Reconceptualizing Educational Research Methodology

From swings, through physics, with pendulums, to gendering: Re-turning diffractive analyses on science and gender in preschool

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Abstract

In this paper we re-turn (Barad, 2014) parts of the diffractive analyses conducted in a research project on science and gender in preschool (Günther-Hanssen, 2018, 2020; Günther-Hanssen, Danielsson, & Andersson, 2020). In our first re-turning, we explore how a swing and scientific phenomena in the data co-created the knowledge construction in entanglements with the researcher. To do this, we engage with how embodiment and re-actualized experiences of swinging came to matter. We then re-turn how certain events in the data are always part of other events, both in time and space. For this task, we elaborate with writing different situations from the data through one another. As we continue re-turning the analysis, new diffraction patterns emerge with each turn. By the end of the paper, our diffractive writings and readings have been re-turned into explanations of how pendulums can be used to think-with and approach gendering in preschool.

Introduction

In this paper, we re-turn (to) (Barad, 2014) parts of the diffractive analyses conducted within a research project on science and gender in preschool (Günther-Hanssen, 2018, 2020; Günther-Hanssen, Danielsson, & Andersson, 2020). By re-turning (Barad, 2014), we do not just "go back" to the diffractive analyses to discuss them again. Instead, we experiment with re-turning the analyses over and over to create something new or different. The point of departure for our re-turnings is a girl, a swing, and scientific phenomena, presented in Günther-Hanssen (2020). Other agents, such as gender theory, data simulations, pendulums, and physics concepts, are then added and experimented with in order to explore what new diffraction patterns, and thus new or other results, can be brought about. At the end of the paper, our discussions are re-turned into an explorative re-search concerning if and how pendulums can work as tools to approach gendering in education differently. Karen Barad (2007) inspired our work greatly by explicitly underlining the importance of *making a difference*:

> A diffractive methodology is a critical practice for making a difference in the world. It is a commitment to understanding which differences matter, how they matter and for whom. It is a critical practice of engagement, not a distance-learning practice of reflecting from afar. (p. 90)

To increase the number of ways in which it is possible to make a difference, we do not just re-turn parts of the analyses from the initial research project, we also re-turn how it was presented and written. The writing of this paper is not only done to describe our material-discursive diffractive* work; rather the writing is part of the entire material-discursive practice. During the writing, instead of only entangling with common formats and structure of an academic article, we experiment together with the text and other agents. One example of this is the different ways in which we

*Diffractive methodology

Diffraction is an optical phenomenon that emerges as waves of some sort (water, light, sound) encounter each other or an obstacle, which makes the waves bend, spread out, and overlap. New directions and becomings are created as the waves collide, without leaving the old ones behind. Diffraction has been productive to posthumanist methodologies (Barad, 2007; Haraway, 1997), and has been further described and used in different studies (e.g., Ceder, 2016; Davies, 2014; Hultman & Lenz Taguchi, 2010; Lenz Taguchi & Palmer, 2013; Magnusson, 2020; Murris & Bozalek, 2019; Rautio, 2013). Within Barad's (2014) diffractive methodology, diffraction is not limited to the optical phenomenon, but considered as a material-discursive phenomenon that occurs within and through the entanglements of all agents and procedures within a specific research apparatus. Therefore, a diffractive methodology requires an understanding of a changing world from within and as part of it (Barad, 2007). As such, we cannot go back to – or return to – the initial research project and look at different pieces of data or its former analytical work again, either from a distance or from outside, nor look at it "as it was". Instead, each returning means re-turning different aspects through entangling with them, as in intra-acting and diffracting – as in creating new temporalities from within. One way of making re-turnings is by reading different insights (concepts, materials, parts of data, etc.) diffractively, through one another, to see what new directions and becomings will emerge as these intra-act (Barad 2003, 2007). Thus, diffractive readings are about looking for differences within phenomena – of which we also are part – focusing on what these differences might do, how, and for whom (Hultman and Lenz Taguchi, 2010).

place text on the sides and in boxes**. Another is by cutting text into shorter sequences, inspired by a "poem-like manner", to make the reading and writing slow down, enabling us and the reader to stay with the data and other nonhuman agencies (Hohti, 2016; St. Pierre, 2017). For the same reason, we are also inspired by Maggie MacLure's (2013a) argument that we need to …"engage more fully with the materiality of language itself – the fact that language is in and of the body; always issuing from the body; being impeded by the body; affecting other bodies" (p. 663). This means that it is not only what different words and language *mean* that is important, but also what they *do*.

> **We have chosen to put some of the explicatory parts of this paper in columns on the side so that readers can choose what parts to entangle with, when, and how. We hope that this way of structuring this paper will make it fruitful for our readers.

The aims of this paper are (a) to explore how different nonhuman agencies can explicitly participate in knowledge construction in entanglements with humans; (b) to engage in the potentialities and challenges of engaging with nonhuman agencies; and (c) to promote posthumanist and post-qualitative* methodological work that makes a difference for research and teaching, together with the concept of responsibility.

