MOBILE DEVICES AND SPATIAL ENACTMENTS OF LEARNING: IPADS IN LOWER SECONDARY SCHOOLS

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ABSTRACT

Based on ethnographic studies of students' learning, this paper investigates how new spatial enactments of learning that include mobile technologies engage students in specific ways that enable them to learn. Data used in the paper have been collected in three lower secondary schools (7-9th form, ages 13-15) where students and teachers have been working with a unique combination of iPads and stationary auditorium based screens for collaboration and learning through videoconferences. Videoconferences have been significant for the schools as they are all based in rural areas where cultural institutions, connections to others and local experts are scarce, and where video-based interactions can open up for new perspectives and resources in learning. In the schools tablets have been used both for video interaction and as a ubiquitous personal device for everyday learning in school and at home, providing students with a digital format that is at hand and accessible for learning. Findings of the research indicate that learning is much more flexible, personalized and diverse when students use their tablets to work with knowledge and that new mobile enhanced body-technology relationships contribute to transforming ways of seeing and knowing in schools.

KEYWORDS

Mobile learning, space of schooling, body-technology relationships

1. INTRODUCTION

In a school in a rural part of Denmark, students are communicating in German with other local students through FaceTime on their iPads. The purpose of the activity is to practice basic German vocabulary through real time communication with local peers. The students are part of a project where three lower secondary schools collaborate through videoconferences as part of their learning and where students use iPads as personal technologies on a daily basis (Meyer 2015b).

The students are 7th formers (age 13-14), and their learning space has recently been expanded through the use of video-mediated communication through a unique combination of iPads and stationary auditorium based screens. These technologies are used for a variety of activities in the individual schools but they are also significantly reconfiguring the material and spatial organization of the schools. More specifically, iPads and stationary large screens generate new ways of framing and capturing knowledge and they enable connected presences that challenge the physical presences and relationships of learning in the individual schools. Based on ethnographic studies of students' learning, the paper investigates how these new spatial enactments of learning that include mobile technologies engage students in specific ways that enable them to learn.

2. SPATIAL ENACTMENTS OF LEARNING – INSIGHTS FROM THEORY

Investigating spaces is a complex activity that must consider not only how spaces matter in schooling, but how spaces are practiced and maintained as significant for learning. Following developments within social theory, spaces can be understood as active social practices in which materiality and meanings are performed in specific ways (Burke et al 2010, Fenwick & Edwards 2012, McGregor 2004). Thus, spaces are inhabited

and engaged with rather than predefined, and these enactments of space to a large extent define what spaces become and how they generate social meaning.

Schools are significant social spaces in which different kinds of materials and practices define modes of engagement and learning. According to McGregor (2004) and Lawn & Grosvenor (2005), spaces such as classrooms are relatively stable networks of objects and relationships that are embodied and materialized in specific ways. Classrooms are thus persistent and hegemonic spatial organisations in which practices are maintained and perpetuated over time (McGregor2004, Friesen 2011, Lawn & Grosvenor 2005). However, spaces such as classrooms are also continually changing, being reorganized and redefined through educational reforms and technological change, though some of these changes are more obvious than others (Johri 2010, Nespor 2011).

Spaces such as schools are also increasingly bound up with new media such as smartphones and other mobile devices, as are students' activities in their spare time outside school (Cook et al 2011, Kukulska-Hulme 2009, Richardson & Wilken 2012). Students' use of mobile technologies can affect how spaces are experienced, imagined and practiced, as mobile devices connect to spaces in new ways, for instance through location technologies, social media and video enhanced interaction (Wilken & Goggin 2012). With the introduction of mobile technologies into schools and classrooms spaces are being redefined by the personalized and localized uses students make of them. Students can for instance enhance their mobility, personalize their learning and position themselves in new ways in the classroom by adapting the technology to their current practices and needs (Burden 2012). In schooling mobile devices therefore generally become meaningful within the social spaces that students inhabit in their everyday learning, where devices are drawn into the fabric of everyday activities.

