

Doli seminar on

Researching Art and Science in Teaching



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Introduction

The aim of this week in Doli was to explore the field of art, science and teaching/learning – a field all of the participants, in one way or the other, are engaged in. In a phenomenological sense, we started the reflections on these by actually entering this field through *practice*. For this workshop week we found it useful to establish “art as practice” as the point of departure for moving into research, and into teaching and learning. We tried to ground our work with artistic exercises done together. These provided “a layer of return” in our discussions and reflections.

Some of the topics that came up were:

- *Art and creativity*: Are they “one and the same thing”? Or is artistic creativity something unique?
- *Is the skill of creativity transferable?* Can the practice of creativity in art classes/exercises lead to creativity in for example science education?
- *Artistic research or research on art*: What are the differences, the commonalities?
- *Has art a value in itself or a means for research or teachers?* Of course art has a value of its own! But what happens when it is used in research, in teaching and learning? Or: How to avoid that art is reduced to mere means?
- *Deconstruction of the art/science concepts*: Is there a need to establish new concepts by deconstructing the old ones? How to research the field where there is no separation between art and science?
- *Creativity of the mind and its relation to art*: Can art promote thinking, and/or is art a *form* of thinking?

The aim of the week was to employ our *own* experiences in this field. The focus was on how and what we have experienced in this field rather than our (rational) thoughts about the correct blend and the correct definitions of art and science.

Outcomes

The envisaged outcomes of the week were:

- a one page statement (synopsis) in which we outlining our thoughts regarding the artistic approach to science education, and where we present how it can be incorporated (see Appendix 2);
- a seminar report, presenting a structured overview of the art/science field;
- concrete ideas concerning how to proceed (articles, research applications etc.);
- possible new knowledge, for example concepts, forms or work.

Below we present a report of our activities, presentations and discussions, organized per day of the week these took place. The report ends with several reflections written after the seminar.

Sunday, 5th of December

When we had settled in at the house in Doli, we started out with a presentation by Edvin on the aim and contents of the seminar.

Evening session – Combining art and science, by Edvin Østergaard

When art and science are combined, we tend to use art as “the icing on the cake.” It is often used as a “pause,” as something that is different from “the real thing.” Similarly, artists tend to state that the art is the most important thing and they then question why one should engage in science research at all – research tends to become “the icing on the cake.” Here, doing the performance, e.g. making the music, is regarded as the real thing. Doing research is perceived as “stepping out” of what is important. The aim of the seminar is to avoid both “icings.”

In June 2010, Aksel and I partook in a seminar in Sheffield, the United Kingdom. It was the first time we made an attempt at *practicing* art and science. The seminar was very innovative. It really tried to focus on researching one’s own art. Art as an activity *and* research as an activity in itself were combined, instead of maintaining the huge imbalance where one is the important thing at the expense of the other.

It is difficult to find activities that give both weight and reciprocity to art and science. There is a danger of reducing art to a mere “means,” e.g. in order to get more students to the physics department. Art is then seen as something that comes next (“nice and relaxing to listen to”), but it doesn’t really impact the research or the scientific subject. The mirror image of that also exists among artists. “My art is the important thing” and the scientific part is then, as it were, used to legitimize art.

The following question is at the core of our seminar here in Doli: “Why is it important to combine art and science?” When I talk about “science,” I mean science as *naturfag*, *naturvetenskap*, that is natural science. In this, we should maybe distinguish further between *science* and *research*. Why is it important to do art in the context of education for *naturfagslærere*, *science educators*? And also: Why is it fruitful to use research when you are doing art?

In (natural) science, new knowledge is being produced, all the time. However, I am not prepared to accept the fact that we, as artists, leave the job (of producing scientific knowledge) to these people! The produced knowledge stems from certain values, certain world views and a certain attitude. If we leave it to the people who are not interested or skilled in art, we have lost. We will then, even more, broaden the gap between art and science – we leave it to “them”, whereas we are occupied with “the fine arts”. We have to take that battle on. We have to show how science is connected to our own artistic relation to nature, and we have to find tools in art in order to promote this relation. This is in the *core* of science, not something you add afterwards.

We need to frame art and science properly. Nowadays, the concept of art can mean virtually anything. After Joseph Beuys, we are all artists! And with *Kunnskapsløftet* (*The Knowledge Promotion*, the new Norwegian curriculum), we are all scientists as well! It is thought that children between 7 and 18 should be educated to young researchers, “researcher sprouts” (*forskerspirer*). Now this education starts already in the kindergarten for children under 7 “research seeds” (*forskerfrø*)! This all illustrated the increased focus on research as an integral part of education.

An added dimension here is the relation between *process* and *outcome*, in relation both to art-making and science-making. When we look at art and science as process, then it may very well be impossible to see the difference. It is about creativity, about putting something new into the world, about seeing things in an innovative manner. But when we look at the outcomes, we

might see very big differences. There is a difference between a symphony and an article in *Nature*.

We start out from an amorphous state, where we have ideas, thoughts, wishes. These are not in any way an answer to a problem. First there is just a good idea; it's part of being human. As an artist you are trained to put this into form. E.g. as a composer, you have to know the instruments, you have to know how to write a score etc. You need to know what a tonal system, a note, a key is. You move from this amorphous stage into the formation stage - and it becomes a piece of work. But fulfilling, completing the process is important to me. One can have all kinds of ideas, but they *have* to become a form.

Exactly the same thing is at stake in the scientific process: it also becomes a form, according to the rules and conventions of science.

In my own research, I found that both Darwin and Wagner worked with the very same ideas: they both claimed that things are not finished; they are in an evolving process. Wagner, as an artist, chooses his form of expressing it, and Darwin, as a scientist, chooses *his* form, according to the convention of being a biologist/scientist. Here, at the idea level, we can see the kinship between the artistic and the scientific work, how they are connected. Darwin and Wagner's works connect to each other in the quality of evolutionary thought.¹

This is connected to Aristotle's distinction between *in potentia* and *in actu*. *In potentia* refers to the amorphous state of ideas which have not yet come to form and expression, but which are there. And *in actu* refers to what comes out of it, when it becomes an actual form.

It is possible to compare art and science on two levels. *Before* it becomes form, that is in the process, and when it *has become* form. To me, this is a very important distinction: between what is, and what is *not yet* there: that which needs a personality, which needs the artist or the scientist in order to become a form. The scientific form can take several forms as well. The same goes for artistic form.

In Sheffield,² I addressed the question: "What would the innovative expression of *art-science* be?" Then we came upon the question of **competencies**. An artist can put something amorphous, an idea, into a form, and there are certain competencies connected to this. When, as a science researcher, practicing work of putting science into a *form*, there are also different competencies involved. One has to be able to handle the format of it; as a scientific researcher to handle the format of a scientific article which meets the standards of a scientific community. The format of an article is conventional, yet the researcher is seeking to express new findings.

The same goes for a composer. The composer has to be able to handle the format of a score, because he or she wants musicians to read it. The score is based on conventions; the musicians read it according to conventions. Yet, the contemporary composer might want to express something in the music that is *more* than a convention! There is a dilemma, when something unconventional is expressed by conventional means.

The notion of competencies might be an important discussion topic throughout this week.

In Sheffield we did an exercise, whereby we started by being in an artistic activity. Then, afterwards, we stepped out of it, and looked back at this activity. We all did it in different groups, but the method we used was the same. We could also do this during this seminar here.

Discussion

Aksel: When we do an activity, we can – without *leaving* the activity – put our "attentive finger", our listening ear onto it. Inside the activity, we may ask: What does it do to the student? What happens? We could for example look at the difference between engaging with felt or with

¹ Østergaard, E. (2011). Darwin and Wagner: Evolution and Aesthetic Appreciation. *Journal of Aesthetic Education*, 45(2). 83-108.

² I am referring to my lecture "Music – Art – Science" at the conference *The Role of Arts in Higher Education*, Freeman College, Sheffield, June 11, 2010.

iron as work materials: What does it do to a student, e.g. to one with emotional blockages, to work with either iron or felt?

Linda: I have the impression that things have changed underway, from when we first talked about coming here, to actually being in Doli and working here. My initial picture of it was that it would be more exploratory, that we would just begin with this area and open it up.

Aksel: I want to distinguish between the creative process and the formative process. Regarding the latter, I want to be able to say in what way the experience had a bodily, emotional and mental impact. Every craft has its particular demands. One can ask: What does the artistic process *demand* of me? But one can also ask: What does it *give* me? What did this do to me, as a learner?

We could think of the following “harvesting” method: say we do an activity which both consists of a creative and a formative process. Then we have a conversation in which we raise two questions: 1) “What did this do to me?”, and 2) “Which essence can we distil from this?”

Firstly, we could start by reporting on **(A) the creative process**, e.g. in the following way: “I did this, and then I did this...”; then we could report on **(B) the formative process**: the impact on thinking, emotions/feelings, and the will – and all three both from an individual and from a social (group) perspective. Finally we could take up **(C) the pedagogical implications** of what we are doing.



Monday, 6th of December

We began by gathering outside on the balcony of the Doli centre. Linda and Solveig invited us to go out in the garden and neighboring area for about 15 minutes and to collect about ten different seeds. When we had returned to our working table on the balcony, Linda gave a presentation on the importance of seeds in our lives. We proceeded by making a list of characteristics of seeds.

Morning session – Looking at seeds, by Linda Jolly

The seed is the part of the plant that is most like the mineral, the smallest part of the plant. If we would present it as a geometric form, it would just be a point. Their life is laid down in a stage which is stable. It doesn't appear to us to be changing. It is matter without apparent life. The conversation around seeds can be connected to nutrition, to politics, to the environmental situation, the right to collect seeds, etc.



In our teaching, the question of how the seed is made is usually taken when we've come to the end of the cycle of the growth of the plant. And then we go in, we could have done that here too; I could have put some of these seeds in water overnight, and then we could have looked at the inside. It is impossible to do this when they are completely dry. But if we had done this, we could see where the little plant in the seed is.

The seeds are nourishment for us *and* for the plants. Somehow, the seeds that offer the *least* for our senses often become one of the largest topics, and a source of inspiration. There is just so little there in front of us!

Seeds that we commonly find in the kitchen were then given to each one and after some initial observation Linda asked us to find descriptive words for what seeds have in common.

Descriptive	Associations
Odorless	Not-yet ness
Limited color palette	Timeless
Condensed	Concealed
Two parts in one	Essence
Symmetrical	Potential
Color between brownish yellow and grey	Separateness from motherhood
Closed on themselves	Expensive dental bills
Smooth surface	Silence
A bottom and a top	Bones
Isolated	Unity
Small in relation to the plant	Earth
Hard	Starting point
Compact	Bread
Light	Storage
Confined	
Single	

Figure 1: The list of descriptions of and associations with seeds that we came up with.

Then we had a little pause. After that we engaged in the artistic activity of using wax to form *one* particular seed (of our own choosing) into an enlarged form. As the wax material was stiff, we first needed to knead it before we were able to work with it. The seeds chosen ranged from a grape stone, to a chickpea, to a pumpkin seed, to a grain of wheat, to a lentil, to one kernel of a berry (of which we were not even sure it was a seed or a fruit containing several seeds).

The second artistic activity involved again making a depiction of one seed, this time two-dimensional, using earth pigments. Solveig provided the following instruction into the activity.

Solveig: Usually when we do the course, we do the whole plant; it is quite different for us just to do one part of it. Usually we use pencils to draw the seeds, but then I thought it would be nice to get hold of the different colors of the earth! Usually pigments are very unhealthy. But if you get these earth pigments in your mouth it is not a big problem. Our aim with this little piece of paper that we are going to work with is to come closer to the colors of the seeds, just as we see them now, in this sunshine, with the shadow, with the reflection we maybe see in some of them. We want to look into the differences in shades of color. But because using this material will be new to most of you, I suggest that we explore that a little bit first. If we put some colors on the

edge of the paper, little heaps, and try to make patches, and then to spare out the form that you see in the seed that you choose. And when you have made this “mineral bed” for the seed form, then you look at the seed once again, and try to differentiate what is actually happening here, with the colors. This, like the other exercise with wax, has very much to do with concentration, with devoting yourself to what you are seeing and to have your consciousness there.

In the afternoon we wrote individual reflections on the art workshop with seeds, according to the model offered by Aksel, which in itself was based on a workshop he and Edvin conducted in Sheffield last summer. Later on, we made a trip to the coast, where we had dinner at the sea side.

Evening session – Poiesis in teaching and learning, by Aksel Hugo

My theme is “poiesis in education.” I want to frame the discussion as follows:

- Historical context of Greece
- Poiesis in the act of teaching and poiesis in the act of learning
- I will join these historical and epistemological foundations with a third frame, which will be: the paradoxical, the mysterious, the irreducible field.

Historical perspective

When we look at education for sustainable development, and ask what it might be in ten years, it may be instructive to take a step back, and to consider the journey that we have made since the appearance of schools academies (around 600 BC), here in Greece. It is a journey that is on the one hand a negative journey, a “stepping out” (cf. David Abram) of a knowing that is situated, relational, communicational, and aware of its participation ethically in a large setting of beings among beings. It’s like differentiating itself *out* of that situation.

But one could turn this around too and say that this is *also* a positive story, a liberation story. A new perspective came with the Greek academies: it was not education, to learn a skill, but to come into communication with a culture and to be initiated in a social, practical, even spiritual way. It was self-education: education for the self! Later we can see what this freeing, this creativity, has led to: a freeing of thinking.

One characteristic of these schools was that if the entry for example was sports, *gymnasium*, (which means *gym*) the aim was not to do sports to play, not to cultivate sports in isolation, to throw the discus as far as one could and to forget the other things, but it was contextualized in developing the full potential of the self. For this reason, they did *five* sports: throwing spear and discus, running, jumping and wrestling: because, in these five you would have the key competencies: directedness, centeredness, etc. to develop the full potential, the capacities of the human being. From *theoria* you would go to right action. A clear, radical aim was to develop the self, the genius of the individual, and *not* that of the group! So Socrates *never* gives any answer. The individual has to come up with the answers.

Aristotle developed a theory, some key concepts, which constitute a *phenomenology* of ways of knowing. He differentiated between three categories of human engagement. Correspondingly there are three types of knowing. Today’s concept, of theory versus practice, is different from this.

theoria	episteme (<i>knowing lawfulness</i>)
poiesis (<i>doing-making</i>)	techne (<i>knowing-making</i>)
praxis	phronesis (<i>knowing to act</i>)

Figure 2: Three categories of human engagement and knowing.

Poiesis is in the middle between *theoria* and *praxis*. It is the mediator. The root of the word is *poe*: “doing-making.” It is the way something you have thought of comes into being and becomes something real. It doesn’t have to be something concrete, it could also be a book or a poem. One could also call it “incarnation,” or even “creativity.” Doing-making is something that is productive: a coming into being. It relates to *techne*: “the knowing of the making.” When you make a chair, a drawing, a poem you are creative, you make something new. From one perspective, this also the case in education, when you make or compose a particular educational space and event, you “make a space for understanding”. In so doing you have to perform, you have to act out of the moment and particular time and situation and thus need to perform *phronesis*, knowledge how to skillfully act out of the moment and the particular encounter with particular students in a particular field and space. Here there is a need of skill or craft – but performed educational *phronesis* may also be named “education as art”. For Aristotle, the highest form of knowing is *phronesis*: knowing to act, and to act ethically; to act correct in the right situation. *Phronesis* you can’t just *have*, like the laws of physics, you need to re-create and re-create it.

Poiesis in the act of teaching

If we now step out of the historical frame and into the class room, into the activity, like we were doing today, in an educational situation, a process, we can say that we were creating something: a *poiesis* of some teaching. We went through a process of learning, and there was some *poiesis* in the learning.

The first thing we see is that in teaching there is creativity: one has to compose how the whole year is looking; how the *week* is looking, one needs to have an idea of *what* one does *when*. In the planning, the choreography, there is a sense of: where are we when? What happens here is a *poiesis* element in teaching.

Regarding the performance of Linda and Solveig this morning, we can ask: how did you lead us into it? What did you say, before we did something? How we subsequently did what we did was very much dependent on how you lead us into it. Performance is also a creative moment. As teachers, we are composers *and* performers.

As teachers, planners, of the space we are in, are we *wise*, in the school? Space is forgotten, it is only content. Speech, especially delivery of speech, is forgotten. We don’t train speech any longer in schools. One of my master students told me that one out of four of the teachers in Germany have speaking difficulties. They should have had lessons in speaking. Yet, their voice is their main instrument!

You, Linda and Solveig, perform out of an understanding of the *poiesis* in *me*, as a learner. I was a plant that was growing, as it were, and you were the gardeners!

There is a kind of choreography of the *poiesis*, of the making. I make discoveries, associations, concepts. You know why you do it. We can, in other words, have a pedagogical point of view on *poiesis*.

Poiesis in the act of learning

I start out with a quote: “If, for a moment, we shift stance, from the act of teaching to the act of learning, we can ask the same question: What is the nature of poiesis in the act of learning? When we participate in a practical, communicative, or intellectual learning process, where is the creative agent? Is it possible to trace it?” I asked this question in my own dissertation. I was led to the activity of “attentive practice,” that accompanies thinking and perception. My movement of attention can be described as a form of mindful, auto-volition (*Eigenbewegung*). As an activity, it can be traced in a variety of appearances:

- as pure attentiveness;
- as mindful pondering in our questioning and thinking activity;
- as intentionality in our sense activity;
- as listening capacity in conversation;
- as body awareness in crafts and sports;
- as presence and tact in pedagogy.

If we map activity from the inside, we will, in all these areas of attentive acts, be able to trace an element of making and creating. The act of creation in science is clearly linked to this isolation of mindful activity; we call it “thinking.”

If we explore the poiesis of the making activity, of this particular human activity field, then we see that it builds on two particular capacities: (1) a capacity of actively *not*-knowing: being able to carry and sustain a question over time; and (2) the capacity of actively spelling and playfully searching to resolve the unresolved.

The first element is the capacity to create a space of (a particular) unresolvedness, *eine bestimmte Unbestimmtheit*. It is a holding capacity of a creative field, a field of potentiality.

The second element is a placing of auto-volition (self-will) within the frame of a space that is created. It is a trying out, a movement and playfulness in the field of the unresolved.

We see here clearly that an element of poiesis is at work at the core of the scientific process.

Poiesis at the heart of cognition

Then comes the last and most important point: What makes us humble in this whole, powerful, strong, self-esteeming, free unfolding of one’s capacity? It is a countermovement. If we go deeply into it, what happens there? Epistemologically, it is important to make a distinction between the *effort* of auto-volition in thinking (*Denkakt*) – it is an effort which is ongoing: a pondering that attentively is steered and geared by my effort; sustaining the unresolved question of what you have in mind “...how can I solve this, how *is* it? – and this *plötzlich*, which is something else, which is *insight*. The latter comes into being in a different way. The resolution of a new insight (or meaningful content: *Denkinhalt*) is “a being given.”

If we explore phenomenologically what the nature of this process is, by slowing it down, we see the characteristic of effort on the one side, being the spiritual activity of the subject (to use the word ‘spiritual’ is not important here, we could also name it ‘X’. Important is that we know and recognize the kind of activity I talk about – and recognize that this activity is precisely not a physical movement)

The activity is always the result of an effort; neither the teacher nor anyone else can do it for the learner. One has to *do* the thinking or observation by one’s self. When we come to the *moment* of an insight: this has *another* character, of an immediate event. Its content is not my production; I receive it. As cognitive event, it has an element of *grace*, Novalis uses the word *Einfall* (fall in) to characterize the quality of this ‘struckness’. You are struck, as in English when we say we ‘fall in love’.

For me, the main point here is the awakening of a sensitivity to differentiate effort from grace, and the act of sustaining a question over time from the event of receiving an immediate insight. To see this dialogical structure in perception and thinking reveals a presence of poiesis at the heart of cognition.

Aksel ends his presentation by a personal story that for him is related to the artistic activity we did that day: First creating the negative space, and then placing the seed in there. To him, it was a huge aesthetic experience. It was about creating a space, in which then something appears. To him, it provided a tiny glimpse of something very sensuous that he remembered from when he was in a particular place at age four or five. One of his very first memories.

Aksel: We were in a sand box with some boys. We had brought our cars. At some point, the others had left. And then there was a discovery, that below the sand there was some gravel, and I could get to the gravel. Can you understand this feeling? I could take out one stone, and one more, and a third, and I was *building* a space by taking things out! It was a huge aesthetic experience. I was completely happy. I don't know why, but I related it today to this seed drawing experience and I could relate it to this epistemological point of actually *sustaining* the unresolved – as an activity, as a space, as a description of this poiesis character, as I experienced it, in thinking. That's the core of science, in life.

Discussion

Jan: I think it's really interesting what you said about this element of grace, the relationship between effort and grace, and *receiving* it. It reminds me of something which Stephen Nachmanovitch wrote in his book *Free Play*, where he writes about the relation between the "creative" and the "receptive", that there is a constant dialogue. I think that in the receptivity, there is an element of grace also, and I think that it's very important to acknowledge that.

An association I have there is with the work of Shaun McNiff, he wrote a book called *Art Heals*. He is an art therapist. He has this notion that when an artist makes a painting (it can also be another artwork), there might be this dimension that the painting acquires a life of its own. He speaks of "the painting becoming an angel" – not in a biblical or Christian sense, but in the sense that it's infused with life, and you have the experience that it is *responding* to you. So at one moment you might have the idea that you are the creator, you are bringing something into the world, but there is a changing point, and I think this element of grace is also there, that in acquiring its own life-force you have this enigmatic dimension that it came through you into the world, but yet in its acquiring its own life it is entering in a dialogue with you of being "other." That is to me a very interesting dimension of the artistic process.

The element of grace cannot be "ordered," it is not like what Heidegger said "in standing reserve," it overcomes you, it catches you by surprise.

It takes a certain capacity for teachers to allow for this to happen; it has to do with a capacity to handle vulnerability, open-endedness, chaos, paradox, that if such a thing, this moment of grace, evolves in the artistic process, the teacher has to be competent, flexible, to allow for this moment of grace to land. At Schumacher College they often use the expression of "holding the space." It is not so much that you create the space, but more that you hold the space, you provide for a certain "area," where this moment of grace can manifest itself. But it is intrinsically such that you cannot plan for this, you cannot create it, you must allow for it to happen. If you would think you know beforehand what this moment of grace would be about, you would miss it. One has to allow oneself to be overwhelmed, and I think this is a challenge, especially when you are in the role of a teacher, a person who has the responsibility, who has to keep an eye on the learning outcome.

Aksel: It's actually something which I came to understand only recently, that the French Poststructuralist critique of how "knowing," and especially "one particular way of knowing," has been colonizing the whole world. The not-knowing is a prerequisite to have this humbleness, this "knowing of the not-knowing." And I find, at least for the Waldorf schools, it should be really very healthy to have a big shower of Derrida, because there is so much knowing, there is so much! We know what's good for the six-year old. Who are you to know what is good for the six-year old? Derrida says in this extreme humbleness: Is it possible to be a teacher? Is it possible for me to stand here and know what is good for you? What do I really understand of this individual? And only when you know you can't, you *can*, I think. The child knows its own growth, and its own processes, not steered by some wise framework, which proves to be a tradition, and has no reasons often, other than "we do it like this..."

When the Poststructuralists come to language, they say: "It's all about power in language." So you have to revitalize language and concepts, make new concepts. I didn't realize that, because at first I thought they were mad.



