

OPINION LAB – TOWARDS INFORMAL LEARNING SPACES FOR DELIBERATION ON SCIENCE



↑ A schematic visualization of what the eventual Opinion Lab will look like, from a bird's eye view. (figure 1) ©Marjoleine van der Meij

In the future, more science and society dialogues are likely to take place. Therefore, citizens need to feel equipped to engage in processes of deliberation on science. Informal science learning spaces can take a role in preparing young people for this 'deliberative citizenship'. But what should 'new' informal science learning environments look like? In this article we describe the Opinion Lab (OL), a playful informal learning space about synthetic biology that was tested in NEMO (Amsterdam) in spring 2015. We present a narrative that describes the OL learning experience and explain its design principles for science deliberation, enriched by preliminary findings of our prototype test sessions.

Have you ever heard of 'synthetic biology'? I ask a boy. "Nope", he says shyly. "Maybe biology?" I try. "Uhhh, plants, humans.... Freek Vonk?" he says. I smile. "True! Biologists study humans, animals and plants; they also study small parts that we are made of, named cells" I say, "Have you ever heard of the word 'cells'?"..."Hmm....DNA?" says the kid. "True, cells 'contain' DNA. Now what does 'synthetic' mean, you think?" I ask. "Do you mean 'made by humans'?" gently interjects his father. "Yes, things 'made by humans' are called 'synthetic'. So 'synthetic biology' basically means 'cells made by humans'" I summarize.

I grab a wooden puzzle (figure 3): "Now let's play synthetic biologist!", I say. The puzzle represents a nucleus with a little piece of 'unfinished DNA'. "This is a cell. Can you finish the DNA of this cell?" After a couple of tries, the boy puts the DNA in a sequence that makes sense to him (figure 4). I celebrate his achievement: "Good work! Now let's see what you have made..... its a plant!" I say, while showing him a visualization. I continue: "This plant is a special one. The DNA that you have just made gives the plant a special property: it takes its 'food' from the air! Therefore it needs no soil." I give the boy and the father time to observe the drawing (figure 5).



Jack



Liv



Zoë



Dax

↑ The four voices about synthetic biology, Jack, Liv, Zoë and Dax, respectively an instrumentalist, critic, inventor and 'bionaut' (figure 2) ©Marjoleine van der Meij

The aim of the Opinion Lab is to provide children with the comfort to 'speak up to science', now or in the future, and stimulate them to embrace a diversity of views.

"What do you think about this plant?" I ask the kid. "I think it's smart of that plant to do this!" he says, after a little bit of thinking. He looks at his father, so I ask the father too. "Well, interesting; maybe we can feed more people with such plants?", he says. The kid and father chat for a little while, and I ask questions to unravel differences in their views. The father seems a bit concerned about this new plant. The kid challenges his view by posing several possible applications ('indoor fruit plants').

I give them headphones: "I have asked other people what they think about this new plant too. Shall we listen to them?". They nod and then listen to Jack, Liv, Zoë and Dax (figure 2). It takes two minutes. I based these audio-characters on focus group sessions about synthetic biology (Betten, et al, 2015).

To represent diverse views that people have of synthetically designed organisms such as this 'new plant', I scripted four very distinctive opinions (OPL Framework, 2015).

"So what do you think now?" I ask the kid. He says: "Well, Zoë sounds like me! But what Liv says also makes sense". "In what way?" I ask. The boy lifts his shoulders, "Don't know, I just think it was ok". The father helps his son "You mean that it can be a bit dangerous to make completely new plants, right? Especially when you also eat its fruits?". The boy agrees.

After conversing more, I pose a 'deeper question': What is nature? I ask their answers to this, question, and then make them listen again to Jack, Liv, Zoë and Dax. We exchange thoughts and then reflect. The boy finally concludes: "I still think the plant is cool, but I understand that dad thinks differently".

Last, I ask them to draw a 'future world' with organisms made from 'new cells'. The kid grabs some pencils. He draws an 'earth' with many smiling stick figures. "What did you draw?" I ask. "Well, if we can feed all people in the world with these plants, we have happy but also looooots of people....!" says the kid. "Interesting!" I say, and we chat a bit more about this world. The kid still speaks enthusiastically of synthetic biology, but notes that it should not be applied 'too much'. I conclude: "Thanks! Let's stick your drawing to the wall!".

THE OPINION LAB

This fictitious dialogue is a typical of conversations in the Opinion Lab (OL), an informal learning environment where kids (and parents) train their science deliberation skills (Boerwinkel, et al, 2014) through a three step process:

1. kids and parents are introduced to a new development in science,
2. the kid creates an 'innovation' in relation to the new development,
3. then a conversation starts in which the child and parent reflect on their thoughts about this innovation, inspired by audio-fragments.

The OL is currently just a prototype (OPL, 2015), for which there is a parent-child conversation moderator, but the final design is a 'stand-alone' informal science learning space, suitable for zoos, botanic gardens or science centers (figure 1).

