

Compositionism and digital music composition education

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Abstract

This article aims to explore the sociomaterial relational activities within digital music composition education via the posthumanist concepts compositionism and assemblage. The study is an attempt at a nonlinear and non-reductivist understanding of educational activities where matter, nature, and culture shape performative practices. Engaging with Latour and Actor-Network Theory (ANT) and its onto-epistemological manifest as compositionism, the explorations also find impetus from posthumanist thinking, Barad's intra-action, Haraway's becoming-with, and post-qualitative inquiry. Four Year 9 classes in a Swedish compulsory school took part in the composing activity and the research intervention. During a four-week participation period, the music composition lessons were video-recorded. Sociomaterial transcriptions of the recorded lessons were transformed into assemblage compositions to explore the outcomes and becomings that emerged. What these sociomaterial compositions brings to the fore is the hybridity of digital music composition outcomes in learning activities.

Keywords: *music education; posthumanism; Actor-Network Theory; digitalization; music composition*

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Introduction

Material relations can be seen as immanent to musical practices. Playing music or composing music is dependent on and entangled with “stuff” (Krogh, 2018). This entanglement also affects music education (Allsup, 2013; Bell, 2015; Folkestad, 2017; Martin, 2012). To explore the relational aspects of music composing in education as sociomaterial practices, I participated in activities including a composing assignment, digital hardware and software, and musical instruments in four Year 9 classes (15-year-old pupils) at a compulsory school in Sweden. Moreover, these learning activities involved a prescribed learning matter as well as a prescribed subjective expression in music, formulated by the music subject syllabus, which states that

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pupils should create music “on the basis of their own musical ideas” (Skolverket, 2018, p. 164).

Governmental policy statements (Näringsdepartementet, 2017; Utbildningsdepartementet, 2017) and writings in the curriculum and the music subject syllabus (Skolverket, 2018) in Sweden also place compulsory educational practices and material relations in an ongoing digitalization process. Digital tools are to be implemented in school education and administrative context with equal availability for all pupils in compulsory school (Utbildningsdepartementet, 2017) and also, more specifically, in the music subject (Skolverket, 2018).

Means to employ digital material in music education are, however, largely up to the individual teacher, working within the local conditions, depending on possibilities and limitations constituting the local school and classroom ecology. Also, professional competence as well as hardware/software manufacturers affect planning and teaching/learning practices (Huovinen & Rautanen, 2019; Jennings, 2007; Schmidt-Jones, 2018). If all these human and nonhuman (cultural and material) participants in a classroom ecology mediate information (Latour, 2005), not only teacher, student, and subject matter, as formulated in the standard didactic triangle (Selander, 2017), shape emerging outcomes of activities. Learning practices, in a sociomaterial sense, need to be understood in extended meaning.

The aim of this study is to explore how processes of digital musical composition in a compulsory music classroom can be understood through the posthumanist theories of compositionism and assemblage. This aim surfaced the following research question: How can sociomaterial assemblages be composed, decomposed, and recomposed to make new meaning of digital music composition education and its outcomes in lower secondary school?

The situated classroom ecology

During a four-week period, I participated in a composition activity in four Year 9 classes, with one one-hour music lesson per week each, at a compulsory school in a larger city in Sweden. There were two qualified music teachers working at the school, and the four Year 9 classes were divided between them, each teaching two classes. A teacher assistant also participated in lessons with one of the teachers. The school, the teachers, and the pupils were unknown to me before I conducted the research. The selection of school was made by sending a question about interest in participating in a research project to several music teachers who taught in lower secondary school in the region to whom I had no previous affiliation. The only requirement stated in the question was that a composing assignment involving digital hardware/software was to be carried out as part of the music subject. Two schools were willing to participate, and I selected the one which had more Year 9 classes involved in the composing assignment. Before I arrived, the pupils were informed about my work and the research. The ethical guidelines of the Swedish Research Council (Vetenskapsrådet,

2017) were followed, and the pupils signed a written consent form stating that participation in the research was voluntary and that they could terminate their participation at any time. The pupils who did not consent to participation are excluded from the research material.

The composing assignment for these lessons was planned by the two teachers before my first meeting with them, but we discussed it together before and after the first lesson. The assignment asked the pupils to compose an updated version of the Swedish national anthem. The teachers gave the pupils a document showing a total of 16 colored boxes, representing measures, divided into two eight-measure groups which was reviewed for the classes in an introductory lecture. In the boxes, the pupils filled in chords from a selection of chords indicated by the colors of the boxes. The tonic in the given key was prescribed in some boxes, such as the first and the last. Using this semi self-chosen chord progression, the pupils were required to orchestrate the composition in Garageband¹ and compose a melody for the lyrics that they composed during the Swedish subject lessons. To compose the music, the pupils had access to iPads with Garageband installed and all available instruments in the music classroom, predominantly guitars and keyboards. Some also brought their own iPhones to access Garageband. One pupil also brought a violin.

When recording the lessons, I used two cameras following different groupings of human and nonhuman actants.² Sometimes the cameras were placed at fixed locations in the room to focus on a group of pupils or one pupil working individually on an iPad, and sometimes the cameras were adjusted to provide a panoramic view of the whole classroom. When using the panoramic view, I moved between the two cameras and made fieldnotes. Sometimes one camera was in a fixed location, and I moved around with the other one, following the mutable assemblages.

Outlined here is what emerged as the situated place and space for the situated education/research ecology, negotiated between human and nonhuman actants' agencies and intentions in conjunction with cultural formations. Ecology, as the study of place where we live or "place *that* we live" (Bennett, 2004, p. 365, emphasis added), is not exclusively seeking equilibrium. Our living place, the world, is formed in dissonance as well as consonance through the individualities, that are interconnected multiplicities of infinite variation (Deleuze & Guattari, 2013). Assemblages of human and nonhuman are fluidly and perpetually formed and reformed, within an interconnected ecology (Bennett, 2004). To move beyond dualisms, perpetuated by Cartesian thinking (Susa, 2019), ecology emphasizes entanglement and multiplicity, and the wholeness of culture, nature, and matter in play.

¹ Garageband is a music making application by Apple that is commonly used in music education.

² Actant, as alternative to actor, is here signifying human and nonhuman participants as mediators. The purpose is to avert predefining and anthropomorphising participants in activities (Haraway, 1994).

Researching within the multiverse

Some concepts that guide the exploration are here further delineated. Digital hardware and software constitute an ever increasing and shape-shifting multiverse making material relations within the music composing practice hard to bypass. The multiverse, in a posthumanist understanding, is an emerging and expanding rhizome where a multiplicity of material possibilities generates humans as nodes of becoming (Ferrando, 2018). Rhizomes expand and reconfigure without predetermined causal effects or linearity as recurring transformations within activities (Deleuze & Guattari, 2013; Latour, 1999), producing unpredictability as a component in music composition education.

