Ghosts, Zombies and Other Spooky Creatures:
New Methods for Visualizing Agency and 'Presence' in Classrooms

Richard Dunk and Elizabeth de Freitas

Paper presented at AERA 2019, Toronto

Abstract: Use of experimental digital visual methods is common amongst artists, hackers, and designers, but is uncommon in research. This paper describes a visual methodology that combines digital images to make visible the distributed agencies at work in a high school classroom. Drawing on Karen Barad's ideas of spooky time and Parisi's social understandings of software, we present a method that considers the visible aesthetics of compound images to emphasize the heterogeneous but collective temporality of the learning event. Through discussion of the images with the teachers who were photographed, we found that not only did this approach prompt a more embodied recollection of the lesson, but also one that was temporally diverse.

Objectives:

Photography and video are increasingly used in qualitative research, especially in the study of classroom activity (Wragg, 2011; de Freitas, 2017a). Visual images of classroom activity can attend to various material dimensions of teaching and learning, but require a framework that does so without "…abstracting human bodies from their territorial settings" (Haggerty and Ericson, 2000). This paper explores classroom interaction, drawing on experimental visual methods in video and photography exemplified by various hackers, artists, and designers (Rose, 2016; Wanono, 2014). Our aim is to open up new pathways for visual research methods in education research, in order to shed new light on the complex dynamics of learning environments. We discuss arts-based visual methods and findings from a study of UK high school classrooms, focusing on the spatial and material practices that shaped the classroom culture.

We use various software tools to examine a large corpus of classroom photographs from a fixed camera, identifying persistent visual factors and then superimposing these to form a kind of sustained long-exposure image. The resultant image captures various movements and clusters of bodies, showing how certain locations are dense with activity while other areas are not. The software helps us track the ghostly presence of teachers, the zombie disfiguring of students during participation, and the strange spooky way by which all this activity and interaction holds the classroom together over time. Our aim is to demonstrate the potential contribution of visual processing software in the study of student and teacher 'presence' and participation, attending to the way that agency is distributed across learning events. This paper also importantly draws attention to the role of software as a knowledge-production device, and shows how we might modify and play experimentally with it, exploring "…the extension of computation into social modes of organization" (Parisi, 2013, p. 30). In particular, we aim to show how these visual methods *make visible* the distributed agency in any learning event, and the heterogeneous temporalities that occupy and traverse the event. This focus on heterogeneous temporalities during learning events makes this paper highly innovative, addressing an aspect of classroom activity that has yet to be

adequately studied. Findings will be analyzed using tools from software studies (Parisi, 2013) and agential realism (Barad, 2007).

Theoretical Framework:
We approach visual classroom data as "blurred genres that are simultaneously social scientific documents and works of art" (Tobin & Hsueh, 2007, p. 79). This arts-based approach follows Hayes (2007), who explores the power of aesthetics in school video ethnographies, attempting to direct viewers attention to the logic and technique of video production. We develop these insights into a more sustained treatment of the unique *digital* qualities of such data, which allow for various software applications, capable of engendering radically different visualizations of teaching and learning. Software studies directs our attention to how these devices "collect, store and transmit numerical, textual, aural or visual signals" (Ruppert et al, 2013). This new focus has the potential to radically alter the way we do research in education, drawing on experimental visual methods from anthropology. For example, Wanono (2014) describes how her work has taken up new aesthetic-political perspectives that reflect the digital technology she is using, repurposing software as a creative language to re-assemble the pixels in her documentary video, and using particular coding tactics to explore particular concepts and concerns.

Our theoretical framework draws on software and media studies to work with digital data, and our analysis uses theoretical tools from Karen Barad, whose work on the spooky time and temporality of quantum ontology helps us think more inclusively about the complex more-than-human agencies distributed across a classroom. Barad has been used in education research in terms of diffractive methods (Hultman and Lenz Taguchi, 2010; Fenwick and Edwards, 2013; Mazzei, 2014; Bozalek and Zembylas, 2017; Lanas et al., 2017), but here we use her work to examine the non/locality of presence in classrooms, utilizing repeated visual reconfigurations of the past to 'hauntologically' face 'ghosts' of potentiality, considering "…what might yet be, of what was, and what comes to be" (Barad, 2010, p. 264).

