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Embodied learning made visible through line drawing

Examples from sloyd education

Abstract

Visual material in the form of video, still images or drawings can show parts of embodied learning that text cannot. Research ethics requirements pose a challenge in terms of making younger students' multimodal learning visible, as the informants need to be anonymized, and this raises the challenge of how important information, such as gaze and facial expressions, can be shown. The ethical requirements exist to protect underage students, and to contribute with a scientific basis for teaching, practical and feasible methods are needed in which the students' communication can be illustrated while ensuring their protection. This paper explores how empirical data from studies involving younger students can be presented so that learning can be visualized while respecting ethical guidelines. The reasoning regarding the methods presented in the paper can also be useful overall for the anonymization of visual ethnography studies, in which the interest is to present empirical data from video recordings so that embodied learning can be made visible.

Keywords:

embodiment, learning, ethics, visual ethnography, sloyd

INTRODUCTION

Sloyd is a compulsory subject in Swedish elementary schools, in which students learn to design and produce objects by working with craft techniques and materials such as wood, textiles and metal (Skolverket, 2022). In the sloyd classroom, there are opportunities for learning through multimodal interaction with the body, materials, space and tools (see for example Alm, 2012; Andersson, 2021;

Frohagen, 2016; Skolverket, 2022; Thorbjörnsson, 2008). It regards learning from the perspective that the whole body is involved in the production of knowledge (Noë, 2004; Pallasmaa, 2009; Pallasmaa, 2017). When making this learning visible in scientific texts, visual material is important. In studies involving underage students, the dilemma arises of how to display visual data, such as gaze and facial expressions, while meeting ethical requirements (Jordan, 2014; Nutbrown, 2011; Rose, 2016; Wiles et al., 2012).

MULTIMODAL VISUAL ETHNOGRAPHY IN COMBINATION WITH CONVERSATION ANALYSIS

There is a long research tradition of making interaction visible by studying conversations in detail, known as conversation analysis, shortened to CA (Sacks et al., 1974). In CA, transcription with specific writing conventions is used to make visible what is said and how. Sometimes, the transcription is supplemented with images to clarify, for example, who is who and how people relate spatially to each other, to materials and to tools. Practices in which embodied actions and cognition are central can benefit from the combination of visual ethnography and CA, such as healthcare professions (Chatwin et al., 2022) and florists (Gåfvels, 2016). To do this, video ethnography is often used (Pink, 2013). Video ethnography gives us some unique opportunities as researchers, according to Groth (2022), such as the opportunity to see events repeatedly and watch them at a slow speed to study details. Brænne and Midtlid (2021) argued that video can serve as an extra, reinforcing layer of communication by allowing the researcher to relive an event through the recording. The features of video ethnography can be helpful in capturing, analyzing and presenting dynamic and complex processes in education.

Multimodal empirical data such as film and photos can be presented in many different ways and the choice of method needs to be adapted to the purpose and questions of the study. For example, photos can be inserted into scientific texts and video material can be made available via link (Pink, 2013). The visual material can then be supplemented with text where it is presented, analyzed and discussed. To guide the reader through the video material, the researcher can create a film with commentary on the clips, a so-called film article, as discussed in Seiler et al. (2021), in which the film is included in an extended abstract via a clickable image. The authors, also craftsmen, describe their practices combined with verbal reflection on the filmed material Seiler et al. (2021). Albert et al. (2019) presented different ways in which video material can be analyzed graphically, for example, by drawing and analyzing the changing shape of the area between people (Albert et al., 2019, pp. 9-10), using “stick figures” showing body positions (Albert et al., 2019, pp. 11-12) and by drawing figures on a still image to show the next steps in a dance movement (Albert et al., 2019, pp. 14-15). Digital video analysis tools can be helpful in visualizing multimodal interactions, for example, with “a timeline layout” in which gaze and actions can be indicated in relation to image and time (Cowan, 2014). In studies with underage informants, these methods are difficult to use because of the requirement for anonymization. One option, as chosen by Johansson (2002, p. 91), is to refrain from using still images from video material and instead use drawings that show what is happening in the transcript extracts. Digital filters may be used to anonymize still images in some studies, as in Broth and Keevallik (2020, pp. 92, 201), but for studies where bodily learning is central, there is a risk of filtering out important information. The research question addressed is: How can empirical data from video recordings with participants who need to be anonymized be presented so that embodied learning can be made visible?