A significant aspect of mobile learning within or outside schools is the body-technology relationship which enables us to see and act in spaces in novel ways. As suggested by Ek (2012) and others, mobile technologies are closely bound up with our embodied engagement in the world, as mobile devices are carried and used in close and immediate proximity to our bodies. Handheld devices thus provide users with dynamic ways of seeing that are embodied and tactile (Cooley 2004, Richardson 2010). With the ubiquity of mobile technology uses in everyday practices the body-technology relation is therefore increasingly becoming a fundamental ontological condition, as seeing, knowing and perceiving becomes mediated through body-technology relations. These bodily schematas (Merleau-Ponty 1964, Ihde 2009) and ways of envisioning and capturing the world significantly alter spatial orientations and involvement through for instance hand-eye-face negotiations and body postures, as when mobile cameras are directed at specific foci of attention in the environment or even at the photographer him/herself in the ubiquitous 'Selfie'.

In classrooms screens of different sizes may be significantly involved in defining spaces and students' orientations within the learning space, for instance through smartboards or personal devices such as pcs. In schools mobile devices such as smartphones may not be as ubiquitously involved as they are in other social spaces, however, portable and personalized devices such as iPads are increasingly gaining access to schools and participating in learning (Meyer 2015a). According to Richardson (2010), windows, frames and screens increasingly affect our ways of seeing as an embodied activity, which influences the corporeal dynamics of social spaces. Technologies such as pcs and television screens have for instance affected our fundamental spatial orientations, as our relationship with these technologies are defined by a frontal ontology where faces and gazes are directed towards the interface of the screen. This ontology, Richardson argues, often turns out differently when mobile devices are involved, as the frontal orientation is compromised by the shifting positions of the body when using portable devices. Micromobility and shifting attention modes therefore define new spatial orientations and ways of engaging in the environment.

In classrooms, new mobilities and body- technology relationships are changing the ways in which seeing and knowing can be practiced, as students work through and on screens of different sizes that organize spaces in specific ways. These relationships potentially change the hegemonic spatial organisations of classrooms, however, knowledge is needed to understand exactly how these new relationships change spatial configurations and thereby learning. In the following, I shall investigate how shifting organisations and relationships between technologies affect the practices of learning and how the involvement of mobile technologies affects students' spatial engagement in different ways.

3. DATA AND METHODOLOGY

Data from the research project described in this paper have been collected in three lower secondary schools (7-9th form, ages 13-15) where students and teachers have been working with a unique combination of iPads and stationary auditorium based screens for collaboration and learning through videoconferences. Videoconferences have been significant for the schools as they are all based in rural areas where cultural institutions, connections to others and local experts are scarce, and where video-based interactions can open up for new perspectives and resources in learning.

In the project, students in all three schools used iPads as a personal device for everyday learning in school and at home. The iPads were continually present in students' learning, whereas telepresence through large stationary screens was an occasional activity where students had to move from their home classes to another locality in the school to participate. The purpose of the research was to investigate how students could learn in an environment where mobile and stationary technologies interact and where learning can be supported by drawing on the knowledge of remote professionals (for instance politicians and industry experts) as well as on teachers and students in other schools.

In the project space figured significantly as students' spatial orientations were continually challenged both by interaction with remote others through videoconferences and by their use of iPads in home classes. The ubiquity of different kinds of technologies in students' learning environments therefore had to be followed both as a local phenomenon in each school and as a shared material and pedagogical space between the schools. Thus, research was organized as a multi-sited analysis (Marcus 1995, Hannerz 2003), where data were collected through observations and interviews in several sites, i.e different kinds of learning spaces in the schools, including shared spaces. According to Marcus and others, multi-sited ethnography has provided a methodological framework for ethnographically following things, ideas and people in global contexts where phenomena are mobile and transient. Multi-sited ethnography thus moves away from the single-sited practice of conventional ethnography and follows the circulation of objects, practices and identities across sites.

