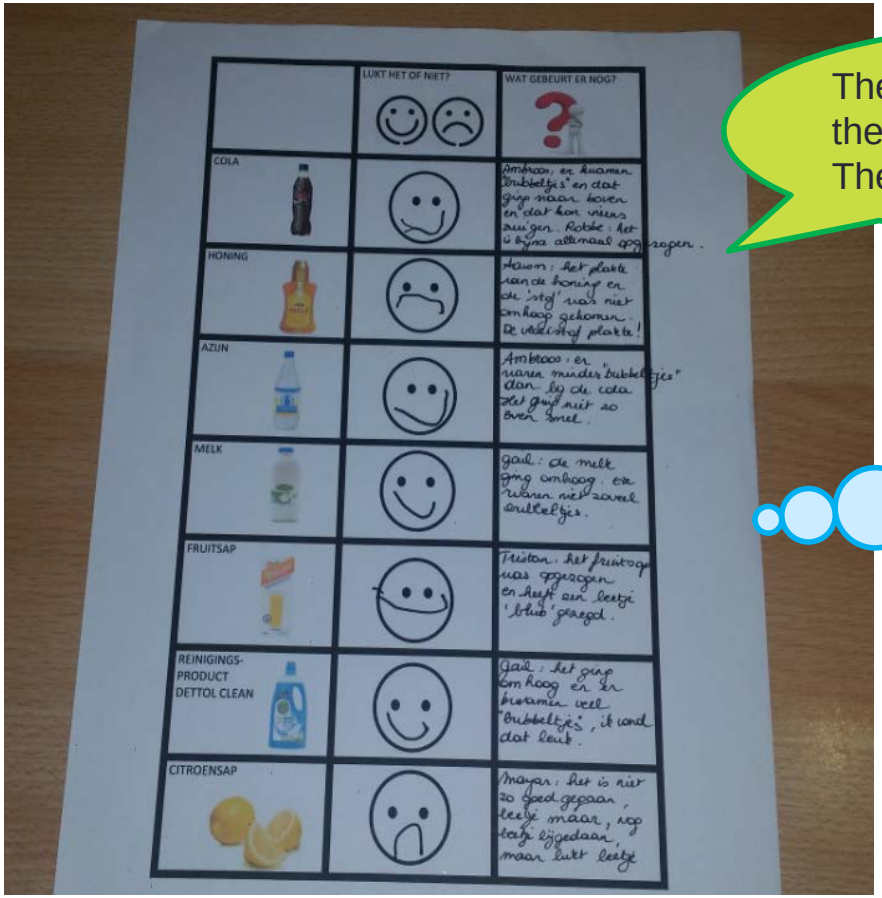
Look, there are bubbles appearing in the cleaning agent!

Would it also work with coca cola? Or *with milk, detergent, honey, vinegar, orange juice,…*

Rationale: the purpose of this activity was to let children build on their own ideas and plan their own investigation. The research record was included to assess their process and findings.

Developing the learning journey: Activity 4

The young children wrote down their observations on the research record: about with which fluids the investigation succeeded and with which not.They chose the fluids they wanted to test and drew a smiley face when the liquid came up in the glass. I wrote down their comments.

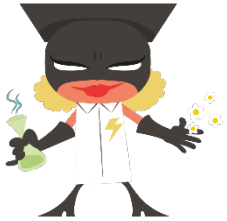


The honey sticked and the 'stuff' did not go up. The liquid sticked!

By using the research records children compared their findings, talked about what they observed to each other, and formulated their reflections so I could write them down. They used their thinking skills and there was a lot of reflection & reasoning.

Together we reflected on the need for oxygen. The children started talking about who needs oxygen. They see possibilities to apply their inquiry skills in other situations.

Developing the learning journey: Activity 5



After the investigations with the candles, there was a group discussion on the use of oxygen. The flame needed oxygen to survive, but who else does? And how can we test it? Because of the focus on inquiry in the previous activities, children are keen to investigate themselves. The children thought about plants, so they planted seeds and investigated what they needed to grow.
Leon brought his mini-greenhouse and bean seeds to the class. After an initial conversation the children came up with a research question: **Will the seeds grow (and germinate) faster in the green house or in a flowerpot with soil?**

Rationale: the purpose of this activity was to apply their inquiry skills in a different setting. Children could set up investigations with plants.

