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Using an 'Ethnogram' to visualize talk in the classroom

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ABSTRACT

Ethnograms are used to visualize data gathered from students' and teachers' talk in the classrooms of a secondary school in the UK. A sample of *talk data* is portrayed in three example ethnograms. The ethnograms transform non-visual data into the visual domain for the purpose of analysis using visualization and abstraction. Using ethnograms the *sound* of talk, as it had occurred during lessons, became *seen* and thus visualized which students talked most or made the most noise, where teachers positioned themselves and the relationships between students' talk and teachers' positions in classrooms. Through visualizing talk, it became possible to see space in the classroom which was louder or quieter and identify students who were silent. Visualizing talk led to alternate perspectives and interpretations of the data and surprising findings to be surfaced. Ethnograms are therefore posited as a potential method for researchers interested in portraying data for further post-collection analysis or to see, for example, sensory data such as mood, emotion or smell. Ethnograms are shown to be an accessible and viable qualitative research method particularly useful for researchers who wish to qualitatively visualize the social interactions and behaviours of people for interpretation.

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Introduction

As a visualization, a map, schematic or diagram can show people where a place is in relation to another place or provide information on connections, components or objects and thus help people develop meaning. Visualizations such as these are *abstractions* and representations of reality and are often complexity simplified. Maps, schematics and diagrams can, for example, provoke particular place meanings, present summaries or a context and provide information such as relative distance or an understanding of time. However for a more rich and vicarious experience, for example, of a future place to visit or see events or people's experiences, digital video has been used (Knoblauch et al. 2008). Unlike a map, schematic or diagram, digital videos can contain and combine music, audio, speech, text or animations and accurately replay a recording of real-life 'on-demand' or as a 'live stream' and are thus multimodal, engaging and entertaining (Ortiz-Ospina 2019). These features inherent in digital video also offer research methods options for researchers and digital video is often utilized for research purposes (Garcez et al. 2011: Pink et al. 2015).

For some researchers, however, there may be some limitations of digital video when used as a research method. For instance, in schools and classrooms although digital video and images of students can provide educational researchers with a faithful real-time replay of live events (Mondada

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2012) they capture only periods in time that were within the focus of the photographer's camera (Garcez et al. 2011) and which were observable. There may also be moral considerations, privacy problems, data protection issues (Rutanen et al. 2018) and safeguarding barriers (Garcez et al. 2011) or methodological and methods reasons for seeking another way of seeing data, particularly data which cannot be seen, for example, such as sound. In relation to *unseeable* data, audio from video is often transcribed to text for analysis (Garcez et al. 2011) suggesting that the richness and complexity within video recordings can necessitate simplification or partitioning of certain data types because of the research objectives or questions.

Returning to visualizations such as maps, schematics or diagrams the technique of portraying reality and complexity in a simplification or abstraction is a widely accepted and commonplace method. Visualization may warrant further consideration by researchers facing video method limitations and offer a feasible method of data collection and presentation. For instance, some educational researchers may wish to see non-visual data or transform complex data from classrooms into more simple visualizations or abstractions to isolate and focus on one type of data from specific individuals in focus or being studied. Or they may wish to visualize non-visual data by transforming it from one data type to another. For example, sound data such as students' talk relative to other students or a particular place in the classroom or the teacher could be transformed into an observable qualitative visualization.

The research study background

Data used in this article was drawn from a two-year ethnographic study of a secondary school in the UK. The study explored how Amazon's Echo Dots[1] were used in classrooms as 'digital more knowledgeable others' to collect data from students' talk with 'Alexa[2]', each other and the teacher. Ethnograms were used because no systematic or suitable method of visualization could be found that was simple, easy to create and analytically useful for post-data collection analysis.

During fieldwork operating in the role of teacher's assistant and as a participant observer, data was collected using a pen and paper by drawing a tally chart. For each lesson, rectangles were drawn to represent desks and seats to visualize the classrooms. Students were represented with a letter and number. Other objects, such as a demonstration bench or washing up sink that became directly involved in the social behaviours being studied were also drawn where relevant. In relation to the aim of the research, each time students spoke a tally mark was written down. Each time students moved a line was drawn from the starting position to the finishing position. The same method was used for the teachers. This system was repeated for each lesson every day throughout the fieldwork resulting in a collection of ethnograms covering the period of fieldwork.

Photographs and video recordings were prohibited within the school being studied due to complexities around ethical approval, the school's safeguarding needs and technical constraints as Asan and Montague (2014) have drawn attention to. There was also a personal moral concern around producing data of students to be stored on remote corporate computer servers, as Peters, et al. (2021) have similarly outlined. Digital video recording in classrooms was therefore not possible and as a participant observer also pedagogically problematic because teaching and supporting students prevented it. Ethnograms as described by Cook navigated these issues and enabled the formation of visualizations of speech data so that it could be seen and analyzed. Ethnograms visually depicted speech data in the post-data collection analysis phase of the research study which led to alternate views of social interactions, and which led to insights being surfaced that were not initially evident and had been previously overlooked.

The problem of qualitative visualization in research

Visual models allow the researcher to gain meaning from data during analysis and presentation (Radnofsky 1996, Nicol and Pexman 2010). Research data is also visualized to communicate meaning to

an audience (Onwuegbuzie and Dickinson 2008). To communicate meaning, qualitative researchers make use of both visual and textual materials (Mohajan 2018). The visual perception of graphics, such as pictures, is an essential part of human life and enables meaning making (Guiraud 1964, Gibson 1979). Within semiology, the concepts of communication and perception have a 'deep affinity' (Guiraud 1964, p.23). The visual display of research is therefore important for visual perception, communication and meaning making. As effective types of visual display, the pie chart and bar chart enable researchers to present data visually and show trends, statistics and comparisons (Tufte 2001a, von Engelhardt 2002). The pie chart and bar chart enable meaning making, are commonplace, have universality, and via commonly available computer software, are relatively easy to produce. However, although commonplace within quantitative research and mixed methods research, they occur to a lesser extent within qualitative research (Miles and Huberman 1994, Morse 2006).