VISUAL LEARNING





This paper is based on the view that learning is always multimodal and rooted in bodily actions in interaction with materials, environment and culture (see for example Eisner, 2002; Goodwin, 2017; Johnson, 1999; Johnson, 2011; Lenz Taguchi, 2012; Lorvik et al., 2019; Norris, 2004). According to Bornemark (2020, 2023), a process of learning starts when we use our sensory perceptions to perceive the world around us. Bornemark (2023) discussed a composed sensuality in which different sensory impressions cooperate. The craftsman receives sensory impressions by touching and handling materials

in relation to a specific context, which makes it interesting to study the making process to gain insight into the learning process (Aktas & Mäkelä, 2019; Groth, 2022; Pallasmaa, 2017).

The examples that form the basis of this paper come from a classroom study that investigates how teaching with a focus on communication around aesthetic dimensions can support students' learning in sloyd education. The research lesson consists of three sessions with four students per time and the students working in pairs. The students are 8–9 years old and in grade 3 in Swedish primary school. The empirical data is collected with video to capture both verbal and body-based communication between students, between students and materials and between teachers and students. Video provides the opportunity to capture gaze, which contributes to communication, particularly evident in younger children whose language is not fully developed Heikkilä (2006).

The study has undergone ethical review (decision Dnr 2022-03830-01) and, given the young age of the students, the data needs to be anonymized (Etikprövningslagen, 2003). Excerpts from the films have been selected based on the study's aim and research questions, and still images have been created for use in clarifying the results. The stills have been processed into line drawings so that the identity of the individual students cannot be discerned, the students have been given fictitious names and the location of the school is not specified. To make the students anonymous, facial features, hairstyles and skin tone have been adjusted. The examples shown in this paper focus on methodology, and the focus on the content of the empirical analysis is dealt with in other texts. Table 1 presents different methods of how a still image from video material can be anonymized to determine which ones can follow the ethical guidelines while showing multimodal learning.

TABLE 1. Experiments with different methods on how a still image from video material can be anonymized.

 <p>A. Photo, white face, arrows for gaze direction</p>	 <p>B. Line drawing</p>
 <p>C. Line drawing with revealed fields</p>	 <p>D. Revealed background</p>

In method A, we lose all visual information from gaze and facial expressions. The white field attracts our gaze and makes us focus on what has been removed instead of what remains in the image. Alternatively, the face can be masked with a blur or pixels, but visual information from the face is still lost. To compensate, gaze directions can be shown by arrows, as shown in method A. The line drawings in method B give us access to the characters' facial expressions in a stylized way. The drawing is made in a layered digital drawing application where the lines are drawn with a digital pen tool on the still image and a layer of white background is then added over the still image layer. To seize the movement of the video, a pressure-sensitive pen tool that can produce a varied line is used. This type of line signals vitality and liveliness that helps reproduce a sense of the movement that took place during the research lesson.

It is a balancing act to determine how much adjustment needs to be made for the image to be considered anonymized while maintaining the specific facial expression. The researcher needs to be cautious and consider both the purpose of the research and the ethical guidelines given that the children are minors (ALLEA, 2017). The black-and-white line drawing in image B can be difficult to orientate in, as the reduction to lines makes all parts of the image appear equal. To direct the reader's attention to the focus of the analysis, vital parts of the image, such as hands and materials, can be exposed to reveal colour (see method C). The revealed parts contribute important information about, for example, the grip of the hand and the surface of the material without being sensitive from an ethical point of view. In method D, everything but the students' faces are exposed. This provides rich information about the environment, which is important to the study. In this particular extract, the environment is not the focus of the analysis and the amount of information in the image makes it difficult to see what is important according to the purpose of the study. Furthermore, the white colour of the faces in method D is in sharp contrast to the background, which, like method A, draws our attention in an undesirable way.

The mobility in the video clips provide information about, for example, the direction of gaze and movement, which is lost in the shift from moving image to line drawing. To enable line drawings to depict what is being communicated, some elements have been removed and others added. For example, the eyes have alternated to better show the direction of the gaze and patterns on clothing can be reduced (compare images A and D with B—C in Table 1). The images are intended to be presented in sequences of images to show events rather than frozen moments (compare Table 1 with Tables 2 and 3).