To explore the situated ecology of the classroom, emerged within the multiverse, a sociomaterial understanding for activities is proposed. This implicates the participation of nonhuman entities in activities, making them actants intra-acting with other human and nonhuman actants. All things equally exist and become into existence, this is sometimes referred to as a flat ontology (Bogost, 2012) and onto-epistemology (Barad, 2007).

Furthermore, matter (e.g., Garageband), culture (e.g., music theory), and nature (e.g., sound production) affect emerging agencies that shape and reshape activities and their outcomes, to diffractive effects (Barad, 2007). Diffraction is the breaking apart of the now into multiple futures. However, it is not a single event, rather a continuous repatterning of now and then (Barad, 2014). Troubling causality and dichotomy, diffraction provides multiplicity in the configuring and reconfiguring of activities studied. A planned assignment in an educational ecology emerges as one actant among other actants, all together forming the activity. The common preconception about educational practices where the teacher via an assignment can control what the pupil will learn needs to be challenged. Predetermined learning outcomes are practical simplifications that disregard the multiplicity that is produced within activities (Murris, 2022).

The intent is to avert preconceived linear causality and presumed effects as simplistic solutions and address the messiness and multiplicity of educational practices (Sandvik, 2010). To elicit alternative thoughts and understandings, this study engages compositionism (Latour, 2010) and Actor-Network Theory (ANT; Latour, 2005). To stretch it even further, provoke diffractive thoughts, experience the unlooked-for in complexities (Löytönen et al., 2015), and avoid limitative methodological rules, post-qualitative inquiry (St. Pierre, 2019a) as an approach to intra-act with the study is activated. The use of the prefix “intra” emphasizes the connectedness of becoming actants in practices. “Interaction” presumes a predefined property of actants in play. To emphasize the entanglement of actants, “intra” is attention to agency as emerging in connections (Barad, 2007) and becoming properties of actants as immanent in the emerging practice, the assemblages that will reconfigure and/or expand within the rhizome (Deleuze & Guattari, 2013).

Digital composition and sociomaterial relations

Research in music composing and education often consider digital hardware/software as established artefacts. Individual digital platforms and hardware/software are, however, in constant flux. Perpetual updates and increased accessibility to software and digital devices for human-nonhuman intra-action make them fluid, rather than establishing them as fixed artefacts of musical creation (Lind & Nylén, 2016), perpetually expanding and reshaping the multiverse. Also, when composing music in a digital environment, the digital affiliates with other established musical artefacts (e.g., musical instruments such as the piano or guitar), and different forms of genre conventions, composing techniques (Folkestad, 2004, 2006; Maes et al., 2018), and Western art music notation and other forms of music notation (Schmidt-Jones, 2018).

Digital platforms of music making possibilities affect the outcomes via veiling or enhancing different features and parameters of musical visualizations and functions (Jennings, 2007; Schmidt-Jones, 2018). Musical knowledge can also be understood as embedded into the features of music making applications (e.g., Garageband), as resources for music composing (Bandlien & Selander, 2019). When treating digital actants *as if* they are members of conceptions in music making activities (Brooker & Sharrock, 2016) but only to a point when their functions are “learned” by the human user, mediating actions of the material actants are bypassed, reducing agency as phenomenon emerging in intra-action (Barad, 2007). Rather, the influence of DAWs³ and MAWs⁴ on music making appears to be entangled in a becoming-with (Haraway, 2016), when for example both gestures and actions are musical and hardware specific (Bell, 2015). Each DAW or MAW setup becomes a specific environment or ecology of music intra-action. The embodiment of musical performance and the participatory aspects relate with the creation of musical meaning, a performative turn from the formalist view of musical meaning as inherent in a musical score (Maes et al., 2018).

When composing with digital tablets, the workflow can become more individualized and thus avert the embodied and participatory aspects of music making (Huovinen & Rautanen, 2019). Also, composing with digital actants bypasses the live experience of musical performance and listening (Kjus, 2018), thus meaning-making aspects of music communication can pass directly from mentalization of musical ideas to recorded music. When MAWs are participants in music teaching and learning, time, space, and place for music creation become fluid as the learner transgresses “inside” and “outside” of education, blending resources and influences of musical creation (Chen, 2017). Material and cultural actants that are engaged are thus not solely under the teacher’s “control” within the classroom ecology. Increasing connections expand the rhizome of music composition education (Lum, 2017). Moreover, proliferating digital possibilities expanding the music composition conceptualizations

³ Digital Audio Workstation

⁴ Mobile Audio Workstation

and compositional approaches (Folkestad et al., 1998; Martin, 2012; Winters, 2012) call for extended configurations within music education (Ojala, 2017; Paavola & Hakkarainen, 2009; Ruthmann & Hebert, 2012; Ward, 2009).

ANT and compositionism

I will activate the notion of compositionism manifested by Latour (2010), as an onto-epistemological conception of educational practices in this study. It is by opening up the ANT sensibility (Fenwick & Edwards, 2013) to “matters of concern”, by moving beyond, behind, and within the partiality of “matters of fact” (Latour, 2004) while acknowledging the frictions within a non-prescribed methodology, and the diaspora of research enactments that this study engages with compositionism. Activating compositionism is not to give up on ANT, but acknowledges the emerged dissonances in the concept while still progressing according to its impetus. Furthermore, compositionism, music composing, and composition are related concepts employed in the study that acknowledge music making activities’ entanglement with the research approach (Latour, 1999, 2010; Sandvik, 2010) and its process. To further stress the research entanglements, the article itself is enacted as a composition, lending some heading titles from the elements of a sonata form.

The three words comprising the Actor-Network Theory concept, as well as the hyphen, are all debatable and perhaps even misleading when considering the digital world (Latour, 1999). For this study’s purpose, especially the “network” part calls for a comment. In relation to the present digital life world, the word “network” is most commonly associated with the internet network and digital networks where information should flow free and unmediated. In an ANT network, however, this mediation or translation (Latour, 2005) or even intra-action (Barad, 2007) is just *what makes* actants come into being through their relations. The mere transportation of uninterrupted information is not enough to make an actant within the ANT understanding of network. Rather, rhizome would be a preferred signifier for connections within performative practices (Latour, 1999). This is a turn from preestablished actors explained by preestablished explanation, the already-in-place “social stuff” (Latour, 2005). Instead, these relations bring about agencies, emerging within this very mediation or intra-actions in performative activities. Groupings are fragile and mutable, thus, describing the actants requires following the actants. The connections are made by and made durable by actants in play, hence not held together by “the social” as a reductivist explanation. For music education, this suggests that digital hardware/software are not merely artefacts. They are mediators (Latour, 2005), becoming actants, entangled with musical meaning-making and affecting outcomes of compositional educational activities. Digital devices “from afar” will affect teacher planning and student learning practices, and indeed, produce educational practices as sociomaterial assemblages.