There is an argument for the use of visual display as a method of communication (Bertin 1983, Tufte 2001a, 2001b) and as a visual language (Guiraud 1964, von Engelhardt 2002) to provide a way of observing data to develop understanding beyond what text or the numeric can afford (Tufte 2001a, 2001b). Beyond visual elicitation methods of data collection (Bagnoli 2009; Varga-Atkins and O'Brien 2009, Copeland and Agosto 2012), the methods for visually depicting results or theories from qualitative research have 'received little attention' (Morse 2006, p.1163). Graphics, as von Engelhardt (2002) has defined are visual displays, and these types of graphics, such as pie charts, boxplots and bar charts, have been acknowledged as powerful and effective quantitative visual display methods (Stockemer 2019).

Some uncertainty (Wall et al. 2013) remains regarding whether current existing visual display tools are for the qualitative researcher and for qualitative analysis (Strauss 1987, Dey 1993). Some novel attempts have been made (see, Lengler and Eppler 2007, Petersson et al. 2021) to remove this uncertainty but diagrammatic visualization for qualitative outcomes has relied upon simple graphing of data or use of graphing as a qualitative visual data collection method (Pain 2012). Suggesting the interpretive possibilities of such a qualitative analytic visualization tool, von Engelhardt (2002, p.4) has posited a potential benefit for researchers as seeing what might not otherwise be seen through the visual presentation of the data: 'People have also been known to make diagrams that display relationships that otherwise would be impossible to grasp'.

Within the field of semiotics (Pierce 1991) developing meaning or gaining understanding by translating one *sign* system to another, for example, writing a story in words from viewing only pictures, has been described as transmediation (Suhor 1984, Siegel 1995). This multimodal approach to information processing might include, for example, combinations of text with diagrams or pictures or with song or video (Leland et al. 2016). Transmediation describes a change in the way information is processed as a basis for knowledge construction and meaning making. Text is no longer the only way in which information and knowledge can be acquired. So, viewers of visual displays can develop different perspectives and generate insights, interpretations and *narrative meanings* (Cook and Hockey 2023) that might otherwise have been overlooked or unsurfaced without the use of visualization. However, visualizations are commonly used in quantitative research to display data (See Umquit et al. 2011, for more on quantitative visual displays). Visualizations also tend to be used with subjects or participants (Kearney and Hyle 2004, Crilly et al. 2006) as part of the qualitative research study data collection phase but less so for post-data collection qualitative analysis. What becomes evident is how visual displays and visualizations help people make meaning from data but unfortunately, are less often utilized in qualitative research.

Visualization with an ethnogram

In order to know where one is in time and space, that is, one's place in relation to other places or people, events or activities, a map may be required to visualize one's relative location (Donnelly et al. 2020). Further to this, not only are maps a 'visually powerful way to tell a story'. (Pavlovskaya

2016, p.1) but maps are often the result of researchers transforming data for analysis (Verdi and Kulhavy 2002, Fallucchi et al. 2021). More recently visualization has emerged from within the field of artificial intelligence (Colombo et al. 2021) but regardless of method, the aim remains the same; generate a context and visually portray complexity more simply for analysis and to provide information for meaning making. Ethnograms achieve this aim too, by providing an abstraction and visualization of social reality and portraying periods of time by simplifying complexity for qualitative analysis. Ethnograms, as described by Cook, visualize instances of one type of data in relation to each other or relationships between different data types in a static and fixed visualization unlike video which repeats complex reality as it occurred in real time. Also, when video recording an individual student, small groups of students or in certain locations of a classroom there is a potential to record only what is seen or believed to be seen or of interest and some bias or oversight may occur. Also, data may also simply not be able to be recorded by the camera or camera operator, and the equipment itself may be intrusive or influence participants' behaviour. Further to these potential limitations, classrooms are data-rich social places and often seen as sensory (Page and Sidebottom 2022) and are spaces where people talk, gesture, move, get angry, sigh, cough, write, sing or think. They produce complexity and swathe of data that may obscure specific data being noticed or seen or which is simply not able to be captured by video or photograph. For example, where smells (Waskul and Vannini 2008) were experienced during classroom experiments or places where the mood, atmosphere, emotion or sentiment, such as anger, frustration, and so on occurred (for more on the senses in anthropology, see Stoller 1989). Currently, when qualitative research seeks to map, visualize or see these data or focus or isolate a data type, methods such as video, photography, diagrams and charts have limitations or steer towards quantitative analysis. For example, when trying to portray sensory data, currently, these methods may lead to numeric results, measures or counts of instances of data and overlook connections, pathways, patterns and relationships or other invisible meanings. No current qualitative visualization options are effective for picturing or seeing social interactions such as talk, smell or mood in classrooms or their relationships and connections. An ethnogram provides such a way, a method to see social interaction data gathered from people. Ethnograms visually portray data from complex social behaviours simply and can visualize data that video and images cannot capture and do so using simple diagrammatic descriptions using lines, arrows and circles (Zdebik 2012). Ethnograms enable an alternate view of the data to be gained relatively simply and can therefore support post-data collection qualitative analysis and interpretations. Interestingly, in relation to video or photographs ethnograms would be a useful post-data collection tool to isolate foci data types and visualize them to speculate on patterns or to provoke hypotheses about sensory interactions or to produce an accompanying picture to augment data analysis and interpretation of digital video and photographs. Ethnograms are, simply put, fixed pictures of people's interactions that may also not be observable and their social practices over time because they are visually descriptive, are suited to interpretive research, qualitative studies and educational research of classrooms or spaces and places where people mingle and interact physically, emotionally or sensorially.

So far, this article has identified some potential limitations of visual methods and presented the importance of visualization as a technique to derive meaning beyond text and number data. It has also presented some moral, technical and ethical issues with methods such as videoing or photographing students in schools. Ethnograms offer another option for collecting and presenting qualitative data particularly that which may be sensory or requires visualizing as it is not able to be seen, for example, sound, mood, emotion or smell. Ethnograms can also transform one data type into another type for further analysis, for example, a picture of talk or, sound so that it is seen.