Re-turning to push further

During our re-turnings we have read various insights, perspectives, agents, and parts of data diffractively (Barad, 2014) through one another – such as swings, preschool childen, gender theory, data simulations, pendulums, physical concepts, field/reflection notes, video clips, and earlier research. Some of these were present in the data and earlier analytical work in the

* Post-qualitative studies in education

The overall aim of posthumanist methodologies in education is to provoke new thoughts, create alternative understandings (even concerning posthumanism), and generate new questions rather than simplified solutions or implications (de Freitas & Palmer, 2016; Lather, 2013; Lenz Taguchi, 2016; MacLure, 2013b; Osgood & Scarlet, 2015; Rooney, 2018; St. Pierre, 2019; Taylor & Blaise, 2014; Taylor, 2017). In recent years, posthumanist and post-qualitative scholars in education have, in various ways, explored the potentialities of highlighting nonhuman agencies in the data and methodological procedures (Hultman & Lenz Taguchi, 2010; Lather & St. Pierre, 2013; Rautio, 2014; Sörensen, 2009; Taylor, 2013). For example, it has been described how field and analytical work was co-created by nonhuman agents and how the nonhumans (and humans) in the data (Childers, 2013; Haus, 2018; Moberg, 2018), or the data itself, co-created the analytical process (MacLure, 2013a; Magnusson, 2020; Mazzei & Jackson, 2017; Ottestad & Rossholt, 2014; Sandvik, 2010; Taylor & Pacini-Ketchabaw, 2015). For example, Emelie Moberg (2018) described how, during a field work in preschool practice, she constantly became "seduced, convinced, instructed, betrayed and lured, but also supported, backed and encouraged" (p. 39) by things like carpets and Minecraft manuals. Jana Maria Haus (2018) described the video data in her project as agentic matter that talked to her and invited her to intra-act with it. To make their analytical work (more) affective, some researchers experiment with areas such as arts-based methods and arts. Two such studies come from Ann Merete Otterstad and Nina Rossholt (2014), and Ninni Sandvik (2010). While working with visual materials, Otterstad and Rossholt manipulated photographs from their data to increase the role of affect and make the role of vision less dominating to be able to abrupt habitual thinking about young children. Ninni Sandvik (2010) investigated the sensations produced when paintings, field notes and the researcher work together. Sandvik explains how this methodological approach "destabilizes the idea of the researcher (as a unity in her/himself) controlling and independently constructing the research process…and it allows thoughts to produce themselves almost artistically as they come along" (p. 37).

initial research project, and some were added especially for this paper. We consider all of these as agents or playmates that co-create the diffraction patterns together (Barad 2014). We present our work below as divided into three overall re-turnings*, named the Swing, the Writing, and the Pendulum. However, we wish to point out that each of these include many turns, various diffractive readings, and intra-actions, and should not be understood as if they are made in a linear manner, nor as separate from each other or as leaving each other behind. As such, our work consists of a series of diffractions. The work with our re-turnings started mutually with the analytical work for the initial research project. For an overview of the focus of each "overall re-turning", as well as the process with each of these, see Table 1. This table was created for readability and transparancy, but our work has not been conducted in a simple step-by-step manner, where one step neatly follows after another. Rather, our work has been:

Taking many turns.

Re-turns.

Back and forth.

Here and there.

Re-turning and turning.

All the "steps"…

…bleeding through one another

(Barad, 2018).

* Why re-turnings and not returnings?

To be able to explore the participation of nonhuman agencies and highlight potentialities and challenges, as well as experiment with how to develop our work into making a difference, we use Karen Barad's (2014) re-turnings and diffractive readings, both of which are part of each other and part of her diffractive methodology (Barad, 2003, 2007, 2010, 2014). Barad (2014) explained the difference of returning and re-turning as connected with either the phenomenon of reflection or diffraction; "While returning might have the association of reflection (how light returns from where it came once it hits the mirror), re-turning…is about diffracting" (pp. 184–185). Thus, if returning implies going back, re-turning means iteratively entangling and intra-acting to iteratively create something new or different. Barad (2014) further described re-turning as "…not returning as in reflecting on or going back to a past that was, but re-turning as in turning it over and over again – iteratively intra-acting, re-diffracting, diffracting anew, in the making of new temporalities (spacetimematterings), new diffraction patterns" (p. 168). Making re-turnings can also be explained as "a process of spatial and temporal diffraction in the turning over and over again across time and space" (Murris & Bozalek, 2019, p.1514). This means that this methodological process is anything other than linear or straight forward, both when it comes to how different times are treated as well as in how the analytical work is constantly moving here and there rather than following certain steps.

Focus	Data	Theoretical playmates	Approach and other playmates
Re-turn: The Swing In what ways can nonhuman agencies in the data, such as a swing and scientific phenomena, co-create knowledge together with the researcher? How is it possible to keep various nonhuman agencies, entanglements, and embodiment from the analytical work all the way to the readers of our paper?	Video clip and screen shots including the co-actings of a five-year-old girl (Emily), a swing, and physical phenomena. Reflection note from the initial research project – first author's embodied experiences of swing and acceleration.	Knowing cannot be fully claimed as a human practice (Barad, 2003). A conceptual approach to physics (Pendrill & Williams, 2005). Scientific phenomena as creative playmates (de Freitas & Palmer, 2016).	Acceleration Sound of squeaking swing Embodiment Movement Cutting text to make certain elements come to the fore
Re-turn: The Writing Highlighting challenges How can we acknowledge other temporalities/intra-activities when we engage closely with certain parts of data?	Descriptions of the event of Emily and swing as well as the swing set area on a daily basis.	Posthumanist performativity Material-discursive Agential cuts Materializations Different times bleeding through one another (Barad, 2003, 2007, 2010, 2018)	Entangled description/diffractive writing
Re-turn: The Pendulum Potentialities of engaging with physics to approach gendering. How can explanations of pendulums be used to think gendering processes together with?	Reflection note from the initial research project – first author reading about physics concepts to understand the swing in the data. Cuts from analysis of Günther-Hanssen (2020) cut from Günther-Hanssen et al., 2020).	Gender theory (Barad, 2003; Butler, 1993) Scientific phenomena as creative playmates (de Freitas & Palmer, 2016) A conceptual approach to physics (Hewitt et al., 2008) Becoming different in oneself (Lenz Taguchi, 2011).	YouTube videos about pendulums, screen shots from the videos. Explanations of physical phenomena Data simulations Movement