Edvin: Back to this relation between effort and grace: I recognize this, that something comes suddenly, it catches you by surprise. I have never really thought of that in an educational setting. I just want to repeat one Einstein quotation you started with. Einstein was asked to give a short presentation of his special theory of relativity. In three minutes' time he explained his theory of relativity, and the first sentence was: "After seven years of pondering in vain (from 1898-1905) the solution suddenly came to me." He puts together the effort of struggling and understanding, which has one quality, which is one level of intellectual effort: I have tried to understand this, and suddenly the solution comes. The German word *plötzlich* is derived from the word *der Plotz*, which is related to sound: the sound which appears the moment when something is full and it suddenly bursts. Einstein also talked about the state he was in when this happened. Arthur Koestler writes about it in his book on creativity, where he writes about

many scientists describing this moment.³ And what is common for this moment of grace is that they are not intellectually prepared; Einstein for instance was even sick in bed when that happened. In the fruitful combination of dream and conscious effort, that's where it happens. So it's a paradox: you are trying all the time to grasp this final solution, but in the very moment when you let it go, then there is the possibility of finding the solution. Throughout the book you can read that many scientists share this experience, and that they know exactly when it happened.

Jan: Earlier we talked about the three B's, the places where new insights often come to scientists working on a specific problem: in the bus, in the bathtub, and in the bed.



Linda: But I also have to say that after many years of teaching I know that it also takes a lot of effort, before this can happen. We should not forget that the preparation is also important, maybe even necessary, for grace to finally happen, *if* it happens. That's this "making the space," or "holding the space," I guess.

Jan: To me there is also the quality of being able "to calibrate," to move back and forth, to move from the static qualities of structure, discipline and order (all the things you have in your backpack as a teacher) into the dynamic dimension of "letting go." Generally, we as teachers have very little training in moving into that dynamic zone. Usually you are trained in the "knowledge transfer." So to encourage going into this situation where the receptivity for a moment of grace is enhanced, is not something we are particularly stimulated to do.

Linda: But the question is: how do you train that as a teacher?

³ Koestler, A. (1964). *The Act of Creation*. London: Arkana, Penguin Books.

Jan: I think an important element is to nourish the child inside one's self, as a teacher, to be able to keep the excitement also for yourself of not-knowing what will happen. And because of your own excitement, others are triggered to be excited too.

On the one hand you need this training to let go. On the other hand, sometimes it can be just around the corner, sometimes it just happens when you are unprepared. For instance when you are working with people who are not skilled in art-making (dealing with colors and working with clay, like e.g. in the exercise with the making of the clay little-me's which we will do this week), but there is something happening because of this element of excitement, of being overwhelmed.

An important word in this context is *latency*. There is a potential which is covered, but which at the same time is already there, lies dormant. Nachmanovitch has this image of Michelangelo, that the sculpture is already in the stone; he just has to carve it out and remove the superfluous material. The potential is already there, but we just have to pay attention. The artwork is already around us, but we just don't see it. So it's important to cultivate this receptivity of things happening just around the corner.

You yourself gave a nice example by what you said about "creating the negative space." Through the negative space you get a completely different approach to supposedly the main object.

Aksel: I have a question to Solveig. Your remark (in the exercise with working with the seeds) was extremely important for me, this directedness is very important. Through your strictness and precision in instructing in what we actually should do, it was possible for me to come into this conversation. The key for me was one little thing in your instruction, you said: "Keep the attendance to the seed *as if you are in a conversation with a person*." That, to me, was very clear; it helped me very much to be able to enter into the task. My question to you is: When you teach, how do you experience this theme of effort and grace?



Solveig: It's very hard to explain this in just a few words. But what you point at here is very important to me. Because if you don't take into account that this is really is a conversation, that you're actually making your own *relation*, not to *what* the seed is but to *who* it is, then you miss the essence of the exercise. And that's also the problem with starting correcting while the student is working. I'm doing it less and less. I try to give the instruction as accurately as possible and then to step back, to leave them to make their own conversation with the object, the seed we're trying to explore and try to get into dialogue with. And in this process you are not to be disturbed, unless you ask for help. Afterwards you look at your own conversation with the seed, *through* the conversations with the others in the group. So there are two acts in this process that are very important, and which are important to keep separate from each other.

But there are many others aspects of importance in this process, and I am very grateful for what has been said here. This state that you have to put yourself into as a teacher, which you, Jan, were talking about, "to allow yourself to be overwhelmed": I think that is very important, not to be afraid of what is coming, also from what is happening between the ones who are making this conversation and the special things that can occur. As you say: you have to carry this and let yourself be overwhelmed in that trust in that what is happening is important, it's a really important aspect of learning. So you have to have this inner trust, that the situation is carried by something that is more than yourself in a way. When you're working in this sort of dialogue, you will experience all the time: "O, but I didn't know that. I didn't see that before!" And the more you actually see, the more you get a desire to know what you *don't* know. It's a continuous process of creativity.

Jan: One thing I would like to add to this dialogue with the seed and having conversations with other participants later: my experience is that the person working with the dialogue with the seed is also very much impacted by doing it with a group together. It is always and necessarily an extended dialogue. So the atmosphere in the group, how other people are, in the similar process, but yet different... I see this as *co-evolving*. Here you have your own artwork, but yet there is something which is more than the sum of the parts. And I think those relations, relations to the others doing the same activity, those relations also extend further to the smells for instance that you pick up or the feeling of the wind on your skin. And maybe because you have this deep dialogue with the seed, that it becomes a *Thou* instead of an *It*, other doors might also open.

Tuesday, 7th of December

We shared the reflections on the art workshop with Linda and Solveig. We did this partly inside and partly outside, at the long table. Linda gives a presentation on the botanical main lesson that she has been conducting since the early 1980's. She starts by describing the frame for the work.

Morning session – An Art-Science Setting for Learning Botany, by Linda Jolly

The island where we have our botanical excursions is rather isolated. There's only one boat a day that goes there. There is no shop, in the first years, not even a telephone connection. We sleep in a wooden house of the 1600's. Before we start, we first get acquainted with the island. Frequently we have a lesson at school before we leave, where we often look specifically at two common trees on the west coast of Norway – birch and oak – before going into the development of the plant, thus opening up to the possibility of finding something like “character” in plants. The main lesson during the excursion begins in the morning with observation, similarly to what we did here in Doli yesterday. In early June there are almost no seeds to be found, so I usually take some along myself and give them a handful to look at.

We have divided the days into different types of activity. A typical day starts with one and a half to two hours main lesson where we study the development of the plant from seed to fruit and seed again. This part involves observation, doing a description together and drawing the part of the plant which is being studied. The pupils write texts and have at the end 8-10 posters showing all stages of plant development. Then we have a break, and afterwards we begin with “the plant of the day.” Everyone draws the same plant on the first day. To be able to work on the technical aspects of it and to allow us to compare the results, we choose a plant which is not too difficult and not too easy, but has a lot of different elements in it. There is approximately an hour to draw this plant. Then we have lunch. After that we have a painting exercise outdoors: landscape painting or color exercises, also dependent on the weather. Then they have some free time before we eat dinner, cooked by the pupils, at five o'clock. After dinner we go on an excursion, for which we have different themes, like “trees.” Everyone chooses one type of tree to study in the course of the time we are there and on the last day they will present their tree for the others. Other excursions look at plants, plant families, and plant identification, using taxonomic keys to determine plants. Other excursions will look at family characteristics of plants. We walk in the landscape which is a more and more overgrown cultural landscape of this island, where, a generation ago, 200 people were living. Today there are two farms, two families, and many recreational cabins.

Every day begins by looking back on the former day and every evening the pupils turn in their work of the day, which is a combination of drawings and written pieces of text. After this first day they have one page where they have drawn or painted seeds with water color pencils. They have also written a text about what they feel is important about the seeds. We hang them together on one wall, and the plant of the day is hung on another wall. We begin each day by going through and looking at their work. This is good way of keeping them from falling behind and getting “stuck” with one drawing which isn't “perfect”: you have the work turned in each day. Then they also have something concrete there, when we do the reflection on the day before.

Maybe from here we can now reflect on what we did with the seeds here in Doli, yesterday.

On Monday afternoon we discussed if we would first do a reflection on the art activities with the seeds in the same way as Linda and Solveig are used to do this with the pupils, or if we would do it according to the model that Aksel and Edvin practiced in Sheffield. This “Sheffield model” of reflection consists of writing down our thoughts on (A) the creative process; (B) the formative process (especially the dimensions of what the activity demands of me and what it gives to me); and (C) the pedagogical implications of the performed activity. We decided to write our reflections out according to this model, and to then later, on Tuesday, practice the kind of oral evaluation that Solveig and Linda are familiar with. This is what we are starting to do now and a transcript of this effort is provided in the following section.

Reflections on the learning activity with seeds

Linda: Was it difficult to find the seeds? Most people have great difficulty finding seeds. It is not an easy thing to do, to be able to distinguish between fruits, seeds and buds. Often when looking at seeds we also use a magnifying glass. You discover that the seed has integrity, a certain wholeness, so in that way it is possible to separate it from the debris.

With the pupils, because of the rapidity of growth at this time of year, when we get to the end of the week, they will look for fruits and seeds and there will be many more than at the beginning of the week. Then we come back to the seeds.



Aksel: It was discovery and exploration, when we went collecting seeds in the garden; we were rooting the topic in “the real”: the feeling of “we were in a real garden!”

Regarding the engagement, there were two interesting aspects to me. For me it was a task which has a combination of something very directed (“*pick some seed*”), and on the other hand

to start completely free: I can walk here, he walks over there. This freedom is quite nice. And in this freedom you open up. The engagement is focused and full.

Regarding the social aspect, we bring the group together; create warmth. *I* have this, and *you* have that: it's very concrete and condensed.

Ceciel: I got a lot of memories, having to do with smells, with light maybe. It was interesting to experience how you connect different senses to finding the seeds. Some you could rattle and you would hear if there is something in there and some you would touch and they were still wet, or very dry, and you had to look also. With some you could try if there was some smell.



Jan: For me, it was first of all the amazement of being here. This was maybe more intense than the purpose of our quest. Yet, our focal point is the seeds and that sort of “organizes” your view, your gaze.

Solveig: At home I know the different seeds, but here I really had to orient myself in a new way, from the beginning.

Edvin: I do think that I was a bit unsure about the intention. There were certain implicit things in this task also. One must know what a seed *is* before one can look for a seed. We were asked to find five to six seeds. Probably you meant different *kinds* of seeds. To me there was something that didn't seem to fit: to find seeds in a garden that is so green.

Linda: Some of the seeds we had collected were indeed too fresh, too green. I had thought about this. My sense of it was, that through this we get a first orientation of which part of the year it is that we are experiencing here. But I had kitchen seeds with me too. And then the task was to find what these seeds have in common.

Usually I would tell participants about Goethe and Linnaeus, that Goethe had this question: "What is it about plants, which allows me to recognize a plant immediately, even when plants are so different? What is the essence of plants?" When I give seeds to the pupils almost all of them begin – without me asking them – to sort them in groups, putting seeds together that are just alike.

What did you experience with this yourself?

Jan: I was wondering strongly, while we were doing it: What do we mean with descriptive? How can we describe without prior knowledge? Do I describe them to an insider or to an outsider? For example, to an outsider I would describe them as all being smaller than one centimeter. Should we approach the seeds *as if* we know nothing about them, just focusing on what is in front of us, or can we bring in the wider world, of experience we carry with us? If you would encourage us to bring along everything we already know about seeds, the descriptions would be quite different.



Edvin: The first task was open, but intentional: to find seeds. The second task was also open but you gave us two guidelines which you wrote on the white paper: on the left side descriptions, on the right side associations. That was a *guideline* for our feedbacks to you. How wonderful Ceciel's first description of the seed was: "*odorless*"! Here we are asked what is common and you give a description of what is not there! Like if I would say: "There is no sound, please put that up on the paper! This is common for the seeds." It is a tricky phenomenological thing, if one should describe a phenomenon on basis of what it is *not*. I am inclined to think that we should

think of *what is there*. My point here is: these thoughts came, and are they part of the process, or are they not?

Solveig: My thought was: Ceciél is going to the seed with all her senses and here there is no response, on that sense. You express it negatively but it is a positive intention from you towards the seed.

Linda: It was unusual, but it was completely within the senses' sphere. Often with the pupils I write the sense descriptions on the one side and the things that aren't sense descriptions, like for instance concepts which we have been taught, on the other side without making any distinction between observations and and whatever else that is said.

Jan: If one does this children's game that one has to come upon a certain object and than the other person can only ask ten questions to try to guess what that object is. These questions, typically, are then excluding more and more categories: e.g. is it alive or is it dead? It's like a perspective of a visitor from Mars. If you approach it this way, then suddenly "odorless" or "soundless" are very relevant, if you don't know at all what the object is about.

To me there is a difference between, "Can you describe?" and to ask, "What is it?" And then there is also a difference between, "What is the seed?" and asking, "What is the seed *to you*?"

Furthermore, to me, the descriptive and the associative are always blurred. It is an artificial division. The mental concepts, the way we relate to the world, to objects, *immediately* brings in the associations. So why would these be different from the describing?

Linda: My experience in doing this has often been that the associations have been the most valuable for characterizing the seeds. In this path towards the plant, I want them to exercise their faculties of observation, and have that as a solid basis. I agree that it is artificial, but it is a discipline to try to hold yourself to what you can observe, disciplining your approach, because we are a group also, we need to have certain structure. With young people, if the first thing that is said is: "It is a baby, it is an embryo", then you would have difficulty to get down to these dry descriptive facts, when their fantasy would be stimulated to do something completely different. These associations, when they come later, will be disciplined by the dry descriptions. It will be a more "exact fantasy" than an open, more associative fantasy.

Aksel: I dislike a bit the word "association." Walking in the gardens, I see the seed "in time." I don't see it, but I imagine a process in time. Is this observation, or is it "Stick to the facts now!" If I see the process, is it something I see or something I don't see? So is it association or imagination? What is it?

Linda: The pupils might very well come with something like the genetic code. It is also an attempt to take seriously something which, actually, at the first meeting, is very devoid of characteristics. They would think: what is there really to describe? The effort is to try to "milk" the objects. One of the first things I did with pupils when I started as a biology teacher was to go out in the forest in the fall and to look for mushrooms. They were to find and to describe them. These descriptions were mostly so empty, so devoid of observations, that it made me a bit desperate.

Aksel: I think this is the main point: to begin to train with discipline.

Edvin: You refer to your experiences with pupils. My experience in phenomenology and in distinguishing between description and "valued feedback," is that these are slightly different, aren't they? In this group here in Doli we have all kind of thoughts. In my case, the first description, of "odorless," immediately put me into a spiral, which made it difficult for me to answer your question. It would have helped me as an adult learner if you had said that you

speak to us as the persons we are and not as a kind of pupils or students. My experience with the adult learner is that I have to begin with saying: “We are now going to investigate the apple and what my intention is that we try to investigate it in an open fashion, so that we use all the senses.” I explicitly have to make this space for it. So we have all kinds of attitudes and knowledge about the apple, but let’s put that aside. We have all things of yesterday and tomorrow – let’s put these away. It’s like you are opening a space explicitly. For me there is a big difference between an adult learner and a pupil.

Ceciel: I have noticed that one of the most difficult things with adults is to get them to leave all of the baggage that they have with them behind and to actually go into seeing what is going on. Even if something is happening that is confrontational to what they already know, then it starts to press on to the situation and you tend to lose track of what’s going on at that very moment. It is very challenging to train adults, teaching them to know when to step back and when to get into it.

Aksel: When, in adult learning, there is a possibility of doing something that you wouldn’t do with young people – like saying gently, “this might happen,” “etc. so that with your mind you are one step ahead of the horse you are leading so to speak – then it will feel as a safe space and it doesn’t hit the emotions so hard, that one is thrown out. You have to hold a little hand before them.



Solveig: I am not quite sure about that. You really have to open up to what happens. And you can then ask: “O, this contribution, how did it come about? What happened in your interaction with what you were looking at?” I wouldn’t want to guide in what manner each pupil goes about observing the seed.

Aksel: This is not what I am saying. I am talking about emotion. If one has 35 students and one is going to introduce drawing to them, one needs to prepare them and have a little hand stuck,

because maybe a quarter of them are blocked, they are afraid of drawing. They have bad experiences from childhood and I don't know what. Or they look at their neighbors, and perhaps think that this has *nothing* to do with science, that it is more about emotion. A quarter of them will drop off, not being able to handle that blockage.

There are different ways of going about this. One way is to say: "Take your hand, put it down, make a circle, and just do this and then we go on." Everybody then starts to draw and you are through. *You just do it*. And then perhaps only one out of a group of seventy-five will *not* draw.

Another way is to just say: "Maybe you should not worry so much. The main thing is the object you look at, and not your drawing itself. The drawing is just a help for you, not something to be looked at afterwards. It's just to make things conscious." Then when they have this consciousness of a possible emotional reaction, it's not striking them so hard. I try to create an awareness of that moment that may occur, so that they can meet it consciously.

Solveig: Yes, to me it's an essential question, how your attitude, as a teacher is guiding in a special direction. To me, the phenomenological way is to see: "Where are we?" And not to think: "Where am I going: What am I going to do to have them paint or draw: they have to do this and I have to find a way to have them do that. Instead one could actually look at what point of departure they have. If you lose that moment of insecurity or vulnerability which might be a part of the relation you lose something of essence. Even if you don't do anything you also express something. I think we should reflect on that, not to lose that moment, but to accept it as a part of the learning process.

Aksel: For me it is the same as when one has a student who for some reason cannot enter mathematics. You do something to try to make him or her enter it. And if someone can't enter drawing, it is not about directing their drawing...

Ceciel: We had the situation of me saying a word, and through this word, you, Edvin, wandered off. It was more a "surplus" you carried with you, which made you go into another direction. There are several ways one can go about when one wanders off. One way is to say: "OK, I have all this knowledge, so where are we now?" Another way is to ask a question to me: "What do you mean with odorless?" It would have stayed within the context of you, and me, and us relating to the seed.

Edvin: I also asked myself that question. But then I chose to follow Linda's instruction. I am wandering out there, I am thinking should I comment on it, but then I think I'll take it to the discussion afterwards, and suddenly I am off the seeds!

Ceciel: We all come from different backgrounds, which is the same with children and with adults. We will always meet the situation where something comes that draws us out of there or something that puts us "on the wrong foot," which challenges us.

Jan: One might say that "emergent properties" may come up. One might not know one's self so clearly *why* one says certain things. Linda talked about starting with the dry descriptions and moving from that to the exact fantasy. Aksel talked about imagination, of experiencing the seed in time. This brings an interesting point for me: what is the difference between fantasy and imagination, in this context? To me, this has to do with the difference between static and dynamic quality. At some point, insights get solidified; they become part of the everyday, part of the static patterns. If you look at Goethe, when he was able to see the flower as a metamorphosis of a leaf, probably in his time, this was some kind of heresy. In the same way, a child nowadays may say something about a seed which may seem, at first glance, totally "off the wall." But if we are able to dwell a little longer on the quality of that imagination or that radical imagination, without setting it aside too early, one might have these breakthrough moments, of perceiving something of the phenomenon that we were not able to do before.

One way of looking at this is that the experience is richer if one, in the end, gets closer to a Goethean or Batesonian way of understanding the phenomenon – people on whose shoulders we lift ourselves up, so to speak. But there is also the potential that the learner –adult or child – gets into this space of radical dynamic quality or imaginative capacity, and that is like a treasure. In the Reggio Emilia approach they try to foster this. If the child in his or her imagination comes up with something that we would take as something completely strange, e.g. a child saying that the rain is caused by a crystal bird in the sky, rather than by the clouds and these processes that we all know about, we lose something if we disregard that utterance by the child too soon. If we dwell upon it a little longer and see the potential also of why the child brings this up in *this* context, and uses exactly this metaphor, this word, this image, we can try to build upon that. Starting from his or her world, rather than from what we already know about the phenomenon, may give interesting openings. You start from the lifeworld of the learner him or herself. From the concrete expression they give to it.

Linda: When I am doing this at other occasions, I don't make two or three categories. This is maybe the first time I have ever done it this way. I experience very often that despite the fact that I ask them to describe what they have in front of them, they would come with other things. And I just put it on the other side of the flip over paper. My experience is, that if you let this go in this way with a group of 25 to 30 people, many things are happening. One thing is that it enriches the observation of each one. If they are following it, they are able to see what the other sees.

Also things that seem to be speaking against each other will resolve in the course of forming the whole picture. There is nothing that I won't write down. But then we can take a closer look and say: "Maybe this is more an experience, or this is actually seeing something new about the seed. Do we have other things as well?" And: "What sayings do we have about seeds?" And then I think the picture becomes richer and richer.

Interestingly, when they write text on their paper, they very often write a poem about seeds, unasked, which shows that a lack of sense experience is supplemented. So this imaginative aspect does come in, but I want to help them doing it this way to come over this way of looking at things with a glance and saying: "O, just seeds!" It is about trying to describe something that gives you very little of itself.

Aksel: Actually you tried to discipline the sensory attention, if you say what the educational intention is. We went from the separate, the dryness of saying the singular words, to "the kitchen," where there are tastes, where there is a context. Aha! And then you continued with providing new context, and again new context, and new context. Starting of from the separateness, one can subsequently have a context experience, of actually placing the seed in context, whether it is a context of the seed's nutritional value, its history, etc. One can also bring in the botanical context of the plant *itself*, but I guess you come to that later. One has this joy in thinking, one is uniting. It's an opposite gesture to this rooting, to this now-I-am-in-the-world feeling. It is this joy of having a unity experience, of "there it is!" This is my feeling of the path from the start to the next phase, from one extreme to the other, seeing the interdisciplinary potential of a "botany epoché."

Second morning session – On making seeds of wax, by Solveig Slåttli

A recurring question to me is: Why is this important? When Linda asked me the first time if I would join her biology lesson, her botanic lesson, and do some artistic work, it raised for me the question of: What is she aiming at? What does she really want me to do? What is her intention, as a scientist or as a biology teacher, to bring me into this? The question hasn't become less

important or smaller in the course of time that we have been working together. Actually it's the other way around; it has become more and more predominant: What *is* it actually, what we do? The way Linda does it is that we go out, and often she takes up the whole plant. She gets the children out, not only to collect seeds, but whole plants and we take them into the classroom, with the soil, with the leaves, with everything. She looks at them, compares them, like the different roots in comparison to each other. She goes from all these different plants into what they have in common and how they differ. For me, that is a way of characterizing something: What is a leaf, what is a seed, what is a root?

What I can say of my own process is a bit the other way round. For me, when we start drawing a seed like we did yesterday, the purpose is not so much to characterize what a seed is, or when we draw a tree, what a tree is. It is not to know the seed better, because of some reason, such as that it is a part of something – nutrition or culture, or the place where it grows, or anything like that. What is the point of departure when you start such a type of work is actually to *free* yourself from all that, and to try to forget. How do you do that? How do you delve into this concreteness, of standing in front of something, and are responsible for what you see yourself, with your senses? And you try to interact with this what you are seeing, just by making a sort of compliment to it by responding to it through what you are doing with the colors, with the wax for instance.



It's interesting to look at what different artists say about this process, and I think we will also come back to that later, because there are different ways of looking upon this creative process from different artists. If you look at Munch, he says: "When I go into this process, painting a tree, I don't paint what I see. There is nothing there on my canvas of what I see. What I paint is what I saw, it has gone through me eyes, my nerves, my blood, my heart, and it becomes something completely different. So what I have when I'm finished is not nature at all, it's

something else. If you look at Van Gogh, what he says about it, even if you shouldn't think that of him perhaps: "We should always aim at nature. We should try not to be concerned with what's happening with ourselves; we should always be aimed at what's happening there. What *is* actually the tree, what *is* the olive tree?" So there is something here, that's going on that is a process of myself in relation to this, that you get very aware of when you are working with art for a long time.