Hence, enacting research within an activity also brings about agencies. The compositionism impetus emerges as an onto-epistemology and as a sensibility to mediated relations in performative actions framing the composing, decomposing, and recomposing of sociomaterial mutable assemblages. To compose, i.e., to assemble heterogeneous things (Latour, 2010), is here immanent to both the student activity as well as the research approach. Compositionism engages an alternative to critique. To decompose also involves in extension to recompose, i.e., to tear down obligates to build anew.

Creating methodological assemblages

Following a post-qualitative inquiry, the terms “method” and “data” are refused (St. Pierre, 2019b), or radically challenged (Murriss, 2022). Prescribed research methods inflict rules with the risk of becoming limiting, cutting into complex processes before they can be fully developed (Manning, 2015). Methods instead need to emerge with the practice studied as the research conducted is a part of creating the reality, they are entangled (St. Pierre, 2019a). Moreover, data collection implies that there is a reality “out there”, separate from “us”, that can be observed. However, this is not the case in posthumanist terms, as posthumanism assumes that we (humans) are entangled with “reality”, which is co-produced in activities. In the process of creating a method for engaging with/within the classroom from a compositionism approach, a scheme that resembles ethnographical methods emerged. Participant observations and fieldnotes as methods in ethnography attempt to provide detailed descriptions of people and doings in their “natural” cultural environment (Harrison, 2018). However, given the posthumanist onto-epistemology synthesis, the researcher and the researched activity are inseparable. Enacted practices of education become in entanglement with the research (Hultin, 2019). That is, my presence as a researcher intervenes and co-creates the activity. The creation and experimentation of/with method perform a cut that forms a duct for directing the inquiry, however still acknowledging the complexity of activities. By staying open to “the yet to come” to avert a delimiting of human/non-human activities, new modes of knowledge can emerge (Manning, 2015).

Assembling music education

When continuing the assembling process initiated in the classroom participation, I watched the video recorded lessons and made selections on what to transcribe. These selections were made with regard to the different camera settings that were employed: lectures, groupings, individual students, and whole classroom view. The selections of transcripts reflect this variety of activities and practices in the classroom ecology. When transcribing the selected events, multimodal transcription conventions were considered as a possible method to generate analyzable data (Mondada, 2016). Within the multimodal transcription model, gestures and actions are described,

but in a unilateral direction (i.e., humans using tools), which is in contrast to post-anthropocentric understandings. Also, gestures and actions are represented with symbols and signs which undermines the non-representationalism immanent to post-humanist understandings and post-qualitative inquiry (St. Pierre, 2019a). Herein a transcription scheme was created i.e., becoming-with (Haraway, 2016) the recorded situations, text as entangled actant, embodying rhythm and overlapping events. This transcription scheme is made with inspiration from and in intra-action with multi-modal transcripts and all involved actants that produced the research.

The transcription process started with utterances made by human actants and time indications. Then the bodily and material intra-actions were added with rhythm and event overlaps materialized as spatial visualizations. Lastly, “utterances” of non-human actants are attended to when meaning is mediated in relation with them; these are transcribed as material/cultural utterances. After the transcription table was completed for the selected parts, I proceeded with the assembling process of the activities. Within the assemblages, diffraction (Barad, 2007) is considered nonlinear effects that form a rhizome (Deleuze & Guattari, 2013; Latour, 1999). Instead of network (Latour, 2010), rhizome signifies the materialization of the activities studied. This is to recognize the nonlinear causality and diffractive effects of intra-actions and to invoke a sensitivity to differences and the yet to come (St. Pierre, 2019a), to avoid presumed outcomes. In order to follow the actants (Latour, 2005) and their mediating intra-actions and to compose assemblages, I transformed the transcription table to a rhizomatic materialization as a spatialization of unfolding textual engagements (Hasse, 2020). A performative turn is made through my engagement with the transcribed events via the assemblage composing act. Decomposing the linear text and recomposing it to mediating actants and activity assemblages allows for a recursive tracing of actants within the perpetual recomposing of activities. The performative turn is a post-qualitative creation of method and opens up a nonlinear understanding for meaning-making intra-actions. To veer away from presumed linear causality of lesson planning and execution that in hindsight only seem to repeat itself via the linearity of transcriptions, the assemblage composition act is an attempt at acknowledgement of all actants mediating capacities and find new modes of knowledge.

Figure 1 exhibits the different functions and events in the compositions. Frame A exhibits functions of actants and how they are attributed to rectangles with different framing and color of text. Functions of lines and arrows are also explicated. Frame B shows an example of how a translation of a textual selection to extraction of mediating cultural actants (B1) and material actants (B2) were performed. Frame C exhibits examples of the arrows and how they display becomings in the assemblages in different forms.

Following the intention of finding new modes of knowledge (Manning, 2015), actions and outcomes are treated as recursively forming and transforming actants and the situated ecology, averting the volition of preestablishing causality through experiences with similar practices.

