

Flexibility and Predictability: Change, Furniture Arrangements and Pedagogical Communication

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Non-traditional learning spaces have been a trending topic and investment opportunity during the last decade. Ostensibly their novel material settings promote active and flexible learning. This article traces the furniture layouts utilized in curricular teaching during three semesters across the first five years of use of an 80-seat non-traditional learning space in University of Helsinki, Finland. We examine space and pedagogical communication as a deleuzoguattarian arrangement; we present a tension between social, organic, and physiochemical predictability and a limited, yet observable drive to change furniture layouts to promote particular kinds of pedagogical communication in curricular teaching.

Introduction

Change in learning environments, particularly towards something implicitly desirable, has been a popular topic during the last decade. Moreover, many terms have been proposed to distinguish these new learning environments from their predecessors. Terms like Innovative Learning Environment (ILE), Modern Learning Environment (MLE), Flexible Learning Environment (FLE), and New Generation Learning Space (NGLS) (Benade & Jackson, 2017) have appeared in policy documents and national education reforms (for example Niemi, 2020) as well as in academic publications as monikers for building and retrofitting initiatives. Subsequently these terms have become part of the general discourse. We would add Engaging Learning Environment (ELE) (Lonka & Ketonen, 2012), Active Learning Classroom (ALC) (Eickholt, Johnson & Seeling, 2020, p. 1) and Smart Learning Environment (SLE) (García-Tudela et al., 2021) to the list as they too build upon an apparent tension between the changing needs and practices of contemporary learners ill-served by allegedly outdated or even obsolete structures and practices of learning institutions from primary to higher education (for example Benade, 2017). Therefore, we prefer the term non-traditional learning space (Vangen, 1998; Campbell et al., 2013; McPherson & Saltmarsh, 2017) as it semantically includes the cultural element and the relation to what came before both in activities and material conditions. As Mulcahy and Morrison (2017) write, oftentimes such terms are defined to include interconnected, but perhaps ontologically distinct material and social elements. These elements include but are not limited to: building architecture, furniture, and digital

technical devices as well as practices, routines, terminology, and culture (Niemi, 2020).

Our goal here is to explore the workings of these interconnected elements and the ways in which material conditions form and express the desire to change pedagogy, particularly pedagogical communication. These interconnections of elements seem to include a kind of circular thinking or reciprocal influence. New pedagogies require new material settings which in turn produce new pedagogies. However, in practice the modulatory control of material artifacts (Mulcahy, 2016; Charteris et al., 2017) does not have a performative effect on their users in such a deterministic way (Niemi, 2020). As cybernetician Heinz Von Foerster put it in 1972, we are dealing with “essentially nonlinear systems whose salient features are represented by the interactions between whatever one may call their ‘parts’ whose properties in isolation add little, if anything, to the understanding of the workings of these systems when each is taken as a whole.” (Von Foerster, 1981, Emphasis in the original).

Changing pedagogical communication in and through non-traditional learning spaces

Interactions are our focus in several ways: Firstly, our primary interest is pedagogical communication, an exclusively social operational (Luhmann, 1989) action between two or more entities (Luhmann, 1995, pp. 98, 137-8) with a twofold premise of actualizing expected change utilizing the asymmetry of knowledge in the participating entities. (Körner & Staller, 2018). Secondly, the rationale of non-traditional learning spaces as described above is wrought around making some actions possible and desirable enough to be chosen instead of other possible actions. In other words, change or novelty is produced by

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relating elements in particular ways through communicative processes (Luhmann, 1995) and non-traditional learning spaces are pedagogical communication about pedagogical communication. Therefore, lastly, we are dealing with processes of distinguishing, selection, and meaning-making involving a variety of material and immaterial elements, psychic as well as social systems.

To study change in the various configurations and flows of interconnected ideas, artifacts, technologies, actions, and practices in the workings of a non-traditional learning space, namely Minerva Plaza, we employ the process philosophy of Deleuze and Guattari (Smith & Protevi, 2020). The reasons are threefold and concern ontology, methodology and terminology. Firstly, Deleuze and Guattari provide us an ontology for looking at processes and change in de-centred networks of relations of diverse entities. In other words, becoming flexible, open, modern, active, or effective as an ongoing process of “ceaselessly establishing connections” (Deleuze & Guattari, 2004) instead of a product of a previous process, such as retrofitting. As Mulcahy and Morrison (2017) put it “notions of learning space as a pre-existing framework in which learning unfolds give way to approaches which view it as dynamic, emergent and participatory.”

Secondly, Deleuze & Guattari, (2004) stated a preferred methodology “Make a map, not a tracing,” which we interpret as a way of retaining the flexibility, openness, and effectiveness of the possible relations and flows. Moreover, as a question of method, tracings should always be put on the back of a map (Deleuze & Guattari, 2004) to counter the artificial reduction of possible flows and connections. For us, this is particularly important in order to understand what relations were possible but not actualized as we will elaborate in the section on methods discussing the cartography we employ. Lastly, the work of Deleuze and Guattari, especially *A Thousand Plateaus* (2004), provides us with a rich network of concepts and ideas for studying change (Smith & Protevi, 2020). Concepts such as assemblage and approaches like Actor-Network Theory are employed in studies on learning spaces more often than Callon, Law, or Latour, not to mention the influence of Serres or Deleuze and Guattari (see Blok & Jensen, 2012, Crawford, 1993).

In this study we rely primarily on the concepts of strata, territorialization, and arrangement to study the use of moveable furniture. Arrangement is an alternative translation of agencement (layout) (Phillips, 2006), the original term used by Deleuze and Guattari (1980). Perhaps a more common translation is assemblage (Acton, 2018; Mulcahy, 2016; Mulcahy & Morrison, 2017; Carvalho & Yeoman, 2021). Nevertheless, we prefer arrangement as we are primarily looking at literal arrangements or layouts of

furniture, even though we are interested in the ways in which they come to exist, how long they exist and what takes them apart. Thus, it may be useful to approach a deleuzoguattarian (relating to, or characteristic of the works of Gilles Deleuze and Félix Guattari) arrangement more as a process taking place over time than as a thing. Strata in turn, are hierarchal bodies of ordered matter (Smith & Protevi, 2020), articulations of coded and formed substances as elaborated below with different subdivisions and ways of moving between content and expression as well as different ways of drawing substances into the strata.

In this study we draw upon an approach presented by Abrahams (2019) that articulates how a machinic arrangement interacts with physiochemical, organic, and linguistic or social, as Smith & Protevi (2020) call it, strata of architecture, and relate it to pedagogical communication. Arrangements belong to the strata but occupy a territory with their semiotic and pragmatic systems and simultaneously have a propensity to go somewhere along their individual lines of deterritorialization.

Thus, we analyze the processes of ordering substances, such as pieces of furniture, through the processes of coding and stratification, congealing into, at least momentarily, stable hierarchal bodies, from which arrangements stake out territories and which of those arrangements also deterritorialize. Moreover, only in arrangements is there a distinction which enables expression and content articulated by different strata to become semiotic and pragmatic systems (cf. Luhmann, 2006). We discuss this distinction further below in conjunction with social strata.

Drawing on Abrahams (2019) in the physiochemical strata the substances are selected and formed based on desired functions (articulation of content) and how the design should look (articulation of expression). These articulations may be de- and re-territorialized by semiotic and pragmatic considerations like procurement policies, available funds, or relations with other strata. For example, the design of Minerva Plaza as shown in Figure 1 called for triangular single-person tables equipped with wheels, which could be moved by a single person and arranged in groupings of different shapes. Both were desired functions and the latter also articulated expressions. However, due to available resources the Plaza was furnished with large rectangular wheel-less tables with folding legs. This induced a need to redesign the furniture layout and thus re-territorialize the arrangement. Most of our observations focus on the physiochemical strata.