What can ethnograms do?

In the study for this article, ethnograms were used to visualize talk by students in classrooms to visualize sound. Although it would have been evident on video that a student was talking during a lesson

if their lips were seen moving, for example, video data would show talk temporally as it occurred one after the other throughout the lesson. Ethnograms in this study, portrayed students' talk by location and in relation to other people in the classroom in one visualization for qualitative interpretation. In this way, they produced a picture of sound for whole lessons captured in an abstraction and visualization. This abstraction of social behaviour, as mentioned earlier, provided a powerful alternate view of the social interactions during that period of time in relation to the people involved and furthered new meaning making. As a participant observer in lessons, taking notes and interacting with students, questions and talk could be heard and collected as data but for analytic purposes visualization and abstraction were sought to see this sound data relative to the other data collected.

Any data that can be collected through the many different available methods in a classroom can, in theory, be visualized by an ethnogram so they might be used, for example, to portray gestures, teacher's questions, raised hands, time on task, engagement, level of attention, peer interaction, mood or body posture, position or locations. As a post-data collection analysis tool ethnograms may provide insights to answer research questions which seek to find out which students interact with others, or where questions or talk emanate from. Additionally, to portray which students are most on task and off task, where behaviours occur, which students are silent or how much some students move compared to others. They may also be used to reveal which artefacts are used or handled, time spent using books or resources, or be used to compare a practical lesson to a desk-work lesson. They might be used to provide insights as to the moods of students at particular times in a lesson or compare lessons over a day or days of the week or a more longitudinal range over weeks or a term. Not only might ethnograms be used inside classrooms but they may be used for corridors, recreational areas, a refectory, playgrounds, sports halls, laboratories or even to visualize where groups rather than individuals gather and interact.

Ethnograms have been presented as an educational researchers tool but wherever people interact or interact with material objects or places ethnograms have some potential to visualize data and through abstraction portray people's social behaviours even if they might be sensory or otherwise unobservable. Ethnograms are not presented as a replacement for digital video and photographs because they are abstractions and visualizations, as argued above, which present a subjective picture of peoples' behaviours for further interpretation. They do not claim to nor aim to, replay live events in real time or claim to portray all data emerging from a classroom. Ethnograms are a visualization by abstraction of pre-identified data, relevant because of a research's aim or objectives and being studied to offer an alternate view of social behaviour for interpretation. They are not a multimodal replication of an array of data types in a real time stream and thus not a capture of reality but a simplification and an abstraction of it. Ethnograms research potential lies in how they simplify complexity through abstraction and generate a visualization which acts as an aid or stimulus to further subjective meaning making by researchers.

Ethnograms in educational research

Educational research has an 'instructional dynamic' (Coe et al. 2017, p.11) and educational research of the classroom has been comprehensive and studied teachers, students, teaching practice and theory. Whether the research paradigm adopted (cf. Strauss 1987, Miles and Huberman 1994; Onwuegbuzie and Dickinson 2008, Slone 2009, Mohajan 2018) is oriented towards the quantitative or the qualitative, data collected is still subjected to the researcher's analytic gaze and results or findings can be visualized. Currently, methods for the visual display of data for qualitative analysis (Banks 2001) are limited (Wheeldon 2010) and present difficulties when aiming to interpret the classroom qualitatively. This is particularly problematic when the research aims to explore social behaviours in the classroom such as interactions of talking and movements. Ethnograms are a form of visual display and offer the qualitative-oriented educational researcher a method of *analytic visualisation* (Verdinelli and Scagnoli 2013) that captures, presents and reveals interaction patterns that have occurred over time in the classroom – a picture of a period of social practices. What this

offers the educational researcher methodologically (Rose 2016) is a way to observe the classroom and the people in it by interpreting a visual artefact or visual abstraction and thus a record of social behaviour.

Abstraction

Abstraction is the main tenet of ethnograms. Humans can comprehend visually presented information extremely efficiently (Viola, Chen and Isenberg 2020, p.5) and therefore develop meaning from relatively simple displays of data via semiotics (Guiraud 1964, Bertin 1983. Pierce 1991). This occurs through three stages: firstly, a transformation of reality to a representation of reality, secondly, by visual interpretation and finally, the formation of a mental model (Viola et al. 2020, p.5). The three-stage process described by Viola et al. (2020) is a form of visual abstraction. Abstraction is a process of selecting and focusing upon what is relevant while extraneous details are ignored. The process of abstraction can be seen when people engage in everyday common-sense reasoning (Giunchiglia and Walsh 1992). This everyday process of abstract thinking is transferable to the visual domain and a viewer of an ethnogram is able to build a mental model (Wild 1996) of, for example, spoken interactions and then through abstraction develop meaning (Viola et al. 2020). The power of ethnograms as described by Cook is not how much data they visualize but the way in which they facilitate understanding and meaning making through visual abstraction, in fact, they reduce the amount of data by simplification as part of the process of abstraction. An ethnogram is therefore a monosemic (Bertin 1983) collection of shapes that present signs (Pierce 1991) and which possess organized and ordered components (Bertin 1983). Ethnograms that are created may therefore semiotically offer affordances (Gibson 1979) which are useful to the interpretive educational researcher studying classrooms and the people in them.

Seeing sound: students' talk

Talk in classrooms being studied was plentiful, emanating from the people present albeit occurring in changing quantities, at different volumes and times and for different purposes and reasons. For instance, teachers talked about curriculum topics and presented information about these to students and then asked them questions. Occasionally a voice was raised or lowered, there were periods of quiet and periods of talk at high volume, and sometimes laughter or anger was heard. Students occasionally asked questions to the teacher and talked to each other but also talked about topics not related to the lesson or learning. Teachers and students oriented talk towards different aims but had in common talk about performance. For example, in the first fieldwork data extract below, a student concerned about failing a test asked the teacher what mark they had and in the second extract, below, the student, similarly asked for their Biology mock examination grade:

> Student:
> 'Did I get more than zero Madam?'Teacher:
> 'Everyone got more than zero!!'Teacher says 'I have just been given your Biology paper from yesterday'.
> Student calls out 'What did I get madam?'