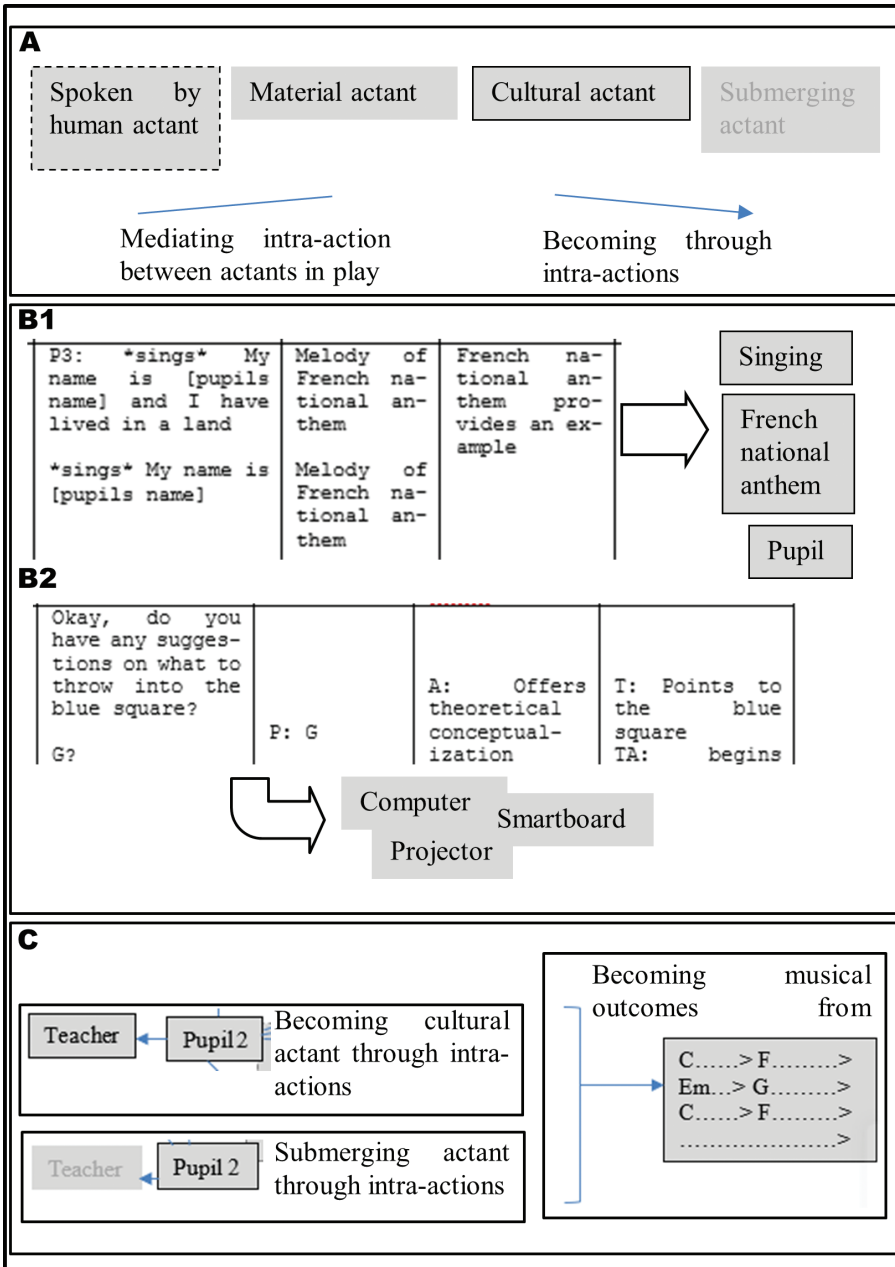


Figure 1. Composition symbol explanation

When presented in printed form, the assemblages become fixed. However, mutability is signified by mediating connections and becomings, as lines and arrows between actants. This is a situated event where all actants intra-act and mediate a specific outcome, although the outcomes are not presumed. Composing mutable assemblages

where information is mediated to a certain outcome or meaning can decompose, breaking into new groupings. They are re-assembled or recomposed to new meaning-making assemblages.

Composition 1: The lecture assemblages

Figure 2 is an example of the transcription table I created for transcribing lecture events in the classroom. The table shows time indications in the video, the teacher's utterances (T), when someone else speaks, pupils (P) or teacher assistant (TA), when nonhuman actants mediate, and finally the sociomaterial relations or intra-actions that emerge. The rhizomatic scheme of composing, decomposing, and recomposing assemblages is presented in Figure 3. For this lecture setting, I placed the camera in the back of the classroom, aimed towards the teacher area. The pupils were positioned in three rows of chairs with an aisle in the middle of them. They all faced the

Time	Spoken by teacher	Spoken by other	Material/cultural utterances	Sociomaterial relations
10:50	Okay, do you have any suggestions on what to throw into the blue square?	P: G	A: Offers theoretical conceptualization Pi: Offers embodied experience A: Perpetuated meaning C: Offers visualization	T: Points to the blue square TA: begins playing TA: stops playing T: types in G in the blue square
	G? You don't have to play yet [TA name]	TA: no		
	In the yellow square?	P: F P2: Am		
	F	P3: This with [inaudible] P: A minor P2: it is called A minor	A: perpetuated meaning A: perpetuated meaning	T: Types in F in the yellow square
	And here, a C	Ps: murmur P: What is it that we're doing? Ps: murmur		T: Types in C in the pink square
	Okay, let's just play the top line C, G, F, C			T: looks to the board