Table 1: Overview of the re-turnings

Re-turn: The Swing

A swing and scientific phenomena taking part in co-creating an analytical process

As we engage with these first re-turnings, we ask ourselves, in what ways can nonhuman agencies in the data, such as a swing and scientific phenomena, co-create knowledge together with the researcher? As Barad stated (2003):

> There is an important sense in which practices of knowing cannot be fully claimed as human practices, not simply because we use nonhuman elements in our practices but because knowing is a matter of one part of the world making itself intelligible to another part. (p. 829)

As we explore how practices of knowing in the initial research project were not fully human practices, we also engage with the question of how it is possible to keep various nonhuman agencies, entanglements, and embodiment from our analytical work all the way to the readers of our paper? We begin with re-turning (to) a situation from the initial research project* that occurred as the first author was working with the analysis of Günther-Hanssen (2020); specifically, a video sequence including the play between a five-year-old girl called Emily, a swing, and various scientific phenomena.

Space-time-coordinate, at a desk at a university in Sweden, Spring 2019.
I am watching a video sequence on my computer screen including the co-actings of a girl and a swing. The swing is constantly moving back and forth. As I watch the moving swing repeatedly, I am iteratively exposed to its squeaking sounds, I start to experience a swinging feeling in my own body. Even though I am sitting in a chair at a desk in a room at a university, I can feel the acceleration – entangled with memories of feeling light and free as I was when swinging as a child. The swing and acceleration not only affect the girl's body, but also mine (*Reflection notes made by the first author, Spring 2019*).

As we re-turn (to) it, we specifically engage with the entanglements of the first author, the swing and physics (Pendrill & Williams, 2005), to elaborate further on how these nonhuman agencies took part in and directed the ongoing knowledge construction.

Close your eyes and feel the swinging

Ann-Marie Pendrill and Gary Williams (2005) explained that, while swinging, the force of acceleration propagates throughout the body and can, for example, be felt in the stomach. Just before the turning point, before the swing stops and turns back downwards again, you experience your body as being lighter; if you swing really high, it almost feels weightless. As a swing is hanging straight down, the force of gravity is experienced the most and, therefore, you experience your body as heavier. Thus, to swing means to repeatedly experience the interchange between feeling heavy and light. These embodied experiences are so strong that it is possible to recall the feeling of swinging by just closing your eyes and think of it (Pendrill & Williams, 2005). Since almost everyone is familiar with swings, let us take a moment and also remind our readers:

Close your eyes,
and think of swinging.
Your body travelling through the air.
Back and forth,
back and forth,
back and forth.
Can you feel
the acceleration affect your stomach?

The feeling of swinging that can be awakened just by a memory can be explained by Barad's reasoning of how effects of intra-actions can materialize in bodies and then be re-actualized again just by thinking of these effects. In this sense, learning scientific concepts is not just about abstract thinking, but can work as material agents (Haus, 2018), becoming parts of our body-mind (Lenz, Taguchi, 2012). However, in the above situation, the first author not only thought of swinging; she was watching a moving swing on a computer screen and hearing its squeaking sounds. These visions and sounds intensified the perception of swinging and acceleration. Memories of how she experienced the whole act of swinging as a child were re-actualized – that is, a feeling of her own body as light and free – memories that she shares with the other authors of this paper.

Feeling light. Feeling free. The hair

in the wind.

Tickling feeling in the stomach.

Back and forth.

Higher and higher.

Higher.

Higher.

(Memories of swinging)

Media 1: Swing
https://shareabit.com/soundOfSwing.mp3

The re-actualized embodied and affective experiences of swinging led the first author to increasingly turn her attention towards Emily's feelings and identity. This meant that, apart from questions of learning science, the first author also started to ask questions of becoming, of bodily experiences, affect, and identity construction. As such, the swing and scientific phenomena in the data co-created knowledge in terms of making the first author focus on how acceleration, velocity, and force could not only become creative playmates in Emily's explorations (de Freitas & Palmer, 2016), but also in her identity construction. This led to the highlighting of how Emily, through playing with the physical phenomena and the swing, could jump higher and longer than she could from the ground, thus becoming someone brave (Günther-Hanssen, 2020).

At the right moment

Letting go

Travelling through the air

Picture 1: Emily jumping

We also bring de Freitas and Palmer's (2016) notion concerning how scientific phenomena can work as creative playmates in children's explorations in our re-turning, to see how the scientific phenomena also worked as creative playmates for the researcher – not only in knowledge construction, but also for her own becoming and the becoming of the whole research process. The analytical work became an affective and embodied process (Lenz Taguchi, 2012; Ottestad & Rossholt, 2014; Sandvik, 2010; Taylor, 2017). By including explanations of how acceleration affects a swinging body (Pendrill & Williams, 2005), memories of swinging, and the sound of a swing, we hope that we have enabled these nonhuman agencies to also entangle with the body-minds of the readers of this paper.