Barad shows how quantum ontology undermines time's arrow, troubling the very idea of before and after. For any given event, there is indeterminacy as to when it occurred or began or ended. Temporality is itself indeterminate. For Barad (2010), this means "Memory – the pattern of sedimented enfoldings of iterative intra-activity – is written into the fabric of the world. The world 'holds' the memory of all traces; or rather, the world is its memory (enfolded materialization)" (p.261). In rethinking and queering time, Barad's quantum ontology points to the "irreducible relations of responsibility" that hold complex entangled networks together (Barad, 2010, p. 265). We submit that our software methods operate like diffractive apparatus, relinking pixel data in ways that make visible the strange co-presence and unequally shared agency in collective endeavors during classroom activity. Although the camera makes a 'cut' and slices an event into discrete static images, Barad underscores how the agencies mobilized in phenomena produce a kind of *heterogeneous but collective temporality*. One of the biggest challenges methodologically, a challenge we take up in this paper, is how to make visible this complex temporal aspect of experience, enriching our study of intra-action.

Methods & Data
In total 621 photographs were taken from fixed vantage points in 7 high-school science lessons in England. The lessons were taught by pre-service teachers, and after processing the images were used as focal points for a group interview reflecting on the teachers' experiences of the lessons and the impact upon their professional development. Following Barad (2007, 2010), we treat the camera apparatus as an entangled "measuring agent" that captures/produces the classroom as a "measured object", achieving a particular permutation of the classroom assemblage, dependent upon additional agential cuts of timing, framing, lighting etc. Rather than treat each photograph as individuated, our use of arts-based software methods allows us to 're-enfold' the singular time-lapse photographs from lesson observations and seek new traces of potentialities.

We produced compound images through varied superpositions of their color channels: Figures 1, 2 & 3, for example, show minimum, maximum, and mean pixel values for a series of 57 time-lapse images taken during a single lesson, relying on various theories of color distribution. The software performs a diffraction with the data, mutating traces of agency and co-occupied temporalities into a visible "ontogenetic reassembling of the world." (de Freitas, 2017b, p. 742). The resulting images provide a spooky trace of co-existence, recording the movements of pupils and teachers in terms of 'blurriness', where the more 'solid' a body or object appears the more static it was for the duration of the lesson (see figure 1). Such images display temporally rich impressions of classroom activity, not unlike the examples presented in de Freitas (2017a). Here, however, we are able to study the longitudinal relationality that emerges over the course of an entire lesson. This conception speaks to Barad's ideas of time, as she argues that " "Past" and "future" are iteratively reconfigured and enfolded through the world's ongoing intra-activity" (Barad, 2012, p. 44).

Findings:
It is important to note that our visual methods track mobility and presence according to the distribution of color across the pixels, and so particular patterns regarding skin color and particular cultural habits regarding clothes will surface and become aesthetically pronounced in the resultant superimposed image. In this way, we are able to consciously attend to the biases of the visual research method, as it shapes what we are able to see (just as all methods do). This facet of visual methods makes them highly effective for raising issues about representation and dominant modes of being in classrooms. As Wanono (2014) claims: "digital code is, in fact, both a physical input into a system and a symbolic expression needing interpretation" (Wanono, 2014, p.188). During interviews with teachers, these images were used to probe their feelings about their own and student agency. We found that the images prompted a more embodied recollection of the lesson, with teachers analyzing their circulation in the classroom, the presence displayed by and around pupils, and how body language and positioning might influence student perceptions. Different images also produced temporally dissonant understandings of actions and positions, as certain poses that were captured in one combination of photographs were invisible in the next, leading to contradictory interpretations of the same event.

We see in figure 1 how the classroom activity accumulates into a complex event: the teacher evaporates through movement across the aisles, leaving only poltergeist-like traces of their presence; a pile of books de/materializes on the teacher's desk, the projector screen is filled with a jumble of changing slides, the door is in a probabilistic state of being both open and closed. In figure 2, however, the ghostly teacher returns to sight, whilst the cloud of student intra-actions dissipates leaving only the most delicate of traces. Here we see the teacher hovering around and transitioning between nodal areas (the laptop, a pile of books, student desks), enacting little visible change on assemblages, but with hints of attention being captured.