In the organic strata we concentrate on the organic entities like individuals and groups populating the physical space and using the furniture. We focus on groups as we are interested in the ways that the furniture is used in constructing the physical space for and during teaching. We

assume conference poster sessions, PhD thesis defenses, meetings, and teaching events to be different from each other both in terms of content, form, and expression, whether it observably affects the furniture layout or not. A profound difference between physical and organic strata is the independence of form and expression in the latter (Abrahams, 2019; Deleuze and Guattari, 2004). As a rough example, in a PhD defense the individuals comprising the audience or occupying the formal positions of defendant, opponent or custodian, do not matter much to the organic or physical expression of the code and form of a PhD defense, in other words how the participating bodies relate to each other. To some extent, this may also be true in cases where the actions of individual participants may severely de-territorialize the event. For example, in PhD defense on a politically volatile subject additional security measures and evacuation plans were in place in case one or more audience members would disrupt the event.

For the purposes of this study, the social strata are particularly interesting in terms of staking out territory and thus actualizing an arrangement. For Deleuze and Guattari, the sign always precedes a territory (2004) and only in social strata regimes of signs take form. Similarly, for Luhmann (1995), a social system’s closure hinges on its “own possibilities for negation while producing its own elements”. For example, some uses of Minerva Plaza were communicated as wrong in the sense of reproducing “traditional” pedagogy and therefore appeared to be signs of insufficient understanding of the Plaza as an arrangement aiming to change pedagogy. This also takes us back to the unactualized hopes of deterministic transformation of pedagogy that we discussed earlier. Therefore, we are interested in the connections between actual states or processes in the physical space and whether they are claimed to signal or represent engaging learning or flexibility. In other words, the meanings given to certain furniture layouts or changes in them.

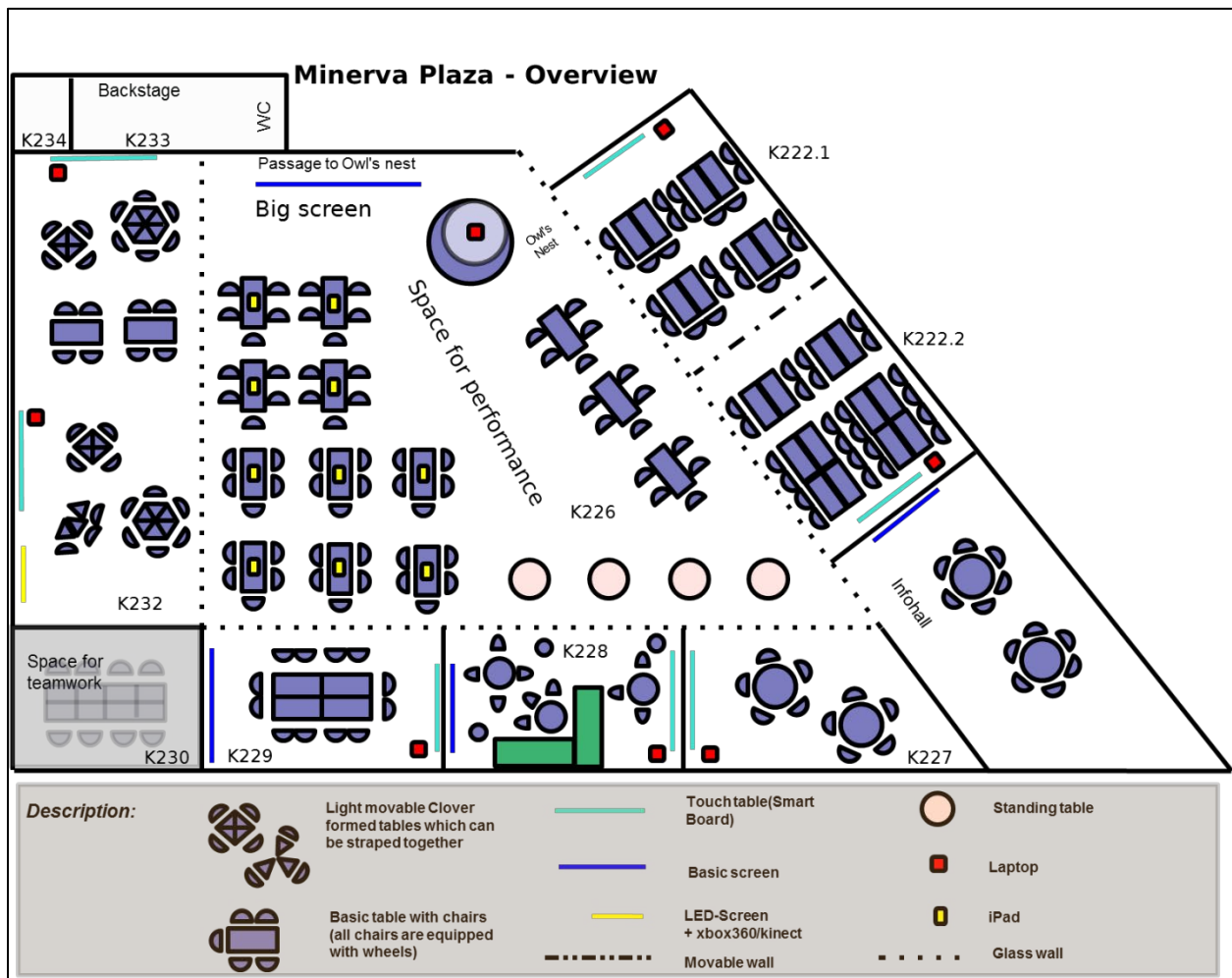


Figure 1. An initial design diagram of Minerva Plaza

Minerva Plaza as a delezoguattarian arrangement

Minerva Plaza has been described as a technology-rich learning environment with explicit guidelines and instructions to carry out learning activities emphasizing learner participation and collaborative knowledge construction (Ruismäki, Salomaa & Ruokonen, 2015). The Plaza was labelled as an Engaging Learning Environment although other monikers listed in the Introduction could be appropriate. As an arrangement, the Plaza underwent a major de- and reterritorialization. Originally the rooms were a part of the faculty library in the central indoor courtyard of Minerva Building which opened in 2005. In its current repurposed form Minerva Plaza consists of a big central space surrounded by five smaller rooms separated from the central Plaza with glass walls. There are also a lobby and a small backstage area as depicted in Figure 1. The height of the space and a maintenance gallery on the top floor provide exceptional possibilities for recording from a bird's-eye perspective as explained in this study. On the other hand, the combination of height and vertical glass surfaces produce room acoustics ill-suited for unamplified speech.

Theories of learning built into the design of Minerva Plaza

The design of the Plaza draws primarily on two theoretical models concerning learning. Lonka and Ketonen (2012) call their take on active learning engaging learning. Engaging learning weaves together the participants' emotions, prior knowledge, the sequencing and materialization of diagnostic and knowledge building acts, as well as goals and assessment. Communication through multiple channels and working in contexts that simulate real life are important throughout the process. (Lonka & Ketonen, 2012). The engaging learning model concentrates on face-to-face teaching of large groups which have been typically taught by lecturing *ex cathedra*. Lecturing is possible and often done on the Plaza, even if the layouts both in the Main Plaza and the adjoining rooms are usually designed to facilitate group work in different groupings.