In line with others (Childers, 2013; Haus, 2018; Magnusson, 2020; Rautio, 2014; Sörensen, 2009; Taylor, 2013), the potentialities of paying close attention to the nonhuman agencies in this data were that aspects emerged during the analysis that the first author did not initially think about, such as the entanglements of scientific phenomena and affect. This alone could have constituted a contribution with knowledge concerning how young children can be seen as playing with scientific phenomena, creating scientific knowledge with and through their whole bodies (also see Areljung, 2020, Haus, 2018; de Freitas & Palmer, 2016). As such, the study including Emily and the swing (Günther-Hanssen, 2020) could have been written solely with focus on the co-actings of Emily, the swing, and physical phenomena. Even though the initial research project engaged with both science and gender in preschool, the analysis of the co-actings of Emily, swing, and scientific phenomena did not show any gendering or stereotypical gender norms that hindered her from playing and using her body. This presents a challenge. Sensing a swinging feeling through the body, entangled with bodily memories of freedom and lightness while swinging as a child, could

seduce a researcher to retain a certain piece of data and overlook other parts. We are aware that a swing might be a very "affect-causing" agent, but we also see this as a potential risk when working with less affective materials. As such, when paying close attention to nonhuman agencies in the data, it is also important that we remind ourselves to not give up our own agency or responsibility as researchers. As Barad (2007) explained:

> We are responsible for the cuts that we help enact not because we do the choosing (neither do we escape responsibility because "we" are "chosen" by them), but because we are an agential part of the material becoming of the universe. (s. 178)

Since discourses and norms become actualized through iterative doings (Barad, 2003; Butler, 1993), they can be hard to notice as the researcher zooms in on certain details and pieces of data. Barad (2007) stated that "explanations of various phenomena and events that do not take account of material, as well as discursive, constraints will fail to provide empirically adequate accounts"… (p. 207). This challenge was also encountered during the analytical work in Günther-Hanssen (2020). Thus, paying close attention to nonhuman agencies runs the risk of paying more attention to some agents (swing, scientific phenomena) than others (norms, discourse) simply because some are more easily detected. We need to re-turn the analysis again.

Re-turn: The Writing

Co-actings with swing and scientific phenomena are part of other intra-activities
We continue with our re-turnings together with the following question: How can we acknowledge other temporalities/intra-activities when we engage closely with certain parts of data? When it comes to making agential cuts, Barad (2010) explained:

> Agential cuts, by contrast, do not mark some absolute separation but a cutting together/apart – a "holding together" of the disparate itself…Agential cuts – intra-actions – don't produce (absolute) separation, they engage in agential separability – differentiating and entangling (that's one move, not successive processes). (s. 265)

To be the only child playing with the swing, as Emily did in the video sequence, was rare. Hence, to be able to understand the circumstances of Emily's co-actings with the swing, we need to engage with the intra-activities that the video sequence of Emily and swing were entangled with. On a daily basis, the swing set area was full of children. These daily repetitive doings were also part of her explorations. Barad (2017, p. 67) explained that "…temporalities are specifically entangled and threaded through one another…".

To make more visible how the temporality of Emily's play with the swing was part of other situations and temporalities – or how different times always are bleeding through one another (Barad, 2018) – we entangled two temporalities from the swing set area with each other. One

description of Emily's play with the swing as the only human agent (written in **bold italics**), with description of the swing set area as it appeared on a daily basis (written in normal type). In this way, we make possibilities for diffractive readings and writing. Entangling the two descriptions of the two temporalities in this way makes it possible to read them through one another (Barad, 2007).

Most times, the swing set area was full of children, both on the swing and on the ground, pushing it.

The usually crowded swing is suddenly empty of children.

Often there were even children sitting on the fence surrounding the swing, queuing for their turn.

Emily enters the swing set area. An opportunity emerges for her to play and explore the swing and various physical phenomena undisturbed for a moment.

Sometimes the children didn't swing with the swing, but instead just sat in it or climbed its bars.

Emily starts to push the swing higher and higher, positioned on the ground.

One purpose of climbing the bars seemed to be to impress the other children.

Emily happily states that she is also going to jump from it.

Sometimes when someone (most often a boy) was climbing, that child was recognized by other children who shouted things like: "Look at X!"

Emily pushes the swing, both by running along with it and by standing still on one spot.

To be able to climb, first one had to manage to occupy a spot by the bars of the swing.

Emily stretches out her arms, and as the swing comes towards her it lifts her body from the ground.

In one situation, Emily wanted to climb the bars.

Emily runs along with the swing in front of her and easily enters it just before it makes a turn and swings back again.

However, a boy who often climbed the bars was not willing to give up the spot to her.

By placing her body under the swing, Emily got to experience its movements from another perspective.

However, Emily refused to move aside and blocked him with her body.

Each time Emily jumps onto the swing, she finishes her swinging with a high, long jump.

A discussion occured between them, with a slightly irritated tone.

As her body travels through/with the air, Emily makes a swooshing sound with her mouth.

When Emily finally managed to get the spot, she climbed up and leaned her head backwards, towards the ground, and shouted: "This is so easy, this is so easy!"

After each jump, Emily turned her gaze and smiling face towards me (researcher).

However, as Emily hung upside down, shouting, none of the other children gave her any recognition as they had done earlier when others (boys) were climbing.

Figure 1: Two temporalities written through one another.