Working together with Linda, I'm trying to be really aware of what is this, like yesterday, when I was working with you, when we started off. I took this terrible risk, and you took a risk with me, because with the children or the students I usually very seldom go directly into this, without any prior exercises. But you really jumped into this, so it was good that we had this trust to do this together. That in itself is very worth looking at, the fact that we really did that.

And now what I would like us to do is that each of us tries to say a little bit about our own experiences in trying to make this special relation to this special seed. What is very important in this process is that we come into communication with what is now, here, because we created something that is completely different.

Besides doing this, we could also try to help each other to get aware of what has come into being here, that wasn't there before. How is what I can see of your relating to the seed, relating to *me*? How do I relate to how you are relating in *your* process? There are many layers in this, when you want to reflect on it. And I think maybe we should start off by just getting into movement, by taking this seed in wax that we have done yesterday in our hands and to let it be passed around. In that way we all get in connection with what the others have done, with *our* hands. Like we did with the seeds yesterday, but we just take occasionally one, and then we touch it, and we pass it around.

Just one little question before we go into the experiences of yesterday: Was there any difference in meeting, touching, your own seed of wax, compared to touching the other seeds? Was it a similar experience?

Solveig asked us to hold the wax form of somebody else and to try to feel it the way the other person had felt it and then to pass it on. Later we were asked if we noted changes or similarities between how our own work had felt and holding the work of somebody else.

Conversation on making seeds of wax

Linda: When touching the wax forms of the others I was looking with my fingers for the things I wanted to achieve myself when I was working with the wax, trying to find how the others were exploring this. It was new; this was where I was looking.

Aksel: I also did this, and when mine own wax form came back to me in the circle, it was this “oldness.” Yesterday I was in it, and then I saw something else. I thought: I can’t just repeat it. Yesterday I didn’t notice the colors, but now I did. From a scientific point of view it was for me very interesting. When I now looked at it, I got some characteristics of the seeds that I didn’t get yesterday by touching them. They all have pointedness and roundness, the morphological qualities, which were not there for me yesterday.

Jan: What struck me was the organic form of the wax; it’s almost like leather or so, shrunk, dried-out. You could almost “eat” them. And here you have these amazing details on the forms of others, it feels almost if they were done with a completely other type of wax.



Solveig: I would like that each of us says some words about just the experience of doing this. Can you reflect on your own process, what happened in you, making contact with the seed, yesterday?

Ceciel: In the beginning it was a struggle with the material, I must say: feeling the material, trying out how I can form it. I was looking at the seed, and I was feeling the material. I do a lot of baking, so I am used to touching the dough. For me it is important to feel it, in order to know what is substance is. I noticed that it was very difficult to shape it. I went back and forth with touching this seed all the time. I tried to get the roundness and at the same time the sharpness here at the edges, and I tried to get the symmetry. I found that very interesting. The pointedness and rounding at the bottom was much less difficult to create. It was a gradual process. Because it was difficult for me there was a tension between all the different things I met when I was touching it and looking at it, and how I wanted to form it. I wanted to make it a bit round, and that was difficult. When I was working at this side, then the other side – as the wax became a bit softer – disappeared. You see, here on this side it looks like there are two halves. I wanted to shape that, and when I was working on that it was difficult to get this roundness again. When I was working on the roundness, it was difficult to get the sharp edges. So, yes, it was really a challenge.

It is my first meeting, or at least I am a beginner you could say. So it is my understanding of the wax in comparison to the seed, and I tried to bring these two closer together. I thought that was a very interesting process, but I'm not there yet.



Jan: I also had the struggle and the resistance of the material, and it brought me to the idea of the “affordances” of the material, what it affords you to do. But also that you have to make-do, as they say in English, one has to make-do with the material. In this case for example there were certain rules that we had, e.g. we should only use our fingers. In my case I smuggled a little, I used the pencil to make the holes. In case the rule would be strictly to *only* use your

hands, you have to just cope with that. And like Ceciél was saying: one surface impacts the other, so you have to make your way. And touching the seed with the eyes closed, I felt that it makes the experience immediately more meditative, but one is also in a way less connected to the seed. You get into some other place. And I noticed the contrast of the oiliness of the wax to the dryness of the seed.



Edvin: I was trying to form something which is comparable to the seed, because that was what I thought the task was of this exercise. In the beginning there were two things that couldn't be compared to the seed, so I had to leave them aside. That was my first question to you also: how could we find something which has the color of the seed. I grabbed this because I wanted to touch it, before we came to the wax. I really liked it, because it has this thinness in it, it has no hole in it and it is very thin. But the color didn't fit. So I had to leave the color aspect aside.

The second aspect was of course the size. Color and size are two important features with the seeds. Yet we had to leave these aside. So what do we have then, I have the texture and the form of it, even the smell, this odorless-ness. But the wax is not odorless. So I actually had two dimensions, two features on which I could concentrate. It was a very oily experience. I just didn't manage to melt these parts together, so I put this side up.

Linda: We have never done this before, so this was also very new for me. I have done something with wax before, with animals in the farm-school courses, but not much. To me, the biggest experience was feeling the seed. It had an incredible and beautiful form; I got an appreciation for the form of this seed, wheat or spelt, which I never had before. There is the

change of form this way, and then there is the back and the front and the top and the bottom. There is almost something like a small thing of hair at the top – how was I going to do that? But I must say that the appreciation for the seed and for a magnificent form became much larger than anything I have ever experienced before.

Aksel: I entered this mainly with a “sculpture mind.” I had a very joyous experience, perhaps even a peak experience. Getting into the sculpting, and getting into the process and I can enjoy it and just be with this process. My mind went back to these sculptures in Athens. I had a technique with my nail actually, it became like a rhythm; I found some rhythm in the work. And then you can rest and not worry so much, you get some flow.



Linda: Can I ask: did you think of this as being an embryo?

Aksel: Well, now you come to the next element, because I’m also a botanist. So in this work in going deeply into this you could say “plastic mind.” And then an overtone of thoughts came up. I didn’t expect them, but it has to do with the embryology of the seed. With how this piece actually comes out, and how the two leaves will come out like this. So I come deeper into the botany.

Then, I am also educationalist, so another overtone also struck me: working with plasticity brings you right into morphology. If you work with clay, it is in itself the medium, it

'entspricht'. It corresponds to form and development of form and form consciousness, which you need to see plants.

Linda: I experience the same sense of beauty as when I have bones, skeleton bones, in my hand: this subtle turning, which you don't notice at first, but when you have it, where it rises there, and it sinks there, this sort of rhythm. I didn't notice this in the seed before.

Aksel: That was also why I picked it, it was like a skull.



Solveig: I chose a grape seed. I never knew that it was such a complicated form, and I thought: I'm not able to finish it in the time available, because there are so many curves, so many different movements. As soon as I got into one movement, there came I became aware of another. It was very difficult to get it into one form. It was really an experience. The grape seed has two different sides: if you see here, this movement that goes up here, and if you turn it around you have another movement that goes in. But when it comes in the middle it goes out again. And then this, which goes out when you come to the middle, it continues to go out, but at the same time it goes in on both sides. So it's a fantastic form actually for me to try out. Then I realized that for me it was difficult doing such a small form, because as you said: when it gets warm it's changing all the time, so you very easily loose what you have already got. Not long after having finished mine, I took Edwin's form in my hand, which is bigger, and I thought: "O yes!" Because when you hold it in your hand you can feel the whole movement of it. Here is something very condensed, and here it opens up, and this ring around. And I think it's also because of the size that you made, that is easier to communicate with, in your hand.

It was very surprising to me how expressive your seed was, and I thought about it afterwards: how did it come about? It is a little bit hard to talk about it, because it's strange. But I took his form in my hand, and the experience of holding it...I could feel the activity in a way, like it was condensed activity. That was an experience. I was so into my fingers, into sensing

with my fingers, after having worked so much myself with my seed. But when I took yours in my hands it was so completely different from my own, and it was like: “O, what has he been doing?” I didn’t think though, I just felt the intensity of it. And then I thought: what we should actually have done afterwards was to put away our own seed, and do what we did today, to take them into our hands, when they were still a bit warm and connected to the activity, because it is different today to touch them.

Are there other comments before we go on to the drawings?

Aksel: There was this intense quietness, which one could have in the classroom sometimes as well. It’s very good, because everybody is inside the process. So it’s a different social space, it’s another togetherness in a way. And I told you already: this touching and shaping – when you move through the senses, we have been observing and now it’s touching, shaping – is another sense entry. It is another formation process.

Edvin: I have one burning question: What *on earth* does this have to do with art and science, and how does it come together? We should have some time to go into this during this week.

Solveig: Now let’s turn to the drawings we made yesterday with the earth pigments and my question again is: what is it what we see? Try to connect some words to “What am I exploring here?” “What is this telling me?” It could be anything, it could be very simple about the colors, it could also be an impression that you get. Whatever.

Jan: The first impression is the shade of the seed in this art work, and the light quite close to the shade, and very visible lines pointing in this direction. There is something about the shade, because the surface itself is all over, and the shade sort of grounds it on the surface. But there is something strange also because the contours seem to be more like a sphere and this seems to be more like a plane, on a flat level.



Linda: I usually need a lot of time to get colors on white paper, so I didn't feel that I was finished. But the strange thing was that this morning when I saw it, I thought it was floating, it didn't have any weight, in spite of the shadow. So it didn't get grounded. And there was very much happening in the surface. The very strong light contrast was difficult for me to handle. So maybe because of that it is a bit flat.

I discovered right at the end that the white had much more fat in it, so that I could get the colors to go better together if I used some of the white. Then it became fun, but I didn't have time to develop it further. So you see I was beginning to get it as another quality, which I liked very much.

Edvin: I was thinking about this as an almond, and I thought that was an almond being divided, so you have two halves: this is the lower half and this is the upper half. And then the style: especially the surrounding is an anthroposophical style of painting, the colors are not sharp. The colors are going into each other.

Aksel: I see three main elements: the brown, the violet and the yellow. It's like the almond, the shadow, but it's very interesting that behind the shadow there is also light. So you have the almond, the shadow, and light.

Ceciel: I like very much that there is difference in direction of the seed and this part, the background. You asked us to first make the surface, something which is "holding the seed", and in this drawing one sees very clearly the distinction between the surroundings, the carrying surface, and the seed within. It somehow tries to make a relation, and then the earth colors bring them together.

Evening session - Presentation on Reggio Emilia, by Ceciel Verheij

*Trött på alla som kommer med ord,
ord men inget språk
för jag till den snötäckta ön.
Det vilda har inga ord.
De oskrivna sidorna breder ut sig åt alla håll!
Jag stöter på spåren av rådjursklövar i snön.
Språk men inga ord.*

(Det Vilda Torget, Tomas Tranströmer)

*Det gör ont att gå genom väggar, man blir sjuk av det
men det är nödvändigt.
Världen är en. Men väggar...
Och väggen är en del av dig själv -
Man vet det eller vet det inte men det är så för alla
utom för små barn. För dem ingen vägg.*

(För Levande och Döda, Tomas Tranströmer)

When Edvin invited me to contribute to this seminar it was difficult for me to find an adequate way of entrance, not being fully acquainted with the ins and outs of the present discussions

within this group. Not being a scientist, nor an artist, nor an (art) teacher, I have to be humble about what I can contribute. Still I found it challenging to share some of my thoughts and experiences so you all might at least get some picture of where I come from and where I am situated. I want to make a contribution to the workshop in Greece by sharing some of my experiences with two inspiring and innovative practices of learning and teaching in the Netherlands, one at a Reggio Emilia inspired school and one in the context of developing a 'living learning project'. Through practicing 'participant observation' in these contexts, I was able to acquire for myself some valuable experiences and insights in learning and teaching.

After having listened closely the past few days I decided not to do a presentation on Reggio Emilia as such. I do not want to focus on the approach as such, because it's a pedagogical approach aimed at very young children, and thus it would in many ways be inappropriate to extrapolate experiences from this educational approach to a complete other setting. Rather, I would like to draw attention to a way of working and understanding characteristic of this educational approach, that to me is highly relevant in any context of learning, regardless of age or level, but to my knowledge is not made as explicitly important elsewhere. Central in the Reggio Emilia approach is *learning through relations, exploring the pattern which connects*. This is not something implicit, not a by-product, or a positive outcome by chance, it's not learning *about* relations, rather *through establishing and becoming aware of relations* we learn and we have to create conditions and contexts which allow for us to learn to shift our focus on the *relations* rather than the separate things, products, outcomes. But I will come back to this later.

As I said, in the past few years I have been involved in two interesting innovative pedagogical approaches, Living Learning and Reggio Emilia.

Living Learning in the Netherlands is a pilot project, which we started a few years ago, inspired by the Norwegian Living Learning project (formerly called the *Levende Skule* project) – an intensive school-farm cooperation project, whereby schoolchildren learn on a farm one day a week over the period of at least one school year. The role of farmer and teacher in the cooperation should be equal. The children participate in all farm work, and while being at the farm, the farmer becomes the teacher, and the teacher takes on a role of assistant or helper. This gives the teacher a possibility to step back from the traditional role as teacher, and observe and work side by side with the pupils in a new context (outside the classroom), thus having the opportunity to develop new relationships with and understandings of the children and gather new experience in other ways of learning.

I had learned about the Norwegian *Levende Skule* project in 1999 when I was living in Sweden, and I was very inspired by it. Back in the Netherlands, I was engaged in the project from its initial stage, being a member of the advisory board, mainly as a translator and transmitter of gathered experiences in Norway. In translating and subtitling the Norwegian documentary *Det Store Spelet*, I was intrigued by a notion used by horticulturist/philosopher Lasse Krantz when he described what the *Levende Skule* project was about: *att odla relationer*. That, to me, seemed the essence of this project: to focus on relations: between children and nature, between children and children (in a new way), between children and environment (farmer, animals, food products), between teacher and children, between teacher and farmer, etc. After having been engaged for some years now, the project has been very successful, in that it's not difficult to see what it brings for farmers and children in light of establishing new relations; the experiences are almost without exception extremely positive. Interestingly enough, this cannot as of yet be said with regard to the experiences of the teachers. It's also interesting to take a closer look at their stance: for once they are given the time and opportunity to take a step back and develop a new relationship and understanding of the children (how they learn in a new context, how they interact with each other in a new context, how they relate to nature), but practice shows that it takes much longer time for the teachers to grasp that opportunity.

The other project I became involved in was the Reggio Emilia approach.

Before telling some of the background of this project, I want to take you on a small sidetrack. I'm going to show you a picture and read an excerpt from an interview (made by Jan)

with the artist Antony Gormley, published in the British magazine *Resurgence*, entitled *On being human*.



Still, by Antony Gormley

Gormley: *"Still, in its primary form, is simply a lead box, a lead skin made around a sleeping child, age six days. And you could think of this child sleeping on the breast or on the stomach of the mother, close to the place where the child grew in the womb. But the sculpture is as much about the removal from that position on the belly and its exposure to the wider world.*

It is a small female child that is calm, and in contact with the supporting surface. But that supporting surface has moved from being the belly of the mother to being the floor. For many people, that is very shocking: This very small object that is somehow abandoned. I often show it alone, in a big room. ...

Our bodies come out of other bodies. In a sense, our primary experience is of dwelling within the realm of another. We learn how to listen, how to move, how to attend to the world, within a totally protected realm. Then, at birth, that is taken away from us. We are made into an object that, in a sense, is separated by space and skin. We are always in a relational field. There are a few moments, maybe in intimate love or moments of total immersion in an immersion tank, where we might recover something of that primal condition. But, in the end, we are born alone and we die alone.

In a sense, that is the human condition: that we are lost in space, from the moment that we separate from the body that contained us originally. This could be a tragedy, a kind of existential loss, but I don't think it is at all. I don't think of the condition of

aloneness of the human consciousness as being a limitation. It's actually the great challenge and inspiration that each of us has. In a way, we are all spaceships.

At that moment of birth, we set upon a journey in time and space, and we have to use it as well as we can."

(Antony Gormley, in an interview with him by Jan van Boeckel, January 2010)

Getting back to Reggio Emilia, there are a few things I would like to share with you by way of a short introduction to the Reggio approach. I don't know if any of you have any experience with the Reggio approach, but I can say some brief things just to get you acquainted. The Reggio Emilia approach originates from Italy, it arose under the inspiring leadership of Loris Malaguzzi right after WWII. Some of you might have heard of a world-famous quote of Malaguzzi: *The child has a hundred languages (and a hundred more), but they steal ninety-nine.*

Reggio Emilia basically works with young children between the age of 0 and 6 years old. The reason why I want to share my experiences with you is that I have come to know it as a unique approach, different from any other pedagogical approach I know. To me in essence it is a pedagogy trying 'to create a *literacy in the language of relations*'.



As Westerners we have been educated and trained to separate, compartmentalize, dichotomize and polarize; in Reggio they strongly believe that we, adults, have to both *un-learn* and *learn anew*. Living in a culture which separates rationality, imagination, emotion and aesthetics, we have to become aware of a consequent impoverishment in the overall quality of much of our concepts and thinking. We tend to confuse our representations of and ideas *about* the world with reality itself. For me the question has become increasingly central what education would look like *starting* from seeing the world as being interconnected, where we human beings are part of a whole, of which we at the same time try to make sense without 'breaking the pattern

which connects'. Trying to avoid looking at 'parts', separate 'things', objects, 'outcomes', and focusing first and foremost on the 'relations between'. What if we would try to 'make school' in a different way, interweaving experiences, thoughts, fantasies and feelings, following the intricate web of how things in life are connected and interrelated? What do I, as teacher, really understand of this child, where does it come from, how does it try to make its own connection to or its own understanding of the world around him or her? In the Reggio approach they found that in order to do so, some concepts need to be questioned and others highlighted:

- **the image of the child:** the cornerstone of Reggio Emilia is the image of the child as competent, strong, inventive, and full of ideas, of a child having 'rights' rather than 'needs'. Pedagogista Carla Rinaldi elaborates on the concept of child and childhood:

*It is known that childhood is an interpretation, a cultural construction. Each society, each historical period defines its own childhood, what it means, dedicates to and expects from childhood.... The image of the competent child is, I believe, by now familiar to all those present, the image on which the very experience of the infant-toddler centers and preschools of Reggio Emilia is founded. **Competent at doing what? At forming relations with the world** (Carla Rinaldi, from "Questions in educating today" – published by the Municipality of Reggio Emilia, 1999)*

- **relationships:** seeing the importance of relationships (physically, socially, emotionally, and intellectually) in the process of learning. Learning is closely related to context and depends on co-construction of knowledge. In Reggio they shift attention to *how* children learn, how they come to understanding and how they can give expression to that. In contrast to learning based on transmitting or reproducing, the Reggio approach to learning is based on 'understanding of problems through experiment, trial, error and testing'. To enhance this they developed a 'pedagogy of listening', which allows children to first and foremost develop their own theories, share them with others (children or adults), and subsequently redevelop them.
- **collaboration:** working together at every level: teachers working with teachers, children with other children, children with parents and the larger community. Much value is given to organization and ways of working together in order to create conditions where experimentation and encounters can be sustained. For this, in addition to the classroom teacher, the pedagogical staff is expanded with an *atelierista* and a *pedagogista*, and their roles are central. Furthermore, much importance is given to maintaining intensive relationships with parents.
- **pedagogical documentation:** observation, documenting and dissemination of learning processes are a vital part in the Reggio pedagogy, being an 'extraordinary tool for dialogue, for exchange, for sharing'. It provides a verbal and visual trace of the children's experiences and work, and opportunities to revisit, reflect, and interpret. Pedagogical documentation is not only used intensively among adults (the pedagogical staff and parents), but just as much as feedback to the children, to enhance and give impetus to their own learning processes.
- **provocation:** listening closely to children and devising a means for provoking further thought and action.
- **progettazione:** this is an Italian word which difficult to translate, it means something like making flexible plans for further investigation of ideas, and devising the means for carrying them out in collaboration with the children, parents and, at times, with the larger community. Learning is a continuous, dynamic process, 'a journey that involves

uncertainty and chance that always arises in relationship with others. Project work grows in many directions, with no predefined progression, no outcomes decided before the journey begins. It means [for teachers as well as atelieristas and pedagogistas] being sensitive to the unpredictable results of children's investigations' (Rinaldi, 2006: 19).

- **valuing the hundred languages:** the meaning of the word 'language' extends beyond the verbal, in Reggio they speak about visual language, mathematical language, physical/bodily language, etc. Languages are different ways in which children represent, communicate and express themselves through different media and symbolic systems. *Poetic languages* are forms of expression strongly characterized by expressive or aesthetic aspects such as music, song, dance or photography.
- **aesthetic dimensions of learning:** The aesthetic dimension is seen as indispensable in learning and education in Reggio pedagogy. It can be seen as *first and foremost a process of empathy, relating the Self to things and things to each other; it is the opposite of indifference and carelessness, of conformity, of absence of participation and feeling* (Vecchi, 2010, p. 5). The *atelier* and the *atelierista* are at the heart of learning. Part of the process of learning through relationships and other connections involves working with a whole range of languages, whereby the role of *atelierista* is to stimulate the role of 'poetic languages'. The *atelierista* should by no means be a technical specialist who transmits specialized skills and helps children to produce nice products or artworks; rather he/she should create space for children for original thinking and self-expression. *'If aesthetics fosters sensibility and the ability of connecting things far removed from each other, and if learning takes place through new connections between disparate elements, then aesthetics can be considered an important activator for learning'*, states renowned *atelierista* Veia Vecchi (2010, p. 9). The *atelierista* supports connections, or as Veia Vecchi more poetically terms it 'the dance', it is a dance 'between the cognitive, expressive, rational and imaginative'. However, the task here is not only to connect, but just as well to break down the constraints created by closed-off disciplines, preconceived categories and predetermined ends.

In 2008 I was invited to participate in the new Reggio Emilia school De Kraal in Amsterdam, to assist teachers in bringing the 'pedagogy of listening' into practice. To learn to 'step back' and make room for processes of observation, listening, documenting and reflecting. Having a background in anthropology, these are some qualities that I have been trained in, more than teachers usually have. De Kraal is a preschool and primary school, where most children have a Turkish or Moroccan background: they speak little or no Dutch when they start school. On top of that, most teachers have a Surinam background, and in most cases they have had a very traditional (often still authoritarian) teacher training education. Certainly not the easiest setting for introducing a new pedagogical approach, however it turns out to be very rewarding.

The more I became acquainted with the Reggio approach and the more I read about it, the more my fascination grew. For the first time I got a feeling of being part of a learning community; not only the children were learning, but we, adults, were just as much learning. In learning to relate to children in new ways, familiarizing myself with notions like 'the competent child', 'aesthetic learning processes', 'pedagogy of listening', 'connecting patterns', initially the experience for me – as much as for other adults and teaching staff – was certainly challenging, if not to say at times unsettling. To what extent am I, are we, adults, able to engage in processes of de-constructing certain notions and concepts and constructing, learning to listen rather than disseminating knowledge, to unlearn and learn – individually but also as a group. The more trust we put in the children in following their own processes of learning and making meaning (and giving their own individual expression to that), in my experience the more we felt comfortable in stepping back. And in doing that we ourselves could learn to rediscover, through the children, the value of long lost languages, of empathic relations, of finding ways to restore

lost connections – within ourselves, to each other and to the larger living world. People always ask: can you give examples of what you were doing with the children, what is it *about*? To me, a Reggio approach is not *about* something, it is learning to focus on relations rather than outcomes, to follow traces and see connections. Setting out on this path is by no means a linear process, with clear knowledge of beginning, middle and end. Rather, one finds oneself always somewhere *in between*, with each step understanding a bit more of the delicacy of the connecting pattern, and how we carry responsibility for sustaining that connection – not in the least through our ways of teaching.