The second model is Knowledge Practices developed by Hakkarainen (2009) and his colleagues. This model draws from the Knowledge Building theory developed by Bereiter and Scardamalia as well as their work on Computer Supported Collaborative Learning since the 1980s. (For example, Scardamalia & Bereiter, 2014) The model of Knowledge Practices emphasizes that "genuine knowledge advancement" has a material basis in the intermixing of meaning and material. Thus, Hakkarainen argues that it is essential to account "the evolution of heterogenous networks of people, technologies and physically embodied as well as

mentally represented epistemic artifacts." (Hakkarainen, 2009).

Minerva Plaza as a physical learning space

Let us look at the ways material and meaning are intermixed in Minerva Plaza as an arrangement and within its various strata. Figure 1 above displayed the initial design of the Plaza with its emphasis on using groupings of different sizes both on the central Plaza as well as in the adjoining rooms. We spotlight three aspects of Minerva Plaza: firstly, the audio-visual equipment has been designed and adjusted to remedy the acoustic characteristics of the space in relation to working in different groupings. The height of the space combined with damping materials on the walls help to keep discussions intelligible in small groups even when sound pressure levels are over 70 decibels. On the other hand, hearing unamplified speech is difficult from different corners of the central plaza so throwable microphones are a boon. Secondly, the Plaza aims to bridge a gap between the ways of working with knowledge that the youth of today employ in their lives and the ways employed in university teaching. This bridging relies mainly on synchronous network-mediated communication using mobile devices. For a more contextualized description of Minerva Plaza, please see <http://vimeo.com/channels/minerva/80450165>. Lastly, technical-pedagogical support is provided on the Plaza, which has been reported as crucial for successful use (Sandström & Nevgi, 2019) and has helped to accumulate, aggregate, and spread know-how over time and through different strata.

Although the furniture used differs somewhat from the original design, they still are reasonably movable. Nearly all the pieces of furniture can be moved by one person, the rectangular tables and the smaller chairs can be stacked. However, there is a substantial difference between the triangular wheeled tables in the plan and the rectangular tables on the Main Plaza. The former can be pushed around as they are lighter, have small wheels, and therefore accommodate people without the lifting capacity the 140x69 cm rectangular tables weighing some 15 kilograms demand.

Research Questions

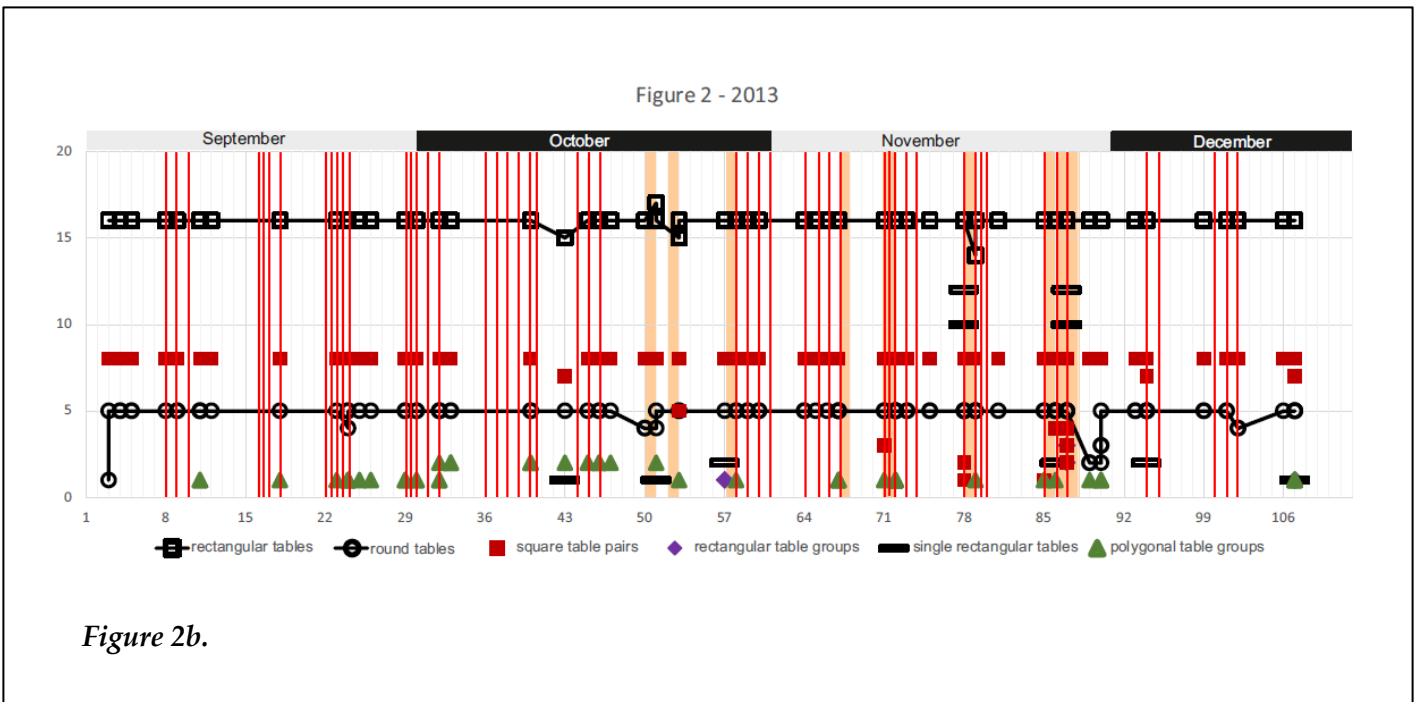
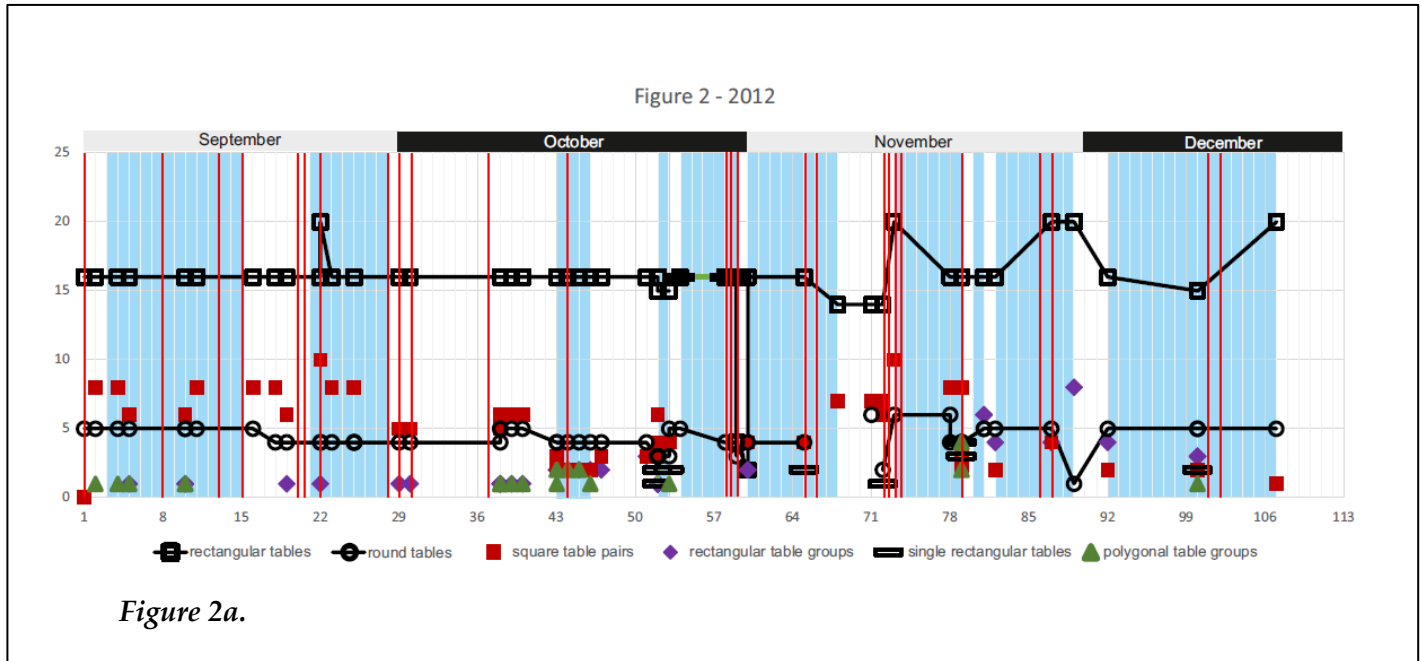
So far, we have introduced the increase of interest towards the non-traditional learning spaces in higher education, established a theoretical framework to study the use of flexible furniture as a delezoguattarian arrangement and presented Minerva Plaza as the arrangement we wanted to observe. Through the study of when, how, and by whom the capacity to change the furniture layout put into use we aim to further our understanding about what kinds of flexibility are desirable concerning the furniture for and during