From this entangled reading Emily's varied explorations with the swing emerge as part of other intra-activities taking place together with the swing area in this particular preschool. On a daily basis, other becomings, or apparatuses of bodily productions (Barad, 2003) were enacted together with the swing area. These included more explicit gender norms than when Emily was the only human agent, enabling and hindering different children from co-acting with the swing in certain ways. Even though these were different situations, and as such different temporalities, it is impossible to draw any absolute boundaries between the intra-activities and becomings. Emily as the only human agent, and other times when there were many children in the swing set area, are part of the same phenomenon - namely playing with the swing in this particular preschool. Emily's opportunities to act, use her body in various ways, and become brave and strong were enabled by the fact that she momentarily had the opportunity to entangle, co-act with the swing and physical phenomena and to occupy the whole swing area without disruption. However, the reason her doings in this situation could be understood as brave and strong can also be found in daily intra-actions where many children were by the swing. Some doings were highlighted by other children as impressive, seen in the following sentence: Sometimes when someone (most often a boy) was climbing, this child was recognized by other children who shouted things like: "Look at X!". As Emily made high and long jumps, the doing was similar to those associated with other (boy) chilrden. However, due to the gendering processes generated while many children were in the swing set area, the opportunity to be highlighted as impressive tended to be greater for boys. Even though gender norms were not created as agents of high significance for Emily's solo doings, as she was the only child co-acting with the swing, they were nevertheless relevant. The gendering processes mattered for Emily's becomings with the swing – despite the absence of children to impress (for further elaborations on how gendering can take part even when one is alone, see Günther-Hanssen, 2020).

Through this re-turning we have shown that, to be able to keep more intra-activities when we as researchers engage closely with certain parts of data/certain intra-activities, it is important that we explore what other processes that the events we choose to zoom in on are part of, as well as how these affect each other. Through the entangled descriptions, it was possible to highlight agents participating in the event with Emily and the swing differently than when we engaged solely with Emily and the swing. Although not immediately obvious, gender norms also worked as agents in this situation, albeit in an implicit way, encouraging us to question why it was necessary to attend to gendering in this situation. We are aware that by focusing on gender we become complicit in the gendering processes and might cause gendered marks on bodies that it might be better to avoid. However, children's closely entangled scientific explorations with different materials also contribute to gendering processes, which also cause marks on bodies. The children encounter unequal opportunities to use their bodies, occupy space, and become in varied ways. The implications for gendering processes to materialize or sediment in people's body-minds can co-create unequal possibilities in how students identify themselves with science (Archer et al., 2012; Brickhouse, Lowery, & Schultz, 2000; Carlone, Scott, & Lowder, 2014).

As the re-turnings intra-act with gendering, we want to point out that we do not engage with gender or gender categories (girls and boys in the data) as something fixed and pre-given; instead, we see gender and identity in line with Barad's (2003) posthumanist performativity (this is further described in Günther-Hanssen, 2020).That is, we see it as material-discursive phenomena, becoming and being iteratively reconfigured in intra-activity (Barad 2007). At the same time, we do not believe that gender categories should be overlooked per se when researching the daily life of preschool children. Even though these gender categories do not pre-exist, gender can seem very real to young children and affect how they act and what interests they develop, as well as how they perceive themselves in relation to other children, materials, places, and contents in preschool (Blaise, 2005; Davies, 2003; Günther-Hanssen et al., 2020; Hellman, 2010; Madrid & Kantor, 2009; Odenbring, 2010; Osgood & Robinson, 2019). As such, we think that within posthumanist methodologies, researchers need to be able to deal with gender as agentic: co-creating and affecting people's lives. Otherwise, there is a risk that the implicit ways that gender norms and gendering structures co-create the events we zoom in on will be overlooked.

In our third re-turning we continue engaging with issues of gendering in preschool by specifically engaging with physics.

Re-turn: The Pendulum

Is it physics or gendering?
In the following re-turnings, the first author was reading about physics concepts, as a means of finding additional ways to engage with the video sequence of Emily and swing.

Space-time-coordinate: The first author at her desk, engaging with a conceptual approach to physics and gender theory, spring 2019.
I am sitting at my desk reading about physics concepts in order to better understand the play between a five-year-old girl, a swing, and various physical phenomena present in the data I am currently working with. As I read about force, acceleration, and net force zero, various concepts connected to gender theory are spinning in my head and entangle with the explanations in the text. I lay down the book and switch to YouTube and start to watch a video clip about a single pendulum to better understand the swing in the data. As the speaker explains that oscillation is a motion that repeats itself regularly and explains how harmonic these repeated movements are, I am thinking: Is he really talking about physics, or is it about gendering? Could explanations of pendulums be used together to think about gendering processes?
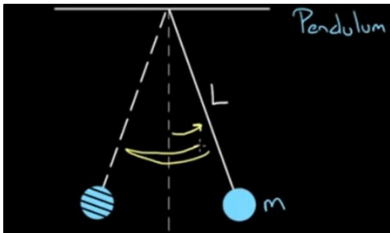
These re-turnings include both re-turning the described moment above, as well as re-turning the thoughts about scientific phenomena as creative playmates in knowledge construction. We take

our point of departure in the video clip[1] about simple pendulums that the first author was watching in the spring of 2019.