For the specific study that the sample images in the paper come from, method C and, in some cases, a variant of method D have been chosen, since they both suit the purpose and questions of the study and comply with the ethical guidelines that apply to this type of study. The line drawings are not exact representations of the still images from the video clips because 1) it is not possible, as the model, video and still images do not consist of lines; 2) adjustments are sometimes needed so that what the line drawing communicates is similar to what the film communicates; and 3) the anonymization requirement sometimes means that adjustments need to be made. Transcription is a process of analysis and interpretation in which the researcher needs to make considered choices (Bird, 2005; Cowan, 2014; Duranti, 2006; Green et al., 1997; Lapadat & Lindsay, 1999; Ochs, 1979; Ten Have, 1990). The transfer from film via still image to line drawing and the choice of what to reveal in the image is such a process. The transcription images should therefore be seen as interpretations aimed at visualizing what the empirical data as a whole show, based on the purpose of the study.

Images, as part of communicating the results of the study, invite the reader to participate in the analysis (Carlsen, 2018, p. 13). The revealed image fields give the reader an opportunity to gain access to extensive preparatory work and thereby, they can compare images and take part in a course of events they would otherwise not be able to take part in (Carlsen, 2018, pp. 13-14). The reader can borrow 'the researcher's glasses' to see the empirical data.

LINE DRAWINGS AS A METHOD TO DEMONSTRATE EMBODIED LEARNING

Line drawings with revealed fields can be used to demonstrate bodily cognition in education. Three examples of how this can be done are presented here under the headings: 1) The room, 2) Touching and handling, and 3) Mirror. The examples come from the study described above.

The Room

Sloyd teaching in Sweden is usually carried out in special sloyd rooms adapted for creating with sloyd materials and tools (Andersson, 2021; Gyllerfelt & Johansson, 2021). In addition to what the sloyd room offers, the teacher can give students access to fictional spaces—that is, spaces created in the imagination. They could do this, for example, by using digital tools. At the beginning of the research lesson, the students chose a place in the schoolyard where the sculpture they were going to build would be fictitiously placed through a digital photomontage. The place the students chose became a contributing inspiration in the development of their ideas. The photo of the place became a visual sketch which, through students' ability to envision, imagination and experience, gave the sculpture a context and could help to facilitate communication in the sloyd classroom.

Figure 1 shows how one of the students, here named Josse, shows and “feels” the area that could be suitable for the sculpture. Here, the movement itself also becomes a visual-bodily sketch (compare Groth, 2022; Kozel, 2013). In the figure, Josse's body has been anonymized through line drawing and a white field. The background is revealed. It would have been enough to anonymize the student by making only the face a line drawing, but the entire body is in line drawing style so that the student's body can be distinguished from the background and the cooperation between environment and body can be made clear. What was supposed to be an anonymization is given an additional function here as a multimodal visual tool to clarify the image's communication. Arrows can be used to indicate direction or connection in images (Kress & van Leeuwen, 2006, pp. 46, 59-66). Kress and van Leeuwen (2006) referred to these types of images as narrative images. In Figure 1, an arrow has been added to compensate for the information lost in the transfer between moving and still images. The dashed part of the arrow indicates the distance the learner has travelled and the solid part indicates where the learner will continue (compare Groth, 2022; Kozel, 2013). The arrow contributes to a narrative and can make the still image tell parts of what the video format shows.



FIGURE 1. Josse tests the surface they plan to use by running around the site while showing the site to her partner, Iris, who is to the left of the photographer/ teacher.

Figure 2 shows the students' photomontage with the finished sculpture in the environment of choice. In the photomontage, the students' selected photo of the place where Josse “run-walked” (see Figure 1) has contributed to putting what the students have created in context. Figure 1 contributes to an

understanding of how the students relate to the environment that will become part of what they create in the sloyd room.



FIGURE 2. The finished sculpture has been photographed against a greenscreen. A digital photomontage has been made with the schoolyard photo.

Touching and Handling







The students in the sequence below (Table 2) were asked to find pieces of wood that could be assembled into a sculpture. For three seconds (Box 14–18), the student Iris examines the piece she has found from several different angles. None of the students say anything, making the line drawings the sole carriers of information about what is happening: body language such as gaze direction, facial expressions and the exploration of the piece of wood. The combination of image and CA makes it possible to show the learning process and the information that is received through the body and senses (Eisner, 2002; Goodwin, 2017; Johnson, 1999; Johnson, 2011; Lenz Taguchi, 2012; Lørvik et al., 2019). By revealing the parts that are the focus of the analysis, in this case the hands and the material, the event can be clarified in a way that makes it possible to give materials and sensory impressions the main role they play in the students' creative process.