Figure 2. Lecture transcription

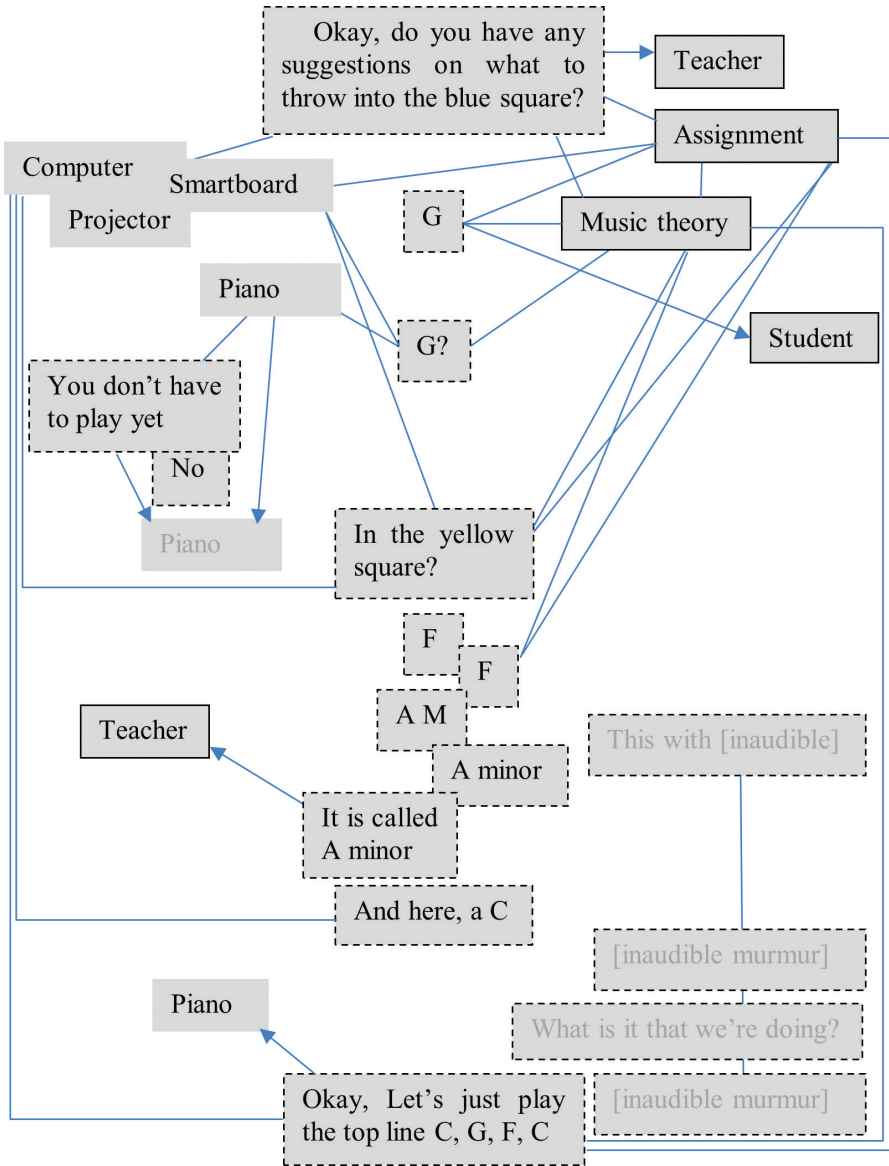


Figure 3. Composition 1: The lecture assemblages

teacher. At the far end, there was a Smartboard hung on the middle of the wall and a projector connected to it in the ceiling. On the Smartboard, the assignment (A) for the lesson was projected: My national anthem. To the right of the Smartboard, there was a desk with a computer (C) on it and to the right of the desk was the door to the hallway. In the far-right corner, there were two lockers. To the left of the Smartboard, there was a door to the teachers' office, and to the far left, a guitar on a guitar stand and a digital piano (Pi) where a teacher assistant was sitting.

Exposition

In the transcribed part of the lecture, the verbal actions become the most frequent actant. In the recomposing act,⁵ the utterances are thus displayed in the middle, building/creating the rhizome. Verbal actions intra-act with cultural actants, such as music theory and the assignment forming assemblages of emerging agencies. Piano as material actant is only intra-acted with as a referent and thus submerges very quickly. Other material actants, such as the computer/smartboard/projector hybrid, are mediating meaning throughout the selection. Verbal actions also, in relation with cultural actants and material hybrid, are what here make becomings. Teacher is one such becoming, student is another. Through the entire selection, the cultural actant music theory is intra-acted with via verbal chord indications. The collective chord exercise is theoretical, and it is only in the very end sounding piano chords become an embodiment in the form of a hybrid of cultural, human, and material actants.

The lecture assemblage is “controlled” by one more frequent actant, the formal teacher, and the composition’s verbal actions seem linear. However, the lecture becomes with the other actants and could have taken any number of forms. Nonlinearity does not mean that time is no more. The nonlinear causality understanding rather signifies recursive intra-acting actants and that several becomings emerge and coexist (De Landa, 1997; Ferrando, 2018) and decomposes, forming a perceived and performative time locality within the assemblage. The time locality is performed as recursive connections between material/human/cultural actants. The decomposing/recomposing of transcripts to assemblages unveils the actants in play. Where transcripts bring human utterances/actions to the fore, assemblage compositions expose the intra-dependency of all actants to unpredictable outcomes.

Composition 2: The heterogeneity ensemble

After the introductory lecture, the pupils would start working with the assignment of composing an updated national anthem. They were free to work with whomever they wanted and to choose what available material to engage with. In the first example, groupings were quite fluid and mutable with pupils coming and going and heterogeneous ideas popping up from a wide array of actants. Two pupils, P1 and P2, participated during the entire selection. They had an iPad each, and P2 also had a guitar. There were only pupils present, no teacher, during the entirety of the recorded sequence.

One camera was positioned at a small distance from P1 and P2. The camera became an actant when the pupils’ awareness of it made the assemblages form around this area. The workflow and sociomaterial intra-actions also proffered an alteration in the transcription table as displayed in Figures 4 and 5. Here, the headings indicate time indications, utterances by human actants, music as sounding actant, mediation by nonhumans, and the sociomaterial relations emerging. Figure 6 shows the recomposing of the transcript to the rhizomatic assemblage composition.

⁵ See Figures 2 and 3.

Time	Spoken	Music sounding (instrument relations)	Material utterances	Other sociomaterial relations
02:02	<p>P3: *sings* My name is [pupils name] and I have lived in a land</p> <p>*sings* My name is [pupils name]</p> <p>P4: what land? Do you have your own country or?</p> <p>P3: I don't know. The national anthem... Sweden!</p> <p>P1: Then we have to change the music. That's dumb.</p> <p>P3: Should we have the same lyrics too?</p> <p>P1: noo... that's not allowed, but...</p> <p>P3: *sings* Du gamla du fria du fjällhöga nord du tysta du glädjjerika...</p> <p>P4: When are we supposed to finish this?</p> <p>P3: *sings* ...sköna</p> <p>P4: When are we supposed to finish this I asked!</p> <p>P3: I don't know, trying to sing *sings* La, la, la, laa</p>	<p>Melody of French national anthem</p> <p>Melody of French national anthem</p> <p>Melody of Russian national anthem</p> <p>Still singing same melody</p> <p>Still singing same melody</p>	<p>French national anthem provides an example</p> <p>Variety of cultural signs provides mixing inspiration</p> <p>Mixed cultural and human actants form a hybrid example</p> <p>IPad, guitar and assignment provides a flightline and other inspiration</p>	<p>P1: sits down</p> <p>P1: picks up assignment paper from floor</p> <p>P2: sits down P1, P4: fiddling with guitar sometimes looking at assignment paper, still listening to P3</p> <p>P2: opens Garageband on iPad and smart instrument, then looking at P3.</p>

Figure 4. Assignment activity transcription 1 (part 1)

02:48	<p>*sings* Du gamla du fria du fjällhøga nord</p> <p>P1: Are you only allowed to use these? P2: yes P1: no!?</p> <p>P3: Hey! You should use Mario chords, in the climax, Mario chords.</p> <p>P1: yes P3: *sings* du du du duu duu du du du duuuu P2: Mario chords P3: It's like... in some way... it's something that you borrow from minor It's like a bit like wouu that makes it like...it's misstreated in like epic metal which makes it like *sings* PAA PAA PAAAAA and then woaaaa P1: woaaaa</p>	<p>Melody of Russian national anthem</p> <p>Melody from Mario bros video game</p>	<p>Cultural hybrid example</p> <p>Cultural actant gives new ideas</p> <p>Video game from afar Piano gives embodiment</p> <p>New genre ads to hybrid</p>	<p>P3: sits down</p> <p>P1: holds out assignment paper</p> <p>P3: claps hands</p> <p>P3: mimicking playing on a piano</p> <p>Moves chair closer to P1</p> <p>Mimicking piano playing P5: joins the group</p>
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Figure 5. Assignment activity transcription 1 (part 2)

Exposition

Working in heterogenous groups, the mutability of the assemblages became palpable within this selection of the assignment activity. Verbal actions work in the background as intermediaries (Latour, 2005) from which actants emerge. Cultural actants are frequent in this selection and are intra-acted with in a variety of ways diffracting information through heterogenous human and cultural actants as new inspirations. Very few material actants are in play. The guitar is an actant when P1 and P2 in the beginning of the selection are alone, but the guitar submerges when P3 joins them and sings hybrids of national anthems.