Pendulums as a metaphor to think gender and identity construction together with
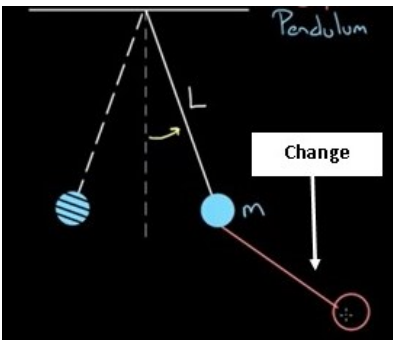
The harmonic oscillator

In the video clip, the speaker explains a simple pendulum. As he speaks, he also illustrates his explorations by drawings made with a computer program. The speaker starts by explaining that oscillation is a motion that repeats itself regularly.

"You just give the pendulum a swing and then it will swing back and forth, back and forth. It's not complicated".

Picture 2: Simple pendulum

The speaker continues by explaining that if you made a change and, for example, added another string with another mass, making it a double pendulum, it would become more complicated.

"This gets really complicated! In fact, chaotic!
Which is kind of cool, pretty sweet,
but really complicated to describe mathematically."

Picture 3: Double pendulum

Thus, the speaker compares the single pendulum and its regular and harmonic swings back and forth, with the movements of a double pendulum. Picture 4 shows how a single and double pendulum oscillating next to each other could look:

"Pretty sweet, kind of cool, but really complicated."
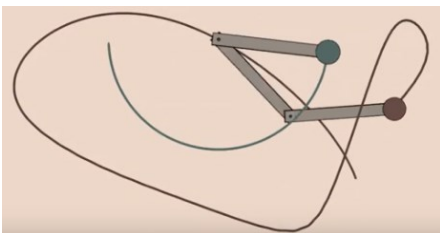
*Picture 4: Single and double pendulum oscillating next to each other*

The speaker continues by stating that since the situation becomes complicated, he is not going to bother with that, "We've got enough things to study" – and he simply erases the part he added.

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[1] Please look at the first 1:08 min of the video clip: https://www.youtube.com/watch?v=WPa5IgLgDyQ

We now read this part of the YouTube clip through gender theory (Barad, 2003; Butler (1993). We will then continue to re-turn this reading together with both the data including Emily and the swing and the swing set area as it appeared daily, as well as a narrative made from data used in other parts of the initial research project.
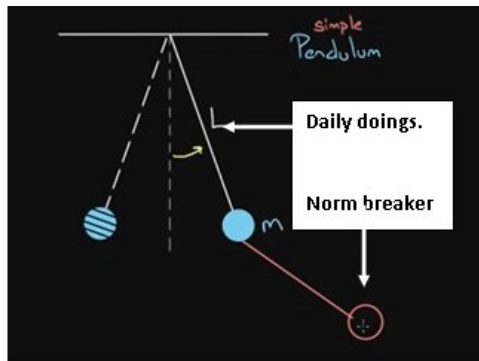
The harmonic "intelligible-ator"

As argued by Butler (1993) and later Barad (2003) gendering is performative; it is a doing or an act that repeats itself regularly. Through repetitive doings we become intelligible as girls/women or boys/men, or other than women and men. It is often more "harmonic" when we follow the norm.

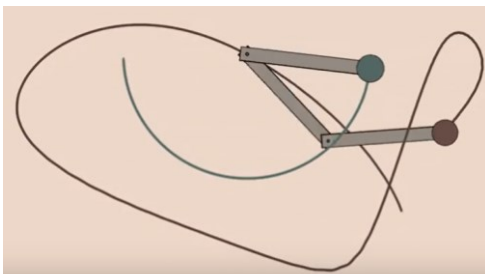*Picture 5: The harmonic "intelligible-ator"*
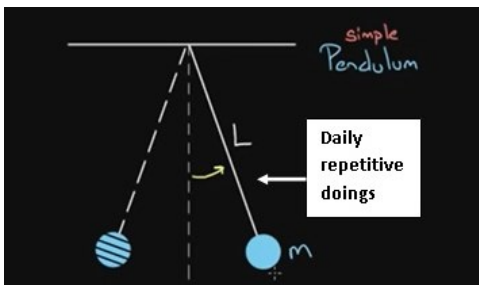
It is not complicated

However, if we change something, if we try to break a norm,

Picture 6: The complicated harmonic "intelligible-ator"

It could be pretty sweet, kind of cool, but many times also really complicated.

Picture 7: The chaotic, complicated harmonic "intelligible-ator"

In fact, chaotic.

As Emily tried to get a spot by the bars of the swing (Re-turn: the Writing) to be able to climb and hang upside-down, like some of the boys often did, the situation became complicated. She had to

fight to get the spot, and when she finally got it and climbed up and called for the other children's attention, no one reacted. As a child in preschool, it can be easier to act more like a single pendulum in many situations, adjusting one's actions in line with gender norms, and iteratively acting in line with these to become intelligible, both to other children and teachers. The initial research project holds examples where the children, together with the material-discursive environment in the preschool, repeated their choices daily about where to be and what to do (Günther-Hanssen et al., 2020). For example, it was common for a number of girls to spend time at a drawing table each day and for a number of boys to spend time in a construction room.

At the drawing table

the girls over and over again

drew hearts and rainbows.

In the construction room

the boys over and over again

rotated their Beyblades[2].

Doings that repeated themselves regularly

just like simple pendulums.

Of course, there are also examples in the overall data from the initial research project when the children did not stick to certain repetitive doings. In these situations, their doings and becomings were more similar to the movements of double pendulums. However, these situations did not generally become as visible.

During our readings of pendulums and gender theory we have been able to develop a way of discussing and highlighting gendering processes in preschool together with single pendulums as a metaphor for repetitive doings and intelligibility. To develop these thoughts further, we will read the situation with Emily and swing, as well as the swing set area as it appeared daily, through explanations of single and double pendulums.