To me it was not surprising when I at some point came across Gregory Bateson as a source of inspiration for some educators in Reggio Emilia, being the great twentieth century thinker who coined the term 'the pattern which connects'. He spent his whole life trying to make people aware about the radical shift needed in our way of thinking, so as to 'make us see the delicate interconnections in life and prevent us from breaking those'. Or as he said: the major problems of the world are the result of the difference in the way people think and the way nature works. Many of the questions and issues raised in the context of exploring art-science-teaching to me are related to the way we think, perceive and learn. What is it in our way of thinking and our way of perceiving that we do not see the delicate interconnections, and therefore we break them? What really was it that Bateson tried to bring across? Reggio Emilia for me is a challenging pedagogical approach, showing one way of trying anew, stepping into the unknown, threading the world from within. I have the feeling that in finding new practices it might be helpful to turn to Bateson to inspire us on our path to learn to think and see anew.

Suggestions for further reading:

- Vecchi, V. (2010). *Art and Creativity in Reggio Emilia: Exploring the Role and Potential of Ateliers in Early Childhood Education*.
- Rinaldi, C. (2006). *In Dialogue with Reggio Emilia. Listening, Researching and Learning*.
- Barsotti, A. (1986). *Staden och regnet*.
- Bateson, G. & Bateson M.G. (1987). *Angels Fear*.
- Bateson, G. (1973/2000). *Steps to an Ecology of Mind*.
- Nachmanovitch, S. (1982) *Gregory Bateson: Old Men ought to be Explorers*.

Discussion

Solveig: Ceciel's presentation connects to what Aksel said yesterday: Putting one's self into a position of *not knowing*. As far as I have experienced as a teacher among teachers, we still have to come to grips with what this means: to observe the children, to be aware how they relate to their environment. As teachers we are usually far more concerned with how to pass on the subject-matter, than how the pupils integrate the subject into their lives in a meaningful way. If one doesn't observe that, half of the class easily gets lost. We must learn to relate to one another and to our individual forms of expressing ourselves. As teachers we have the responsibility to provide a space for these expressions. Listening to these expressions requires another kind of awareness than that we direct towards the subject-matter.

Aksel: What do you mean, Solveig, when you say: "Be responsible for the other person's expression?"

Solveig: As teachers I mean we must leave a space, a room, where the pupil's individual expressions can evolve. I think this is important, if we want the children to relate in a good way to the world around them. If one is not welcomed in the act of expressing one's self – whatever comes – one will easily either copy someone else or one will keep silent, trying to avoid attention or one might choose to force oneself upon the situation. As a teacher one can try to secure the social space and care for the ability to listen to what comes from the other. By caring for this space the child will know that its expression *counts*. We need that trust and in whatever new relation we make, as human beings.

Jan: *Language, but no words.* There is a problem with the words. Words are power, one has to be attentive. One has to acknowledge that words cannot be used lightly. The word is released in the air and it exists at the moment of its utterance. It is picked up by the ear and then it's gone. In a way it is a sacred moment. They have a real effect; they evoke something which was not there before. I was referring to that when we spoke about each other's work: we tend to go into some kind of automatic pilot, a use of words, which we have with us from our cultural backgrounds, or social conventions, of what is appropriate to say when a teacher asks you to respond us in a certain way. That disallows us, or doesn't allow us enough, to approach the process of uttering words in a fresh, new way: weighing the words before you release them.

To me, there is another aspect to this and that is the dimension of how indigenous peoples communicate through stories. The story has a meaning, which is there for "the good listener." This means that if there is a storyteller relating a story to an audience, the meaning that the individual participant in the audience gets out of it is very much dependent on where this person is at that moment in his or her life. So the meaning is evoked, there is a resonance, to the extent to which the story is meaningful to you. What that means also is that in ways of communication they are very attentive to this. For example: it is often very inappropriate to ask pertinent, direct questions, or questions that force one to give an either-or answer. Much more appropriate is to ask open questions which leave enough way for the respondent to respond in a way that is appropriate. The answer often also has a story like quality, not a one-to-one match to the question. So it is story meeting story, edges moving along each other. And only the resonance takes place where there is some kind of synchronicity that allows the spark to jump from one to the other.

That means that if you have a group of, say, fifty people listening to the story, that there can be fifty different interpretations or ways of making meaning, including the storyteller him or herself, because this resonance process also means that the things that people pick up are also reflected back to the storyteller, which leads him or her to go into new ways of evolving the story.

One fundamental aspect of this is the meaning of silence. Silence is in its own way a form of communication. This relates to the notion of in-between space or negative space. The silence allows for the words to “stand out.” To talk about, for example, what an art process is, then it is not only the words which we choose to give meaning, but also the acknowledgement of the silence. For the teacher, as I see it, this is one of the most challenging things: to know when it is appropriate to be silent. Usually we go on the automatic pilot that our words just float from us, because we want to be convincing, we want to perform, we want to be assertive, we want to make a point. But to step back, to let the silence be there, as a way of allowing others to open up, is something radically different.

Aksel: I heard two counterpoints in Ceciel’s story. There is an interesting difference between starting from an intention and then moving to the open – *or*: to *start* from the open, the not-knowing and to see if an intention comes, in the educational process. What I heard today was a counterpoint to my point yesterday. Are these approaches complementary?



Ceciel: One has this seed, and one is going to relate to this seed, and in this relation one tries to open up, again and again, through this whole process we went through yesterday. It is important to do both. The other way would be to not have something concrete *yet*, to start from. Or: where does it start, we don’t even know! But one is in a process and one doesn’t know where one is heading. And one allows for this not-knowing for a time, which gets longer and longer. And then one suddenly comes to a point of: “Yes, this is what we actually are going to focus on.” But it is still holding a space, of trying to, and then: it disappears, and then you try again. Maybe it takes months; maybe it takes a short time. Both are different ways of getting at it. But all the time it is important to relate it back the starting point, to the relationship.

Linda: Regarding this relationship-based learning: How do you learn from experience, *odla relationer*, of doing a practical task. It is not only the relationship to the tools, the soils, the plants or whatever, but it's the relationship to people.

Aksel: Linda's instruction: "Go out and pick seeds and come back," was very directive. But immediately, it is actually opening to the relational; you create a kind of maximal relational field including the social, and nature. I am reflecting this balance.



Jan: Reflecting further on *odla relationer* is that it may be a suggestion to do a completely different exercise the next day, but which is still very much tied to it. I was thinking of this exercise we did with Peter London at Schumacher College, he invited us to make some kind of art work, which could be made out of found objects in the garden or it could be paint, but the idea was: here we are in a human body, then imagine one's self "coming back" to the world in another natural form: what would the natural form be in which you would like to come back to the world? If one would do such an activity *after* this, one would create new relationships.

Aksel: When do I succeed in this process? It is a long miniature-like journey. Again and again, one has to *not* know what one is seeing. And then it is this thinking: if one really looks, it is a question and one is in the not knowing. And then: "O, I didn't know that a grape stone looks like this, yet I have seen it so many times. One all the time has new, small, knowing in miniature. The extended process that Ceciel described is also happening in a very small format. It's like one long journey.

Jan: The difference between this, and what Peter London was doing, is in the "me." In this journey we made with the seeds, it is still, in some basic sense, "out there," in front of us. How does the seed connect to my life, my being? This level, however, is always there, in art. We may think we are doing something "out there," that it is just a seed there, but this inner me is in it

too, yet is often not acknowledged. But if one would enter that territory more intentionally, with an activity like, “How would the natural form be in which you would like to present yourself into the world?” then it hits one harder, in a sense. There’s no escape.

I don’t think that one approach is better than the other. In the context of *odla relationer*, if one goes back and forth between these levels it becomes really interesting. One feeds the other. After having done such a thing that Peter London suggested, for example, to go back to the flower maybe: the whole flower will be different because of it being also connected to something within one’s self.

Wednesday, 8th of December

Morning session – On making “little-me’s,” by Jan van Boeckel

In my doctorate research on arts-based environmental education, one of the sources of empirical data is my performance of facilitating the art-making activities with groups of participants. One of these is a step-by-step modeling of a seated, miniature version (a “little-me”) of one’s own body. The participants do this with their eyes closed. I have done this particular workshop with groups all over Europe, ranging from two participants to about thirty during one session. I learned to do it from British sculptor Antony Gormley, at Schumacher College, where I attended the *Art in Place: Linking Art to Ecology* course in September 2006. The purpose of the course was to offer the participants an opportunity to explore the relationship between humans and the natural world, based on the premise that nature has always inspired artists, and the view that art offers a medium for a deeper environmental connection. My own role at Schumacher was that of “course facilitator.” When Gormley guided us into making the mini-me’s, I was one of the participants among the other course students.

What was surprisingly new to me was Gormley’s perspective on connecting the body to the “art in place” theme of the course. According to the course flyer, Antony Gormley “has revitalized the human image in sculpture through a radical investigation of the body as a place of memory and transformation, using his own body as subject, tool and material.” Since 1990, Gormley has expanded his concern with the human condition to explore the collective body and the relationship between self and other in large scale installations like *Allotment*, *Critical Mass*, and *Domain Field*.

I was rather intrigued by the drawing and clay making exercises we did with Gormley, which we partly did with our eyes closed. For me, doing an art exercise with a focus primarily on being aware of one’s own body, did not immediately make sense in the context of a course on “art in place,” that aimed to connect art and ecology. Somehow the idea seems fixed that a combination of art and ecology is about working with nature “out there.” Oddly, this juxtaposition (involuntary) perpetuates and enhances a Cartesian dualism that sets the human mind (*res cogitans*) apart from the rest of the body and its environment (*res extensa*). In reality, however, a sharp distinction between “me” and “environment” is arbitrary.

The art-making session at Doli lasted from about 9 to 12 am, and consisted of three different activities, inspired by my experience in 2006 at Schumacher College. The first two were carried out inside, in the conference room. The last one was practiced in the garden outside. At all occasions, the participants (that is: all participants in the Doli seminar, except me, the facilitator) received no additional information on what the goal or desired outcomes of the activity were. Even the *wording* of the instructions (“the invitation”) was kept to a bare minimum.

The first part of the consecutive art making activities consisted of drawing one’s own body with the eyes closed, thereby using the hand that one normally doesn’t use for either drawing or writing. I asked the participants to start by making a small dot in the middle of the upper part of the paper, as this would be the reference point where they would start drawing the head and subsequently they would move down to the other, lower parts of the body. Each time I asked them to draw a specific part of the body and, while drawing it, to focus on what they were feeling right at that particular body part they were drawing.

The second of the series of art activities this morning was to work in pairs. One person would “scan” the head of his or her partner in this “exercise,” using his or her index finger in a spiraling downward movement, from head crown to under the chin. The partner would “undergo” this scanning, again with the eyes closed, and was asked to express – or rather: *register* – the tactual sensations with a pencil (also using the “wrong” hand) on a white piece of

paper. What the person would draw would be the sensations he or she was picking up, while the other person's index finger would track the whole head: from the highest point of the cranium to the neck. Each circular scanning movement would go around the head and, when finished, would proceed just below the level where the former circle had been drawn, thus effectively touching every part of the head of the partner. The person undergoing the scan was, as it were, a scan *monitor*, registering the minute movements and intense tactile sensations he or she was feeling. Here one person was touching the head of another person at places that normally only very few people in life are allowed to touch. This circumstance makes this art activity (or so was my own experience when I did it) rather overwhelming and powerful.

Through these two exercises, in which we used only a pencil and a white sheet of paper, the ground had been prepared for the subsequent assignment, the making of a little-me of clay.



For this third and final part we went outside and sat alongside a long table. The participants received two lumps of clay, each the size of a large grapefruit. The first task, still with having the eyes open, was to form one of these into a cubic form. This cube was to be the “chair” on which the clay person, the mini version of the self, would be sitting. The other lump would be used as material to mold the body of the clay figure itself. This was done with the eyes closed, and bit by bit, in a structured and chronologically predetermined sequence. As facilitator of this activity I offered, what one might call, a “guided meditation” on the different parts that constitute the body, starting from the foot on the right hand side. I would ask the participants to focus on what they were feeling in this foot, and to make a small foot of clay that they should put in front

of the cubic form. From there, I asked them to get a new piece of the clay lump, from which they would then form the lower leg and calf, again paying attention to what they were feeling in this body part. From there we proceeded to knee and upper right leg to the bottom, sitting on the cubic clay chair.

The same procedure was then repeated with the leg on the left hand side. When both legs and buttocks were ready, they went on forming the belly, waist, breasts, shoulders, and the back – the complete torso. I was careful to point out that the participants should not make an effort to make an aesthetically pleasing or physically *accurate* human figure, but that they should only try to express in the clay what they were feeling at that moment, in the specific point of their body that I asked them to focus their attention on when working with the clay. One of my suggestions for example was, “If your belly feels round, *make* it round, if your shoulders are feeling heavy, *make* them heavy!”

Finally, when a participant had completed the little-me, he or she was allowed to open the eyes, and to wait in silence until all the others were ready too. When everybody was ready, the five little-me’s were put on a row beside each other and we talked about how the results looked and how the process had impacted us.



After the morning of art-making activities, we had a session to discuss the ways in which the experience had impacted us. This discussion was not recorded at the wish of some of the participants. This conversation took place in an open, unstructured way. Jan tried to encourage the participants to feel as free as possible in commenting on how they looked back on partaking in the activity. On basis of the context Jan provided of the meaning that this activity had to him (from a pedagogical and existential point of view), Aksel distilled the following five core elements:

1. My first reflection is that making the clay figure of one’s own body could be another entry into anatomy and to an understanding of the body, even into the relation between mind and

body and the relations between (and ecology of) the organs. The point is to begin from the whole (from an “understanding” point of view) and to begin with experience (from a “learning” point of view).

2. Doing this activity does something to the *presencing* of the participant in his or her own body, which has an effect on how he or she enters in and engages with any communicative or intellectual process. Through engaging in this, the person is more rooted, more “presenced,” and has also fewer blockages. This will have an effect on what one does afterwards, as Jan has also observed when he facilitated this activity at other times. This could even apply to something which would seem totally disconnected to it like for instance mathematics.
3. Doing the other, “preparatory” exercises prior to making the little-me’s, meant that one enters the creative process consciously and one confronts hindrances and mistakes. It is a tool to take one’s self a little less seriously and to be less focused on what others think about you. One becomes less judgmental, less shackled, and freer to be creative. The “level of spontaneity” (J.L. Moreno) can be actively raised by these preparatory exercises. They lower the level of fear and raise the level of spontaneity.



4. The importance of place and space is often overlooked. It matters where you are in relation to what may, or may not, take place. This applies to the atmosphere of the surroundings, but also to the social atmosphere between the participants. Furthermore, it applies to the relation between the participant and his material. If you alter the place where the activities are carried out, these relationships may also change – and hence the conditional space for creative and fruitful processes. One has to *work* with the conditions at hand. In this case it

made a big difference that we made the clay-figures outside, and did the preparatory drawing activities inside. This dimension, as well as the third one, is about a “gardener’s consciousness”: one doesn’t grow carrots but one *creates conditions* for the carrots to grow. The carrots do the growing themselves. It is about carefully paying attention: this carrot may need some more shade, that one needs some other care.

5. My fifth reflection is on the vulnerability and spontaneity of the facilitator in relation to the actual moment or event in a uniquely situated situation. This is the *phronesis* aspect of the role of the facilitator, being attentive to adults’ space. The circumstance that the facilitator allows for his or her vulnerability is perceived by the participants and this has an effect: an opening towards the future, to the lived moment, to the “not yet.” True knowledge-building starts here. The latent properties of the art process are only realized in actually doing it. The term Novalis used for this is “poetisation,” as an act.

Evening session - Presentation of project “Foucault’s Pendulum”, by Edvin Østergaard

This presentation is built on the application which was sent to “Verker Underveis” (“Works in Progress”) in December 2010 and approved in March 2011.

Prosjektforslag: Foucaults pendel – Prosjektidé

Grunntanken i dette prosjektet er å bruke et naturvitenskapelig fenomen som utgangspunkt for en scenisk-musikalsk forestilling. Fenomenet jeg velger er ett av naturvitenskapshistoriens enkleste, men mest betydningsfulle og mangetydige forsøk: Foucaults pendel. Forsøket rommer perspektiver som går langt ut over det rent fysikalske. Intensjonen med prosjektet er å iscenesette Foucaults pendel og den ”historien” som fenomenet har å fortelle.

Foucaults pendel er et uhyre enkelt forsøk: Et lodd, som er hengt opp tilnærmet friksjonsfritt i rommet, settes i svingninger. En vil da, etter en viss tid, kunne iaktta at pendelens svingeplan dreier seg langsomt. Forsøket ble første gang utført av Jean-Bernard-Leon Foucault i Paris i 1851, og det er det første allmenn kjente forsøket som (be)viser at jorden roterer. I vitenskapshistorien trekkes da også Foucaults forsøk frem som det uomtvistelige bevis på at det er jorden, og ikke solen, som er i bevegelse. Som fysikalsk fenomen viser det at hvert punkt på jordens overflate er i konstant bevegelse, og at rotasjonshastigheten varierer avhengig av hvilken breddegrad man befinner seg på.

Dreiningen av pendelens svingeplan er det endelige uttrykket for overgangen fra et geosentrisk til et heliosentrisk verdensbilde. Dette er et kvantesprang i menneskets forståelse av seg selv i relasjon til verden; det innebærer et tap av stabilitet og sikkert ståsted. For det er jo ikke svingeplanet som dreier seg, det er vi som sakte forflytter oss, mens svingeplanet står stille. Den svimlende bevisstheten om at den grunn vi står på beveger seg med ufattelig høy hastighet, har siden Foucault aktualisert menneskets ønske om å finne et fast holdepunkt. Men for dagens mennesker kan det å søke det faste punkt i seg selv ha medført en gradvis tilsidesettelse av naturen. Spørsmålet er om vi igjen trenger å komme i berøring med verden, gjennom å erfare verden i sin konkrete tilsynekomst.

Som følge av tiårs iherdig positivismekritikk er sannhet mer og mer blitt noe som den enkelte konstruerer eller som samfunn og kultur enes om. Dermed står naturen – sakte, men sikkert – i fare for å bli redusert til blott og bar arena for menneskets gjøren og laten. Naturen er i ferd med å miste sin egenverdi. Et motiv for dette prosjektet er ønsket om å gi verden og dens fenomener deres iboende verdighet tilbake. Det naturfenomen som Foucaults pendel

synliggjør er jordens egenbevegelse, noe som samtidig altså er *vår* egenbevegelse. Dette er ikke noe vi har konstruert eller blitt enige om; egen-bevegelsen er et udiskutabelt faktum, ikke en mental konstruksjon. Intensjonen med dette prosjektet er å problematisere og kunstnerisk bearbeide pendelforsøket slik at denne vår og jordens egenbevegelse *erfares*, ikke bare representeres som mentalt bilde (slik tilfellet er for eksempel i en fysikklærebok). Derfor skal ikke Foucaults pendel være en metafor eller et eksempel på noe annet og utenforliggende; fenomenet skal utgjøre selve *kjernen* og sentreringspunktet i forestillingen. Prosjektet vil måtte starte med en inngående utforsking av selve fenomenet. Utforskingen ønsker jeg å foreta sammen med mennesker som til sammen har en mangfoldig bakgrunn (dramaturgi, scenografi, fysikk, mytologi mm.).

Idéer til scenisk gjennomføring og kompositorisk grep

Pendelsvingingen blir den sentrale orienteringshendelsen i forestillingen. For å få dette til må det altså være mulig å henge opp en pendel over scenen. Foucault brukte i 1851 et lodd på 28 kilo og en 67 meter lang pendel. I fysikkbygget på UiO henger en pendel med en forgyldt kule på 32 kilo (20 cm i diameter) og en snor som er 14 meter lang. Jo lengre snor, og jo tyngre lodd, desto mer stabil vil svingningene være, og desto videre kan sirkelen være. I de seinere årene er det utviklet ny teknologi for å gjøre opphengs-punktet tilnærmet friksjonsfritt. Dreiningen visualiseres ved at klosser (eller andre gjenstander) slås til side ettersom svingeplanet dreies og loddet beveger seg rundt sirkelen (som vist på bildet under).



Det dramaturgisk-kompositoriske grepet vil altså være å ta utgangspunkt i *pendelens doble bevegelse*. Pendelen i bevegelse vil ha en egenrytme som kan utnyttes, forsterkes og kontrasteres i det drama-turgiske forløpet. I tillegg vil loddets tilsideskyving av stadig nye klosser (eller andre gjenstander) kunne utnyttes for å utløse forskjellige visuelle, musikalsk

og/eller dramatiske hendelser. I tidsrommet fra *I.* til *II.* (se figuren under) vil da svingeplanets bevegelse kunne igangsette ulike "aksjoner". Buestykket *I. - II.* får da karakter av grunnlinjen i et "partitur".

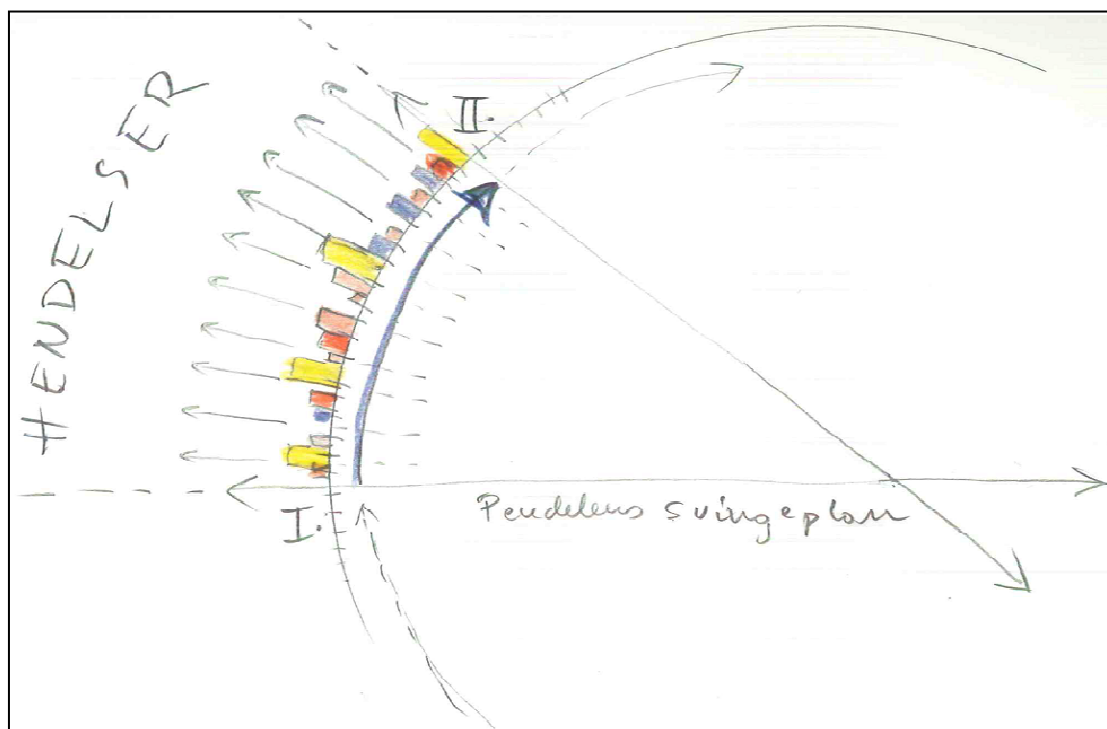


Figure 3: I tidsrommet fra *I.* til *II.* vil svingeplanets bevegelse kunne igangsette ulike "aksjoner".