Both are examples of student talk oriented towards performance but perhaps also which could be suggestive of fear, anxiety or worry or curiosity or other unobservable emotion or feeling. When talking to students in a lesson teachers frequently framed talk within the context of forthcoming summer GCSE examinations, a significant event for Year 11 students each year. Focusing talk upon this significant terminal point of examination and assessment again hints at data that was unobservable emerging and begins to build an alternate picture of classrooms as possibly emotional and sensory places.

The content of students' talk was observable because what words were said, questions asked and what sentences were formed could be read as transcribed text. As has been suggested above, there

was also emerging evidence that mood or emotion may also be something unobservable but present in classrooms. This required a method to allow it to be seen and analyzed. The thinking at this point in the study was that something was occurring that was not being identified because it had not yet been portrayed or seen. The full dataset had been transcribed and what was being sought was a way to look at the data again to generate insights beyond content and quantity or through an analysis of conversation or interaction analysis (Walker and Adelman 1975). What was needed was a method of portraying emergent themes so that they could be visualized as a formal picture or map that could then be analyzed and interpreted. It was felt that sound, talk and speech, needed to be seen to understand it more. Talk data from the classrooms was therefore portrayed in ethnograms. Numerous ethnograms were created and collectively and individually analyzed to generate themes and to surface potential concepts to explore.

Example ethnograms from the study are presented below in Figure 1 and Figure 2 and Figure 3. In these ethnograms, students are represented by a capital letter and number (M1 and M2 and so on). The teacher is indicated by a capital 'T' in a circle. Arrows indicate the direction of talk showing which student was engaged in talking to another (for details on the steps to create an ethnogram). In Figure 1, below, it becomes possible to see what talk looked like. There are multiple ways in which to now see this sound and thus think analytically about it. For example, it is possible to determine where it might have been louder with more talk (M1), quieter with less talk (F2). It is possible to see who engaged in talk with others (M1 and M2 and M4 with both M3 and M5). It is possible to see relationships of talk between students and importantly who did not talk at all and was silent (F3) and who did not talk to who, where there were talk pairs or isolated groups. It is also possible to look for what is not there, to look at places where students did not sit, where the teacher did not venture or where no sound emerged. The visualization of sound using an ethnogram means that alternate views of a particular unseeable data type are created. For instance, in Figure 1, sound is seen as coming from the teacher's left side and right side and from in front. Sound does not emanate from either of the back corners of the classroom.

In relation to position, place and movement, temporal and corporeal data, it too can be portrayed by an ethnogram. During one particular social interaction in a lesson, when once again talking about examination performance, the teacher talked with several students and was also in different places within the classroom when doing so. The three extracts below are about performance and were spoken by the teacher when in the main position on the left in Figure 1, above.

Teacher: 'Lads! [looking towards students M1, M3 and M4] have we got our [full] 3 marks yet?'
Teacher: 'I need your tests back in, we will now change over to a new topic so we need to do our topic poster first to start off'.
Teacher: 'Write down the key points and I will give you detailed revision notes next lesson … this type of question, slightly different to this, will be in a GCSE paper'.

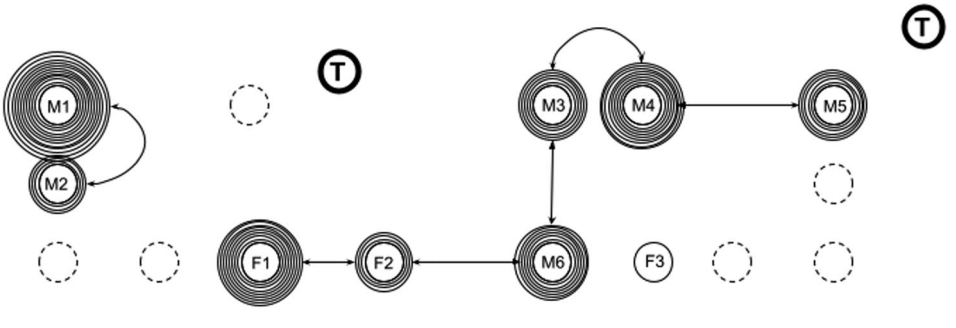

Figure 1. Seeing students' talk in a lesson.

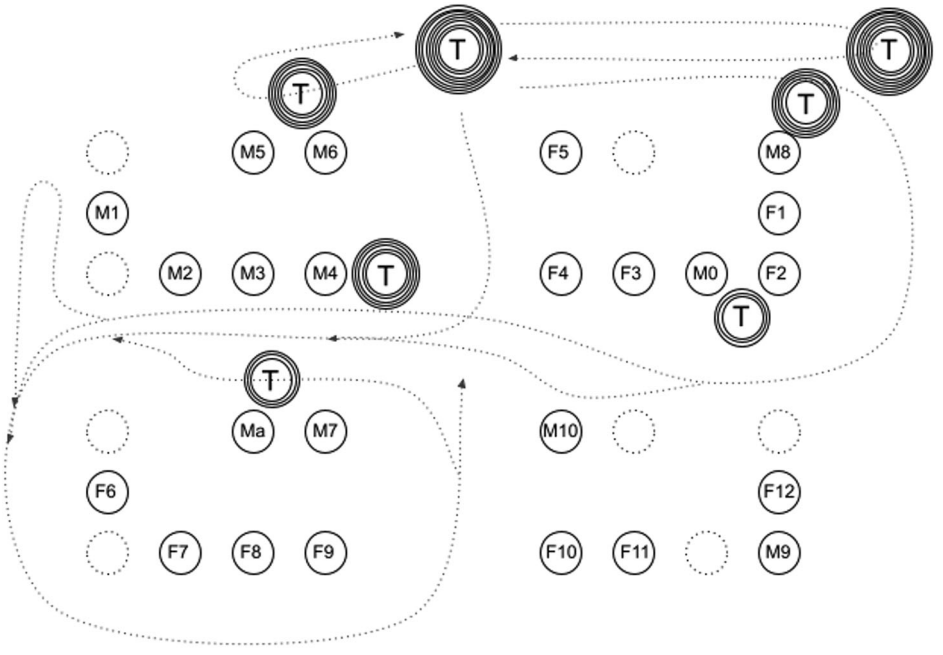

Figure 2. Movement, position and talk of the teacher (T) in a lesson.