In other images (see figure 3) the students in the dark blazers accumulate into a shadowy mass. The density and lack of motion appears to 'swamp' the teacher, as they re-assemble in a collective co-presence. Taking a lead from Parisi and Terranova (2001), implications for teaching here are *affective*, and our interviews with teachers explored the following questions: Do the teachers feel this oppression over the duration of the event? Does this accumulated saturated presence of the students evoke for the teachers the dissipation of their own agency? How are the heterogeneous temporalities contained within these images positioned within the "cybernetic loops of the networked society" of the classroom (Parisi and Terranova, 2001, p. 125)?

When discussing the images with teachers, attention was drawn to the ephemeral but visible students, whose overlapping intra-action creates dark clouds of activity within the lose bounds established by the seating layout, painting the lesson as ongoing spooky relations between and around students and, to a lesser extent, the more static assemblages of books and stationery on the tables. We believe the constrained nature of students has pedagogical implications, and may suggest a passive involvement in learning, particularly in an inherently practical subject like science.

Significance:
Qualitative researchers frequently rely on digital visual methods of various kinds, often using video and other visual data in their research. This paper addresses the urgent need to explore potential creative applications that refuse the naive 'realist' readings of such data. We explore the spooky quantum co-presence of student and teacher in the classrooms, using arts-based software applications which allow for a powerful analysis of classroom intra-activity. We show how to mobilize creative and artful software applications to help us better communicate ethical and social concerns that fuel education research. Such experimentation seems urgent as we rely increasingly on software (often tacitly) to collect and analyze our data. The very same technologies that serve the control society and the archiving and conscripting of bodies for human capital can and must be appropriated and mutated in an attempt to break with impoverished images of teaching and learning. Our study of classrooms is an important example of arts-based experimentation precisely for this reason. Following Barad (2007, 2010), an agential realist approach to digital visual methods provides opportunities for increasing our understanding of the spatio-temporal nature of teaching and learning, and in our case, directs our attention to how heterogeneous temporalities and diverse mobilities shape the learning environment. Our research makes visible an underexamined aspect of teaching and learning – that being the co-presence that

endures in particular localities, forming spooky haunting forms of relationality and belonging.

Figures

Figure 1: A superposition of images from a school science lesson showing the combined mean value of each color channel. The more 'blurred' an item appears, the more it moved during the lesson.

Figure 2: A superposition of images from a school science lesson showing the combined maximum value of each color channel.
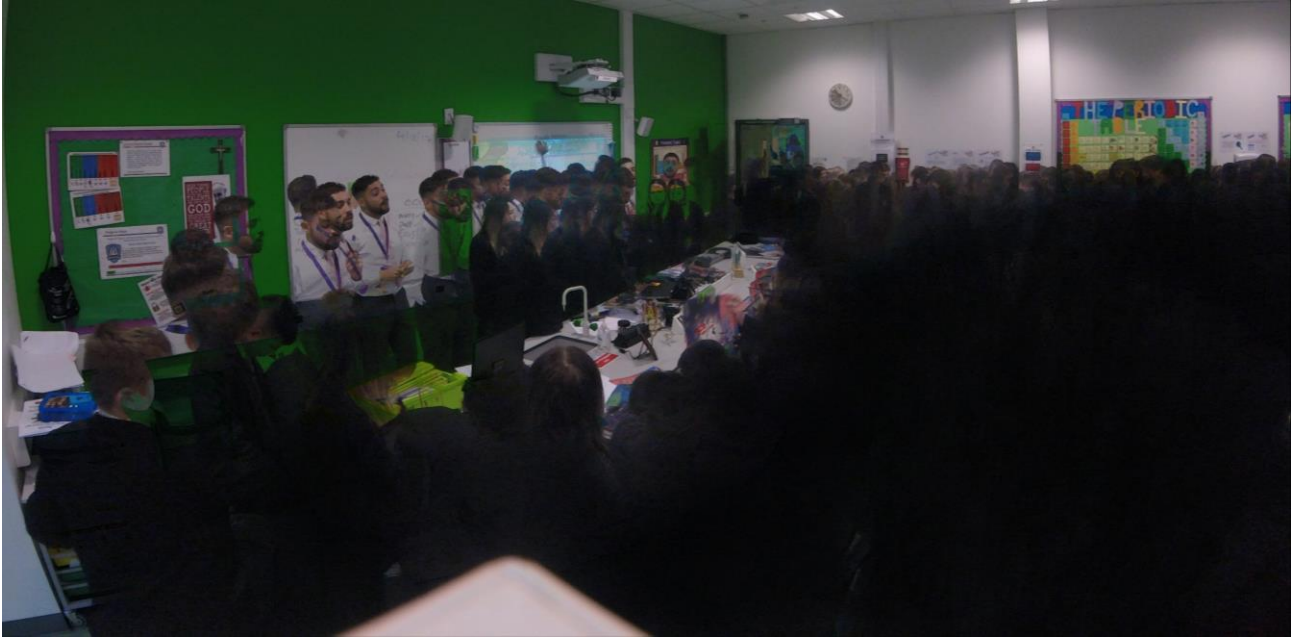