Data were collected through voice- and video recordings, as well as notes and photos of teaching and learning scenarios and used to map differences and connections within the schools and between the schools studied. As mobile devices are personal, portable and flexible, they contributed to creating specific infrastructures of movement within the material and spatial organization of schooling. These movements are processes that define students' learning and that can be followed and observed through attention to shifting socio-material configurations in practice (Latour 2005, Dussel 2013). In these configurations not only iPads and stationary video screens are involved, digitalized whiteboards such as smartboards are also visible in classrooms as are pcs, mobile phones and an array of resources such as books, pens and paper, jotters, calculators etc. (Meyer 2015a). The material set-up of the learning spaces is therefore complex and shifting, which emphasizes the significance of methodologies that can capture processes and practices of spatial enactment.

4. WORKING WITH TABLETS IN GEOGRAPHY

As mentioned above, most classrooms in the schools studied are fitted with smartboards that act as the teacher's new blackboard, and are sometimes used by students to present information or homework. In these spatial set-ups, IPads, notebooks and occasionally mobile phones function as significant resources for students and specifically iPads are generally used as personal devices that are close to the students and at hand. iPads are moveable within the space of the classroom and can be carried anywhere outside it, if allowed by the teacher. Therefore, iPads often serve to make connections between the teacher's space at the front of the classroom and papers, books and posters that the students use for their own purposes in specific learning activities – sometimes defined by the teacher.

In the project I observed a geography lesson where the students were learning about rocks. According to the teacher, this was a very difficult topic for the students, as names and categorizations of rocks had to be learned for the exam, and for most students this was a challenge as they were generally not used to memorizing terms and concepts. As a response to these challenges the teacher had chosen to organize the teaching around a number of activities that involved different approaches to learning the terms and

categorizations involved in working with the rocks. The students had for instance in groups produced a poster of rock variations that was displayed on the wall at the back of the class. The purpose of the poster was to activate students' knowledge through the representational work of defining and drawing species of rocks. In the lesson observed students were asked to work on an online quiz where they had to use the information from the production of the poster. The purpose of this activity was to both reiterate and check their knowledge – and to identify any areas of missing knowledge that needed to be reworked into a new version of the poster.

Figure 1. Posters made by students

At the beginning of the lesson the teacher had introduced the quiz to the students through the smartboard, identifying the webpage to be used as well as a repetition of the terms involved. As the quiz was taken from an online resource, the students were urged to use their iPads to answer the questions. The teacher's introduction to the task through the smartboard and whiteboard defines a classic spatial dynamic of disseminating knowledge from the front of the class towards the students who are seated and spread out in rows or clusters in the room (Kalthoff & Roehl 2011). Following the teacher's instruction the students' own work on the quiz now reversed the front to back logic as students had to map out their own trajectories of learning from the smartboard at the front of the class to their own repositories of knowledge, the posters, at the back of the class. In drawing these new trajectories and spatial dynamics, students used their iPads in significant ways to personalize trajectories, frame knowledge and save information that was necessary in order to complete the task.
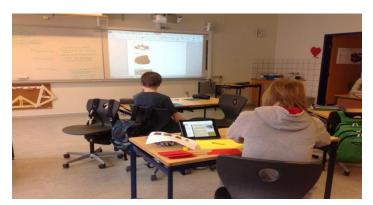

Figure 2. working from the personalized space of the desk

As a mobile device the iPad has the potential of creating new dynamics in the spatial set-up of the classroom, as students can translate specific ways of framing concepts and knowledge into their own format and modality by viewing and forming it through the frame of the iPad. This is done for instance by simultaneously viewing information on the smartboard and on the iPad screen, which enables the student to shift his/her attention between the teacher's framing and his/her own framing of the material on the personalized screen. In this way the information displayed on the smartboard by the teacher can be domesticated and adapted to the personalized space inhabited by students in the class. Within this personalized space, often demarcated by a workspace such as a desk, the iPad can participate in spatial configurations that are organized to suit the embodiment and visual framing of the student. As the iPad is a

flexible and portable device, it can both be placed in a stationary position as seen in figure 2 and held in the hands of the student to be moved to other locations and positions where knowledge is displayed as seen in figure 3.