Skal dette bli en opera, et musikkdramatisk verk, eller et i hovedsak musikalsk verk med visuelle tablåer? Spørsmålet om det dramaturgiske utviklingsforløpet må avklares i den videre prosessen. På det nå-værende stadiet ser jeg for meg en besetning bestående av instrumentgruppe (orkester), kor og sang-solister. Det er et poeng med et i hovedsak akustisk-musikalsk uttrykk som harmoniserer med pendel-fenomenets enkle, ikke-bearbejdede uttrykk.

Bruk av tekster

Det kan, eller kan ikke, være aktuelt å bruke tekster som grunnlag for kor- og sangsolistdelene. Jeg har i tidligere kunst/vitenskap-prosjekter benyttet tekster som kontrasterer og komplimenterer hverandre for å beskrive ett og samme fenomen, som tekster om månen i *The Two Moons* (2006). Tekster i tråd med dette prosjektets idé er Leonardo da Vincis astronomiske tekster, for eksempel hans beskrivelse av menneskets posisjon mellom jordens senter og dets "egen hemisfære":

Each man is always in the middle of the surface of the earth and under the zenith of his own hemisphere, and over the centre of the earth. (fra: *The Notebooks of Leonardo da Vinci*)

Denne teksten, skrevet i en før-vitenskapelig tid, gir en vitenskapelig-poetisk beskrivelse av menneskets posisjon i det geometriske og det eksistensielle rom. Teksten er hentet fra en tid hvor det ikke var en selvfølge at den fysiske beskrivelse av rommet skulle ha en forrang for den eksistensielle. Valg av eventuelle tekster vil måtte gi seg ut fra den videre konkretisering av verkidéen. Men, som antydnet over, prosjektets gjennomføring er ikke avhengig av at én spesiell

tekst finnes. *Foucaults pendel* kan realiseres som en ordløs, men likevel vokal-musikalsk scenisk forestilling.

Kort om deltakere

Edvin Østergaard er komponist og førsteamanuensis i fagdidaktikk i naturfag ved Universitet for miljø- og biovitenskap. Som komponist har han vært aktiv siden debuten i 1988 da septetten *Spiel-Räume* ble fremført i Esbjerg med Esbjerg Ensemble. Som forsker arbeider Edvin Østergaard i skjæringsfeltet mellom kunst og vitenskap med fokus på blant annet kreativitet og kunnskapsprosesser. Dette er realisert i verk som *The Einstein Resoundings* (2005), *The Two Moons* (2006) og *Unpredictable Moments* (2008). I perioden 2008-2009 var han gjesteforsker ved Harvard University, Boston. Her realiserte han bl.a. *Darwin, Wagner and the Missing Link of Art and Science* (2009), en komparativ studie i Darwins hovedverk *Artenes Opprinnelse* og Wagners opera *Tristan og Isolde* med utgangspunkt i 1859. I år kom hans første CD, *Die 7. Himmelsrichtung* (LAWO Classics).

Hans Henriksen er professor i regi ved Kunsthøgskolen i Oslo. Utdannelsen hans er masterstudier i regifag fra St. Petersburg Statlige akademi for teaterkunst (1996). Fra debuten som regissør i 1996 har Henriksen iscenesatt en rekke forestillinger på de fleste av de norske scenene, samt teatre i Danmark. Han ledet regilinjen ved KHiO fra 2002 til 2007. Henriksen har tidligere samarbeidet med Østergaard i *The Einstein Resoundings* (2005) og i urfremføring av konserten *Den 7. himmelretning* (Ultima, 2007).

Serge von Arx er professor i scenografi og kunstnerisk leder for scenografilinjen ved Akademi for scenekunst, HiØ. Han er utdannet arkitekt fra ETH, Zürich, Sveits. Hovedfokus for Serge von Arxs arbeid ligger i relasjonene mellom arkitektur, billedkunst og scenekunst. I tillegg til hans virksomhet i under-visning og forskning, arbeider von Arx som scenograf, designer og arkitekt. Gjennom sitt 12 år lange samarbeid med regissøren Robert Wilson har han hatt ansvaret for utvikling og realisering av en rekke scene-, utstillings- og installasjonsprosjekter over hele verden. Han har vært involvert i utviklingen av det særegne visuelle språket Robert Wilson har utviklet over flere prosjekter. De siste prosjektene til Serge von Arx er *Orfeo* på La Scala, *Ifigeneia* på Trøndelag teater og *Shakespeares Sonetter* på Berliner Ensemble i Berlin. Se også <http://www.sergevonarx.com>

I dette tverrfaglige prosjektet ønsker jeg også å knytte til meg fagpersoner med kunnskaper om Foucaults pendels vitenskapshistoriske og tekniske aspekter. Aktuelle personer kan blant annet være: *Anders Isnes*, fysiker og leder av Naturfagsenteret, UiO, og professor *Lutz H. Schön*, Humbolt Universität, Berlin (som har bistått med installering av en Foucaults pendel på NTNU).

I og med at "Verker underveis" inviterer til en åpen prosess rundt prosjektets idé ber jeg om forståelse for at *Foucaults pendel* på det nåværende stadiet ikke er videre konkretisert mht. det musikalske og kompositoriske forløp. Her håper jeg på aktive innspill i prosessen.

Nesodden, 1. desember 2010, Edvin Østergaard

Discussion

There was no clear separation between presentation and discussion on this evening. Edvin and Aksel had set up a pendulum in the room and we talked as we observed the movement of the pendulum in the middle of the circle where we sat. Thus, the discussion wandered between observation and comments on Edvin's project. An attempt to render some of the exchange follows.

Reflections after Edwin's presentation on the pendulum of Foucault

Edvin introduces the project of an opera based on Foucault's pendulum. It took place around a suspended pendulum in the living room. He told about research which is going on in Germany and that they had hung up a pendulum at the University in Trondheim which was almost free from friction at the axis. Edvin tells that no music is composed yet, that the point of the invitation "Works in Progress" is that it is to be not an individual, but more a group process where feedback to the composition will be done in seminars. This is a totally new way of working. After the introduction several topics were addressed; we talked about the pace of the pendulum's plane of oscillation and how this depends on the latitude.

Jan: It might be slow close to the equator...

Edvin: Yes, moving south from Berlin to the equator, it would take longer time to go through it. And moving towards Oslo it would take slightly shorter time.



Jan: If you are sitting in the audience in Berlin what would make it different than the passing of the arm of the clock?

Edvin: The difference would be that when the pendulum arm hits one object, something happens on stage. It could be a visual change, it could be a musical change, or it could be a pause. And the duration between one action and the next action is fixed, but would slightly change moving north or south. The distance between each object (see drawing in project

proposal) would be the same, but the time the pendulum moves from the one to the other would be slightly different.

Jan: I still don't get it. You have a giant clock with a needle going and you have events happening every minute, like another piece of music. What is the difference from the perspective of the audience?

Edvin: There are no differences because the clock would be exactly the same in the North Pole as the pendulum. But when you move southwards the clock is still having the same pace, but the pendulum is not – it's plane of oscillation moves slower. That is the only difference. Your watch is exactly the same, but the pendulum is not. The pendulum's pace is dependent on the latitude.

Jan: Let me put the question differently: To get that excitement I would have to sit in a plane very quickly to experience the difference.

Edvin: That's right. You wouldn't have that experience when you are sitting in the audience in Berlin. That's what you have, this pace here. But normally we think of the duration of a Beethoven symphony as the same in different cities, don't we? It's not a big point. This is the result of going into the phenomenon with the pendulum. This piece would have different durations depending on the latitude of where it is performed.



Edvin: (...) One could imagine that a totally new text is written to this pendulum “opera”. One could imagine that no text *at all* is written to this, because the text itself would make disturbance to the pure expression. It doesn’t have to be. (...)

I am really fond of this text by Leonardo da Vinci. You find it on the third page (of the project description), because it is so precise. I used it in the last movement of the “Two Moons”. As to describe the human being in this new world – and this about 1610, nearly 250 years before Foucault made his experiment! – he says: Each man is always in the middle of the surface of the earth, and under the Zenith of his own hemisphere. His own centre of the earth! Each man is always in the middle of the surface of the earth. Isn’t that wonderful? I mean, the surface of a ball doesn’t have a middle-point! So, by definition, every man would be in the middle! And what kind of hemisphere? He would be under the Zenith of his *own* hemisphere, his personal hemisphere. And his feet point to the centre of the earth. And there it is, one’s own position over the centre of the earth. It is a very elegant way of saying that the world is round, isn’t it? Actually he had to formulate it this way so that he wouldn’t be an Inquisition target. So those kind of texts are of course wonderful and very poetic to use.

Linda: The pendulum was also the compass, sort of, metaphor.

Edvin: How, Linda?

Linda: For instance, that we oscillate between extremes and come nearer and nearer the middle – what they call in it German, this youthful period, Sturm und Drang, “himmelhoch jubeln, jauchzen, zu Trübe bedrückt.

Aksel: Always when you do something concrete there is something mortal coming. And today it’s *shadows* – I don’t think you have seen them! (referring to the moving shadows on the ground).

Linda: Just fantastic: how those shadows come together that emphasizes this point: they join, and then they split...

Aksel: If you have different colors, because you have colored shadows, painting: blue, shadow of yellow and yellow shadow of green. Can you see it, how it is? In a way, if you look at the shadows, it feels like breath. Rhythm has something to do with life. Particularly when they over cross, when you have a double-shadow.

Jan: One of the things that intrigue me is that if this is the proof of the earth is rotating, then... to *understand* that the earth rotates on basis of the phenomena, is something else. That takes a lot of reasoning, to *feel* the earth moving, on basis of the phenomena. There you have to do some mental gymnastics.

Edvin: What kind of gymnastics would that be?

Jan: For example, when you said that – was it in Uganda? – there is no movement of the oscillation plane; then I have to process that in my mind before understanding it. And that it goes slower towards the equator, and so on.

Linda: You don’t have the experience of moving through the atmosphere at a 1000-something km an hour. So it is absurd.

Edvin: Because it is all moving with us, as we are also.

Jan: it was to me very interesting, at Gentle Actions in *Kunstneres Hus* in Oslo last month, as David Abram was talking about the clouds. Why is it that the clouds not shoot over us? I’d never

wondered about that before. The clouds are directly above you so it immediately resonates with your own experience. But maybe this aspect that there is this distance between experiencing the phenomena and what it is actually proving is also an interesting trigger.

Edvin: So actually it connects to this image of the sudden shift here... To *think* that the sun is not moving, but we are moving, is the same quality of shift. It must be experienced. There is no mediator, there is nothing in-between.

Jan: An interesting aspect of that is that we can *know*, we have learned at school that the earth is rotating around the sun but we still, with this knowledge, experience the sun as coming up. We can tell it ourselves a hundred times that it is not like that.



Linda: That's the paradox of the geocentric and the heliocentric. You know it is heliocentric, but you experience it as geocentric.

Aksel: It is a bit a paradox, as I see it, because the actual mystery is that the pendulum is constant. It is resting in itself, in all sorts of ways. So if you set it in this motion and the earth starts to move, it will keep on... And if you have the weight and you add more to it, you would maybe think it would go faster; it doesn't change. So, for me it is a paradox: it has its own time and its own renewal; it even has its own space. (...) For me it is a paradox, you have to turn around and see, the earth moves, but the pendulum doesn't really bother about that. It is free. The interesting thing is: what decides this? The moment decides everything. (...) This pendulum (used in the demonstration) was not perfect. If we think that perfect is completely perfect, but it has a shape. If the shape is not perfect something will always happen. If it is perfect something would also happen, because you can't control it. (...) But my main feeling – this was more physics, now it is art – is my existential feeling, I have a strong sense of joy, when I see a stone is free. You also feel that if you are as a child on a swing.

Linda: There is a deep fascination which is satisfying. If it makes you happy, or... it is something, you feel... And that's the whole hypnosis part, too. And it is very hypnotizing I think. You don't get away from it, it is worse than television, this thing!

Edvin: A psychologist, a psychiatrist, should be in the team! Those who use hypnosis.

Aksel: When you read the text there was something about an idea. I heard something about a motif. I heard something about coming back to the concrete, understanding that we are standing on the earth. Can you say something about the motive for this?

Edvin: Yes, that relates also to Jan's question about the existential part of it. There are different ideas here and one idea is connected to the work we have done in phenomenology, actually the notion of the *ontological reversal*; the idea that during the history of science the laws of nature have become more important than nature itself. Suddenly, slowly, we turned the whole relation to our existence on the head. So the phenomena of the world become *examples* of the laws of science, and not the other way round. That is what I always say to my students: it is the other way round! The laws about nature, about what we see and experience, they are examples of understanding it. So the physicist who see it this and this way, the poet would see it this way; that is the main thought in the "Two Moons". The poet's and the scientist's approach to the moon is so different. Yet, it is still there, it is actually *one* moon.

Aksel: The point of the Two Moons is that there is one moon.

Edvin: Because the artist and scientist are isolated, they seem to be unaware of the fact that they are actually looking at the same phenomenon.

Aksel: So the point is to resurrect the moon, not to resurrect science.

Edvin: "To give nature its dignity back", that is something we have to do consciously. I think that is the task for art. Of course we are working with it in science too... I am aiming at the Norwegian opera and they have their way of thinking. Maybe it has to be quite another setting of it. The performance should be in the *fysikkens hus*. I don't know, it should be in relation to physicists.

Aksel: When da Vinci speaks, he speaks in a way that he is still present in his experience of "standing on the earth"; it is very earthly thing. (...)

Edvin: We are soon rounding off. I would just make a small distinction between science and research. This (phenomenon) is very much science, this is *naturvitenskap*. And in this project I would have research connected to it.

Ceciel: I think, what Aksel actually said, about the resurrection of the moon, that is really the point. Somehow this is connected to my feeling of when you were drawing this (see seminar introduction) and you had these points directed to the artistic and the research expression. And this is exactly what I was aiming at (in my presentation). What is it you are doing when you're going out into some artistic expression or thinking? What is behind it? What are you trying to do with the artistic expression? It is not the artistic expression in itself, but it is *aiming* at something. It has to do with the connection to nature. That's what it is about. And through that, with yourself, without a connection to yourself... I thought this was very interesting.

Edvin: It goes back to this resurrection of the moon. You are not healing science or art, you are healing the moon. I think I see your point. Of course, I am also directed towards expression. This project is very concrete; we are talking about a performance. It is a concert in the concert hall, for an audience. And for me this point of this form is extremely important. I won't say it

ends here, of course it goes on, like with music, when the people experience it, it goes on. Science also goes on, the scientific paper is not the end point, it goes on.

Ceciel: Yes, but I think it is important to make it explicit. That is actually what you are after... otherwise it gets lost pretty soon, I think.

Edvin: What gets lost?



Ceciel: The resurrection of the moon. If we don't make that intention clear and carry it from the beginning with us... It should be there.

Edvin: I just want to read to you my ideas about research questions: this is something I want to research, how this comes out, what happens in the process? So I have three examples of research questions here (reads from the project proposal). This is not either art or science; what you are doing here has to do with ideas, intuition, new ideas – and this has not become a form which we could call science or art expressions. But at some point maybe it becomes more an artistic expression. What is that actually? It is a form called “opera”. And the scientists they have their forms.

Jan: I think there is an interesting difference here between the *expression* and the *process*. The difference to me would be that the artistic expression aims at some result, that could be in the form of a performance or an art work that is being exhibited: that is the expression that is manifested. But the *process* is what goes on before that.

Edvin: Yes, just like I illustrated on the first evening, the process and the outcome of it, the expressions.

Jan: When you aim to have it in a performance, how do you prevent it from becoming static?

Edvin: In this case, actually, it lays in the pendulum itself and its latitude. One might say a piece which is eight minutes long, the score itself, is extremely static because it is only there, but the *performance* might have larger or shorter durations. These are examples of what I would call research questions: "How does reflection interact with the emerging of the work of art?" We are talking about a reflection which is in dialogue between different people. "How does the artistic stream interact with and influence the unfolding of the phenomenon?" Which means, I have an artistic-aesthetic access and not a purely physical access to the phenomenon. How does that interact with the scientific phenomenon, as the process goes on? Those are examples of research questions in this art-science research project.

Jan: For me it is also very interesting to see: what would be the emergent properties in such an activity that in itself has a static dimension. What is the leeway here, still, for emergent properties? The unexpected, the mystery? Things that you could never organize, or *Bestellen*, as Heidegger says; *Bestellung*. Things that jump upon you from behind your back. This to me, is the quality of an emergent property, that it can never be completely anticipated, therefore it is emergent. Maybe, if the form of the pendulum would be slightly different, how that – it becomes as chaos theory – how that organizes the way in which it starts to cause minute changes in the rhythm. Something like that. The other interesting thing with this hypnosis idea is that maybe the circumstance that it goes back and forth all the time at the same interval, causes hypnosis. Or if you turn it around: if the movement would be irregular, maybe you would not have hypnosis happening...

Linda: This might be a concert at which people never leave! (...)

Edvin: I hope I can invite you to a concert in a few years time to the concert. And then you hopefully remember this evening and reflecting on this phenomenon. (...) The resurrection of the moon is very important for me. And what you said, Jan, the very last thing, typical, I have it in the back of my mind. But it is so important to have it - the relationship between the monotone which is here and the unexpected of the changes, which might be the consonance-dissonance relation in the whole composition. It might be. Because the monotony of this should of course be broken and how is that done? Maybe that is the most important thing?

Jan: Maybe in this ball, of the pendulum, a human being should be sitting. The sequence of the performance, it reminds me of the wise-crack about Einstein and his theory of relativity; if someone would travel with the speed of light and return to the same spot, he would not get older in the mean time. The person in the ball is the *only* one who is not moving with the same speed as the earth is rotating. [Laughter]

Thursday, 9th of December

We started the morning with sharing with each other the motives and expectations with which we had come to the Doli seminar.

Morning session – Conversation on motives for partaking in the seminar

Jan: One motive for me to come here stems from an interest in how we, as educators, can nourish a first sense of wonder, in a process of connecting to nature through art. Starting from an arts-based approach is very different than beginning from the science side. My expectation before coming here is that it would be a meeting of minds, of people with different points of gravity in their work. I was also intrigued by Edwin's question in the letter of invitation: "What is artistic research?" Is it different from other research? I think it offers enrichments but also limitations.

To me, going into the interfaces between art and science education is both timely and important. Other approaches- e.g. environmental education proper – seem to be failing. We need a different view to what education is about, and this is a new territory.

Linda: There is something that I had thought to take up this evening, which is my personal entry into this field – without any connection whatsoever to visual arts. I started drawing just to get to know plants, out of a need to differentiate. One of my first experiences was that through the process of drawing I understood the nature of poetry and music – as a flash of instant comprehension. It was an entry into a quality, an understanding of a field that I never had a relationship to before. Later during my biology studies at the University (California) I functioned as an assistant on botany excursions. In Germany where I came to the University on a Fulbright scholarship, my professor tested my abilities by taking me for an early spring excursion in a flora I had almost never seen. When I then even dared to correct her botanizing in the field, I was appointed as a sort of "last authority" for future excursions. I understood that I had found a way of identifying plants through my own training with drawing.

I have worked in cooperation with Solveig in using drawing with the pupils in biology, and we did not have any model for how we wanted to teach. Among other teaching sessions, we tried out something similar over many years to what we did here in Doli, using drawing and painting in teaching botany. Pupils often mention this experience, even many years after. Some pupils talk about meeting art and science through the activity.

The last thing I want to mention are the visits that I made during the last months to see what is actually being taught in the schools as natural science. I was struck by the poverty of what is offered in the classrooms: the lack of access to living phenomena and the lack of context which gives the dimension of meaning. So my questions are pedagogical. I am a science teacher, but working together with artists has been extremely fruitful for me and for the pupils who have had this opportunity.

Solveig: What makes this fruitful is not just the use of art in biology, but the connection, the cooperation established between teachers trained in different disciplines and their main subjects respectively. The dynamics in these relations is part of what manifests the experiences for all parts involved. Having to participate and listen closely how another teacher connects to the subject-matter and to the students creates an atmosphere of trust and respect that nurtures the children's own ability to contribute and cooperate.

In this process of building relations the pupils themselves have often been the best guidance. As humans in a nascent state, they are not burdened with all sorts of preconceived notions and conception. Sometimes they have “freed” me from the performing activity that I tended get into while teaching and allowed a state of “presence,” where everyone in the class could enter.



Ceciel: Because of your contribution Solveig, I can be very short, because I partly recognize myself in what you just said. For me the starting point is our connectedness to nature, and my end point would be a *re*-connectedness to nature. I am interested in how we each, on our paths through life, find our own ways to connectedness. In this respect, it has been very interesting for me to hear each one present here tell about their different points of entry, be it as scientists, science teachers, art teachers, artists, and how we from our different backgrounds and disciplines try to search for ways to reconnect. Edvin for example makes an attempt – coming from a science background and seeking help of artists in his project on the *Two Moons* – ultimately with the aim to make us all “bow to the phenomena,” to resurrect the moon, in Aksel's words. And Solveig guides us to seek connection by means of artistic self-expression in the seed exercise, and Linda as well, focusing more on the biology aspects, and Jan through the exercise of “little-me making.”

But then education comes in, which to me is a very important aspect. Aksel showed us yesterday in his presentation on 'poiesis in education' how historically education has evolved into a process of liberation (from situated, relational learning to education of the self, independent of the surrounding, emancipating), eventually getting to a poiesis of learning, which to me was very interesting.

But there remained one question for me afterwards: what is the meaning of all this if we do not in the end ultimately aim to re-unite to nature in a new way? We live in a world which is out of balance, we are facing huge problems of which we are all very well aware, so something has gone drastically wrong in our relation to nature. So my motivation is: if in education we

seek to re-establish and re-think our relation to nature, then how can we do that? And then I mean not only how do we reconnect the children to nature, but also what does it take for us as adults to create a better understanding, do we as adults really understand what is needed, what is lost in ourselves? These questions we need to address ourselves, if we are at all going to take responsibility for showing children how to take responsibility. That is our responsibility! So for me the educational part is very important: How to work towards change in education.

Aksel: At a deeper level, my entry point is also the connection to nature. Already at the age of 11, all my steps centered on that question. Is there a disease, and if so, is there a way towards healing, a therapy? On this journey I discovered that “man” is not unimportant. Education, for me, came as a byproduct of my interest in nature.

I reflected on how to rethink the science book. To me, science is not just conceptual negotiations. If you come into the creative side, it is about becoming more human (not David Abram’s “becoming animal”). It is not only a question of protecting nature, but also of entering a dialogue that has creative resonance at both ends. My stance is close to Novalis: “Our responsibility is not only to protect, but further, to continue creation.” It is taking responsibility for the creative and the wonderful. In all activity, even in the cold scientific activity, one stands in this relation, there is this reciprocity. You enter a creative relation, carrying a responsibility and the ethical question comes along immediately. Here is the link to sustainable development. It is important to make this link more explicit. There is a dialogical question in thinking: I discover that I am not alone, but embedded in a conversation. It is a reconnecting experience, and this takes place not only in art but it is in fact the core of scientific activity.