The visualization of this data in the ethnogram (Figure 1, above) suggests that the teacher had a specific place in the classroom where performance information that was deemed very significant and important, was delivered to students. The teacher places themselves at this location to speak about performance. Atmosphere and mood also changed when this occurred. The ethnogram therefore visualizes specific places that have particular meanings by producing a visualization of this type of social interaction.

Following the portrayals of speech data from further lessons in ethnograms, there was an emergent relationship between the location or position of the teacher and talk. Further ethnograms were created to see where the teacher located themselves in the classrooms when they were talking to the whole class or to individual students in order to explore this.

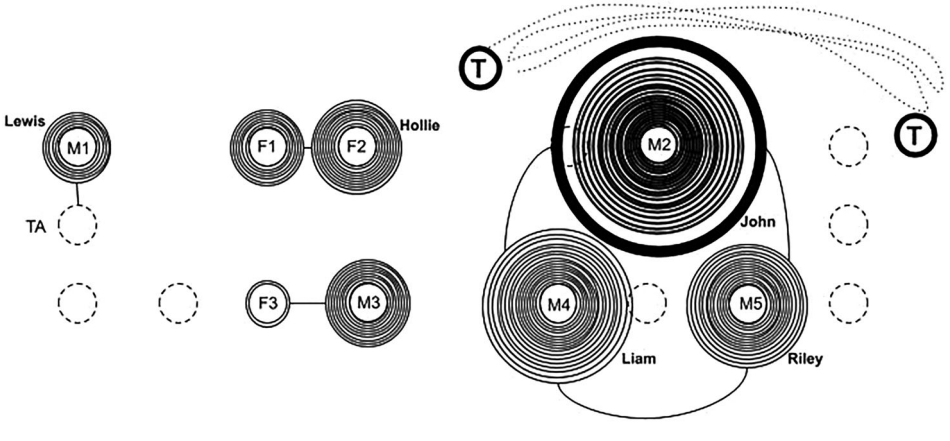

Figure 3. Teacher position, movement and student talk jointly visualized.

In Figure 2, below, the positioning of the teacher in a lesson is visualized, the path they took to move to each position is shown with a dotted line. The ethnogram suggests that this teacher in this lesson located themselves in seven places in the classroom, moving through and around what they appeared to have produced as four quadrants of space. It can be seen in the ethnogram that the teacher did not go to the bottom right quadrant or near students F10, F11, M9 and F12. The teacher did however navigate closely to M10. These places within the classroom appeared to have differing meanings for this teacher. The majority of the teacher's time was spent at the front and the majority of their talk was from the front. This classroom's sound came from the front portion of the classroom space. In contrast to the front space, the rear space is relatively quiet producing no sound from students located there (F6, F7, F8, F9, F10, F11, M9, F12). In terms of student's assigned gender as recorded in the teacher's register (listed as only F for female and M for male) these students at the rear were mostly female students. The front left quadrant comprised male students. The front right quadrant was a mixture of male and female students. The ethnogram suggests that the teacher moves to and positions themselves near to students shown in the register as assigned as male (M5, M6, M8 and M4 and M0) and talks at these locations.

For this study, when a hunch needed to be explored, ethnograms enabled this because they captured and visualized data that was potentially overlooked and which had interpretive value in forming rich descriptions. They enabled sound to be seen, for example as in Figures 1 and 2, above, and thus forced data to be considered in a new way because the map of relationships and patterns between data types was abstracted and visualized. The transformation and transmediation of data from sound to sight provoked new interpretations.

What then becomes possible through an ethnogram is to take a hunch or emergent idea and move inductively forward by enabling obscured or hidden patterns and relationships to be surfaced and this could be through combining multiple ethnograms or converging data from separate ethnograms into one. For example, taking students' talk from one ethnogram and mapping it against the ethnogram of a teacher's position in the classroom during a lesson, speech is observable in relation to the teacher's body (see Figure 3, below). Sound and movement are jointly visualized for analysis.

In Figure 3, above, it can be seen that M2 talked the most. It can also be seen that the teacher appears in two locations in close proximity to M2. The teacher positioned themselves next to M2 but moving only to M2's left and right, remaining close throughout the duration of the lesson. From the ethnogram's portrayal of the sound in this classroom some interpretations were made. Firstly, this was a *loud* classroom because of the talk shown. Secondly, and perhaps more importantly, the right side of this classroom where M2, M4 and M5 were located was the loudest place and the teacher remained on this side. Other interpretations can be made but these were the two key features of this lesson in relation to sound that were used to develop the notion that the teacher positioned themselves near M2 as a way to manage the talk behaviour of M2. In terms of the management of behaviour, Figure 3 portrays a lesson in such a way that further questions emerge such as, what did this lesson feel like to be in if you were the teacher? Or, what did this lesson sound like and what mood or atmosphere did this lesson have if you were, for example, student F3?

So far, as shown in Figures 1–3, through the use of ethnograms, it has been possible to produce a visualization which makes unseeable data in classrooms *seen* for further interpretation and meaning making. Ethnograms have been used to produce an abstraction of real-life complexity in a simplified visualization of specific pre-identified data types. Ethnograms have been used to portray data in relation to the research aim and objectives and have been used as part of post-data collection qualitative analysis.