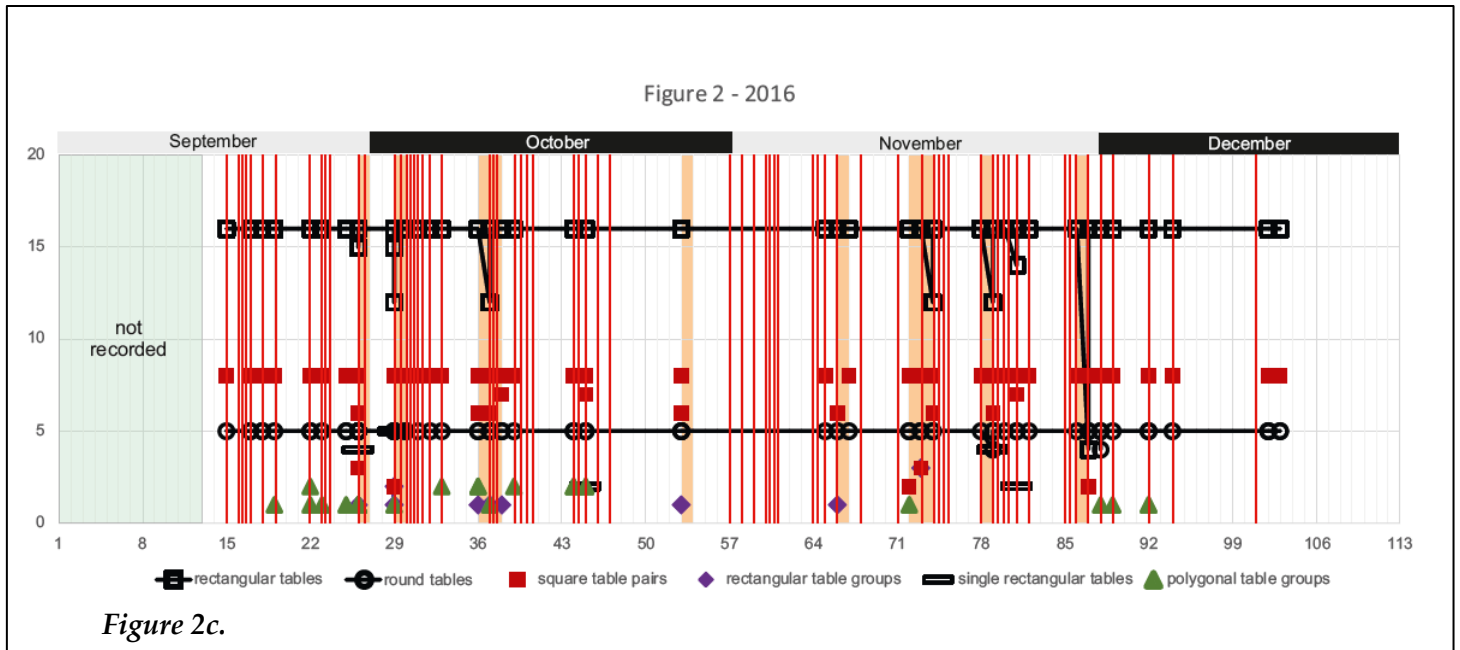
teaching events included in the curriculum. So, in our chosen theoretical approach we are primarily interested in de-territorialization, which we analyze by employing cartographic methods to answer the following:

- I. Do curricular teaching events produce changes in the furniture layout and how long do they last?
- II. What are typical or re-occurring features of arrangements concerning furniture?

Method

To study the processes of territorialization involving the movable furniture, we employed observation-based digital cartography as a method of inquiry. Thus, all descriptions, analyses, and interpretations were rooted in observations; most of these observations were stored and processed digitally to produce maps of the furniture in Minerva Plaza. This involved developing an appropriate method which is elaborated in a separate forthcoming text.





In this section we give an overview of the cartographic method adapted from Cartography of Controversies - a particular flavor of Actor-Network Theory (Venturini, 2010) - after which we briefly discuss the consequences of working digitally. We also describe the acquisition and content of initial research material and how the actual data were selected and produced. Lastly, we examine the key ethical considerations of this study.

Digital social cartography as presented by Venturini (2012) consists of the following tasks: 1) observing the actors, 2) tracing the relations between actors, 3) creating enough maps of matters of concern to represent the voices of all the actors, and 4) aggregating information to make things more orderly and easily understood, even though this means actively omitting information and reducing the richness of the observations. Moreover, the observations should not be limited to only one theory or methodology and the chain of translations should be retraceable from reported results all the way back to the formalized observations. (Venturini, 2012) To our understanding the requirement for several theories or methodologies lessens the predilection to harmonize observations with theory because of the inseparability of data collection, interpretation, and theory (Wolcott, 1999; Feyerabend, 1999; Ericsson, 2007). Thus, we supplemented the deleuzoguattarian process philosophy with Niklas Luhmann's work on social systems. Methodology-wise the idea of second-order observation is drawn from second-order cybernetics (von Foerster, 1984; Pask, 1996). We describe the practical procedures of working with data in the section titled Analysis.

In the following we will elaborate on tasks one to three. The first task, observation, comprised time-lapse video

recording and fieldwork. We traced the relations between actors in space, time, and by the type of activity. The spatial tracing included selecting and manipulating images of the different furniture layouts. The duration of each layout and its relation to events held in Minerva Plaza were traced by adding metadata to the time-lapse recordings by creating new versions of the video files as well as annotating the new video files as described below. Adding metadata also created the first map as connections between different parts enabled traversing between points in data. We aggregated the data by a) creating additional maps of the furniture layouts and b) adding explanations collected during the fieldwork. The additional maps included superimposing line drawings of all the layouts during one semester into summarizing images (Figure 3) and combining layout descriptions and event data into graphs (Figure 2) presented in the findings.