In continuation of this holding the iPad and adapting it to the view of the individual student is an embodied and positioned act that places the student in charge of the learning in specific ways. Drawing on the particular relationship between the hand and the mobile device Heidi Rae Cooley (2004) suggests that vision and seeing may be understood as material and dynamic processes in which the hand and the device form a tactile vision, conceptualized as a fit. In Cooley's perspective, PDA informed vision is never freed from the hand as the hand and the device always co-constitute vision. When students process and work through their learning trajectories with the iPad they therefore also engage their bodies in specific ways to articulate and constitute the spatial dynamics of vision as a framing practice.

When the students seek the posters at the back of the class to engage with knowledge they have produced prior to the lesson observed, they use the iPad to capture images of the poster, and in this process to reproduce, 'shrink', adapt and transport knowledge from the stationary placement of the poster on the back wall to their individual seats in the classroom, where the image can be used for working on the quiz. Gunther Kress argues (2010) that capturing is a natural process connected with the ubiquity of mobile pocket devices when users select and save visual material to their smartphones and similar devices. In capturing, Kress argues, the user cuts, copies, and pastes material rather than producing it from scratch, making the user a sampler and bricoleur of knowledge. In addition to this, Kress argues, capturing often transforms textual modes into visual modes by framing them with the mobile camera in specific ways.

Figure 3. Capturing aspects of the poster for personalized use

For the students observed in the geography lesson capturing becomes a way of framing knowledge relevant for solving a task, and for transforming it into a format that can be carried, saved and reused on their device and in their preferred space in the classroom. Capturing therefore allows the student to hold a view in place that is relevant for the specific task, i.e the quiz. In this case the iPad provides a way of organizing knowledge, of zooming in and framing a personal field of vision, which can be moved, reworked and fitted into new contexts at the student's will. The tactility of this vision is underscored by the potential of holding and 'handling' the device to exactly fit the view desired. Understanding this vision as a personalized, embodied perspective on the knowledge involved opens up for an understanding of the activity as a continuous negotiation of visual formats that focuses attention on a variety of interface (screen and poster/paper) formats which are engaged to produce knowledge.

5. LANGUAGE LEARNING AND THE HYBRIDITY OF SPATIAL PRESENCE

As mentioned above, students in the schools researched sometimes use videoconferences to interact and communicate with students in other local schools. In the situation described in the introduction above, students are communicating in small groups with students in another school through FaceTime in German. However, as part of their weekly German lessons students communicate with others in a variety of ways, for

instance also through large screens situated in spaces dedicated to videoconferencing and through the sharing of video material they have produced separately on their iPads in each school. In each of these learning scenarios students' vision, engagement, embodiment and spatial position is framed differently, depending on the configurations used. IPads and other kinds of screens figure significantly in these configurations, and in shaping the spaces, embodiments and fields of vision offered to students in their learning.

Figure 4. Interacting through the window of the tablet

In the case of the FaceTime interaction, communication with others was contained within the frame of the tablet and placed in students' personal space within their home classroom. Thus, the embodied perspective of vision was defined by the position of the students within the home class and their preferred spaces in this classroom. Typically, the students were seated at or close to the desk they usually work at - this organization had been negotiated by the teacher and the students, and the teacher had taken care to place students at a distance from others, so they did not disturb each other in performing the activity. However, students' learning was affected not only by the presence of other students in the room, but by the intrusion of others' views, engagements and voices into the classroom through the video-enhanced interactions. This became clear for instance as some students in the other school were perceived as unfocused, disruptive and noisy. The familiarity of the students' spatial placement was therefore challenged by the hybridity of spatial presence, as proximity and distance was experienced simultaneously through the 'window' of the tablet. The integrity of space (Richardson & Wilkins 2012) was thereby challenged by the FaceTime interaction, at the same time that it was infused with alternate voices, spaces and views.