TOWARDS SPACES FOR DELIBERATION

Since research and innovation will impact people's lives in the future, in a way which is often uncertain and indefinable beforehand, it is useful to reflect on purposes of science while 'doing it' (Owen, et al, 2012). These days, such reflection on research and innovation is becoming more inclusive, opening up to the societal 'arena'. Therefore it is important to

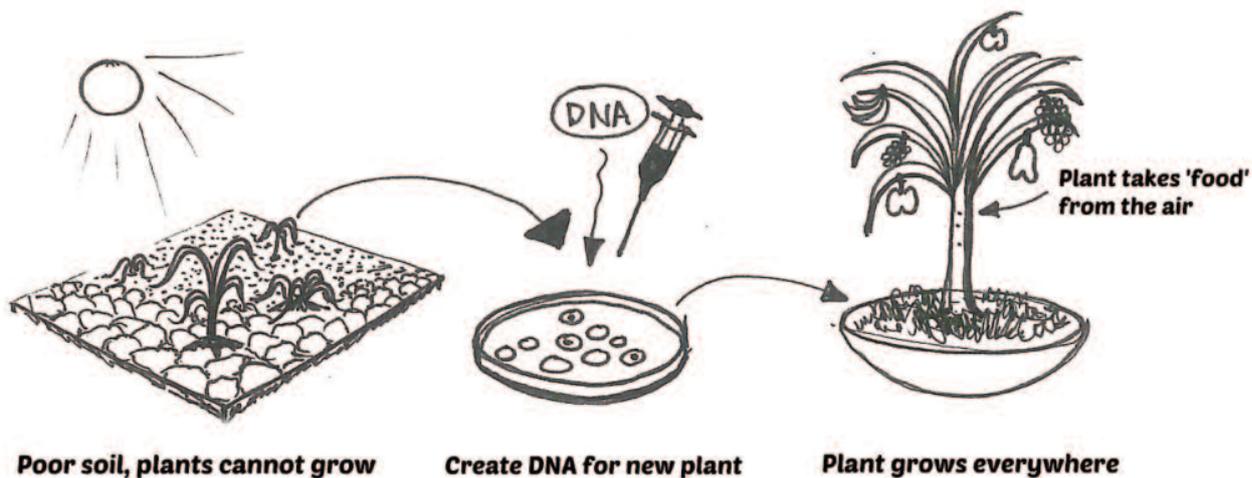


↑ The Opinion Lab conversations build upon kids making a fictitious piece of synthetic plant DNA. Kids create the plant by means of this wooden DNA puzzle. (figure 3) ©Marjoleine van der Meij



↑ The different possible ways in which kids can configure the DNA puzzle. (figure 4) ©Marjoleine van der Meij

Many kids started to articulate differences between their own and other views, based upon their interactions within the Opinion Lab environment, e.g. "I think differently; he [father] thinks this is unnatural, but I think it is natural"



prepare kids for such reflection. Informal science education spaces like science centers, zoos and botanic gardens can play a role in training such 'deliberative skills' (Boerwinkel, *et al*, 2014).

Looking at the OL prototype, spaces for training kids in deliberative reflection on science might be different from the usual informal science learning spaces in the following ways:

1. Potentially controversial developments in science are addressed.
2. Embedded visuals are, besides being explanatory, imagination triggers.
3. Different views are provided to support kids in discovering their own position.

The aim of these spaces is to provide children with the skills and confidence to 'speak up to science' and encourage them to embrace a diversity of views (Boerwinkel, *et al*, 2014; Owen, *et al*, 2012).

Designing informal learning spaces for deliberative thinking asks for openness from designers. No longer do we seek to give 'correct content'. Firstly we have to present science in a balanced manner; we need to encourage everyone to form their own opinions. One way to do that is by providing stories from people in and outside of academia, explicitly mentioning the 'authors' of such views. Secondly all voices should be presented equally to embrace diversity in thinking about science. Therefore we allow every visitor to make sense of the content in his or her own manner, we may have to limit our own definitions of what is to be learned from the exhibit.

Learning impacts of deliberation spaces - findings of OL testing
Preliminary findings from OL prototype test sessions (done with children aged 8-12 at Nemo, Amsterdam, spring 2015), show what learning does occur in deliberation spaces. In general, after kids created a 'synthetic biology application' (with the puzzle, see figure 1), they were initially enthusiastic. However, during the sessions we could see their views broadening; through considering the audio-fragments (figure 4) and discussing with their parents. Sometimes they adopted other views into their own initial view. The drawing exercise showed that most kids eventually formed a clearer version of their own opinion, while accepting the existence of different views. The fictitious dialogue above illustrates that the kid adopted some concerns about synthetic plants ('over-population') besides merely seeing potential opportunities; as he did in the beginning.

WHAT'S NEXT?

Questions remain as to whether these informal learning spaces for science deliberation work without teachers or parents accompanying the kids. Stand-alone spaces require additional tools that incite reflection. Also a challenge occurs when people do not follow the tasks in order. Therefore the re-design will be tested in 2015-2016.

↑ A visualization of the synthetic plant to trigger the kid's imagination. (figure 5) ©Marjoleine van der Meij

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