Figure 3: A superposition of images from a school science lesson showing the combined minimum value of each color channel.

References:

Barad, K. (2007) *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham: Duke University Press.

Barad, K. (2010) 'Quantum Entanglements and Hauntological Relations of Inheritance: Dis/continuities, SpaceTime Enfoldings, and Justice-to-Come.' *Derrida Today*, 3(2) pp. 240–268.

Barad, K. (2012) 'Nature's Queer Performativity (the authorized version).' *Kvinder, Køn & Forskning*, 1–2 pp. 25–53.

Bozalek, V. and Zembylas, M. (2017) 'Diffraction or reflection? Sketching the contours of two methodologies in educational research.' *International Journal of Qualitative Studies in Education*, 30(2) pp. 111–127.

Fenwick, T. and Edwards, R. (2013) 'Performative ontologies: Sociomaterial approaches to researching adult education and lifelong learning.' *European Journal for Research on the Education and Learning of Adults*, 4(1) pp. 49–63.

de Freitas, E. (2017a) 'New Empiricisms and the Moving Image: Rethinking Video Data in Education Research.' In Koro-Ljungberg, M., M., Löytönen and Tesar, M. (eds) Disrupting Data in Qualitative Inquiry: Entanglements with the Post-Critical and Post-Anthropocentric, New York: Peter Lang Publishing Inc.

de Freitas, E. (2017b) 'Karen Barad's Quantum Ontology and Posthuman Ethics: Rethinking the Concept of Relationality.' Qualitative Inquiry, 23(9) pp. 741–748.

Haggerty, K. D. and Ericson, R. V. (2000) 'The surveillant assemblage.' The British Journal of Sociology, 51(4) pp. 605–622.

Hultman, K. and Lenz Taguchi, H. (2010) 'Challenging anthropocentric analysis of visual data: a relational materialist methodological approach to educational research.' International Journal of Qualitative Studies in Education, 23(5) pp. 525–542.

Lanas, M., Rautio, P., Koskela, A., Kinnunen, S., Viljamaa, E. and Juutinen, J. (2017) 'Engaging with theoretical diffraction in teacher education.' Discourse: Studies in the Cultural Politics of Education, 38(4) pp. 530–541.

Mazzei, L. A. (2014) 'Beyond an Easy Sense: A Diffractive Analysis.' *Qualitative Inquiry*, 20(6) pp. 742–746.

Parisi, L. (2013) *Contagious Architecture: Computation, Aesthetics, and Space*. Cambridge: MIT Press.

Parisi, L. and Terranova, T. (2001) 'A Matter of Affect: Digital Images and the Cybernetic Re-Wiring of Vision.' *Parallax*, 7(4) pp. 122–127.

Rose, G. (2001) *Visual Methodologies*. Thousand Oaks: Sage

Ruppert, E., Law, J. & Savage, M. (2013). Re-assembling social science methods: The challenge of digital devices. *Theory, culture and society*, 30(4), 22-46.

Tobin, J. & Hseuh, Y. (2007). The poetics and pleasures of video ethnography of education. In In R. Goldman, R. Pea, B. Barron & S.J. Derry (Eds.), *Video research in the learning sciences*. Mahwah, NJ: Lawrence Erlbaum Associates. 77-92.

Wanono, N. (2014). From the grain to the pixel, aesthetic and political choices. In A. Schneider & C. Pasqualino (Eds) *Experimental film and anthropology*. London: Bloomsbury Press. p. 183-198.

Wragg, E. C. (2011) *An Introduction to Classroom Observation*. New York: Routledge.