Learning German can become a student centered activity when iPads are used to frame vision and when they allow for embodiments and spatial organisations that support the engagement of students in speaking the language. In school T, where I observed the FaceTime activity described above, the students were asked to make a film where the vocabulary from the FaceTime activity was incorporated, and where the goal of the activity was to share videos with students in the other school (see Meyer 2015b). This activity took place within the same period of time in the two schools and was later shared through a videoconference that involved both schools. Thus, the schools were aiming to share visual spaces not only through real time interaction, but also through prerecorded material that could be projected on to a large screen in the telepresence auditorium. The local and embodied vision captured by the iPad was thus rescaled to work as a shared activity on a large screen in a different spatial organization, a classroom dedicated to videoconferencing (see figure 5), where students where repositioned as spectators to visual presentations made by others (as well as themselves). Screenic visions that involved German therefore shifted between handheld, embodied visions enacted through the tablet, and upscaled large screen interactions in which students were placed in rows in front of the large screen, and where seeing was removed from the tactile vision of the hand.

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Figure 5. Sharing videos in the telepresence room

6. CONCLUSIONS AND SOME IMPLICATIONS

Seeing through and on the screen is a ubiquitous activity in the schools observed, where screens are both fitted to classroom walls and placed close to students' bodies and work spaces. These shifts in interactions with technologies participate in creating spaces in which students are placed and learning embodied in specific ways. IPads in particular take part in creating dynamic spaces in students' learning, as IPads are continually involved in what students do and how they choose to frame, fit, see and save material that they are currently working with.

Large stationary screens, on the contrary, generally invite frontal orientations in which students face the interface chosen by the teacher and in which teachers' framings of information and knowledge often prevail. However, large screens can also be linked to students' devices, such as iPads, as when a film or presentation is shared in the telepresence room. The dynamic of these links is to transport material from the personal space of the student to a shared space in a different part of the school, where the spatial organization is focused on showing, sharing or viewing material on the large screen.

Richardson (2010) argues that mobile devices compromise frontal interactions with screens, as these devices adapt viewing, framing and presence to the mobility of the body. Richardson does not include schooling in her research, however, from the (relatively few) data presented in this paper it can be argued that frontal orientation still dominates in the positions taken by students when using the iPad, but that the embodiment and spatial engagement is much more flexible, personalized and diverse when students use their tablets to work with learning. As seen in the examples described, students use their tablet both as a stationary screen positioned on or close to their work desk, and as a portable screen that can be directed and operated through the hand. When students use their tablet in a standing or moving position they are able to capture and direct attention to material and spatial domains that are removed from their desk in the classroom or from the teacher's domain at the front of the class. In this sense frontal orientations can be redirected to comply with students' needs, while still integrating the teacher's point of view or taking it as a starting point.

As illustrated by the examples above, a significant principle for spatial organization and classroom infrastructure that includes the iPad is therefore proximity and in particular the embodied or tactile seeing that is connected with the tablet which enables students to combine corporeal proximity with cognition and understanding. This is a mode of enacting learning which incorporates the student's body in new ways, as well as integrates a more extended part of the student's immediate surroundings and personal perspective in the learning. Within this proximity students can capture local knowledge or even engage in remote spaces, as with the German lesson described above, though the latter may to some extent compromise the integrity of the student's spatial presence.

As a format for seeing and knowing through the hand, and through increased body engagement in learning, the iPad reconfigures not only spatial dynamics but also connectivity within the infrastructure of learning. This includes connections with other kinds of interfaces like large stationary screens, where students can display and share personalized material in enlarged formats with remote or local others. Shifts between screenic formats however also affect students' corporeal positions and engagements in learning, as does connections to remote others in hybrid spaces. These potentials for student centered learning reconceptualize spatial enactments of schooling through enhanced body-screen relationships.