In summary, ethnograms have been presented and argued for as an alternative method for capturing and then seeing data that may not be observable or not possible to be captured through video recording. Importantly, they have been presented as a research methods option for researchers seeking other ways (Pink 2006) to capture and portray data for analysis and have not been

presented as a replacement for other viable methods already established and used such as video recording. Ethnograms are not an either/or scenario and are not argued to replace a method such as video but instead to expand the options of qualitative research methods and could be complimentary to video methods. Ethnograms have also been presented as a research method for simplifying and bringing into focus specific instances of a data type to isolate them and produce abstractions of social reality to enable researchers to deal analytically with the complexity of busy, social places. Ethnograms have been presented as an effective way to visualize social behaviours in educational environments for qualitative analysis. Examples have been shown in Figures 1–3, which portray talk from students and teachers, and thus which visualize sound. Ethnograms have made sound *seeable* and transformed data from one sense to another sense: from the visual to the auditory.

Discussion: the 'Other' senses

In relation to the senses, it has been argued that humans are visual and that the eyes are the primary sense organ and sight is 'the privileged sense of the West' (Stoller 1989, p.5). Seeing and the process of visualization however is only one way in which humans make sense of the world. The other senses have recently been the focus of researchers interested in developing sociological interpretations (Pink 2015) in a relatively recent sensory revolution (Howes 2005) which includes work around taste (Stoller 1989), smell (Waskul and Vannini 2008) and touch (Classen 1997, Nätynki et al. 2023) and the sixth sense(s) without a bodily organ, such as 'ESP', telepathy or clairvoyance (Howes 2009).

In search for deeper understandings of people through ethnography, Stoller (1989) has discussed how awakening the senses and embracing alternate perspectives of the importance of different senses to different cultures and peoples can lead to this depth of knowledge. Howes (2005, 2009) and Classen (1997) have written extensively regarding the senses in anthropological work. This is not to say that the visual needs to be neglected simply that the other senses have been given more attention recently and recognition of their importance and also to acknowledge the role they may play for different peoples and for the researchers of these peoples. Some of the problems that have been raised in the research studies of the senses are a neglect of the sensorium and primacy of the visual and limitation this might have on interpretive research fieldwork. Hence why, within the sensory revolution (Howes 2005) contributions that advance knowledge in this area would be useful. Ethnograms have been shown to make a contribution in that they can provide a way for researchers of people to visually portray observable and unobservable data collected during ethnographic, sensory or qualitative research fieldwork that observes people. Observations may entail those such as the use of material objects as part of sport, labour and work (Carter 2022), craftwork (Marchand 2022), craft and the senses (Cook and Hockey 2023) or creativity (Keating and Łapińska 2023) or participant observations of routines (Hockey 2019), rituals, practices or observations of emotions and experiences (McMillan 2022) be they verbal or oral accounts, autoethnographic, ethnographic or other qualitative methodological approaches.

Ethnograms then may have a role to play as a qualitative research method for presenting data visually for analysis that was captured or collected through commonly known methods such as participant observation, audio or video recording, tally charts, fieldnotes or photographs. Data can be transformed into visualization and abstraction to portray social reality through an ethnogram.

In this way, ethnograms, as a viewable artefact, utilize the sense of vision but do so for qualitative analysis and interpretation but in doing this can facilitate foci on the other senses (Howes 2005, 2009) because these may now be visualized. For instance, researchers wishing to see emotions during a routine can now visualize this using an ethnogram. Research interested in portraying *smelly* social interactions or spaces can now do so. As has been argued ethnograms provoke interpretations that are novel because of the way in which they transform data from sense to sense and take advantage of the well-developed, in some cultures and peoples, visual sense and visual literacy. In terms of this, through semiotics (Daylight 2012), ethnograms work to develop or

suggest interpretation and meaning by being representational of social reality through abstraction, portraying utterances, gestures, mood, emotion, sound, movement, taste and smell, observable and unobservable behaviours.

For this study, ethnograms were used to see students' talk and question asking and to connect this social behaviour with other data such as the teachers' movements, talk and positioning in the classroom. As part of an experimental ethnographic educational research study exploring an artificially intelligent digital voice assistant where other methods of participant observation, fieldnotes, digital audio recordings and text transcriptions were drawn from, ethnograms were most successful in surfacing emergent themes and potential concepts to pursue analytically. They were thus effective in portraying data for meaning making and interpretation and also used post-analysis for presenting data as findings and for dissemination.

Limitations

Ethnograms have been presented as an abstraction, a visually simplified portrayal of social interaction that aids interpretation and analysis. They have been argued as a way to single out pre-identified data from an array of possible other data in order to see patterns and insights related to this data focussed on. Rather than consult multiple data simultaneously, ethnograms can isolate data of choice in relation to a research objective or question so that this data is visualized for further analysis. Ethnograms have not been presented as a research method to replace video recording as a qualitative method but instead have been presented as an abstraction and visualization of data and so could augment video recording methods. Some researchers or research questions may require a real-time portrayal and faithful replay of live events that have occurred, ethnograms cannot do this. Ethnograms cannot depict the colourful, animated social interactions that occur in real life over time or foster a vicarious experience.

Ethnograms have been presented as a way to visually present data for post-collection analysis (Eisner 1997) and as such are suited to educational researchers interested in abstraction and the visual. Currently, the data used to produce the ethnograms for this study was sourced from a manual record of interactions and ethnograms were manually produced by drawing individual circles and lines and placing them carefully. No automatic system has yet been created and ethnograms need to be created manually using software or pen and paper.

Ethnograms depict social interactions in a summary form and do not provide any quantitative data and thus require the viewer of one to form their own interpretation and meaning making from it. This subjective and interpretive feature may be seen as a limitation for researchers seeking the numeric or for whom interpretive work lacks objectivity. Ethnograms may therefore only be suitable for researchers whose orientation is towards qualitative research methodologies and methods and the visual.

Conclusion

Environments people inhabit are complex social spaces where an array of data is produced in real time. Sometimes this is overwhelming. For qualitative-oriented researchers of these spaces, there are research methods available for collection and analysis of this data. However, there are less opportunities to qualitatively visualize this data for interpretation and subjective meaning making. Although digital video and photography accurately record real life so that it can be re-observed some issues for educational researchers have been presented and some researchers may be seeking simplicity and a focus on unobservable or sensory data.