Data: collection and production

The primary data for this article were time lapse recordings shot from a birds-eye perspective during the autumn terms 2012, 2013, and 2016 in order to outline the transition from project-resourced development and use into established use without additional support or development resources. In autumn 2012 there were three part-time support persons available on the Plaza and the different strata were still adjusting to one another. In 2013 one full-time support person had been hired and the Plaza had been open for reservations during the planning phase of the academic year. So, this was the first year of organisational stability on the Plaza; 2016 was the first year a dedicated

		Initial duration	Edited duration
Primary	Time lapse recording 2012	162901 frames (1:48:36:040)	99121 frames (1:06:04.840)
	Time lapse recording 2013	154323 frames (1:42:52:920)	94085 frames (1:02:43.400)
	Time lapse recording 2016	150997 frames (1:40:39.880)	86896 frames (0:57:58.56)
Auxiliary	Opening ceremony	87410 frames (0:58:16.400)	23838 frames (0:15:53.520)
	Introduction to Minerva Plaza 4th December 2012	0:28:50	0:28:50
	<i>Field notes between September 2012 and December 2014</i>		

Number of events / minor & major layout changes	27.08. – 18.12.2012 [[SEP]]64/ 74 & 22	04.09. – 18.12.2013 [[SEP]]90 / 112 & 24	19.09.- 18.12.2016 [[SEP]]90 / 46 & 26
Teaching events	26 / 9 & 2	51 / 11 & 2	68 / 13 & 5
Conferences and seminars	5	8	5
Other events	33	31	17

support person was no longer available on the Plaza although support was still provided.

To produce the actual data, we edited and post-processed the records semi-automatically into two new video files. All Sundays and nights between 11 pm and 6 am were removed because the official open hours were from 8 am to 8 pm, Monday to Friday. Some events were held on Saturdays, by special arrangement; we wished to include the possibility of late-night or early morning setup activities. During post-processing we added the date, time, frame number, and name of the source video file as superimposed text on each frame to make spotting and tracing problems easier both during and after post-processing.

Analysis: digital cartography of video recordings

This section elaborates on the processes of combining, filtering and (re-)presenting information to find the changes in furniture layouts and trace their conception and lifespan as reported in the Findings section. To increase clarity, we describe tracing the relations between actors, creating maps, and aggregating information separately even though they were closely intertwined during the analysis. The initial tasks were to find the changes and connect the information about the reservations and the video recordings. We did this by annotating each change and each reservation on the

timelines of the time-lapse videos with ELAN software. By annotating we mean adding hyperlinks and metadata. ELAN requires all annotations to have a starting and ending point and thus a duration. Therefore, by annotating (1) each furniture layout, (2) all acts of moving furniture, (3) all official reservations recorded in the reservations database, (4) lists of the furniture use in the layout, and (5) freeform observations, we created a reasonably accurate temporal map of both changes in layout and actors involved in each change

Table 2 presents the number of annotated events during each semester. We only annotated events found in the reservations database. Therefore ad hoc visits and meetings of the design team are not annotated as events, even though they may have changed the furniture layout. These unannotated events together with all-day events changing the layout as many as four times, increase the number of layouts in relation to the number of events.

Another increase is visible in the number of teaching events which is partially explained by the fact that room reservations for 2012 were already completed when Minerva Plaza could be advertised, let alone booked. The number of other events during 2012 reflects the number of grand tours to both faculty and visitors.

To better grasp each layout in relation to all the layouts we performed two separate comparisons. The first comparison focused on the expression articulated by the arrangement and involved extracting a still image of each of the 251 layout variations and viewing them traced into single images together with a grid of thumbnail-versions of the images comprising one semester. To aid the comparison we selected a frame with ample light and no people visible whenever possible. By temporarily reducing the amount of detail we could get a good overview of the long-term development of layouts and their variations, but the temporal distribution of variations was reduced to order of appearance.

The second comparison focused on the content of the arrangement. We performed the comparison with the annotated descriptions of each layout variation to gain distance from visual information by relying exclusively on text. Creating these annotations also served as a quality control for the initial annotations as we had to enumerate all the furniture and compare each layout variation with the one

preceding and following it. Because the annotations had temporal intervals readily available, we created graphs depicting the changes both in the quantity of deployed pieces of furniture, possible groupings, and shifts from one idea to another during both semesters. The result is Figure 3 in the Findings section.

Ethical Considerations

The most pressing ethical issue in this study was the combination of several hundred participants and the Finnish legislation which considers images and audio recordings which enable the identification of a person to be treated with the same limitations as social security numbers and other personal information. This included the responsibility to inform each person about what is collected and how it will be used and stored pre-GDPR. Procuring consent forms from all the participants involved in months of non-stop recording was not a feasible solution. Fortunately, the resolution, perspective and time-lapsing of the video recordings prevented reliable recognition of individuals without additional information. In negotiations with the Chief of Security of University of Helsinki we deemed it sufficient to post a written notification about the recording and its purpose outside the room. The notification also included an example frame of the recording with a magnified section showing the resolution of the images. At the time of writing excerpts of the time lapse recordings have been available on Vimeo for several years and no one has contacted us to ask questions or have something removed.

Another issue was the use of the recorded material. Thus, we have promised not to use any of the material in a derogatory or disrespectful fashion. The purpose of this research project is to understand the use of Minerva Plaza, not to judge or condemn any involved actor. This also includes the assessment of individual human actors. Within the University there might be the temptation to use the materials for assessment of personal prowess or quality of teaching, but this has been explicitly ruled out in the notification mentioned above and consent forms of recordings not used in this study. Because of this promise, the theoretical and methodological affiliations either withhold from critique or at least advocate care and restraint in passing judgement. (Serres & Latour, 1995; Venturini, 2010) This does not mean abstaining from interpretations which are not shared by the participants. What we think we owe to the participants as researchers is to produce elegant research which goes beyond summarizing the data or picking out bits with curiosity value (Silverman, 2007).

Findings

What created observable differences in the furniture layouts during autumn semesters 2012, 2013 and 2016? The

answer is put together through dealing with two questions, namely:

- I. Do teaching events produce changes in the furniture layout and how long do they last?
- II. What are typical or re-occurring features of arrangements concerning furniture?

Do teaching events produce changes in the furniture layout and how long do they last?

The short answer is: yes, although not very often, and the lifespan of different layouts varied, as shown in Figure 2. Changes in the furniture layout as well as the amount of teaching events (see table 2) were rather different during autumn semesters 2012, 2013 and 2016. Therefore, they are reported separately. During autumn 2012 changes in the furniture layout seemed to have three reoccurring characteristics: 1) they were carried out for events which were not teaching included in the curriculum, 2) they were mostly done prior to the event, and 3) they were persistent. For example, on October 1st, 2012, a long table for 16 was assembled in the middle of the Plaza for a meeting of some sort. It stayed in place until October 10th, one of the layout stayed in place until October 24th. During the nine days the long table was in place, four teaching events were held in the Plaza. In 2013 and 2016 a default furniture layout was already territorialized as it became mandatory to return the furniture to the default layout after use. Thus, there is one dominant layout visible in Figures 3b and 3c for years 2013 and 2016.

What are typical or re-occurring characteristics of furniture arrangements?