REFERENCES

Burke, C., Cunningham, P. & Grosvenor, I. (2010) Putting education in its place: space, place and materialities in the history of education. *History of Education: Journal of the History of education Society*. Vol 39, no 6

Burden, K., Hopkins, P., Male, T., Martin, S., and Trala, C. (2012) *iPad Scotland Evaluation*. Faculty of Education, University of Hull

Cook, J., Pachler, N. & Bachmair, B. (2011) Ubiquitous mobility with mobile phones: A cultural ecology for mobile learning. *E-Learning and Digital Media* ((3), 181-195

Cooley, H.R. It's All About the *Fit*: The Hand, the Mobile Screenic Device and Tactile Vision (2004) *Journal of Visual Culture* Vol 3 (2): 133-155

Dussel, I. (2013) The assembling of schooling: discussing concepts and models for understanding the historical production of modern schooling. *European Educational Research Journal* 12, 2. 176-89

Ek, R. (2012) Topologies of Human-Mobile Assemblages. In: Wilken, R. & Goggin, G. (eds.) *Mobile Technology and Place.* Routledge

Fenwick, T. & Edwards, R. (eds.) *Researching education through actor-network theory*. Sussex: Wiley-Blackwell

Friesen, N. (2011) *The Place of the Classroom and the Space of the Screen*. Peter Lang

Johri, A. (2011) The socio-materiality of learning practices and implications for the field of learning technology. *Research in Learning Technology*. Vol 19, no 3

Kalthoff, H. & Roehl, T. (2011) Interobjectivity and interactivity: Material objects and discourse in class. *Hum Stud* vol 34

Kress, G. (2010) *Multimodality. A social semiotic approach to contemporary communication.* Routledge

Latour, B. (2005) *Reassembling the social: An introduction to actor-network theory*. Oxford: Oxford University Press

Kukulska-Hulme, A. (2009) Will mobile learning change language learning? *Recall* 21 (2) pp.157-165

Lawn, M. & Grosvenor, I. (eds) (2005) *Materialities of schooling. Design, technology, objects, routines.* Comparative Histories of Education. Symposium Books

McGregor, J. (2004) Spatiality and the Place of the Material in Schools. *Pedagogy, Culture and Society*. Vol 12, No 3

Nespor, J. (2002) Networks and Contexts of Reform. *Journal of Educational Change* vol 3

Hannerz, U. (2003) Being there…and there…and there!: reflections on multi-site ethnography. *Ethnography* 4:2, 201-16

Merleau-Ponty, M. (1964) *The Primacy of Perception and Other Essays on Phenomenological Psychology*. Illinois, Northwestern University Press

Marcus, G.E. (1995) Ethnography in/of the world system: the emergence of multi-sited ethnography. *Annual Review of Anthropology* 24, 95-117

Meyer, B. (2015a) IPads in Inclusive Classrooms: Ecologies of Learning. In Isaias, P. Spector, J.M., Ifenthaler, D. and Sampson, D.(eds.) *E-Learning Systems, Environments and Approaches. Theory and Implementation.* Springer

Meyer, B. (2015b) Learning through telepresence with iPads: placing schools in local/global communities. *Interactive Technology and Smart Education*, no 4, vol 12

Ihde, D. (2009) *Postphenomenology and Technoscience: The Peking University Lectures*. New York SUNY Press

Richardson, I. and Wilken, R. (2012) Parerga of the third screen: Mobile media, place, presence. In: Wilken, R. and Goggin, G., (eds.) *Mobile technology and place*. Routledge,

Richardson, I. (2010) Faces, Interfaces, Screens: Relational Ontologies of Framing, Attention and Distraction. *Transformations* no 18

Wilken, R. & Goggin, G. (eds.) (2012) *Mobile Technology and Place*. Routledge