Ethnograms have successfully visualized talk and movement in classrooms from this study and through abstraction pictured talk by transforming data from one sense to another sense: from sound to sight. In this way, ethnograms have been able to contribute methodologically to qualitative research by providing a method for dealing with data that is evident in social spaces but not

captured through other methods. Ethnograms also contribute by providing another method for qualitative researchers seeking alternate ways to capture and analyze data and who may be in search of different perspectives on data they already have. Through the process of transforming data from one sense to another, this is a possibility. Examples have been provided where sensory data or other behavioural data could be visualized in an ethnogram. Ethnograms have therefore been posited as a research method to add to the already existing range of methods rather than as a replacement to, for example, video or photography. Ethnograms are just one of many methods options but may be more suited to qualitative researchers, educational researchers or sociological and anthropological researchers interested in creative research methods.

Declaration of conflicting interests

The author has declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Notes

1. An Echo Dot voice assistant is a digital 'smart speaker' that responds to spoken instructions. The Echo Dots were used as a data collection tool and were a focus of the one-year research study.
2. Alexa is the name given to the Amazon Echo Dot device's artificial intelligence voice assistant software.

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References

Asan, O., and Montague, E., 2014. Using video-based observation research methods in primary care health encounters to evaluate complex interactions. *Informatics in primary care*, 21 (4), 161–170.

Bagnoli, A., 2009. Beyond the standard interview: the use of graphic elicitation and arts-based methods. *Qualitative research*, 9 (5), 547–570.

Banks, M., 2001. *Visual methods in social research*. London, United Kingdom: Sage.

Bertin, J., 1983. *The semiology of graphics: Diagrams, networks, maps*. California: Esri Press.

Carter, T.F., 2022. Sensory ecologies: the refinement of movement and the senses in sport. *The senses and society*, 17 (3), 241–251.

Classen, C., 1997. Foundations for an anthropology of the senses. *International social science journal*, 49 (153), 401–412.

Coe, R.J., *et al*., 2017. *Research methods & methodologies in education*. 2nd ed. London: Sage Publications.

Colombo, M., *et al*.. 2021. "Streetwise: mapping citizens' perceived spatial qualities." In *Proceedings of the 23rd international conference on enterprise information systems*. Vol. 1, 810–818. SciTePress..

Cook, R., and Hockey, J. 2023. 'Gravel cycling craft and the senses: scenes, sounds, vibrations, fatigue and typifications on off-road tracks'. Senses and society. Available from: https://www.tandfonline.com/doi/full/10.108017458927.2023.2181138.
Copeland, A.J., and Agosto, D.E., 2012. Diagrams and relational maps: the use of graphic elicitation techniques with interviewing for data collection, analysis, and display. *International journal of qualitative methods*, 11 (5), 513–533.
Crilly, N., Blackwell, A., and Clarkson, P., 2006. Graphic elicitation: using research diagrams as interview stimuli. *Qualitative research*, 6 (3), 341–366.
Daylight, R., 2012. The difference between semiotics and semiology. *Gramma: Journal of theory and criticism*, 20, 37–50.
Dey, I., 1993. *Qualitative data analysis: A user-friendly guide for social scientists*. London, United Kingdom: Routledge.
Donnelly, M., Gamsu, S., and Whewall, S., 2020. Mapping the relational construction of people and places. *International journal of social research methodology*, 23 (1), 91–108.
Eisner, E.W., 1997. The promise and perils of alternative forms of data representation. *Educational researcher*, 26 (6), 4–10.
Fallucchi, F., *et al.*, 2021. Enriching videos with automatic place recognition in google maps. *Multimedia tools and applications* 81: 1–17.
Garcez, A., Duarte, R., and Eisenberg, Z., 2011. Produção e análise de vídeogravações em pesquisas qualitativas. *Educação e pesquisa*, 37, 249–261.
Gibson, J.J., 1979. *The ecological approach to visual perception*. Boston: Houghton-Mifflin.
Giunchiglia, F., and Walsh, T., 1992. A theory of abstraction. *Artificial intelligence*, 57 (2-3), 323–389.
Guiraud, P., 1964. *Semiology*. Boston.: London.
Hockey, J., 2019. Everyday routines as transformative processes: a sporting case. *Sociological research online*, 24 (2), 219–234.
Howes, D., 2005. *Empire of the senses: The sensual culture reader*. Oxford: Berg.
Howes, D., 2009. *The sixth sense reader*. Oxford: Berg.
Kearney, K.S., and Hyle, A.E., 2004. Drawing out emotions: the use of participant-produced drawings in qualitative inquiry. *Qualitative research*, 4, 361–382.
Keating, M., and Łapińska, J., 2023. From cookbooks to ASMR: significance of sound and hearing in culinary recipes. *The senses and society*, 1–12. https://www.tandfonline.com/doi/full/10.1080/17458927.2023.2181137.
Knoblauch, H., *et al.*, 2008. Visual analysis. New developments in the interpretative analysis of video and photography. *In forum qualitative sozialforschung/forum: qualitative social research*, 9 (3). https://www.proquest.com/scholarly-journals/visual-analysis-new-developments-interpretative/docview/869615944/se-2.
Leland, C.H., Mennonno, A., and Schools, I.P., 2016. This is how we get along: transmediation as a tool for thinking. *The Mid south literacy journal*, 1 (2), 60–72.
Lengler, R., and Eppler, M. 2007. 'Towards a periodic table of visualization methods for management'. Iasted *Proceedings of the conference on graphics and visualization in engineering*, Clearwater, FL, USA. Retrieved from http://www.visual-literacy.org/periodic_table/periodic_table.pdf.
Marchand, T.H.J., 2022. *The pursuit of pleasurable work: Craftwork in twenty first century England*. Oxford: Berghahn Books.
McMillan, M., 2022. Who feels it knows it: black bodies and the sensory experience of the dance-Hall. *The senses and society*, 17 (2), 223–227.
Miles, M.B., and Huberman, A.M., 1994. *Qualitative data analysis*. Thousand Oaks, CA: Sage.
Mohajan, H.K., 2018. Qualitative research methodology in social sciences and related subjects. *Journal of economic development, environment and people*, 7 (1), 23–48.
Mondada, L., 2012. Video analysis and the temporality of inscriptions within social interaction: the case of architects at work. *Qualitative research*, 12 (3), 304–333.
Morse, J.M., 2006. Diagramming qualitative theories. *Qualitative health research*, 16 (9), 1163–1164.
Nätynki, M., Kinnunen, T., and Kolehmainen, M., 2023. Embracing water, healing pine: touch-walking and transcorporeal worldings. *The senses and society*, 1–18. https://www.tandfonline.com/doi/full/10.1080/17458927.2023.2180864.
Nicol, A., and Pexman, P., 2010. *Displaying your findings: A practical guide for creating figures, posters, and presentations*. Washington, DC: American Psychological Association.
Onwuegbuzie, A., and Dickinson, W., 2008. Mixed methods analysis and information visualization: graphical display for effective communication of research results. *The qualitative report*, 13 (2), 204–225.
Ortiz-Ospina, E. 2019. The rise of social media. Published online at OurWorldInData.org. Available from: ' https://ourworldindata.org/rise-of-social-media' [Online Resource] [Accessed 20th April, 2023].
Page, D., and Sidebottom, K., 2022. The sensorium and fleshy schools. *British educational research journal*, 48 (4), 771–784.
Pain, H., 2012. A literature review to evaluate the choice and use of visual methods. *International journal of qualitative methods*, 11 (4), 303–319.
Pavlovskaya, M. 2016. Digital place-making: insights from critical cartography and GIS. The digital arts and humanities: Neogeography, social media and big data integrations and applications, pp.153–167.
Peters, M.A., *et al.*, 2021. Video ethics in educational research involving children: literature review and critical discussion. *Educational philosophy and theory*, 53 (9), 863–880.