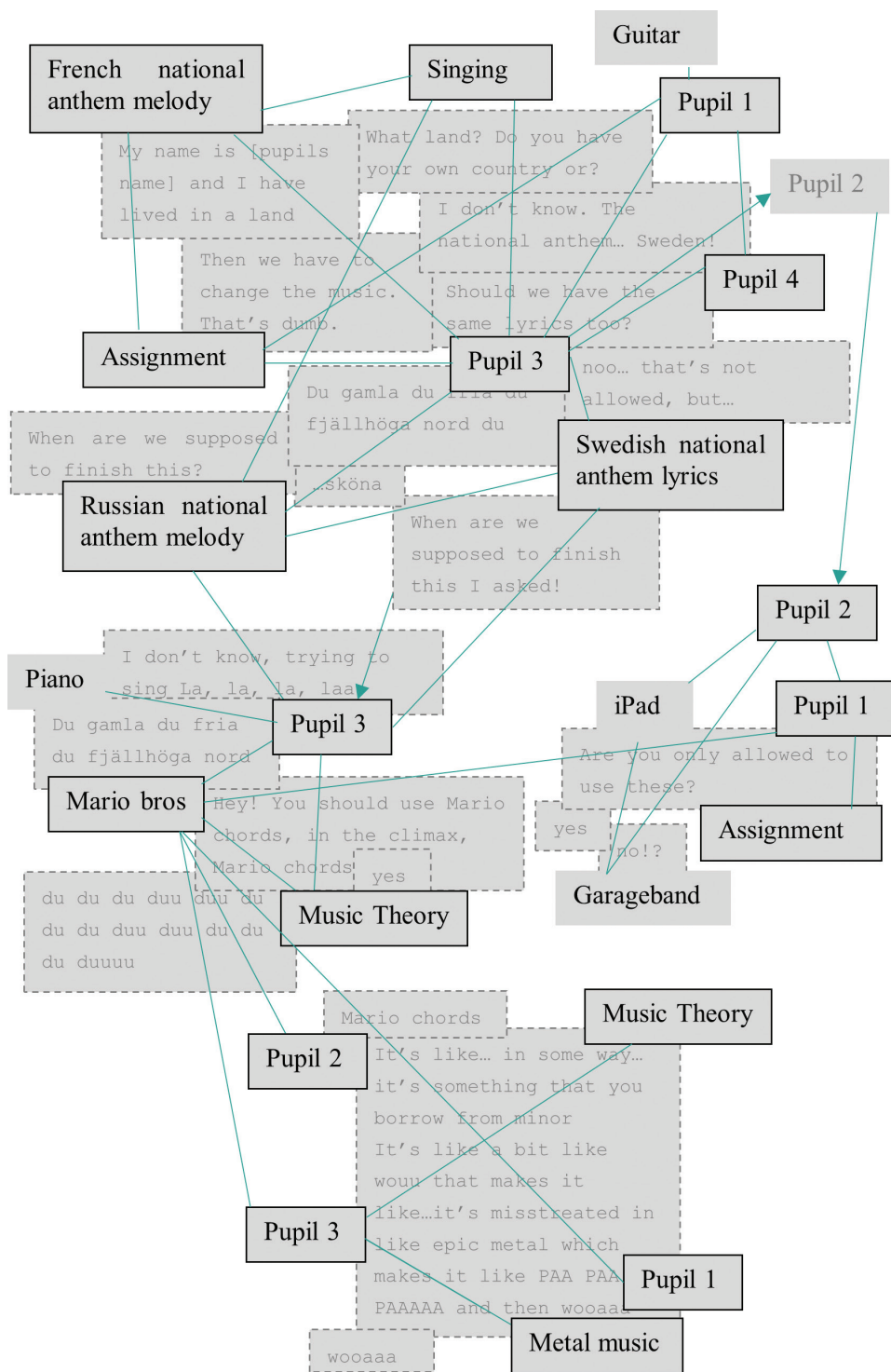


Figure 6. Composition 2: The heterogeneity ensemble

When P3 intra-acts with cultural actants, it requires proficiency and previous knowledge in music making. P2, who mostly listens to P3, at one point picks up the iPad to get Garageband to help make sense of all the cultural actants in play and what they mean for the assignment. A variety of cultural actants holds the first assemblage together. When P2 intra-acts with the iPad, Garageband, and the assignment, assemblages are recomposed into new cultural actants in a simultaneous assemblage, as P3 continues singing. The two assemblages, however, decompose and recombine via P1 to form an assemblage of new cultural actants and all three human actants.

The assemblage composition uncovers the mutability of activities. Also, this seemingly messy locality is structured via the changing assemblages that display meaning-making hybrids formed by the participating actants. In recomposing transcripts, these assemblages can expose forms of meaning-making that can be performed and activated in the classroom.

Composition 3: The duo/quartet multiplicity

Composition 3 is the second example from an assignment activity. There were two pupils sitting at a table with one iPad each in front of them. They were working in relation with their individual iPad and Garageband, trying out chord progressions and also talking to each other during this activity. The camera was placed behind and between them giving a view of both iPads and actions performed. Here, the headings in the transcription table are the same as in the previous example; time indications, spoken by human actants, music sounding, material utterances, and other sociomaterial relations. The transcription from this selection is displayed in Figures 7 and 8, followed by the assemblage composition in Figures 9 and 10.

Exposition

In this selection of activities, material actants are seemingly particular and small scale, constrained to functions within the software, as play buttons or autoplay. However, connections to the wider music technology ecology affect these functions. All actants work within cultural ecologies, making them multiplicities through their connections.

The first assemblage in the selection forms a musical outcome, or becoming, with cultural and material actants. The human actants also intra-act with material actants in the learning activity of getting to know or aligning with (Hasse, 2020) the software and hardware actants. The negotiations between material and human actants generate new musical outcomes, becoming musical cultural actants, which are recursively intra-acted with, that generate new assemblages. Outcomes and agencies that emerge also become specific to the iPad/Garageband/human hybrid especially palpable when the autoplay function is involved.