Most of the time the furniture on Minerva Plaza was comprised of sixteen rectangular tables and five round tables. The rectangular tables were most often used to create eight square tables with seating for eight people around each. The relative homogeneity throughout the observed 250 furniture layouts is based both on the pieces of furniture involved and the layout of these elements in the Plaza. Figure 2 below displays the three populations of furniture layouts as a function of time. On the Y-axis are the numbers of different pieces of furniture used in each layout. The change of background color in 2012 shows a major change into a distinct layout idea like moving from groups of two tables into lines of tables or an amphitheater setup of chairs without any tables. In 2013 and 2016 the default layout is shown in white and deviations from the default with a color. There were 72 major changes in total during the three semesters. The vertical red lines mark teaching events. Consequently, the relations of the background color and red



Figure 3a.

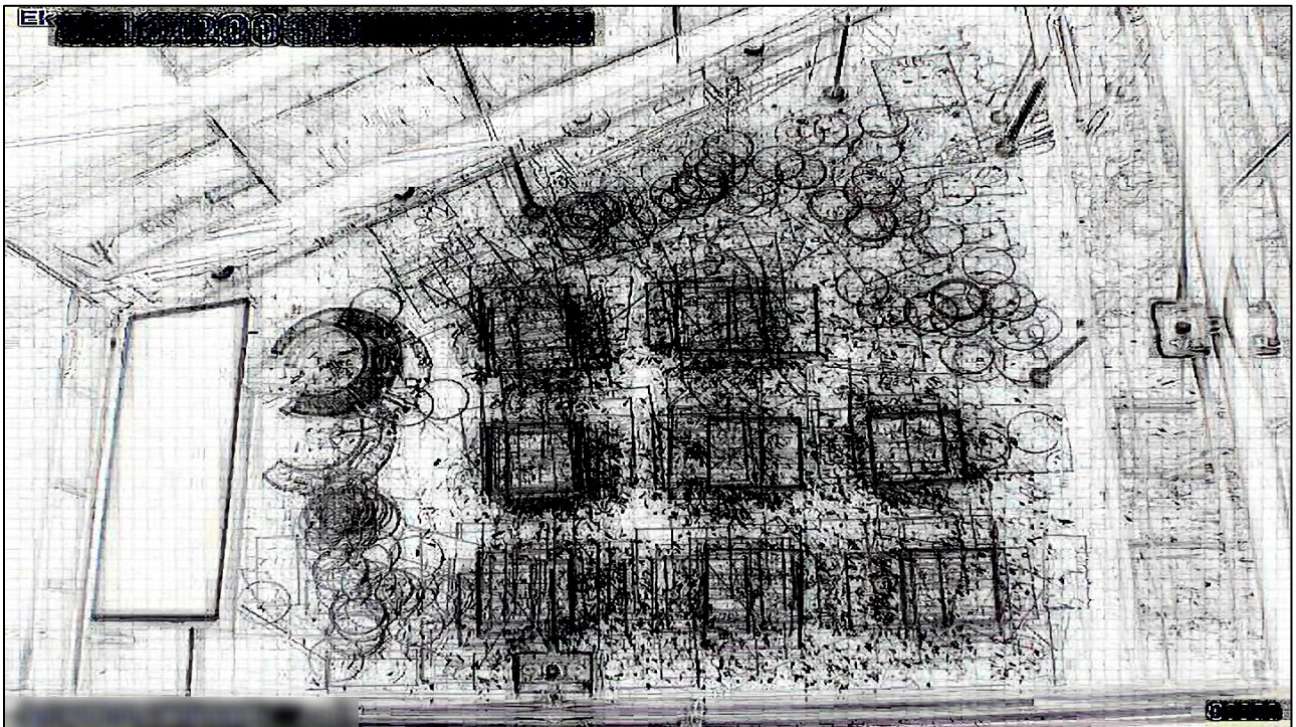


Figure 3b.

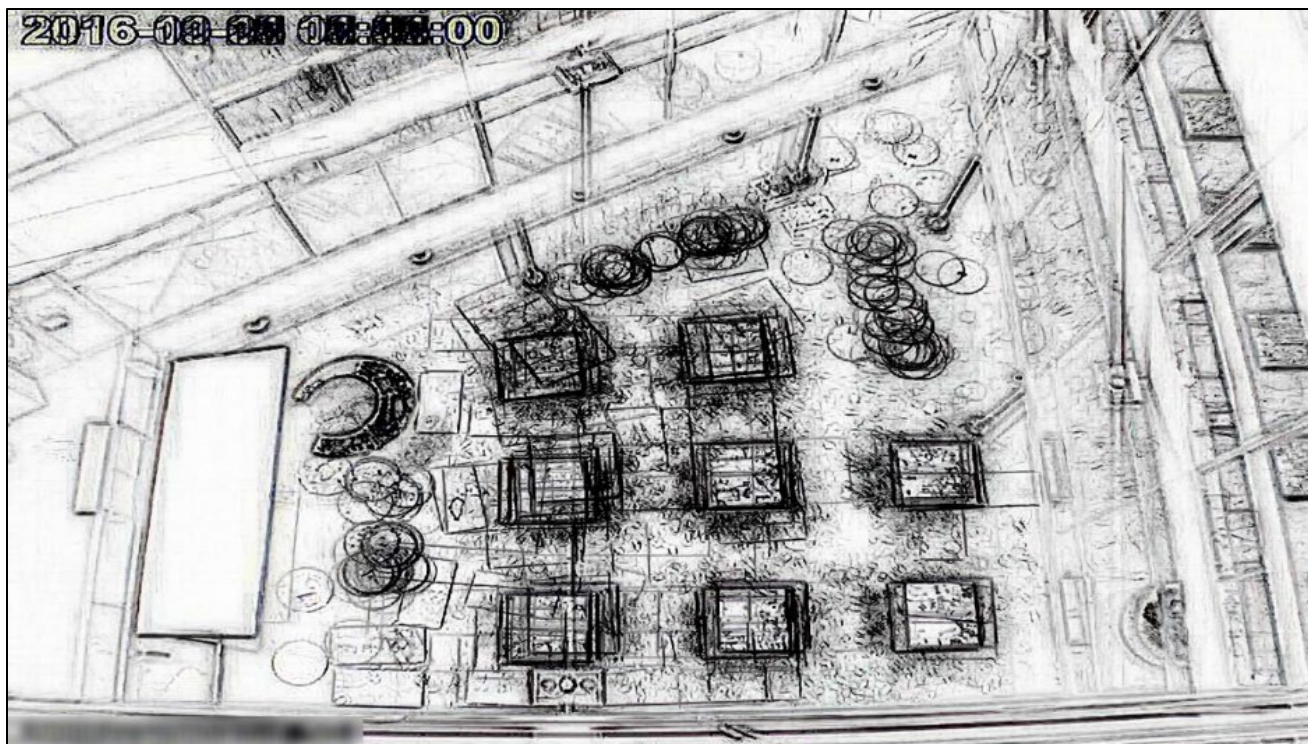


Figure 3c.

lines show the connections between major layout changes and teaching events.

As hinted by Figure 2, autumn 2013 was markedly different from 2012 in terms of physiochemical content and expression, namely the use and layouts of furniture. Changes were no longer persistent as a layout of seven or eight squares comprising two rectangular tables were the territorialized norm. From the beginning of September, the same layout persisted until October 24th when it was altered for a day long unconference for a day and then persisted with minor modifications until November 11th. Altogether 13 out of the 112 layouts during autumn 2013 did not include the seven or eight square table pairs characteristic to the now default layout. In 2016 seven layouts out of 70 were not variations of the default layout. Moreover, the participant involvement in changing the furniture layouts changed in 2013. Thereafter most changes were undone by the participants at the end of the event even if it meant working overtime, as they were required to restore the default layout. This is visible also in Figure 3 which focuses on the expressive aspect of the furniture by superimposing line drawings of all the furniture layouts on each semester. So, long-term territorialization did indeed happen.