Edvin: I have put down two main motives: (1) To focus on a phenomenon which itself exceeds our explanation, our access to, or our different perspectives of it. A phenomenon is always more than what we can explain. It is about giving the world its “worthiness” back. I start with a phenomenon that is “stolen” from us by the physicists. I can’t accept this reduction – I can’t

accept the pendulum as a mere *scientific* phenomenon. What is tended to be done again and again in science education is to reduce the phenomena to example of one particular understanding of it.

That is why we in our teacher education program, work half a day with the students on the apple. They are biologists and this is something they can use to demonstrate their theoretical concept (it is “healthy food”, it’s acidic, it is sweet, etc.). So the apple tends to become an example of the knowledge that is contained in the textbook. But it’s really the other way around. I am practicing the ontological re-reversal in a very practical way. We must resurrect nature as a worthy dialogue partner; giving nature its worthiness back. I enter into a dialogue with another person. He or she is not an *example* of my ideas, but a unique person who has his or her worth also. I must accept this other person as something that exceeds and goes far beyond my pre-understanding, my knowledge, and not reduce him or her to an example of what I already know. The same point is just as valid in any dialogue with nature, or with phenomena.

Giving the worthiness of nature back is, I would propose, something we should do very consciously and do very concrete. When we were looking carefully at this pendulum yesterday evening, it was like a religious event. We very consciously bow to this phenomenon of nature.

And my second motive (2) is my personal point of departure. I have struggled so much with coming to an expression, both in science and in art. That is why it is so extremely important to me to work with different forms of expression.

Let me give you an example of what I mean by coming to expression: At a seminar in 2001 Sigrid, a colleague of ours at our department, , drew herself like an apple tree with strong branches and bearing many fruits of bright colors. I drew myself like this, a tiny dot on the large paper. It was a seed (which of course is much more than just a dot!). There is so much potentiality in a seed, it has to grow. At some time this seed will come to expression, and I have a very strong feeling that this has happened with my “seeds”. I guess that’s why I, in my introductory talk, focused on the relation between process and form. Find a form is necessary for coming to an expression. .

Discussion

Solveig: When I said that it is important to get the students into action, I meant actually that they go through this process and get to this expression. For me, this is the starting point in the pedagogical dialogue. To make sure that everybody has come to an expression, which one can be in dialogue with. I see that as a starting point as well as an ending point.

Aksel: How do you work to *avail* entrance into the process, into something that can end in an expression? How do you avail engagement as a prerequisite to entry into process? *Gjøre tilgjengelig*. You do something and then what do you do for example when half of the class cannot enter into it?

Solveig: Anyone can always do something, for me the task would be to help them find what they *can* do, and then this will be their starting point. Because it’s there, it is always there!

Ceciel: I have a question to Edvin, on this “bowing” to the phenomena; I thought it was beautiful what Aksel said yesterday, that the ultimate aim is the “resurrection of the moon!” You try to do that through science education, and in the project *Two Moons* and this new project with the pendulum you are trying to do this with the help of artists. To me, if we all would be bowing, how can we be sure that our ways of doing that are not lacking something, and isn’t that exactly the point where the exploring part starts? With the art works we have been making, isn’t that what we were trying to do. From what I understand of you, there is a big part of not-knowing, and not-understanding. Should we not try to open this door further, and how

can we do that? There is still this vast open field of what we have lost in all our ways of coming to self-expression. I think that is where this exploration of art comes in, in a very different way than *using* art to make us bow. It is an open, existential question. That is the really challenging part.

Solveig: There is something of being in this mode of being in dialogue with something that you don't know what it is, that you see that there is a limit for what you can understand. And it makes you humble. Something happens in you, as a human being, and that changes you. In that experience of coming to that border, seeing: this is different from me, this is an otherness that I don't understand. You change. And this is to me, what the ethical relation is about. It is about that point. It is not saying to yourself: "We don't know and now we have to move further." But it is in this inner soul and that's why this situation with the children were they had put me out, where I had to leave everything that I was thinking I should do or think, or... They stand there, and they stand there as something that I cannot grasp, and in that moment it opens a humbleness in me, and it opens a space where something can come into presence, where something can be expressed, from the other side. And I think that is as much with nature as with people. It has nothing to do with the activity; it has to be situated in this humbleness of knowing that you don't know. It changes you.



Linda: I never really had the intention or the goal of creating a continuous interest in plants or wanting to study them – we just take plants – further. In a way, it is using this path towards the phenomena, to be a path to each other. I once held a talk for a class which was at the end of its school time. I said them that everything we had done at school, all the subjects were really an excuse. They were excuses for creating a meeting place. And I think when the pupils are drawing plants, even drawing seeds, it's always an expression which they make. It is almost always expressing a connection which is made in the process. And then this expression is seen and taken up in a dialogue with each other. I experience it as what you are talking about:

making a room, where they have the opportunity to meet me, Solveig and each other in another way.

One expression of that has been that we never just do our own things, but we also participate as pupils in each other's activities, just like the other pupils. So in this learning space, which to a certain degree occurs, there is a possibility for something happening, for them to see and meet each other in another way, modeled maybe on the dialogue with the phenomena in nature.

Solveig: It is the most challenging part, when you can make this space for each one to contribute, when you hang up, on a wall, the seeds that everyone has done, then this new process of looking at them is very challenging. These are creations from your friends, from someone who is like yourself and it's much easier to fall into judgment then: what I like, what I dislike, what this is like, how you express – instead of going into the phenomenon of the creation that is there. If you can practice that, to be true to what you actually explore in the expression of the other without judging, you make this space bigger, both around you and inside yourself. So there is a continuum opening up for the other's expression, for coming closer to their connection to their own creation.

Linda: I am actually deathly afraid of a white page and colors. Drawing is not something I do easily. I am probably more vulnerable there than in any other activity, such as what we did with the clay.

When we "stamp" the expression that we have made by judging it, it is even more difficult to dare to do something. So this is the dialogue which is so challenging and delicate and something that has to be worked with. I learned from Solveig to try to look at this expression with the same sort of reference with which you look at a seed, the same sort of wish to bring this "worthiness" to this expression, as you do to the nature phenomenon itself.



Edvin: When trying to go into the task we were given, namely to mention the associations we have when looking at these pictures, I am, again and again, fascinated by this double message; that you are free to say everything, but you are not at all free to say anything! There are certain things you shouldn't say, and there are certain things you might say. For me it would be easier if it was said to me: "Look at these pictures and come with your feelings and emotions, but you shouldn't do that, or that, or that." It's like: when Jan gives the instruction to us to close our eyes, and to use the pencil with the "wrong" hand, it's clear to me, this I have no problem to accept. However, when you have an open instruction, essentially anything might come out of it. To me it is a problem that there are things you shouldn't say because they don't fit into a (at least for me) hidden scheme.

Jan: Words evoke meanings, associations. I think one of the things we have to work at is this ability to uphold judgment. I think that that is one of the most difficult things to do, to develop and nourish this sensitivity, because we are so inclined to pass judgments, even without *knowing* that it is a judgment. To find the appropriate words, and find when it is appropriate to be silent. I think it is meaningful in this context to relate this to the discussion on "description" and "associations." Are these really separate or are they the same? Descriptions immediately bring in associations, and vice versa.



Solveig: When you do this for a long time with children, you try to come into a sensitivity, not only for your communication with this art work that you have in front you, but a sensitivity with the whole social situation. What can be helpful in this challenging process is to encourage the students just to describe what is actually there in front of them, like you did with the seeds. Looking at each others work is a vulnerable situation. Sometimes a single word can block a person to express himself for a long time. I had a friend in Bergen, a famous painter; he got a critique in a newspaper from a man who was not schooled in painting at all. He pointed at certain negative things. This old painter, with his fifty years of experience, he knew that what was written was not true, but for years he couldn't do an exhibition, because of the words.

You can not totally avoid that people get hurt by feedback but it is the responsibility of the teacher to pay attention to what happens and to balance out the situation.

Aksel: I think it is whole field which has to do with developing a research culture. With intention and not-intention, and the helping hand and the critical hand, I find it is quite important to point out two pictures, always. I appreciate it when you dare to take up some pain, by putting up a critical reflection, or a mirror. There is always a double space: a social space and a phenomena space. By saying things, you are in both spaces.

My experience is that we are usually very good at encouraging, and encouraging, and encouraging. But we are not so good at loving critical, safe space. Not just to say: this is good, this is good, this is good, but to have warm and cold atmosphere. That for me is a framing of this whole field, at a meta-level.

Solveig: In principle you should allow any expression to come.

Aksel: And there is a very big difference between having a 5th year class, and having adults, what you can expect.

Jan: I hear myself also making judgments; we do this all the time. Even if one is conscious of that one should uphold judgments, you still do it. But the shift Peter London encouraged us to make is to see the art work as an expression, as something released in the world that has its own story. The person who has released it into the world should feel as safe, as free, to share whatever he or she wants to share about this piece of work, as to *not* share it. To encourage people to be in that space requires this attentiveness. In which even a remark saying how beautiful or how wonderful this is can limit you. To encourage the person to share the story behind what the creation is, is the key and the most difficult to do.

Aksel: Would you agree that sometimes a question in itself – not the intention, not how it is said, if it is said in a pure way – can provoke something uncomfortable, and it is not wrong that it is unpleasant? Or should it always be pleasant?

Jan: The *mere* act, of asking a question, can involve a power relationship, which inhibits the person to share the story that he or she would share if he or she would feel safe. I think this is a very important aspect. Asking the question is setting the agenda, is saying: “I find this topic now what is at stake. This is what I want to hear from you.” Whereas, if one waits and is attentive, just waiting for the moment that the story comes, then it is not qualified by the question. I am not saying that one should not ask questions at all, but there is a big difference in the kind of questions one *could* ask.

Aksel: But can it be helpful to ask questions that are difficult? Bringing some kind of resistance: “Ah, this is the field I haven’t looked at, this is blank, I haven’t looked at this yet.” Like in doing research: I discover that there is a lack.

Jan: To me, this relates in a fundamental way to how we look at education. At one of the art schools I know in the Netherlands it may happen that one has made a painting that one is satisfied with oneself, and then the teacher comes and says: “This is rubbish.: He may turn the art work on its side, ninety degrees, and then say: “Now start all over again on the same painting.” One is urged to destroy something that is intimate for you. They see a quality in the learning process of being able to this.

The other way of learning is that one stays *longer* with the story that is in one’s own art. At *Gentle Actions* in Oslo last month, there was an interesting presentation by Alan Boldon on the opening seminar. He had made a painting in which one could see a spinal column and a skull, which was made on basis of a dream that he had had. For him, making this painting, as a sort of self-interrogation, was the start of making several other paintings inspired by this

particular painting. Maybe he couldn't have done this if the art teacher would have put his work upside down, and said: start all over again.

Aksel: So your answer to my question is: No. That is OK but then we disagree. My experience, e.g. at the Waldorf schools, is that pupils are often very sick of getting comments like: "This was good, and this was good, and this was good." They don't like that. They like if the teachers say: "This was good, this you can improve, try this next time." Then you add something which is not good.

Solveig: But then I think we touch upon the difference between art and science process. What are you working with when you are working artistically? For me it is not the same, because when one is exposed in this way, when one does an art work, one is working with one's images, with one's feelings. It's another way of going about that and relating to that also. And if you work with something that you can have more rational dialogue with...

Linda: One can take the extreme: it would be absurd not to correct a mathematical mistake.

Jan: Maybe to clarify to Aksel, I was not saying that the teacher should say, "This is good and this is good," but to me, critical judgment is *as* much passed in saying it is good as it is in saying it lacks something. It is, again, the sphere of the teacher coming into the lifeworld of the participant. The other quality – putting aside, at least for some time the saying of this is good or this is bad – but asking: what is it?



Aksel: This is not what I am saying. What I am saying is: raising a question that comes out of the things itself; that, in itself, may be a resistance. I am not saying "putting judgments." I just want to be very precise. I feel it is a cultivation that is important.

Let's put it the other way: if I get the question from you, it might be very helpful, even if it is not so good to hear. So pain is not necessarily bad, that's what I am saying.

Jan: But my questions at the art activity we did with the little-me's were more to the extent: what happened, what did it do to you? Not: did you do it good...

Aksel: My point is that there are two ditches you can go too much into. You can be too afraid of being unsympathetic, and understand what words can do, and you can be too polite, too afraid to say something that might...

Jan: Maybe we don't disagree. I think there is also room for this, but there is also an appropriate time for the other thing. When I for example give Wildpainting courses, I will be critical when there are mistakes when we are learning to mix the colors. I think people can learn that they add too much. But when it comes to the individual expression of this "soul"-like dimension, this inner world, this is something else.

Aksel: But I am not talking about being critical and making corrections. I am talking about raising questions. It is not giving answers.



Linda: But sometimes you have to have a very high degree of insight in yourself, and in that question you're asking... because asking questions is very often a paraphrase of a criticism. And often children are much more aware of this, and vulnerable for this. It might be much better to

actually make the criticism, which lies latent in the question, than to try to disguise it which is often the case. I know it from myself, at any rate.

Solveig: It's interesting because now we have a phenomenon here that we are reflecting upon. The challenge is really to stay with the phenomena as it is, also when it comes to emotions. As a teacher one often has this underlying intention of correcting the pupils, to lead them, that they might come to know more and better. Then you always have to correct, you have to lead them on the right path. Maybe it should rather be a question of helping them to make their own relation to the subject, that they dare to go into their own dialogue with it, but also into dialogue with me, with the other children, and feel free to communicate about these relations. This is what I think creative processes are about. You don't stop being critical of course but it is another attitude, it's another way of facilitating the creative process than that of correcting.



Ceciel: It is interesting what you say, that we are actually still in the course of learning of how to then go into that process. We are only beginning to learn that.

Linda: It is not easy to distinguish between a descriptive and a characterizing message, that is, something that becomes limiting.

Edvin: The point is that the distinction between descriptions, limitations and judgments doesn't exist per se. They exist in a relation. And they have to be defined explicitly.

Aksel: I think in the sharing of social space a new perspective can add something. I came to get an understanding during the week, how much effort it takes to really understand an other perspective. I understood more and more how different the entries are. Into an exercise, for example, or afterwards, into a conversation. This whole task, of being to immerse yourself into an other perspective, to loose your self, in a way, doing an exercise, in order to have a good

conversation. When it became clear, this morning, that the motives are different, only then it is possible that they may relate, and that you can't enter this interdisciplinary way of working without going out, to understand, and *then* going in.

Afternoon art exercise – drawing the negative space of olive trees

In the afternoon Solveig facilitated an art exercise of drawing “the negative space” around an old olive tree. The tree itself was to be “spared out” on the dark paper. An added dimension was that this sketching with white chalk was performed in twilight, at a time the sun was setting. The purpose of the activity was to acquaint one's self in a new way with the phenomenon of a tree and its environment.



Friday, 10th of December

Morning session - Reflections on the pedagogical implications of the seed exercise

Based on his experiences with a similar workshop in Sheffield in the summer of 2010, Aksel Hugo presented a structure for writing up our reflections. We were asked to put in writing what we took to be the pedagogical implications of the seed workshop that we had been doing that day. Only on Friday did we have time to go through what we had written down following the format that Aksel had suggested at the beginning of the week.

Jan: The invitation to try to describe aspects of a seed caused me to think about what we actually mean by “describing.” How can we describe a phenomenon without any prior knowledge? Do we describe the seed for somebody who is already knowledgeable about the terms and categories we use, or do we make an effort to describe an object for the proverbial “visitor from Mars”? As an example of this, we can take the description of seeds as “small.” As Linda pointed out, this description is relative – if we take into account that also a coconut is a seed. Would we still call this small?

I liked that the philosophy underneath this approach is to start from the living world itself. Yet I somehow missed that we took up the descriptions, associations, expressions, to a meta-level, the level of asking: What does it mean? How does this connect to myself, to our lives?



I also wondered about the aspect of intentionality, the willfulness, with which the exercise is approached. Is it about getting to know the seed as accurate as possible? Is the effort about

making a “true representation” of the seed, or to acquaint one’s self with “the soul” of the seed? Or are both the same? What is the formative dimension in this? Is it a repetition of an exercise with certain expected outcomes, or is there also a poetic dimension, allowing for the unexpected?

To me, possibly problematic could be that the exercise unwontedly invites to showing one’s competence and skillfulness in accurate depiction, which may put off the less-skilled. How do you deal with the different levels of competencies?

Regarding the latter, it could also be encouraged to make a personal expression, e.g. to make a poem on the seed, or on the relation between that particular seed and *you*. I had to think of the kind of exercises that Peter London suggested in *Drawing Closer to Nature*.

The exercise demanded of me to pay careful attention, control, restraint. What it gave me, on the other hand, was that I looked at seeds with fresh eyes. One could expand on this, I believe, by bringing in the other dimension of what is there *inside* a seed, that is not visible; where is the life there?



For me it also brought up an interesting dimension of “making the familiar unfamiliar.” Does one, as a facilitator, need to take the phenomenon out of the context of the ordinary life world to make it more approachable, or not? What are the consequences of using tools like a magnifying glass or camera? And what happens when our view is intentionally kept limited to only seeing the silhouette of the seed or when we see something that we would never see in “real life,” like the speeded-up germination of a seed in a time lapse film sequence? Does the artificiality of the “manipulation” bring us closer to the phenomenon or does it put us more at distance?

This brings me to the reflection of whether the activity that Linda and Solveig facilitated was about knowledge *transfer* (from “teacher” to “pupil”)? Do these exercises leave enough room for the teacher to enter a new experiential world herself or himself too, allowing one’s

self to go into uncharted terrain? (And does the teacher report on that as well: her/his excitement, the risk of failure, etc.)

How does the exercise contribute to sustainable development? Do we anticipate that the impact on the pupils goes along the scheme: *acquiring new knowledge* → *change of attitude* → *change of behavior* or is that too simplistic? Perhaps these types of activities can be considered as forms of “education for sustainable development,” but if the artistic dimension was left more open-ended the outcomes will, as a consequence, also be unpredictable. One should not rule out that they can at times also be contrary to a desired result and thus perhaps *un-sustainable*.

Other questions are: Could this exercise be expanded to other subjects, e.g. in interdisciplinary education, or is it an isolated activity? And to what extent does facilitating such exercises necessitate biological, didactical and/or artistic competence of the teacher? What role does the element of time, of rhythm, the whole choreography of the process, play? (Joseph Cornell holds that one first needs to awaken enthusiasm before one can fruitfully focus the attention of children.)

Aksel: Regarding education and the pupil, I am interested in dimensions of fostering responsibility and creativity, developing contextual understanding. For me an entry point is: what should this serve, for the future, on the levels of phronesis, poiesis and episteme. This exercise provides a way to understand a plant, its morphology. It provides an extended concept of botany. I am interested in examples of how it can be framed.

The element of a situated, grounded experience was to me stronger than its contextualization. A situated social process is so important for sustainability.

Solveig: I tried to pull together what I see as the essence of the different stages of what we were doing. There are skills that you are exercising at each of these levels. One exercises the confidence to make one’s own judgments and give one’s own expressions. Going through this we developed our ability to use our senses and gain more confidence in bringing our own expressions out in front of others. These were the different stages we went through:

1. *Going into the garden.* Here one has to get one’s self in relation to the space, the environment and one’s own body. One puts one’s self in the garden, the environment where the object is to be found (in this case, the seed). One also puts the object in a context. This is contextual learning.
2. *Coming back to workshop space.* One has taken this first step, created one’s own story. Now one shares it with others: how it was to be there together. One relates one’s experiences to the stories of the others and thus situates one’s self. At that point, one comes to another level. Here one can try to extract what the shared stories have in common. One can look at what is common and what is individual (social and personal).
3. *Going back again to the seed and developing a new relation.* Doing this, you expand on your personal relation to one seed, leaving the commonly found concepts behind, as it were. In this next stage one uses all the senses to communicate with what that is, there in front of you. One can do it in all kinds of materials; we did it with wax and paper/earth colors. The relation to these materials brings out one’s imaginary experience of the seed. You enter an imaginary space, which establishes a relation to your inner images, to the material and to the object you have in front of you..
4. *Looking together at all the impressions of the seed.* Doing this, you relate to your own image to the others’ images of the object. Not only the seed out there, but also the seed in your imagination. Here one is in a sort of social, multi-perspective space. One is exploring with the others one’s own and the others’ expressions. What do they have in common, what do they tell us about the seeds?

Ceciel: For me, it was foremost an effort of connecting to nature by means of seeds, experiencing their confindness. We were approaching the seed from different angles: from sense experiences, language, and materials. In this process we were connecting hand, mind and imagination, moving from individual process to the shared process, and back again to the individual experience. Thereby we were all the time establishing new relationships to the seeds and also to each other.



Edvin: I put down five elements:

1. *Coming closer to nature.* There was a clear *intention* in what we were looking for. We went into it and came very close, also in an emotional way: touching it, being one with it.
2. *Seeing the beauty in nature.* We were allowing the element of “beauty.” To me, I never saw seeds as beautiful, but now I do.
3. *Training the senses.* It was fundamentally a sense-based experience. Allowing this takes time: tasting seeds, looking at seeds – even hearing seeds, as in the case of the rattle of grape stones in a dried-out grape! In this, much more than the eye sense is activated. It is important to leave enough time for it.
4. *Training the skills of observation and interpretation.* This is so basic in phenomenology. It was trying to pull these things together. Paradoxically, there is a felt need to justify doing observation, but somehow we don’t need to justify doing interpretation.
5. *Creativity is an important skill to practice.* Maybe this skill could be incorporated further. One the one hand can try to be as accurate as possible. On the other side one can make

an effort to connect the soul of the seed to the soul of the observer. The personality of the observer is connected to this great realm of creativity.

Linda: It is incredibly valuable hearing your experience. The experience that Solveig and I have in doing this goes back at least 25 years. It is changing all the time. But until this week we had never used wax before. We only started using earth pigments a month ago. This exercise with seeds is just the starting point of working intensively, for eight to ten days, with plants – the whole day. This is effectively creating a path towards a phenomenon, to connect to it. Thereby my (and everyone's) experience – and thus interest and joy – is enlarged.

At the same time, it is about didactically connecting with the others through the phenomena. Is it science, art, nature studies, even perhaps therapy? One uses elements and processes, observation, analysis, generalization, synthesis, color, form and materials.

Here in Doli, I only to a very little degree pointed to the larger social and economical context of seeds (e.g. the monopolies on seeds, the national and international laws, the implications for third world countries). Doing so brings in the "shadow" aspect. Doing this or not doing this depends on the situation. The context differs, if there is sufficient room to place it in the context of our daily life.

We start with the seed, this apparently dead object, this residue of a life process. When we do a course with pupils, we start with the seed, to structure the subject according the innate lawfulness of the development of the plant itself. Usually at the end, when we have gone through the whole life process of plants, the biology of the seed will be taken up at that point.⁴

Edvin: I distilled the following common threads in our reflections:

- A. *Connecting to nature*, relating to space and environment, coming closer to nature, making the requirement for a room, mirrored didactically in terms where it takes place, there should be a relation to the environment.
- B. *The training of competencies*. Connecting art and science has to do with training certain competencies: seeing the soul of the seed accurately. Which competencies do we need to train in the context of education for sustainable development?
- C. *The experience*. This way of working is based on experience. It is emphasizing experience as an entry to education for sustainable development. Wide range of forms of experience.
- D. *Contextual understanding*. This understanding is both within botany itself and across the subjects. We always primarily train the abstract understanding. One can apply this to science, but to art as well.
- E. *Creativity*. When do we train creativity in our education? Creativity is now coming to be one of the main indicators for sustainability.