Developing the learning journey: Activity 5

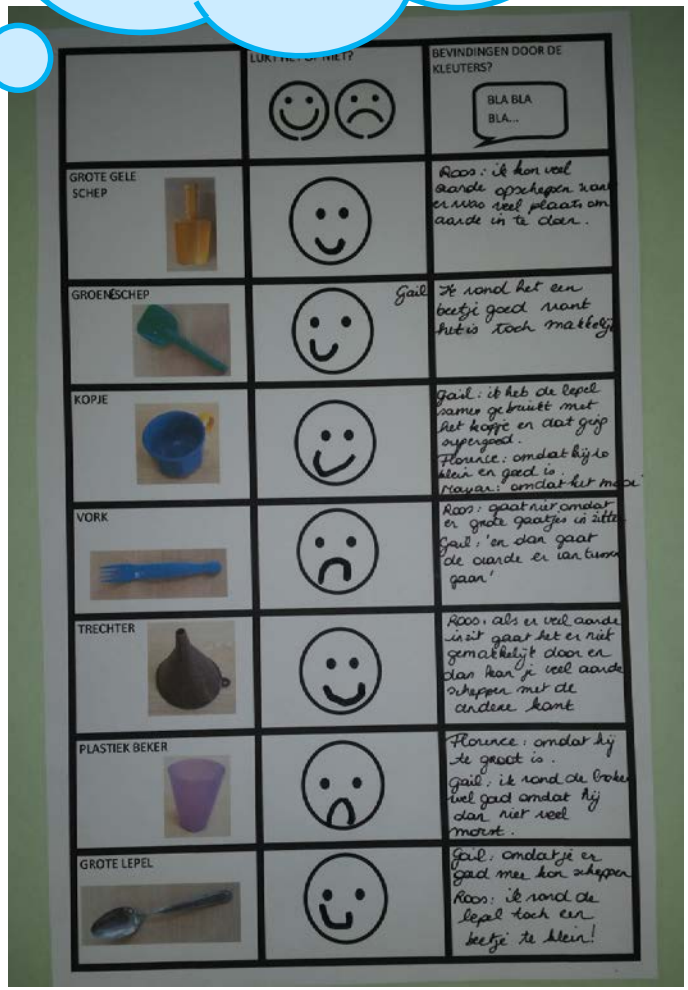
These girls thought the seeds would germinate faster in soil.They tested which tools were fit to fill the flowerpots, and wrote down their findings on a research record.

These children worked together very well, helping each other and sharing their ideas. Together they decided what the seeds needed.

I will try the funnel.

We should pour some water on the soil… or else the seeds will not grow!

We will put it near the window! Now the seeds have light and they can grow.



Developing the learning journey: Activity 5

Another group thought the seeds would germinate faster in the mini-greenhouse. They gave each other directions and cooperated well.

(check: one opening opened and one closed) My dad told me this!

This way the seeds will get 'oxygen'!

Look, you have to tear there, at the dotted line.. Do you see it?

You have to pour water everywhere, on every part of the paper.

Grouping was very important here. Assessment of the process in the form of a research record increased reflection and reasoning on the process. The research notes were added to the lapbook children made of this whole series of activities.

Developing the learning journey: Activity 5

In both groups children worked together as a group, and discussed their initial ideas. In the end they compared the results of both groups. The children experienced that both investigations resulted in small plants with roots, but the plants in the greenhouse grew faster.

The children used prior knowledge and thinking skills to set up their own investigations. They compared their results, and drew conclusions from their findings. Again this activity made new questions arise (e.g. why do the plants grow skewed?)

In both situations the seeds could germinate and grow initially. However after some time the plants in the greenhouse died. In the greenhouse the seeds were planted on a wet paper cloth or on cotton wool. In the plant pots the children used soil. This also offered potential for further investigation.

Assessment for learning: lapbook

- The children drew pictures to record their research .
- Photos were taken during the process and added to the lapbook with the comments of the children.
- The children evaluated their research ► reflection
- A lot of language was used / non-native speakers are encouraged!

Children’s progress

Gail wanted to be the first to talk in the ’Babbelbox’. She is an open and articulate child. She finds it difficult to cooperate since she likes to do things her own way. Although, she felt a bit uneasy to talk in the ‘Babbelbox’.

I thought it was superfun when I turned the candle on the cups…

Ambroos shows an ability to use his knowledge in new situations and is very curious. He has a very broad vocabulary and can easily connect ideas.

Those candles went out because there is lemonade in it and then the lemonade moved aside.

Robbe is articulate but lacks confidence and can be concerned about making mistakes. He is involved and curious.

I thought it was fun to turn the glasses over it and then.. Euh.. The lemonade went in the glass because I turned the glass over the lemonade.

Reflections

Review of children's progress

- The children were *motivated* and enthusiastic during all the activities.
- They are used to this way of working. They come up with all kinds of questions and are eager to find answers. They take initiative to try out things for themselves, and look for creative solutions.
- They used their thinking skills to apply gained knowledge to a new situation.
- Using the research records and the lapbook were useful in assessment for learning: children talked about their experiences, looked back at them and used this to go further in the process.
- Children listened to each other's ideas and helped each other during the investigations.
- Doing it yourselves' = better insights in science.

Role of the teacher

- I used open-ended questions and tried not to give the solution I had in mind.
- I encouraged children with limited language skills and children that don't speak that often: I fostered encouraged them to articulate their ideas.
- Every child could take part in the process
- More coaching and less directing. I felt investigations were often still too much guided by me: in the future I wat children to take even more initiative, and take a step back as a teacher.
- Even more possibilities and creative solutions should come from the children.

Reflections

Reflection questions for the reader

- How do you explain difficult scientific concepts to young children?
- How do you encourage reflection and reasoning during STEM activities?
- Do you build on childrens ideas?
- How do you try to assess inquiry processes?
- How do you help children make connections between different experiences?

Sources

- http://www.proefjes.nl/proefje/067
- http://methodes.plantyn.com/content/assets/techniekexplora/docs/TEEX6_dekeerzijde.pdf
- https://www.youtube.com/watch?v=FFZmL1BT_mQ

ACKNOWLEDGEMENTS

CREATIVITY IN EARLY YEARS SCIENCE EDUCATION (2014-2017)

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