Dance of iteration and change
This reading is made together with another video clip[3] retrieved from YouTube, including a data simulation of the differences in how single and double pendulums oscillate. The pictures below are screen shots from this video clip. The quotes below consist of different cuts from the finished text

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[2] A Beyblade is a toy that that you spin and compete with.
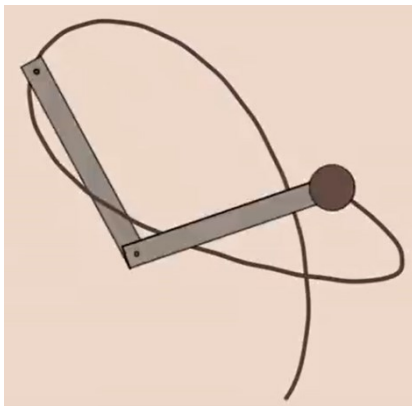[3] https://www.youtube.com/watch?v=d0Z8wLLPNE0

of (Günther-Hanssen, 2020).

"In the more common situations as there were many children by the swing, the children had more one-dimensional positions or opportunities, for example 'the position' as someone pushing the swing, someone sitting on the swing, or as someone jumping or climbing the bars of the swing" (Günther-Hanssen, 2020, p. 904). We can think of these positions repeating themselves like the motion of a single pendulum.
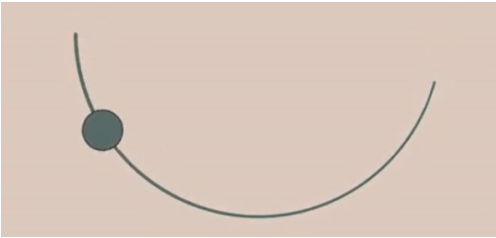
Picture 8: The motion of a single pendulum

"In these situations, gender norms co-created the children and were also re-created by the children, in the iterative doings performed together with the swing set area. This was apparent, for instance, in the way that individual children repeatedly got similar and more one-dimensional opportunities and in that Emily had to fight to interrupt these iterative doings to get a spot by the bars of the swing" (Günther-Hanssen, 2020, p. 904).


"When Emily instead was the only human agent co-acting with the swing, gender discourse was not an explicit agent with regard to compelling Emily to, for example, use her body in a cautious manner in line with gender stereotypical norms" (Günther-Hanssen, 2020, p. 904).

Picture 9: The varied and dynamic movements of a double pendulum

Together with the swing, Emily repeatedly made explorations in various ways, pushing the swing from different positions, lying under it, placing herself in it, as well as jumping from it. She moved here and there, changing her direction to explore and become – just like the varied and dynamic movements of a double pendulum. We think of the constantly changing movements of the double pendulum as a metaphor for how identity construction can be seen as something constantly becoming different in itself – identity as difference within – not between (Barad, 2014). It is a metaphor to help us focus on how one same child, like Emily playing with the swing, can constantly become different in her/himself (Lenz Taguchi, 2011).

However, since Re-turn: the Writing showed that Emily's varied explorations and becomings with the swing as the only child cannot be separated from the gendering processes created within the intra-activities of the swing set area on a daily basis, we need to see these repeated doings and becomings as part of Emily's identity construction. This means that a better picture would be one that includes the iterative movements of the single pendulum and the differentiating movements of the double pendulum put together.
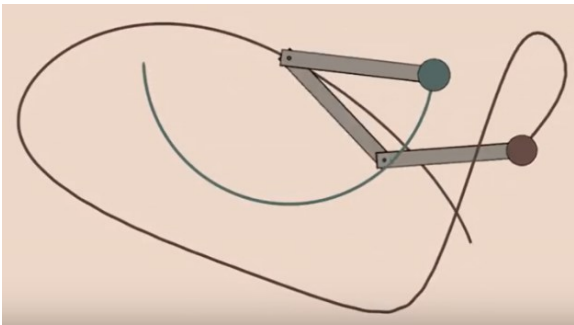

Picture10: The iterative movements of the single pendulum and the differentiating movements of the double pendulum put together

The movements of the single pendulum in this picture can be thought of as Emily being pushed into acting in line with gender norms, knowing that her place usually not is by the bars of the swing. Regarding the movements of the double pendulum, these can be thought of as Emily not giving up her spot by the bars, fighting to be able to climb up and explore and become in other ways. These can also be thought of as Emily's differential explorations and becomings with the swing, as she was the only human agent. Even though difference and constant becoming are the core focus of posthumanist methodologies, we argue that repetition must also be taken into account. Repetitive doings are also becomings that become new again and again, but in similar ways.

In sum, the single and double pendulums can be used together as a metaphor to think of gendering and identity construction as constantly ongoing processes entangled with each other, including both variety and clear changes in direction as well as repetition and similarity. This single-double-pendulum metaphor helps us to see that there are no absolute boundaries between highlighting gendering processes and re-thinking about how these could be approached differently. Highlighting gendering processes and re-thinking them are part of the same phenomena. If we as researchers would focus only on the single pendulum – that is, on the repetitive doings causing gendering – we risk overlooking all the other ways of becoming that a child is involved in every day. If, instead, we focused only on the double pendulum – that is, the becomings that differ, surprise, or are anything but repetition – we risk overlooking how gendering processes actually affect and hinder the child in many situations, even during situations of variety, as shown in Re-turn: the Writing. Furthermore, even though repeated doings can be narrowing and part of gendering, repeated doings and becomings also have a place in education.