<p>12:16</p>	<p>P1: I don't know! I hate it!</p> <p>P3: Wait, are you recording? P2: Naa P3: You are! P2: No, this is just...this only makes a click. The red one...wait what? The red one records.</p> <p>P1: Or God, no wait...what!?</p> <p>P1: but wait. P2: Yes, hey check it out, my red records. The green only makes this beat.</p> <p>P1: Aaah</p> <p>P1: How do you erase then? P2: I think you go to this one and press.</p> <p>P2: And then you press on th...</p> <p>P2: eeh?</p>	<p>Metronome click, C, C, C, C, F, F, F</p> <p>Count in click C, C, C, C</p> <p>Count in click C, C, C, C</p> <p>P2:Count in click C, C, C, C, F, F, F, F, Dm, Dm, Dm, Dm, G, G, G, G</p> <p>Metronome click</p>	<p>Music theory embodied in software</p> <p>Align with playback bar</p> <p>Hardware offer interface</p>	<p>P2: Press play button</p> <p>P2: Stops play</p> <p>P1: press record</p> <p>P2: slides marker to start P2: press record</p> <p>P1: stops record P2: taps on chords P1: struggling with moving marker to beginning P2: press play P2: points to playback controls and marker. Press stop. Moves marker to beginning.</p> <p>P2: changes to track view. P1: changes to track view P2: taps on recorded track P1: press on recorded track P2: press 'delete' in popup menu P1: press delete</p>
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Figure 7. Assignment activity transcription 2 (part 1)

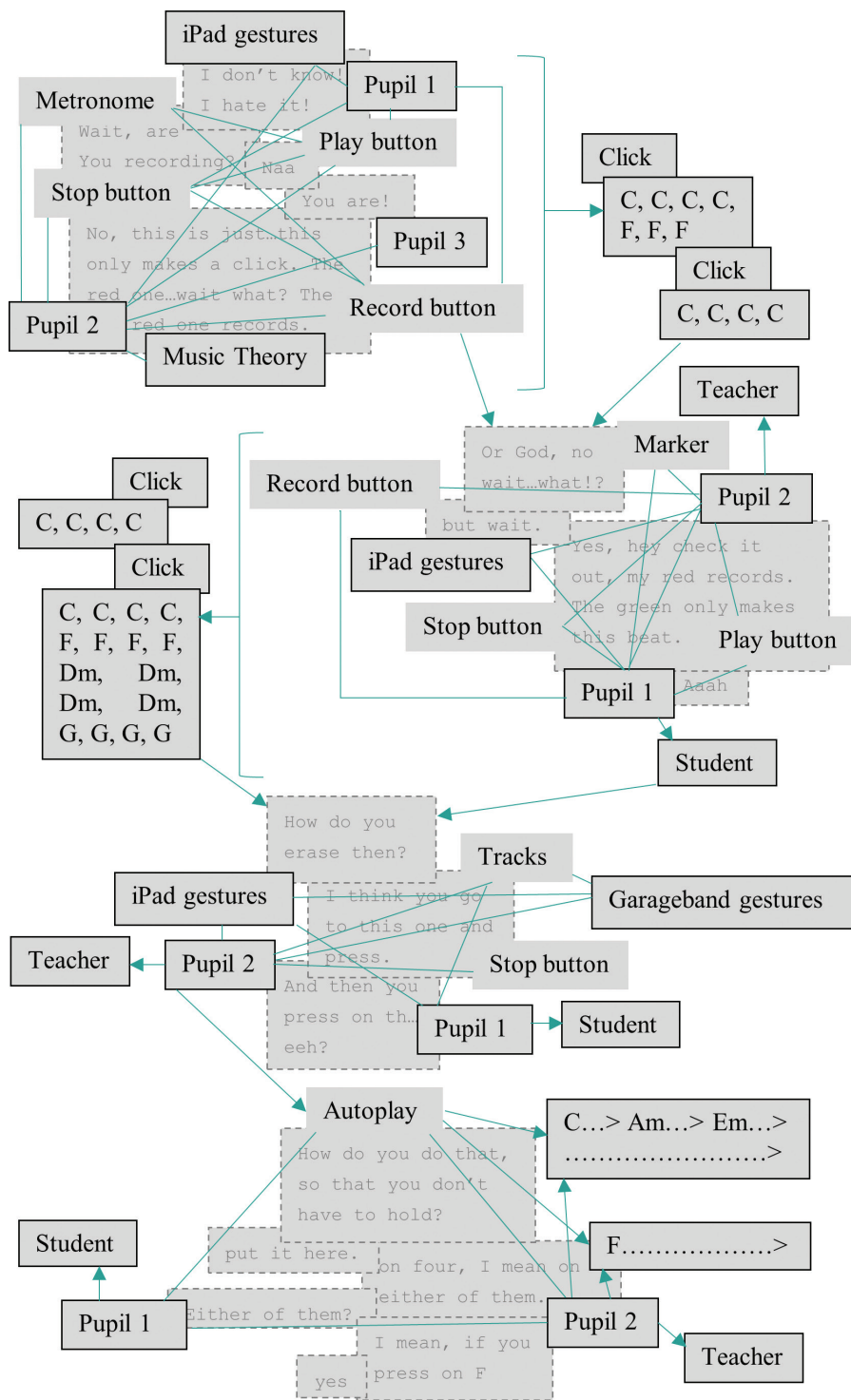


Figure 9. Composition 3: The duo/quartet multiplicity (part 1)

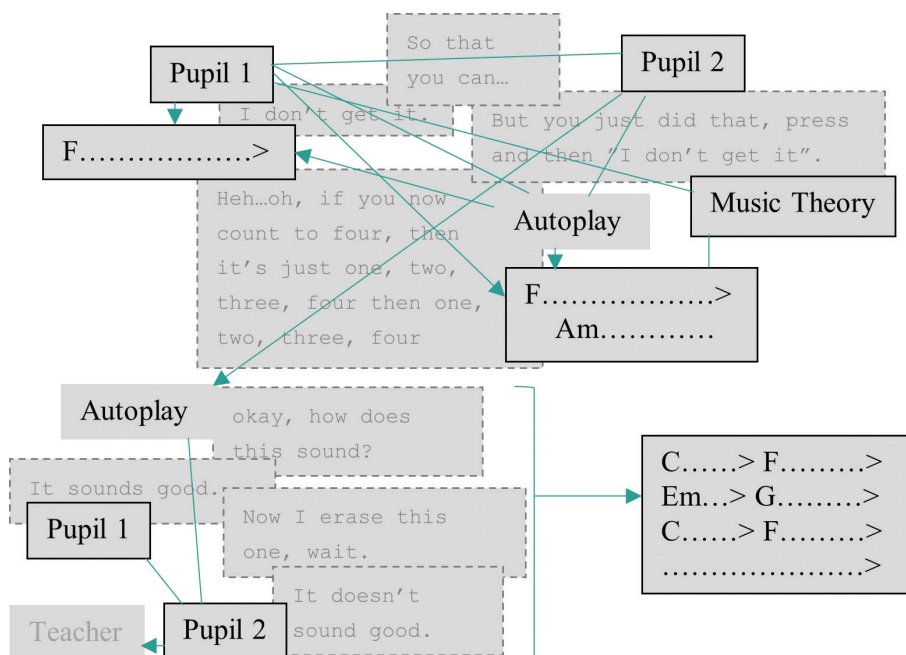


Figure 10. Composition 3: The duo/quartet multiplicity (part 2)

Recapitulation

The three compositions are examples of common activities and groupings that occurred during the four-week composing assignment period. Each assemblage is particular, and outcomes are irreducible, making generalization impossible. Also, each selection could have played out differently, depending on the diffractive outcomes of the intra-actions. Slight changes can make slight differences, or large differences in the outcomes. The compositions or schemes of connections and becomings in activities, also become actants that can be intra-acted with recursively. They are performative; however, in this fixed form, they become examples of fluid time frozen to enable elicitation of relations and what *can* become in learning activities involving digital actants. Hence, embodiment and participatory aspects are versatile and intra-related within human/nonhuman assemblages, as well as meaning-making aspects become diffracted and pluralistic. The versatility of outcomes becomes pronounced in composition 2 and 3. Although the pupils were given the same assignment with a similar review lecture, outcomes differ depending on which mediating actants emerge in the assemblages, and which actants intra-act to diffractive effects.