What (de)territorialized the furniture?

When we showed Figure 3 to the coordinator of Minerva Plaza and asked about the reasons behind this development,

he mentioned three key reasons: Firstly, because the iPads available on the Plaza were used in most events, it was very useful to prepare them for whatever use was expected and pass out one or more per table to avoid traffic during the event. In other words, the layout with table pairs expressed a practical physiochemical and organic content. Secondly, most teachers were happy with the default layout. Lastly, very few users had planned a specific furniture layout to facilitate activities during their event. Thus, the dominant layout seemed to have become coded into Minerva Plaza and helped to reduce contingency in physiochemical, organic, and social strata without irritating the users enough to desire change or novelty.

Nevertheless, the furniture was de-territorialized by events with expectations that the current furniture layout did not fit. In a doctoral defense the key reasons might have been tradition and the preordained positions of the participants, an unconference used the fishbowl technique for debriefing and a project kick-off needed to provide seats to more people than the space could house with the tables in use. Altogether, 9 out of the 72 major layout changes were done for or during curricular teaching events. An introductory course to Didactics - what most of the Anglo-American world would call Pedagogy - included furnishing the room in the pedagogical script of one of its lectures. Another course was designed around working in groups of three or four with the furniture laid out into 19 tables with seating for three or four around each. Two drama pedagogy



Figure 4a.

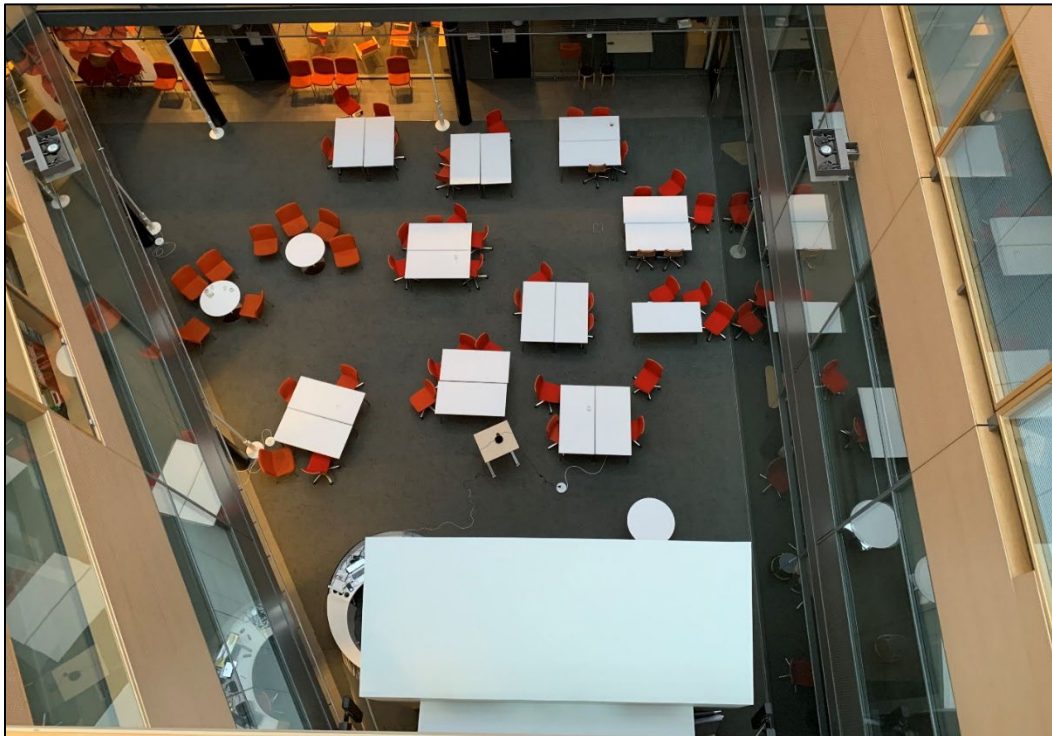


Figure 4b.

events moved most of the furniture aside to create an open space into which a few pieces of furniture were placed to create a specific scene. Finally, one biology seminar in 2013 needed more seating than was available in the default layout. In 2016 three of the five major layout changes for curricular teaching were done during one four-hour teaching event on September 30th, one seminar day used a U-shaped table group and the fifth layout change was restoring the default layout after a trade union event.

Conclusions

This study focused on the changes of furniture layouts in a non-traditional learning environment called Minerva Plaza. Particularly changing the furniture layout for and during curricular teaching events interested us. Our central finding, however, was the consolidation of a default furniture layout comprising seven or eight square tables, which took place during the autumn semesters 2012 and 2013 and was very much in effect in 2016. The key issue is not the reoccurrence of a particular furniture layout during 2013, but the various factors contributing to the process of one layout becoming a territorialized articulation of content and expression. Apparently two tables combined to form a square with seating for six or eight seem to fit most uses of the Plaza both in terms of activities and the number of participants. Or the participants considered adapting to the existing layout to be easier than changing the furniture layout as discussed in the previous section. The wheeled tables shown in Figure 1 were moved much more during our field work in one of the adjoining spaces.

A second and perhaps more profound factor in changing the furniture layouts is their limited importance for learner engagement and receiving the attention of other participants. As Swinnerton (2021) points out, the relationships are more complex. Especially wireless screen sharing and the need to use microphones seemed to change the logistics markedly. The physical location of the speaker was much less important for communication than sharing your screen and holding one of the wireless microphones. Radio transmitters de-territorialize getting seen and heard from the domain of architecture and partially from the realm of wired electronics. Seen from the perspective of audio-visual technical means, however, the logic and logistics do not seem to be radically different from using overhead projectors or computers connected to a data projector with a cable. In all these cases one person at a time can present something visual, even though the time required to switch presenters is much shorter.

The perspective and definition of the time lapse recording used in this study cannot grasp these aspects of the activities in the Plaza observed during our fieldwork and sometimes recorded for other purposes. Nevertheless, additional

inquiry on the structuration and phenomenography of pedagogical communication on the Plaza or similar environments would also help to understand the effect of furniture on pedagogical communication.

The flexibility concerning physical location within the described above relates directly to a limitation of interpreting the findings of this study and implies another. The time lapse used in this study does not capture what is on the screen and the time interval seems to be too long to capture all the movement of the microphones. Therefore, it was crucial to include other forms of observation to have at least some idea of what the time lapse recordings are missing. For example, the course Orientation to Research Work in Education (ORWE) which the first author followed closely as it exploited and pushed the possibilities of Minerva Plaza during each semester, is not special in any way in the time lapse recordings and its use of furniture layouts. Only when one knows what to look for, are the moments of actively exploiting the moveable furniture to orchestrate a certain task glimpsed.

Even with its limitations, this study provides a long-term perspective into the territorialization of learning space as a deleuzoguattarian arrangement and elaborates on some of the complexity involved in claims of producing new pedagogy or pedagogical communication through changing its material settings. Perhaps it would be more accurate to ask whether something is both possible enough and desirable enough to de-territorialize arrangements pertaining to pedagogical communication. After all, the moveable furniture provided both flexibility and predictability. In addition, the furniture was and continues to be moved to promote different forms of pedagogical communication. This includes layouts and groupings altered by changing physiochemical and organic safety measures against COVID-19 infections.