⁴ Written comments from pupils are included in Appendix I.

Reflections

In the following chapter we present some reflections on the seminar, written after we had returned home. The idea was that each one of us has the opportunity to give expression for perspectives that have come in the wake of our seminar.

On the role of research in art/science, by Edvin Østergaard

What did I expect would come out of our workshop, and what did actually emerge? For this week, we had discussed some intentions – or at least we had some ideas and suggested foci. The idea was “to explore the field of art, science and teaching/learning” and for this reason Aksel and I called the seminar “Researching Art and Science” - without actually knowing what this might imply. In the invitation we further stated: “In a phenomenological sense, we start the reflections on these by actually entering this field through *practice*.” What kind of practice do we mean? And which “phenomenological sense” is referred to here? An important background, which we perhaps did not emphasized strongly enough, was also our common interest in learning and educational issues.

In my introduction to the seminar on Sunday December 5, I mentioned the distinction between *science* and *research* without elaborating on it. Now, in the light of hindsight, I realize that this actually is a decisive distinction to be made. In Norwegian one would say “vitenskap” (not necessarily meaning “naturvitenskap”), and “forskning” (probably meaning all kinds of discipline-oriented research). When referring to the English “science” we need to problematize the predominance of *natural scientific approaches* to understanding and practicing science. So before the week, I thought of the title “Researching Art and Science” as very precise: the aim should really be to approach the coalescence of art and science in a research mode, and this we would do by *practicing* the art/science coalescence and by *practicing* research. Now, however, this intention seems a bit idealistic, even naïve. It presupposes a common understanding of both art and science – and their sets of practices. So, what are the lessons to be learned?

First of all: There are *different kinds of practice*. Art practice is one kind of practice (or rather a set of various practices), often accompanied by the practice of aesthetic reflection – which of course also is a kind of practice. The works of Joseph Beuys are both works of art and aesthetic reflections on art and the role of artists. It is impossible to distinguish between Wagner’s operas as musical works of art and his thorough and controversial writings on the New Drama and the role of organic composition. Ideas and works of art are one, even though their expressions are different. Science practice is another kind of practice, and also science practices encompass a wide, multifaceted range of different methodologies, research approaches and methods. For some reason we tend to think that science is more theoretical than art. Why so? This has to be questioned and critically discussed. To me, this unfortunate division between practice and theory makes less and less sense, especially when it is mirrored in the art/science dichotomy. Does not the (mostly unconscious) confirmation of a division between practice and theory reinforce the art/science dichotomy instead of removing and weakening it? If we sincerely are aiming at bridging art and science, shouldn’t we at the same time aim at bridging practice and theory?

If we were, phenomenologically speaking, to investigate the practices and skills practiced this week, we would most probably come to the conclusion: there were many. Yes, it would certainly have been a useful exercise, to try to distinguish different practices and discuss their characteristics. We employed a wide range of qualitatively different skills, and it is difficult (but not impossible) to extract specific science and art skills out of this totality of “doings”. We would at least have to introduce more categories than “art practices” and “science practices”.

But we did not critically examine the question: What is research practice? If we had, we might have come to the conclusion that the answer to this question is somewhat ambiguous; it presupposes a (common) understanding of these research skills.

On my way back from Greece it struck me that if we had “practiced” the title “Researching Art and Science” we should have tried, very explicitly, to activate three different forms of practice: art, science and research. These are overlapping fields of practice, hardly to be separated. We have intensively focused on the differences and similarities between art and science; I think we also ought to focus on the relationship between *science and research* by explicitly and carefully defining them in terms of concepts and practices. Now, in the reflective mode, and for the sake of clarification, I tend to regard science as “naturvitenskap”, whereas research, at least in our setting, is research on learning processes, “læringsforskning” or “Lernforschung”. This implies that research is regarded as a tool for framing and exploring the learning dimensions of art/science. The focus of research then is the *interplay* of art and science:

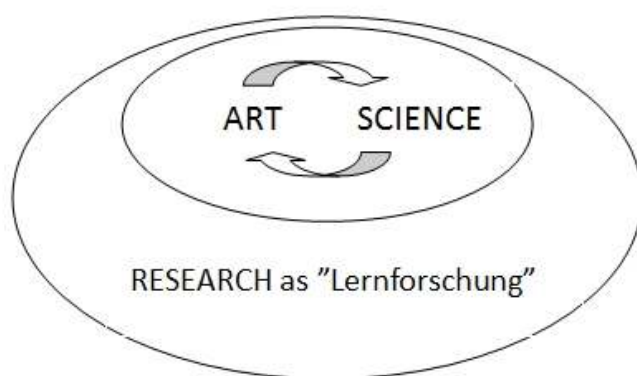


Figure 4: the interplay of art and science within research on learning processes.

Let's look back on the exercise lead by Linda and Solveig on Monday, an art/science exercise on using both biology (or botany) and drawing. The form of the session was twofold: first “an exercise” and thereafter “a reflection” (I think that these words were used). If this session would have included a research component, it would have been a *threefold* session: first the art-science exercise, then a researching investigation, and thirdly, a reflection. Let me elaborate a bit on these three stages:

- The art/science exercise was aiming at exploring the phenomena of seeds (and several related phenomena). The intention was to work in a parallel manner with knowledge on seeds in their manifold appearances and use artistic efforts to reveal and transform their quality. The biology part of it, the dimensions of seeds and plant growth, was predominant. Thus, the exercise was more of a biology class using artistic means than an art class employing science.
- The research investigation would have been based on an intention, an objective or (even) some specifically formulated *research questions*. At any rate, there would have been some kinds of questions which we would try to answer in a methodological manner. Let me give four examples of possible research questions: (a) How did the art/science exercise effect the participants' relation to nature in which the exercise took place and the seeds were collected? (b) Which skills were activated/trained during the exercise? (c) What did the participants learn about seeds (botany)? (d) In what ways did the participants' (different) backgrounds affect the experienced outcome of the exercise? In order to answer these questions, we would have chosen

methods and measures. And the findings would eventually have to be discussed against theoretical propositions.

- Finally, the aim of the reflection would be to reflect on both activities – that is; first the experience of doing the art/science exercise, and secondly the experience of researching the learning dimensions of the exercise. Were there differences and similarities? And which different and similar skills did we employ in the two activities?

The seminar was titled “Researching Art and Science” – what we actually did was to *explore* the relation of art and science, rather than research it. This is, however, a fruitful point of departure! And maybe it was precisely this explorative mode that was the predominant practice during these days: *the practice of exploring questions of mutual interest*. This exploration certainly made me aware of the manifold aspects of art/science/research practices.



One last argument about the skilled practitioner: I sometimes find it embarrassing to hear that “everybody can paint” or “everybody is an artist”. I do understand and agree with Beuys’ intention of demystifying art as a cultural “upper class”, bringing it down from its elevated position. However, by doing so, the works and immense efforts of art practice and the tools of artistry which are needed in order to become an artist, are neglected. From my experiences I know that not everybody is a cellist. This argument is valid also the other way around, for research and the researcher. Hearing that “everybody is a researcher” in a similar manner

makes me think that the noble art of research is devaluated to a mere commonplace activity “everybody” can join. From my experiences I know that not everybody can perform a semi-structured interview. In order to do so, one might have to practice for years, probably as long as it takes the amateur musician to become a cellist. We don’t gain anything by simply overlooking the obvious qualities of the skilled artist and the competent researcher. “Researching Art and Science” is simultaneously an attempt to frame and – hopefully – practice their core competencies, being well aware of the specific masteries of art, science and research.

Reflections on the Doli Seminar by Jan van Boeckel

The reflections that follow are the result of an effort to write down what my thoughts are, looking back at our seminar in which we explored the relationship between art and science, now nearly three months ago. In doing this, I have intentionally not looked at the materials that have seen the light of day so far, in the form of transcripts, images, and reflections of others. I have formulated what first came to my mind, and subsequently I have tried to give these thoughts some further elaboration.

One of the mental images I have, looking back at our gathering in Doli, is of the *Two Cultures* of C.P. Snow. With that famous notion he meant a breakdown of communication between the sciences and the arts/humanities. Below, I will elaborate on what I take to be some of the central distinctions between the culture of science and the culture of art. In doing so, I will dwell primarily on the text “Bateson and the Arts” by Stephen Nachmanovitch. According to this author, educator and improvisational violist, both the artist and the scientist are in the business of uncovering reality. Though the relationships between science and art may be rich and complex, they are *also* fluid; with Bateson, Nachmanovitch believes that the two domains are aspects of an essential *unity*.

In popular understanding, however, science and art remain utterly incommensurable. “Science” is commonly regarded as a set of logical and precise procedures and facts. “Art,” on the other hand, is seen as the domain of inspiration, subjective understanding, of taking intuitive leaps that cannot be taught or quantified. Nachmanovitch stresses that art is especially strong in communicating “what is unsaid.” The artist is able to participate in information of which both the artist and his or her audience are *unconscious*. Nachmanovitch juxtaposes this characteristic to scientific inquiry. “The scientist,” he says, “must write for his or her audience in such a way that everything is unequivocally laid out, all the data and its interconnections held in conscious awareness. Since, the information in any culture, in any human or biological interaction, is recursive, multilayered, and multidimensional, *something essential always gets squashed or cut out*” (Nachmanovitch, 2007, p. 1123, my italics).

Still, as said above, the circumstance that art and science may have wholly different relations to the information that is made explicit or that remains unconscious, does *not* imply that there is isn’t *any* common ground between the two activities. On the contrary. neither art nor science can do without reference to larger patterns and contexts: “The artist uses story, image, and movement, to evoke layers of reality that cannot be explicitly stated, but which are every-present” (ibid., p. 1124).

Nachmanovitch argues that a *professional* life in the arts consists of refining one’s technical skills, keeping up with the new developments in the field and interacting with other people who can further one’s career. But this conceptualization of art is too limited for Nachmanovitch. Again, leaning on Bateson, he suggests that perhaps the word “artistry” is more appropriate. For him, this term entails the transformation and expansion of the person into something more inclusive than the limited concepts of identity and meaning we may have (Nachmanovitch, 2007, p. 1127). One of Bateson’s central contributions is that he not only

challenged fundamental dualisms like mind/body, self/other, organism/environment, conscious/unconscious, thought/feeling, but he also offered a way to bridge such splits. Bateson was aiming for what he called “simple thinking.” As he stated in a lecture in 1980, “creativity finds a simple pattern that can contain the great complexities and contradictions *without diminishing them*” (Bateson, cited *ibid.*, p. 1128, my italics). A scientist typically collects information and makes connections and patterns explicit. To Bateson, however, the complexity and multidimensionality of the world could only *partly* be explained and encapsulated in the simple formulations of discursive thought. He distrusted what others have since called the “logocentrism” of the Western philosophical tradition – that is, its overarching concern with truth, rationality, logic, and “the word” (cf. Searle, 1983). Cognition, according to Nachmanovitch (2007, p. 1128), is always partial. Of its very essence, it “leaves out the complexity and multilevel nature of the world around us.” With our consciousness, we are able to focus on a single detail of our perceptual world. But in doing that, as he explains, we run the risk of reducing a feedback loop in nature to a line segment, and then we erroneously take that segment to be the whole. It is as though we, with our Western (purposive) consciousness, have somehow been acculturated to prefer straight line cause-and-effect thinking.



Added to this predisposition there is still another defining characteristic of scientific practice. In his essay “The Writing Artist,” Jan Svenungsson suggests that a scientist aims to establish knowledge which should be valid at least for a certain time and which can be shared and used as such by others:

Let's imagine a scientist someone studying an occurrence in nature. She will be looking hard at data, evaluating connections, testing alternatives, calculating probability, in order to arrive at a theory which will aim to answer, and put to rest, the questions that drove the scientist to this particular area of work. Eventually, our scientist will publish her theory, which will then be confirmed or repudiated by her peers. If she has done well it might become established as a truth. Later this truth might turn out to have been only temporary, but that is part of the game. It is good for everyone involved when the answer proposed seems stable, because then it can be used as a platform for new research. The value of a scientific result is higher when there is agreement on how to understand it. (Svenungsson, 2009)

Whereas both artistic activity and scientific research are driven by curiosity, the fundamental difference, according to Svenungsson, is that the primary product of artistic activity is not knowledge, but the *inspiration* to search for knowledge. An artist strives to install in the viewer or reader "an urge for further search, for further preoccupation with *what there is*" (Ibid.).

Bateson liked to quote a statement that was attributed to Isadora Duncan: "If I could say it I wouldn't have to dance it." To him, the essence of a work of art is metaphor and interconnectivity. This is how Bateson reflects on Duncan's famous remark:

If this were the sort of message that could be communicated in words, there would be no point in dancing it. But it is not that sort of message. It is, in fact, precisely the sort of message which would be falsified if communicated in words, because the use of words (other than poetry) would imply that this is a fully conscious and voluntary message, and this would be simply untrue. (Bateson, 1972, p. 138)

Where, then, do we put the new notion of "artistic research"? (Svenungsson calls it "the new hybrid.") Is this concept an oxymoron, that is, a figure of speech that combines contradictory terms? In order to answer this question, I refer again to Bateson, to understand the different levels (or as he called it "logical types") of learning. I think it is fundamental to distinguish between art as *process*, as a way of knowing/understanding in its own right, and art as *result* or *product*. I believe that through a conception of art in the former, fluid sense that one can truly state, with Joseph Beuys, that "everybody is an artist." Whereas, when the meaning of art-making is conceived of in the latter sense, it can likely only be brought about through skill, talent and training; it tends to entail the long road of practice, requiring patience, enduring frustrations as well as breakthrough moments – in short: the blood, sweat and tears but also joy of "developing one's talents."

In the context of reflecting on art as process, with a group of students/participants, I distinguish the following phases or levels of engagement:

- 1) The art making activity *itself*. On basis of a set task (or, as Peter London likes to call it, "an invitation") by the workshop facilitator, the group sets out to work. The participants engage in the process and as they immerse themselves deeper in it, they use what has been termed "the right side of the brain."⁵

⁵ Here I dwell on Gregory Bateson (among others) who made a contrast between the "left brain," the part of consciousness that is calculating, rational, and the "right brain" where processes of dream, humor, metaphor, and most understanding of the sacred occur (Charlton, 2008, p. 123). Recent research, however, has found that the two brain hemispheres are in fact highly complementary. Science writer John McCrone even speaks of "myths" that have grown around the brain's asymmetry. He calls the suggestion that the left cerebral hemisphere is the coldly logical, verbal and dominant half of the brain, while the right is the imaginative and emotional side "simplistic at best and nonsense at worst" (McCrone, 2000).

- 2) The activity is finished and the participants gather to reflect on the experience. This means a “stepping out” of the artistic experience and a confrontation with one’s own results and those of the others. In the context of the Doli seminar and the case of the making of the clay versions of one’s own body with the eyes closed, this encounter was all the more dramatic because when the participants opened their eyes there was literally a new reality (or a latent reality that *only then* manifests itself fully). Putting verbalizations to the experience is simultaneously creating more reflective distance to the period one was immersed in the activity, but also bringing forth new understandings which help one (also through the observations of others) to make sense and meaning of the experience. Here one can make a further subdivision between two modes of reflection:
 - a. The first form is one in which the reflection *is part of* the (art) teaching, in effect working towards (what I take to be) to a great extent anticipated outcomes, e.g. when Linda asked us – after having gone out in the field in search for seeds (or for what we took for them) – to name as much of the characteristics and associations to the phenomenon of a seed that we could think of. This was done prior to the sketching of the seed and the molding of a wax form of a seed, but directly tied to it, and thus, to me, an integrated part of the artistic process.
 - b. The other approach is reflection in a form such as I tried to practice in my “little-me”-making, activity, by asking such open questions as “How was the experience?”, “What did *you* get out of it?”, “How was it to do this with your eyes closed?” etc. Even after having facilitated this art activity with clay several times with different groups, I keep getting amazed by how different the outcomes are each time.
- 3) A further stepping out of the experience is when we reflect on a *meta*-level on two consecutive and interwoven aspects of the same activity as process: to reflect *both* on what it means to be immersed in the artistic experience **and** on how we directly afterwards tried to come to terms with it in the interpretative “*genomgång*.” When doing this, we are, as it were, researching in what way (and to what extent) engaging in artistic process – and subsequently making an effort to understand what actually happened – constitutes a learning experience, from beginning to end. One may call this level a researching-*of*-the-research or reflections-*upon*-immediate reflections.

Coming back to the question of what artistic research is about, I believe it can take place at any of these distinct levels, but ideally would comprise all three of them.

For Bateson, deep down, artistic process is about enhancing the possibility of finding what he calls “grace.” As Charlton (2008, p. 104) explains, art is not subject to purposeful, language-bound, conscious rationality. For Bateson, the opposite of the latter is what he calls *primary process* – all the mental processes that are not consciously rational and mediated by language and logic:

Consciousness talks about specific things and persons and attaches predicates to them. Primary process usually does not identify things or persons. Its focus is the process of relationship between them. It is primarily metaphorical, depending on the equating of like with like, which is the essence of pattern. The subject matter of primary process is always the relationship between the self and other people or environment. This is the context in which artistic activity takes place. (Charlton, 2008, p. 105)

In Bateson’s way of understanding there is a complex layering of the conscious and the unconsciousness. When he tried to illustrate these multiple levels of the mind, he sometimes would refer to Samuel Butler’s dictum that the better an organism knows something, the less conscious it is of the knowledge or habit. What happens in the process of “knowing better” is

that the knowledge sinks to deeper levels. It is here that the element of (artistic or scientific) skills comes in: at the moment a jazz musician improvises on his saxophone, he brings to bear all the training that he has gone through up until that point, but when he actually makes music, he “forgets” this knowledge; playing comes “automatic.” Even more so, just like with other engrained skills like for example cycling, if he *would* actually think about that he was doing, he might get into trouble – that is, play a false note, or in the case of the cyclist, fall from his bike.

Coming back to how I started this essay, by referring to C.P. Snow’s *Two Cultures*, I believe that the same person can at one point be in the culture of “art” and at another occasion (or moment) in the culture of “science.” But being in both cultures *simultaneously* seems most of the times difficult – if not impossible. Above, I have elaborated at some length on the themes of art as process versus art as result and the importance of mastering artistic skills but also the limitations of being too much aware of them. I want to end these observations by suggesting that at Doli the different angles and levels of engagements that we brought to bear often felt entangled in confusing and yet also surprising ways. I believe there was a deep richness to the experience, maybe *because* we did not set out to define and carefully structure what we were about to do. In hindsight, the misunderstandings, paired to the trying out of new modes of combining art, research and reflection, could actually be conceived as assets – even as doorways – to new forms of understanding in this so far still largely uncharted terrain. But for that we have to push further with what we just started uncovering.

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Reflections on the Doli Seminar by Solveig Slåttli

In my contribution to the reflections on the experiences in Doli, I have chosen to concentrate on the questions which came up in connection with the presentation which Linda and I did on our interdisciplinary cooperation with botany/art. These questions involved, among others, what art as a discipline in its own right has to do in a science lesson and how such an arrangement can at all be designated as interdisciplinary since art in this case seems to be in danger of being reduced to a “means” of teaching botany. After the seminar I found it useful to recapitulate something of the history which lies at the basis of the pedagogical approach (of which we presented just a bit in Doli), to reflect on the differences in learning processes that are usually associated with in the disciplines art and science and to look at the degree in which way “art” and “botany” are identifiable as separate disciplines in our approach.

Art and artistic learning processes

One of the goals for instruction in esthetic disciplines is to give the pupil constantly richer possibilities to give expression to his or her immediate experience. This occurs mainly through practicing of the skills which belong to each discipline. One thing that artists themselves seem to agree on as to artistic development is that talent plays an insignificant roll seen in relationship to training and in-depth studies. It is the daily artistic work over long spans of time which constitutes the main point of being able to create art. In the artistic exercise one attempts to find a form which releases the content, a means of expression which manifests a heart-felt theme. Working with artistic means of expression may lead one to experience also the opposite, namely that the work of art “takes over” and becomes the focus and a new content reveals itself. One who is good at drawing can capture the flight of a bird with a couple of lines, the shimmer of light in raindrops with help of nuances of grey tones or the mood in a train coupé through contrasts of light and dark. Edvard Munch tells us something about grief and jealousy *both* because he is in contact with realities of the human psyche *and* because he has developed a higher level of possibility of expression through color and form. As an artist he doesn’t make a detour through explanation and reasoning, he creates his picture directly out of immediacy to the phenomenon. Mark Rothko with his extremely simplified, abstract painting is able to give an experience of the own life and harmony of colors which touches us at a level which lays beyond what words can say, but which we still recognize and resonate with. This continuous exchange between being near with one’s senses to both content and form is at the core of the artistic training process and is mirrored in the curricula for art education.



As regards to the discipline of drawing, this may be described with the following keywords (which are not arranged in any specific order):

- Practical in-depth studies in formal elements of drawing such as point, line, light/dark shades, room, texture, nuances;
- Observation exercises;
- Knowledge of drawing materials;
- Training in drawing techniques;
- Practical and methodical training in capturing movement, rhythm, tension;
- Knowledge concerning styles;
- Studies and training in composition;
- Knowledge of and insight in important artworks and artists;
- Training in analysis and critique of one's own and other's work;
- And as a continuous practice: experimentation with the liberation of one's own personal expression.

To be able to say at what moment and according to which criteria the work of a pupil/student can be characterized as *art* is dependent on the context in which the work is evaluated, and the same holds true for any other work that potentially could be considered as art. My experience is, however, that it is of no help to the student to use this characteristic in one's lessons. It can be just as de-motivating as it can be stimulating to be declared to be an artist in a phase where one is driven by an inner urge to achieve new skills of expression.

Art in Botany Lessons

When I for the first time went to the natural science room with drawing materials I was on foreign ground. Here I found there were other approaches. Of course one did train skills of observation and description of phenomena, but not with the artist's way of looking. One separated, compared, characterized and found inherent laws. One took things apart and searched for the essence under the microscope and in biochemical processes. Even the way Linda's biology room looked like – a jungle of plants and parts of plants – it was nevertheless clear to me that she attempted to give the pupils a physical proximity to the plant and to the world of plants as a whole, in addition to the formal botanical knowledge. From the very start it was also clear that she didn't want a break in the botany studies in the form of artistic elements with plants as a motif. Linda's wish was to receive help to be able to draw nearer to the botanical phenomenon in new ways which made them come forth more clearly and differentiated for the pupils. She also wanted to participate in the artistic exercises and casted herself into each task I gave in order to be able to experience herself which qualities could be found in the drawing and painting approaches to plants. In the same way, I had the opportunity of actively participating in her scientific approach.