Extended meaning is generated when recomposing the transcription tables to nonlinear assemblages. When transcribing workflows in complex activities to written text, causality can easily be read into the result. Utterances or actions emanating

from one human make a certain effect that generates a certain outcome. To avert this linear thinking and preconceived understanding of learning activities, the assemblages instead group actants that become mediators and their relations in the performative activities of composing music. The outcomes of these groupings are hybrids of mediators in fluid relation to each other that are performed in nonlinear, “messy” activities.

Material/cultural utterances were created in the transcription table as a way to speak through and as nonhumans (Adams & Thompson, 2016; Michael, 2004) to acknowledge and emphasize them as actants within activities. However, to turn away from the risk of anthropomorphizing things (Thompson & Adams, 2020), the performative act of recomposing assemblage compositions actuates nonhumans within the hybrids and lets them do their work. Also, this actuates a turn from representation of the nonhuman to performative doings. The compositions can uncover and display the “flatness” of activities where human and nonhuman equally become within the hybrid entanglement of which doings and outcomes are irreducible from.

Coda

With compositionism the intent is to build, construct, or compose something new from a critique of the formalist view of compositions (Maes, et al., 2018) as emerging from human singularities. The autopoietic (Haraway, 2016) understanding of music composing and its outcomes is insufficient. When digital actants are proliferating, extending, and invading every practice we partake, they become mediators (Latour, 2005) of new meanings. Engaging with compositionism is an attempt at finding new understandings in entangling research and art making practices to rupture preconceived understandings and allow complexities (MacLure, 2006) in learning activities.

Although studies have acknowledged musical compositions for the affiliation between human, material, and/or cultural aspects (Brooker & Sharrock, 2016; Folkestad, 2004, 2006; Maes et al., 2018; Schmidt-Jones, 2018), this study intensifies this relationality of compositions to sociomaterial hybrids. The duo/quartet multiplicity assemblages and its musical outcomes as irreducible to singular entities, emerge recursive engagements with previous experience in working with Garageband, music theory, and/or music composition as actant. When there was limited previous experience, the enhancement/veiling of musical features in software (Jennings, 2007; Schmidt-Jones, 2018) reduced pupils to intermediaries, transporting information from one function in the software to another. Learning becomes hardware/software specific and bypasses the subject matter as becoming actant in activities. In this case, learning becomes-with (Haraway, 2016) Garageband as teacher, generating the inexperienced learner’s outcomes as specific situated intra-actions with the situated software. Gestures that are both musical and hardware specific (Bell, 2015)

allow for the emergence of agencies, experiences, and embodiments other than traditional musical instruments. Also, previous experience entangles “inside/outside” of music education (Chen, 2017) which further diffracts learning experiences from recursive engagements with the same educational subject matter which becomes palpable in assemblages of composition 2 and 3. The expanding multiverse, the rhizome of material possibilities (Ferrando, 2018; Lum, 2017), here becomes hybridized and specific, making the “equal” in music composition education an acknowledgement of personalized situated entanglements.

Attentiveness to what the learning matter becomes within the hybrids when engaging digital hardware and software is of importance. By inviting more actants into the music composing activity, pupils in the heterogeneity ensemble intra-acted with the learning matter in different and diffractive ways. The pupils in the duo/quartet multiplicity are instead involved entirely with the intra-actions in the hardware/software, making music composition learning limited to that specific assemblage. The extent to which the assignment is adapted to the hardware/software actant will also affect and delimit outcomes (Gemeinboeck, 2020). Proposedly, two or several assignments to intra-act with, that change intra-action patterns with the software could be available to extend possibilities for all learners. The diffractive outcomes that emerge from different hybrids can furthermore become part of the intended learning matter. Outcomes become actants that can be further intra-acted with in extended learning activities. Furthermore, material actants such as musical instruments can extend the digital intra-action to other embodied experiences, and increase the affiliation possibilities (Folkestad, 2004, 2006; Maes, et al., 2018; Schmidt-Jones, 2018).

The nonlinear logics that emerge from the compositions of assemblages suggest a performative turn (Maes, et al., 2018) to understanding of composition outcomes. When learners with limited experience in creating music are involved in music composition activities, they need opportunities to engage with differentiated musical cultural and material actants. To increase the experience of differentiated intra-actions with differentiated material and cultural actants, a pupil’s own musical ideas (Skolverket, 2018) can emerge as an actant in the matter/nature/culture learning entanglement. Learners with more experience and proficiency are more likely to incorporate their past into the now to diffracted outcomes although keeping their mediating capacity. Hardware/software specific music composing can on the other hand be seen as extending possibilities (Folkestad et al., 1998; Martin, 2012; Winters, 2012) of intra-action for both inexperienced and experienced learners when proficiency in traditional musical instruments is not needed. Furthermore, learning the hardware/software (Brooker & Sharrock, 2016) will not obviate its capacity as mediating actant in situated hybrids of music composing. The duo/quartet multiplicity and the heterogeneity ensemble provide examples that features in digital music applications are not merely resources for human action (Bandlien & Selander, 2019), but actants in irreducible meaning-making assemblages of music composing.

Making meaning of diffractive outcomes of digital music composing activities as hybrids emerging from assemblages can become extended possibilities for teacher planning when inviting actants into play. In addition, for learners in school, opportunities increase to become capable mediators in music composition activities, extending possibilities in the multiverse, if diverse musical actants are offered.

Author biography

Jonas Asplund is currently a PhD student at Stockholm university with research subject in music education and special interest in digital music composition and posthumanism. Jonas has for 20 plus years worked as a teacher within music education in Sweden including cultural school, compulsory school, secondary school, and university levels. Also, in tandem, Jonas is a freelance composer within contemporary classical music and electro-acoustic music including various collaborations over the years with ensembles and musicians in Sweden and elsewhere.

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