Petersson, J., *et al.*, 2021. Two novel approaches to the content analysis of school mathematics textbooks. *International journal of research & method in education*, 44 (2), 208–222.
Pierce, C.S., 1991. *Peirce on signs: Writings on semiotic*. Chapel Hill: UNC Press Books.
Pink, S., 2006. *Doing visual ethnography*. London, United Kingdom: Sage.
Pink, S., *et al.*, 2015. *Digital ethnography: Principles and practice*. London: Sage.
Pink, S., 2015. *Doing sensory ethnography*. London: Sage.
Radnofsky, M.L., 1996. Qualitative models: visually representing complex data in an image/text balance. *Qualitative inquiry*, 2 (4), 385–410.
Rose, G., 2016. *Visual methodologies: An introduction to researching with visual materials*. 4th ed. London: Sage.
Rutanen, N., *et al.*, 2018. Tensions and challenges concerning ethics on video research with young children – experiences from an international collaboration among seven countries. *Video journal of education and pedagogy*, 3 (1), 1–14.
Siegel, M., 1995. More than words: the generative power of transmediation for learning. *Canadian journal of education / revue canadienne de l'éducation*, 20, 455–475.
Slone, D.J., 2009. Visualizing qualitative information. *The qualitative report*, 14 (3), 489–497.
Stockemer, D., 2019. *Quantitative methods for the social sciences'. 50*. Cham: *Springer International Publishing*.
Stoller, P., 1989. *The taste of ethnographics things: The senses in anthropology*. Philadelphia: University of Pennsylvania.
Strauss, A.L., 1987. *Qualitative analysis for social scientists*. New York, NY: Cambridge University Press.
Suhor, C., 1984. Towards a semiotics-based curriculum. *Journal of curriculum studies*, 16 (3), 247–257.
Tufte, E.R., 2001a. *Visual explanations: Images and quantities, evidence and narratives*. Connecticut: Graphics Press.
Tufte, E.R., 2001b. *The visual display of quantitative information*. Cheshire, Connecticut: Graphics Press.
Umoquit, M.J., *et al.*, 2011. Evaluation of exposure-specific risks from two independent samples: a simulation study. *Bmc medical research methodology*, 11, 1–10. doi:10.1186/1471-2288-11-1.
Varga-Atkins, T., and O'Brien, M., 2009. From drawings to diagrams: maintaining researcher control during graphic elicitation in qualitative interviews. *International journal of research & method in education*, 32 (1), 53–67.
Verdi, M.P., and Kulhavy, R.W., 2002. Learning with maps and texts: an overview. *Educational psychology review*, 14, 27–46.
Verdinelli, S., and Scagnoli, N.I., 2013. Data display in qualitative research. *International journal of qualitative methods*, 12 (1), 359–381.
Viola, I., Chen, M., and Isenberg, T., 2020. Visual abstraction. In: M. Chen, H. Hauser, P. Rheingans, and G. Scheuermann, eds. *Foundations of data visualization*. Cham: Springer, 15–37.
von Engelhardt, J., 2002. The language of graphics: a framework for the analysis of syntax and meaning in maps, charts and diagrams. Unpublished PhD thesis. Amsterdam.: University of Amsterdam.
Walker, R., and Adelman, C., 1975. Interaction analysis in informal classrooms: a critical comment on the flanders' system. *British journal of educational psychology*, 45 (1), 73–76.
Wall, K., *et al.*, 2013. 'That's not quite the way we see it': the epistemological challenge of visual data. *International journal of research & method in education*, 36 (1), 3–22.
Waskul, D.D., and Vannini, P., 2008. Smell, odor, and somatic work: sense-making and sensory management. *Social psychology quarterly*, 71 (1), 53–71.
Wheeldon, J., 2010. Mapping mixed methods research: methods, measures, and meaning. *Journal of mixed methods research*, 4 (2), 87–102. doi:10.1177/1558689809358755.
Wild, M., 1996. Mental models and computer modelling. *Journal of computer assisted learning*, 12 (1), 10–21.
Zdebik, J., 2012. *Deleuze and the diagram: Aesthetic threads in visual organisation*. London: Continuum.