For every new botanical step new artistic exercises were tried out. The ability to observe showed itself to grow in leaps and bounds already after the first plant drawing. To attempt to show with a pencil how the leaf of a lily of the valley slings itself around the stem in a double arc or how the colors change at the transition between root and stem, is demanding and

requires intense observation and many attempts before one is satisfied. The focus was constantly on the plant or the phenomenon of the plant which was being studied. This made the pupils less critical to their own drawings than what I had experience in the art lessons. They wanted primarily to get a hold of the thing itself, and the “thing” we observed with help of the pencil was composed of elements which not only were recognized through exact observation of physical details, but just as much through capturing and reproducing the *movement* and the faint *rotation* of a tulip stem, the *rhythm* and *intervals* in the leaves on a rose or the *volume* and feeling of the hidden room in a bluebell. It was therefore both logical and useful to weave in basic elements of artistic exercises which were relevant to become aware of these aspects. New materials and techniques were also gradually introduced and gave the pupils increasing possibilities to express the essence of what they experienced in ever more nuanced ways.

This type of nature study in selected motifs was earlier a foundation in all art education. In the course of modernism the artistic focus turned more towards the picture elements in themselves and after a time, also partially parallel, the artist’s creative and innovative way to relate to reality became constantly more important. The observation exercises of the type life drawing, still life or nature and landscape studies were abandoned in most institutions of art education from the middle of the prior century in exchange for experimentation with materials and one’s own ideas. Creativity became the fashionable word in schools. With the motto “all people are artists” and “everything is art” a fresh wind blew through the art lessons and the pupils could enjoy themselves with collected junk, egg cartons and mâché. As art teacher the most important task was to release the artistic potential in everything and everyone. To do in-depth studies in form of observational drawings became accordingly associated with copying reality, something which could hinder the creative process. The new focus on creativity was useful and important, but as the years went and the junk pictures and egg cartons became a part of all classrooms, the concept of creativity missed its potent strength of inspiration and dropped into the category of clichés which one uses carefully because one recognizes that the word represents a content which cannot be defined with simple methods or approaches.

The focus for the drawing and painting exercises in the biology lessons was basically neither creative nor done for artistic expression. The reason I agreed to work with Linda on plants was that I had worked long enough with drawing to know how this can intensify sense perception and one’s experience of reality.

It was exciting to let the pupils work with observation with help of methods and materials from art without focusing on a result that should necessarily be creative or show artistic expression. It did prove that the absence of the concept “art” promoted a more open and unbiased attitude to drawing and painting than I had experienced otherwise in art lessons. For some of the pupils it seemed that it was actually liberating for their creative capacity to not have to do something that was “artistic.” They made leaps in their drawing abilities which would be hard to imagine happening in the art lessons. The question which was asked in Doli about how one can avoid that art is reduced to a means for teaching science is therefore for me somewhat remote. From the experience I have in our art-biology cooperation one could just as well ask the opposite question: Has botany been used as a means of teaching pupils to draw? And I will, with all respect for those who are concerned with keeping the scientific path clean, that we have, whether we intended it or not, done just this. Through botany the pupils experienced that after this period they had learned to draw. Art and science had to such a degree been used as a means for each other that they threaten to erase the borders between the two disciplines. The worst thing was that we didn’t worry about this for a second. Our focus was that the pupils would acquire curiosity, engagement and courage to work further. That they would acquire a tool to observe and experience the natural world around them, connect themselves with it and with each other through an interaction which also allowed them to recognize both principles and laws and inspire them to seek out further knowledge.

One can ask where the skepticism for using art as a means for teaching science comes from. Is it such that art is suspected of having the potential to engage the feelings of the pupils

and as such fool them to swallow even more heavy, abstract theory in the same way religion is supposed to be a means of misusing power? Or is the fear that by using art as a means we assault the essence of art, doing violence against the genuine creative process, if we place the easel and the microscope in the same class room? Has art and the concept of creativity such as the picture we get today from academic art critique, the art market and the media made us doubtful and embarrassed in relation to being creative in our daily lives and in our teaching?

Opening up for art-enriched approaches in natural science has in accord with our experience made it possible to encourage inspiration and creativity for the subject matter, something which easily gets lost when the pupils are faced with advanced scientific knowledge. The pupils can take part in a wealth of experience which spurs them to greater curiosity about the subject.

I hope that the experiences we had at the seminar in Doli will give an impetus to further research which would give more predominance to a pedagogical perspective on things, Such research would ideally be such, that the ambitions of the different disciplines do not suppress one's ability to take into account the fact that learning is in its essence a complicated and complex process, and instead uses these characteristics to make education more rewarding.

Reflections on the Doli Seminar by Linda Jolly

As a natural science teacher who has cooperated with art teachers in over 30 years in teaching youth between the ages of 11/12 and 18/19, I was very grateful for the opportunity of sharing this particular interest with others who are also engaged in questions concerning the meeting between art and science. I was excited not only about doing other exercises than those I had worked with, but also in being able to share this work which Solveig and I have done so long with a group of "critical friends". We had just recently done a workshop with adult artists on seeds (Gentle Actions, October, 2010 in Kunstners Hus) and had experienced the same positive feed-back that we have seen among youth. Aside from collecting some of the work which has been done by pupils and gathering response from two classes (appendix I), we had never had the opportunity of working with others who are engaged in this interface and had ourselves done no further research on the topic. What we have done is based on our own experience as teachers and trial and error as well as a continuous dialogue during our sessions. I want here to focus primarily on lessons learned for further development of teaching methods and at the end say something on the form and process of this week. I want also to include some of the reflections and references Jan and Solveig and I used I writing an article for a Norwegian pedagogical journal (Norsk Pedagogisk Tidsskrift, 4/2011).

Science and/or art?

It is not so easy to convey to others concerning a combining of art and science in education. There are those who immediately know that this is not science and those who are sure that you are doing a sort of instrumentalization of art for the purpose of teaching science. Are we trying to sweeten the bitter pill of science or trick the pupils into observation while all the time denying them a true artistic creation? Or have we leveled out the differences between art and science by creating a new discipline that is neither science nor art? The seminar in Doli gave me the opportunity to think over and clarify my motives for working in this way. I want to render some of my reflections on why I defend this approach as science.

Science begins with questions. As a science teacher one can reflect over the apparent lack of questions among youth. When attempting to get them to describe an organism, one can be

overwhelmed by the poverty of observation.⁶ If questions and interest are to arise, the pupils must be capable of seeing – not seeing things they “know” and are finished with the moment they give objects names, but seeing in such a way that new questions arise. We commonly designate this as “a sense of wonder” and as such it is also a fundamental and explicit platform for science teaching in the Norwegian curriculum. What methods can be used to see more, to open up for wonder and reflection and to create the opportunity for establishing a relationship to living things for both the pupils and the teachers? Our experience is that working with artistic qualities and tools gives such a possibility. Two books have underlined this for me: *Drawing on the Right Side of the Brain* (Edwards, 1979, in Norwegian, “Å tegne er å se”) and *New Eyes for Plants* (Colquhoun and Ewald, 1996). Both books have given me further insight into the possibilities which I discovered myself quite by accident as a student.

Seeing the parts in the whole and the whole in the parts

In addition to opening up the senses, enabling the world of nature to become a richer experience (quote from pupil: “green is no longer just green”), I have also discovered that drawing plants and the landscape corresponds to the challenge that comes from the phenomenological/hermeneutic approach to scientific research: the parts are seen in relationship to the whole and the whole is recognized in the parts. As an appeal to awaken another and more ecologically sound access to the world, this is an obvious demand. But how can this be done? It is difficult to see with “new eyes”. We need techniques to shake us out of habits of perception that result in “it is just a seed...just a leaf... just a tree”. Drawing/ painting is one possibility.



⁶ Henri Bortoft writes in his book, *The Wholeness of Nature*: “Science students are often not interested in observing phenomena of nature; if asked to do so, they become easily bored. Their observations often bear little resemblance to the phenomenon itself.” (Bortoft, 1996, p. 2).

The more the pupils draw plants, the easier it is for them to recognize not only the plant in a different setting, but also its taxonomical relations. This recognition is not a product of analytic deduction – the additive summing up of isolated characteristics, but is experienced as an intuitive leap from a feeling for the whole to the details and vice versa. This is perhaps the reason they experience that they have learned so much in so short time. They write, for example: “I feel that I have learned a lot about plants on this excursion. I have learned to recognize trees and plant families...It is incredible what we have learned in such short time” and “I feel generally that I have learned an enormous amount on this excursion, much because of the practical teaching. I feel that it worked very well with teaching first, then drawing, which you can call teaching yourself...” (Appendix I) In this way the art exercises can be seen not as a supplement or an added esthetic factor for teaching biology, but as an essential method for attainment of good learning outcomes.

Thus practicing seeing through drawing, nurtures an expertise which can rarely be taught with conventional methods such as still done in Norway with dried plants in a herbarium. The philosophy professor, R. Brady (2000) discusses recognition as a form for acquired knowledge. As examples, he uses field botanists, foresters and similar occupations where instant recognition is a matter of course, but at the same time considered to be a talent or unusual skill, rather than something that can be systematically developed. Further he shows how this way of seeing, where seeing is also immediate and pre-reflected recognition, is a well known and accepted competency within the world of art. With examples from art he illustrates that, “Recognition grasps the whole – not summing, but integrating the parts.” By using drawing as a method in botany, it is possible to train and access such a “recognition”.

Reading nature

On the botany excursion the pupils draw several hours each day. Coordination between eye and hand demand presence and the work is usually done in an atmosphere of quiet concentration. Asked to comment on drawing as a tool for learning, pupils wrote:

“I learned much more about what I drew than I would have otherwise learning. In some way the organisms become alive.”

“I think that the drawing of for example the plants sits deeper when one draws them. The more drawing, the more understanding.”

“Drawing starts another train of thought and I feel that I get a better relationship to the object.”

“To have the possibility to concentrate on drawing during a whole week has given me the feeling that I have developed myself, and I want to continue to draw, because I have understood that it helps me to understand the object I observe.”

“This (drawing) makes it possible through “art” to get a better understanding and “feeling” for the scientific. “

Through the work with drawing, the pupils give expression for a richer experience of plants and also that they understand them better. Dahlin (2001) maintains that it is possible to work scientifically and at the same time emphasize the esthetic dimension of learning. He writes that the goal with such an approach is not only to appreciate what is beautiful in natural phenomena, but also to understand them better: “Nature ‘speaks’ through the gestures it makes in its forms, colors, sounds, smells and tastes. From ancient times, human inquiry has always tried to understand this ‘language’ of Nature” (ibid, p. 254)). The ability to “read” nature and achieve an understanding of life processes has been characterized as “ecoliteracy”, a basic

competence for those who work towards a sustainable development (Orr, 1992; van Boeckel, 2006; Stone and Barlow, 2005). Cultivation of such a reading of nature in biology lessons should be just as important as reading biology books and articles.

During our seminar we experienced an example of this with the collection, drawing and modeling of seeds on Monday. We came into contact with sense experience of form and color which was enriching and stimulating. Such sense experience urges us to deepen our observation and study of nature and underlines what we miss when operate at the level of abstract concepts and knowledge. Can such experiences contribute to an understanding of sustainability?

Science teaching and sustainability through art?

By connecting to current problems and societal questions such as we referred to in the exercises in Doli (p. 6), aspects of sustainability are woven into the lessons and connected to the observations the pupils are doing through the exercises. When a class in 2010 was asked to evaluate if this fieldwork had anything to say for sustainable development, among the replies were the following:

“We have a much greater respect for nature and plants. We have also learned about how dependent we really are on them.”

“I think that this has been sustainable since I have gotten much more interest in nature. We have learned about plants and about the connection between what we do and the consequences for nature. I think this will lead me to think more about the consequences for my actions.”

“I have made more connections in this subject which are a basis for long term thinking.”

“I feel that I have learned a lot about important aspects of the world today. Through learning about plants there is an awakening interest to preserve the biological diversity. Connecting to themes that have to do with society and development has been very interesting for me because it sets things in perspective and relationship to each other.”

Many of the themes which have been discussed in the lessons come as a result of questions the pupils ask, for example: What has genetic engineering to do with biological diversity? What role do soils and vegetation play for climate change? These are questions which lead to larger perspectives. A bridge is built between nature experience and a sense of worth as a foundation for sustainable living. Our experience has been that a positive and creative focus on plants can form the basis for engagement in the larger environmental problems. As Mantere (1992), we think that a genuine understanding of nature and motivation for act in accordance with sustainability is based on meaningful experiences, and that these are often connected to esthetic aspects.

Seeing the world as we are – development of social competencies.

The intention with drawing as an activity in biology is to give the pupils new access to experiences in nature and create the possibility to see beyond their own concepts and what they already “know”. Goethe commented on this: “What is the most difficult of all? That which you think is so easy – to see what is directly before your eyes.” (Goethe, Xenien, aus dem Nachlass 45). This demands an effort for active observation, but the pupils tell that the process is enriching – “green is not longer just green”, as one of the pupils wrote. The experience that observation is not a constant entity, but something which changes and develops, can also become a key to understanding the standpoints and experiences of others. This implies at the same time a responsibility for how one experiences the world. The world is not static and

objectively given, it is formed in interplay with our ability to observe. The biologist and philosopher Humberto Maturana says that we become more human through the recognition, "that we do not see the world as it is, but as we are" (quoted in Senge et al., 2005, p. 203). The focus on becoming absorbed in the phenomenon and at the same time becoming aware of one's participation in the phenomena, is what Dahlin (2001) characterizes as hermeneutical phenomenology. How does drawing contribute to this?

Creating one's own expression and becoming aware of others

The first drawing which the pupils make is of the same plant species, usually *Ranunculus acris*. The plant species is recognizable in all the drawings, but none of them are the same. Each drawing has its own expression which tells about the plant, but also about the person holding the pencil. The drawing carries the personal signature of the one who made it. One pupil wrote: The drawings become more personal, they often demand a long time to make them and then one is more attached to them." Sørenstuen (2011) emphasizes that artistic work in nature can strengthen both a feeling of belonging and a sense of identity.

When another pupil wrote that, "fantasy opens up", this is an expression for participation in a creative process in spite of the objective framework for the task. Reproductive drawing is a type of drawing which is of secondary importance in art classes today. Many pupils like doing this and not having to relate to a demand to be creative and inventive when they draw or paint. One pupil wrote: "Learning has never been a big problem for me, but I was afraid for the drawing." But in the next sentence he says just the same: "I dare to claim that I have gone through a drawing-metamorphosis and feel that I can now almost draw." Drawing can give a concrete experience of progression. Making a learning process visible for one's self and for others strengthens communication. A feeling of community can grow out of seeing each other through the drawing and through the process. The pupils have expressed that they both see more and feel they are being seen.

During our work at Doli, we had the opportunity ourselves to experience the challenges in working in such a way in the interface of art and science. Relationships were put on trial when we put ourselves in a vulnerable and unaccustomed situation. Trying to give expression for what you observe through forms of art-expression can mean, especially for people trained in natural science, that you expose yourself for uncertainty and the feeling of nakedness. A heightened form for sensitivity, especially for criticism can be one result. But venturing into unknown territory can also open for dialog which can be the seed for further growth and exploration.

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Appendix I – Pupils on botany excursion in 2005 and 2010

Here we have translated and included some comments to the botany excursion written by 17/18 year old pupils in 2005 and 2010.

We have gotten a much greater respect for nature and plants. We have also learned about how dependent we really are on them.

I think this excursion has dealt with sustainability in that I have gotten much more interest for nature. We have learned about plants and about the connections between what people do and the results of these actions for nature. This will (I believe now) get me to think more about the consequences of my actions.

I have seen the larger connections on this excursion which are the basis for long-term thinking.



I feel that I have learned much about important aspects of the world today. Through learning about plants I have gotten an interest in taking care of biological diversity. Connecting themes on this excursion to social studies has been very interesting for me since I become able to set things in a larger connection to each other.

The drawings become more personal, they often demand a long time to make them and then one is more attached to them.

Fantasy opens up when you are drawing.

I feel that my own development has been enormous. I can see it in my drawings.



Learning has never been a problem for me, but I was afraid of the drawing. Now I dare to claim that I have undergone a drawing metamorphosis and feel now that I can draw.

I learned much more through drawing than I would have otherwise learned. Organisms become much more living in a way.

I would say that the picture of the plants sits much deeper when you have drawn them - the more drawing, the greater the understanding.

The drawing starts a completely different thought process and I feel that I get a much closer relationship to the object.

Having the possibility of concentrating on drawing a whole week has given me the feeling that I have developed myself and I want to continue drawing because I have understood that it helps me to understand the object I look at.

Drawing enables us through "art" to get a larger understanding and feel for the scientific.

I feel that I have learned a lot about plants on this excursion. I have learned to recognize trees and plant families...It is incredible what we have learned in such short time.

I feel generally that I have learned an enormous amount on this excursion, much because of the practical teaching. I feel that it worked very well with teaching first, then drawing, which you can call teaching yourself, and the outings.

I became much more aware of nature.
This excursion has given me a great respect for life.

I feel that I have developed my abilities of observation considerably and notice already how much more attentive I am to nature around me.

I have learned to see in a new way, green is no longer just green.

You see so incredibly much more.

Appendix II – Education for sustainable development

Input from the Research Group ART-SCIENCE-LEARNING, based on the seminar in Kato Doli, Greece, December 5th – 11th, 2010

Participants: Ceciel Verheij, Jan van Boeckel, Aksel Hugo, Linda Jolly, Solveig Slåttli and Edvin Østergaard

Background: Section for Learning and Teacher Education at the Norwegian University of Life Sciences has raised the question of developing future teacher education to serve *Education for Sustainable Development (ESD)*. Connected to this intention a seminar took place within the research group Art-Science-Learning, exploring possible entry points and contributions from this research group to the development of ESD. This short synopsis summarizes the initial outcomes of the seminar, as an input to the section meeting at Løvlia on December 14th 2010. The following text lays out *a rationale* and depicts *five main areas* where the re-search group sees its possible contributions to Education for Sustainable Development.

1. Connecting to nature through art

Art-based approaches to observing and exploring of natural phenomena have an intention of drawing closer to nature through physical situatedness, engagement of the senses and emotional connectedness. The use of drawing as a means of understanding plants in biology is an example of this. Through interplay of engagement in pure observation and artistic, creative and reflective practices, embodied understanding of natural phenomena can be developed. Through careful observation the intention is to generate trust in one's own perceptions and judgements. Through sensory participation the intention is to develop competencies of *wonder, respect* and *responsibility*.

Science education needs to relate concretely to nature and environment. The education of science teachers to enable them to support their students *to connect to nature* will require careful (didactical) research and development. A key element is the "choreography" of the process of learning in space and time. We believe that artistic exercises are tools which allow for students to draw closer to nature.

2. Training competencies relevant for ESD

The embodied dialogue with nature and natural phenomena cultivate certain competencies like attentional focus and discipline, perceptual differentiation, imagination and openness for surprise, sensitivity to nuance-es, appreciation of beauty, discovery of connectedness, sense of wholeness, toleration of chaos as a path to insight, and ability to restructure and see relationships in a new, creative manner. Through the use of art, nature inquiry may develop our *multiple intelligences*, which again invites the full potential of solving a need or a problem. In a sharing process with others the skills of expression and communication can be practiced. Thus, you may learn to enter understanding within a space of multiple perspectives. Developing capacities of seeing and sharing expressions with others may build social intelligence through a collective, open and inclusive re-search process.

3. Deepened experience

A phenomenon is always greater than the sum of our partial descriptions of it. By reducing a phenomenon to an abstract model (for instance, a given trait is just an expression of the genes) before we have studied its appearances, we are in danger of losing respect for concrete

phenomena. By placing ourselves in dialogue with the phenomena where they are found, we encourage students to develop richer experience that also allows for beauty and wonder. Using our senses the emphasis is on the unknown, the not yet discovered qualities and lawfulness. Deepening our experiences may enable us to see more. It also makes us see that the world is in a poor state. Rich sense experiences in encounter with nature and environment have an educational value in themselves, not only connected to ESD. Art-based educational initiatives are aiming at sensitizing the students' engagement and ethical preparedness to act. Both research and practice in this field will need to develop a new interplay between sense-based artistic and scientific processes where artists and scientists learn and communicate with each other in the study of nature and natural phenomena.

4. Contextual understanding

Starting with studying phenomena in a situated context, the teacher sets the stage for contextual understanding. Phenomenological science education implies creating experiential paths towards understanding the phenomenon. In the case of studies in botany it opens for structuring a school subject according to the situated appearance and morphological development of the plant itself. The students learn to know the plant in the context of enfoldment in time (morphology), uniqueness and diversity of constituent part (seeds, roots, leaves, flowers and fruits), unity and lawfulness of biological structures (cells, organs), taxonomy and traits (species / families), and nature and location of nutritional properties (sugar, starch, fats, oils, organic acids). Seeds can be studied in their biological context, but also in cultural, historical and political context: as i.e. the battle in politics, market control, and distribution and property rights of seeds in the third world today.

Art exercises combined with science are efforts for creating paths towards understanding phenomena in context. Going from individual process to the shared process, and back to the individual experience, we are all the time in the process of establishing the relationship anew. Contextual understanding is built as a social process in communicating and synthesizing plural perspectives. Applied research is needed in order to develop an "art-science didactic" within distinct fields of science education (biology, chemistry, physics) serving contextual understanding.

5. Creativity

Creativity is a core indicator for sustainable development. Education for sustainable development should thus have an explicit focus on supporting skills of creativity. Creativity is built on the confidence of trusting your own judgements and ideas and expressing them as your own. When students are drawing plants, drawing seeds, each step in the process is an expression of a connection that is made in the process. And then this expression is taken up in a dialogue with the others. Through the use of art (clay, drawing or painting) this process may connect hand, mind and imagination.

In this field, two major questions remain to be developed: how do we practice creativity in teacher education in the future? And what would research and development in *the schooling of creative skills in science education* look like? In relation to ESD, we must ask how we educate the possibility of taking responsibility. Through using art, we train a trust and skill of coming to a relational situated judgement and expression. In cultivating embodied and situated connectedness to nature, trust in sensing, skills of judgment and expression, and contextual understanding we prepare a ground for *taking situated responsibility*.

International Research Strategy

The research group Art-Science-Learning sees a need of developing a research strategy for 2011-2020 within the context of teacher training for sustainable development at SLL. This

strategy is also put in connection with an application for the Centre for Excellency in Education (2011). A new field of research on art-science-synergy is emerging on the international arena. The five motives listed above may serve as a structure of possible fields of both *basic research* and *applied research* within the new field of interdisciplinary art-science studies in education. Area 4 (contextual under-standing) points particularly towards applied research and action oriented work in close contact with pilot schools and pilot courses – development of phenomenological science education at SLL. Area 4 could also build on the applied research and development work in context-based learning connected to projects in “Levande Skule” and “Gården som pedagogisk ressurs”.

The content, mandate and academic profile of this strategy may also imply a *professorship in art-science studies in education*. This should be developed further as a spearhead for the development of this new and innovative educational research field. Through the contacts developed in the course of the last 10 years internationally, the professorship would immediately be embedded in a broad international research net-work. As in other academic fields, it would be important to balance between basic and applied research – and to develop a PhD-group as well as action-oriented projects in schools and teacher training at SLL – possibly also at other educational institutions focused on art, science and learning.

Report and conversations

A report from the research seminar in Doli will be written and distributed by February 1st, 2011. Based on the workshops, reflections and lectures during the seminar – the group tried to distil a position paper giving the main educational motives, theoretical perspectives and burning issues – all in relation to the development of teacher education for sustainable development. It also contains photo-material of pedagogical exercises (exploring the nature of seeds - Linda), the pendulum-project (Edvin), and the artistic exercises (Jan van Boeckel and Solveig Slåttli).

This synopsis is a first short orientation and input to the conversations at the Løvli seminar.

(Aksel Hugo; Linda Jolly and Edvin Østergaard, December 13th, 2010)