TRANSCRIPTION KEY

.	Short pause, about 1 second
.2	The number indicates the length of the pause in seconds
/ /	Text in slashes describes what they do/say and how
()	Text in brackets is the researcher's comment

Variation of Jefferson (2004)

TABLE 2. In the transcript, we meet the students Iris (left) and Josse (right), who have just started creating a sculpture with pieces of waste wood. Iris has found a piece in the box and exclaimed, “Oh, look at this! Isn’t it good?” In Box 13, she is showing it to Josse, who looks at Iris and suggests that they make a cat. Josse says nothing about the piece Iris is showing. Iris then looks at the piece from different angles and also examines its weight and balance (Boxes 16–18).

<p>13.</p> 	<p>14.</p> 	<p>15.</p> 
<p>0:41 <i>Josse: we have to find a .3 /looking up/ lets' just make a cat</i> <i>Iris: shall we make a .2 /puts down piece, still looking at Josse/ cat</i> <i>Josse: yes (says something else that is not really heard)</i> <i>/Josse looks further in the box/</i></p>	<p>0:47 <i>/Iris picks up the piece of wood and examines it again from different angles/ (Boxes 14–17).</i></p>	<p>0:48</p>
<p>16.</p> 	<p>17.</p> 	<p>18.</p> 
<p>0:49</p>	<p>0:50 <i>/Iris balances the piece in one hand/</i></p>	<p>0:50b <i>Josse: here's something .2</i> <i>/Josse holds up a piece she found in the box/</i></p>

In the transfer between video and still images, the time aspect is lost. In the transcript in Table 2, the time of the still images is indicated, which can help the reader get a sense of how activity and time are related. A box with rounded corners was chosen to frame the images. This layout allows the narrative to be part of the well-established visual language of comic books, which can tell about events and time (Brunetti, 2011; Kuttner et al., 2021; Sousanis, 2015).

Mirror

The piece of wood Iris is examining in Table 2 has been noticed by Josse, which is indicated by her giving the piece a few glances. At first, it may seem that Josse ignores Iris’s finding by not saying anything specific about the piece of wood and instead suggesting that they make a cat. Later in the sequence, it turns out that Josse’s response to the piece of wood Iris shows is the piece she found while searching

(Box 18). The shape of the piece mirrors Iris’s piece, and the students later explore this further haptically and with sound (see Table 3).

TABLE 3. Continuation of Table 2. Josse has found a piece of wood similar to the one Iris has. They compare the pieces.

<p>19.</p> 	<p>20.</p> 
<p>0:52 <i>Josse: act as ears .3 maybe they</i></p>	<p>0:55 <i>Josse: and . them too .2 m:m:m</i></p>
<p><i>/Iris and Josse compare their pieces/</i></p>	<p><i>/Josse points to Iris's piece. Moves to the next arc and the next while making sounds/</i></p>

Josse haptically senses the arc shapes with her fingers, first on her own piece and then on Iris piece (Box 19). Box 20 shows an interplay with haptic touch, gaze and sound used when the shapes are examined.

EMBODIED LEARNING MADE VISUAL

The examples in the paper were created to make learning visible in still images from video material with students who needed to be anonymized. To make the line drawings easier to read, they were supplemented with revealed parts to indicate the focus of the analysis. By revealing hands and materials, the steps in the learning process where senses are used and considerations are made in action can be made visible. The revealed parts direct the focus to embodied learning and can thereby challenge a hegemonic view of learning centred on the verbal and one-sided localization of knowledge production to the brain (Noë, 2004, p. 209—231; Pallasmaa, 2009; Pallasmaa, 2017). The examples presented show that still images in sequences from video data can, to some extent, visualize how body, material and space cooperate in learning situations and how dialogue in action is crucial for learning to occur.

In video ethnographic studies involving underage students, the ethical aspects make it impossible to use streaming video material or still images without anonymization. In the process of anonymization, important information can be lost by removing, for example, facial expressions and voice. Line drawings with exposed fields in combination with CA can then be a method that enables the depiction of multimodal communication, where body language and the action of the hand can be in focus. This facilitates research with underage informants, and at the same time, the presented methods can be useful overall for anonymization of visual ethnography studies, where the interest is to present empirical data from video recordings so that embodied learning can be made visible.

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