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References

- Abrahams, G. (2019). The Building as a Deleuzoguattarian Strata/Machinic Assemblage, *Architectural Theory Review*, 23:3, 363-379, DOI: 10.1080/13264826.2019.1698397

- Acton, R. (2018). Innovating Lecturing: Spatial Change and Staff-Student Pedagogic Relationships for Learning. *Journal of Learning Spaces*, 7(1). <http://libjournal.uncg.edu/jls/article/view/1556/1225>
- Benade, L. (2017). Is the classroom obsolete in the twenty-first century? *Educational Philosophy and Theory*, 49(8), 796–807. <https://doi.org/10.1080/00131857.2016.1269631>
- Benade, L., & Jackson, M. (2017). Intro to ACCESS special issue: Modern learning environments. *Educational Philosophy and Theory*, 49(8), 744–748. <https://doi.org/10.1080/00131857.2017.1317986>
- Blok, A. & Elgaard Jensen, T. (2012). *Bruno Latour: Hybrid Thoughts in a Hybrid World*. London: Routledge
- Campbell, M., Saltmarsh, S., Chapman, A., & Drew, C. (2013). Issues of teacher professional learning within ‘non-traditional’ classroom environments. *Improving Schools*, 16(3), 209–222. <https://doi.org/10.1177/1365480213501057>
- Carvalho, L., & Yeoman, P. (2021). Performativity of Materials in Learning: The Learning-Whole in Action. *Journal of New Approaches in Educational Research*, 10(1), 28-42. <http://dx.doi.org/10.7821/naer.2021.1.627>
- Charteris, J., Smardon, D., & Nelson, E. (2017). Innovative learning environments and new materialism: A conjunctural analysis of pedagogic spaces. *Educational Philosophy and Theory*, 49(8), 808–821. <https://doi.org/10.1080/00131857.2017.1298035>
- Crawford, T. Hugh. (1993). An Interview with Bruno Latour. *Configurations* 1.2 (1993) 247-268.
- Deleuze, G., & Guattari, F. (1980). *Capitalisme et schizophrénie. Mille plateaux*. Paris: Les éditions de minuit.
- Deleuze, G., & Guattari, F. (2004). *A thousand plateaus: capitalism and schizophrenia*. London; New York: Continuum.
- Eickholt, J., Johnson, M., & Seeling, P. (2020). Practical Active Learning Stations to Transform Existing Learning Environments Into Flexible, Active Learning Classrooms. *IEEE Transactions on Education*, 1–8. <https://doi.org/10.1109/TE.2020.3009919>
- ELAN (Version 4.x.x) [Computer software]. (2013). Nijmegen: Max Planck Institute for Psycholinguistics, The Language Archive. <https://archive.mpi.nl/tla/elan>
- ELAN (Version 5.x) [Computer software]. (201x). Nijmegen: Max Planck Institute for Psycholinguistics, The Language Archive. <https://archive.mpi.nl/tla/elan>
- ELAN (Version 6.0) [Computer software]. (2020). Nijmegen: Max Planck Institute for Psycholinguistics, The Language Archive. <https://archive.mpi.nl/tla/elan>
- Ericsson, Frederick. (2007) Ways of Seeing Video. In Goldman, R., Pea, R., Barron, B., & Derry, S. J. (eds.). *Video Research in the Learning Sciences* (1st ed.). Lawrence Erlbaum Associates. 145-155.
- Feyerabend, & Preston, J. (1999). *Philosophical papers*. Vol. 3, Knowledge, science and relativism. Cambridge University Press.
- García-Tudela, P.A., Prendes-Espinosa, P. & Solano-Fernández, I.M. (2021). Smart learning environments: a basic research towards the definition of a practical model. *Smart Learning Environments* 8, 9 (2021). <https://doi.org/10.1186/s40561-021-00155-w>
- Hakkarainen, K. (2009). A knowledge-practice perspective on technology-mediated learning. *International Journal of Computer-Supported Collaborative Learning*, 4(2), 213–231. doi:10.1007/s11412-009-9064-x
- Körner, S. & Staller, M. S. (2018). Pedagogy of terrorism. Mujahid Guide revisited, *Journal of Policing, Intelligence and Counter Terrorism*, 13:3, 332-344, DOI: 10.1080/18335330.2018.1503700
- Lonka, K., & Ketonen, E. (2012). How to make a lecture course an engaging learning experience? *Studies for the Learning Society*, 2(2), 63–74. doi:10.2478/v10240-012-0006-1
- Luhmann, N. (1989). *Ecological communication*. Polity Press.
- Luhmann, N. (1995). *Social systems*. Stanford University Press.
- Luhmann, N. (2006). System as Difference. *Organization*, 13(1), 37–57. <https://doi.org/10.1177/1350508406059638>

- Phillips, J. (2006). Agencement/Assemblage. *Theory, Culture & Society*, 23(2-3), 108–109.
<https://doi.org/10.1177/026327640602300219>
- McPherson, A. & Saltmarsh, S. (2017). Bodies and affect in non-traditional learning spaces, *Educational Philosophy and Theory*, 49:8, 832-841, DOI: 10.1080/00131857.2016.1252904
- Mulcahy, D. (2016). Policy matters: de/re/_territorializing spaces of learning in Victorian government schools, *Journal of Education Policy*, 31:1, 81-97, DOI: 10.1080/02680939.2015.1099077
- Mulcahy, D. & Morrison, C. (2017). Re/assembling 'innovative' learning environments: Affective practice and its politics, *Educational Philosophy and Theory*, 49:8, 749-758, DOI: 10.1080/00131857.2016.1278354
- Niemi, K. (2020). 'The best guess for the future?' Teachers' adaptation to open and flexible learning environments in Finland, *Education Inquiry*, DOI: 10.1080/20004508.2020.1816371
- Sandström, & Nevgi, A. (2019). From needs to deeds: Where is pedagogy in changing the working and learning environments on a university campus? *Journal of Corporate Real Estate*, 22(1), 1–20.
<https://doi.org/10.1108/JCRE-01-2019-0003>
- Scardamalia, M., Bereiter, C. Smart technology for self-organizing processes. *Smart Learning Environments* 1, 1 (2014). <https://doi.org/10.1186/s40561-014-0001-8>
- Serres, M., & Latour, B. (1995). *Conversations on science, culture, and time*. Ann Arbor: University of Michigan Press.
- Silverman, D. (2007). *A very short, fairly interesting and reasonably cheap book about qualitative research*. London: SAGE.
- Smith, D. & Protevi, J. (2020). "Gilles Deleuze", *The Stanford Encyclopedia of Philosophy* (Spring 2020 Edition), Edward N. Zalta (ed.),
<https://plato.stanford.edu/archives/spr2020/entries/deleuze/>
- Swinerton, B. (2021). Collaborative lecture theatres: Does redesign of teaching space impact on pedagogy? *Journal of Learning Spaces*, 10(3).
<http://libjournal.uncg.edu/jls/article/view/2089/1547>
- Vangen, C. M. W. (1998). The new golden rule. *Buildings*, 92(3), 68-70.
- Venturini, T. (2010). Diving in magma: how to explore controversies with actor-network theory. *Public Understanding of Science*, 19(3), 258–273.
doi:10.1177/0963662509102694
- Venturini, T. (2012). Building on faults: how to represent controversies with digital methods. *Public Understanding of Science*. 21(7),
doi:10.1177/0963662510387558
- Von Foerster, H. (1981). *Observing Systems*. Intersystems.
- Wolcott, H. F. (1994). *Transforming qualitative data: description, analysis and interpretation*. Sage.