While difference can open up for excitement, multiplicity, creativity, and equality, repetition can co-create recognition, belonging, and comfort. What is important is that repetition and change work together, without one dominating the others. With this as a point of departure, we can look at the picture of the single and double pendulum in a new light, as if in a dance of iteration and change.
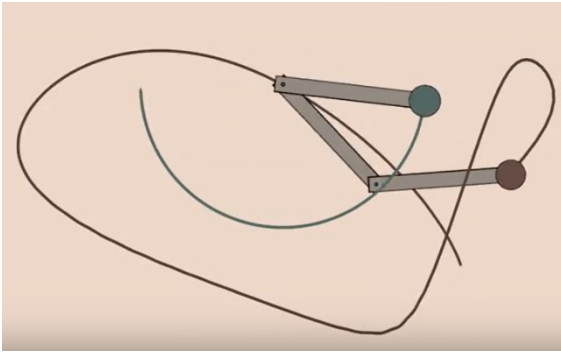
Picture 11: A dance of iteration and change

Making a difference together with responsibility

An over-arching question for all of the re-turnings was: How can we promote our posthumanist and post-qualitative methodological work into something that makes a difference for research and teaching, together with the concept of responsibility? As we conclude, we can state that the methodological approach used in the paper – making re-turnings and various diffractive readings – has been fruitful to attempt to make a difference. By engaging with various nonhuman agencies during the whole research process, we have been able to create knowledge together with these agencies, which we did not expect from the beginning. Even though it was "really complicated", we continued to bother and did not think that we had enough things to study (reply to YouTube speaker). For example, who would have thought that pendulums could actually be agents to approach gendering in (preschool) education together with? We did not create this knowledge alone, but in entanglements with swings, pendulums, and other agents, yet the responsibility lies with us as researchers. This means that responsibility is not something that we can choose to engage with or not; it is always already part of each entanglement. Barad (2014) explained that:

> Responsibility is not an obligation that the subject chooses but rather an incarnate relation that precedes the intentionality of consciousness. Responsibility is not a calculation to be performed. It is a relation always already integral to the world's ongoing intra-active becoming and not-becoming. It is an iterative (re)opening up to, an enabling of responsiveness. Not through the realisation of some existing possibility, but through the iterative reworking of im/possibility, an ongoing rupturing, a cross-cutting of topological reconfiguring of the space of response-ability. (p. 266)

It can be a struggle to conduct entangled and embodied posthumanist analysis, and it can be even harder to describe how these were done. By including the nonhuman agencies that we have been

working with, such as a conceptual approach to physics (Pendrill & Williams, 2005), memories of swinging, and the sound of a swing in the paper, we have tried to make a difference to how knowledge is presented. By retaining these agents in the manuscript, we take responsibility for the whole research process by making it possible for readers to gain insights in how, and together with what, the analytical work was conducted. We also give our readers a chance to join us in bodily entanglement with these and, for example, to feel the swinging and acceleration in their bodies. We believe that this makes our analytical process and its directions more intelligible.

Another way in which we tried to be responsible to the differences constructed during our re-turnings concerns gendering and gender categories. During Re-turn: the Swing, we could have stopped after stating that Emily could explore and become in various ways with the swing. However, by doing so, we would have overlooked the other, gendered, situations that this event was entangled with. This could be shown practically by the entangled writing during Re-turn: the Writing. During this re-turning, a way of dealing with gender categories within posthumanist research could also come to the fore; that is, as agents among other agents, co-creating and affecting people's lives. Even though posthumanist methodologies try to undo and re-think dichotomies and categories such as gender, we argue that gender categories cannot be overlooked per se when researching the daily lives of preschool children. Gender categories can seem very real to young children and affect their possibilities to act, explore, and become. This means that we have a responsibility as researchers to highlight when and how gender affects children's lives in limiting ways. If we, as posthumanist researchers, only try to re-think gendering and gender categories, not admitting their participation and limiting affects, we argue that we would ignore some of the most powerful agents that children are entangled with every day. At the same time, it would not have been responsible of us, or fair to the children, to stop after highlighting gender categories as agents, without trying to also re-think the gendering processes in the data. The children in the initial research project were both adjusting to gendering processes *and* trying to do and become in different ways. After various diffractive readings of pendulums, gender theory and data from the initial research project, we created a metaphor for gendering and identity construction as constantly ongoing processes, including both variety and clear changes in direction as well as repetition and similarity. From this, we argue that there are no absolute boundaries between highlighting gendering processes and a need to re-think how these could be approached differently. Rather, these are parts of the same phenomena.

To summarize, during our re-turnings, we never returned to the data in the initial research project as it was; rather we engaged with it to create something new or different, and accountable. Barad (2010) explained how the very act of making re-turnings is entangled with responsibility:

> To address the past (and future), to speak with ghosts, is not to entertain or reconstruct some narrative of the way it was, but to respond, to be responsible, to take responsibility for that which we inherit … Responsibility is by necessity an asymmetrical relation/doing, an enactment, a matter of différance, of intra-action, in which no one/ no thing is given in

advance or ever remains the same. (p. 265)

Hence, we not only consider the making of re-turnings and various diffractive readings/writing in the paper as a fruitful way to create something new or different, but as a way of making something that is accountable and respectfully produced through knowledge production with high demands for responsibility.

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The authors confirm that the text is original and has not been published or submitted elsewhere.

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