Uses of Video in Educational Research

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Abstract

While most are familiar with the idea of using a video camera as a generic recording device, a deeper understanding of what happens "behind the camera"; the biases that audio and video recording usually are accompanied with; and the type and level of analysis of recorded footage, is still largely lacking in many educational research communities. In this paper, a quick survey of some technical, methodological, and analytic issues is presented with a view to introduce to the reader some established paths to pursue for further study. A brief presentation of work attempted elsewhere is also offered, and several suggestions for incorporating video into research in the local context are proposed for the reader's consideration.

Perhaps almost everyone would have at least some sort of passing familiarity with video technology. Surely, many of us are avid consumers of the moving image, having grown up to things like the *The National Geographic Specials*, or, the Gulf War I & II "live" on *CNN*. Most people who have handled a modern digital video camera easily appreciate its quality and ease of use, and it is not uncommon to hear many people who have been video-recorded remark: "I didn't know that I said *okay* so many times", for example. Yet, despite this familiarity with the moving image, analysis and critical judgment of such images are not common skills, let alone the technical appreciation for the production of such images and sound. In educational research settings, at least in CRPP alone, many projects understand the intrinsic value of the video record, as a means of preventing the inevitable bandwidth overload for the observer who has to witness so many simultaneous events in the typical classroom. Also, video is treated as an augmented audiorecording of the study, with the moving images assisting intelligibility of the recorded sound in a procedure akin to lip-reading. For the Core project of CRPP, even the project proposal specifies the acquisition of "high-quality audio and digital video recordings of samples of classroom work that illustrate good practices in the terms established in Panel 3", and the pursuit of "significant analyses of the classroom talk from qualitative perspectives, partly to discover new features of classroom *activity*, and partly to illustrate key findings from Panel 3." (Luke, Freebody, & Lau, 2004, emphasis added). The function of this paper is to serve as an introduction to the CRPP

academic community, some issues involved in the production of videos used for research; some notable projects that have been undertaken elsewhere. Finally, some proposals will be tabled for discussion and subsequent refinement that a good debate will be apt to produce.

Technical Issues

Easily the most overlooked aspect of video production, technical aspects can become very daunting to the technophobe. While consumer-grade equipment have increased in quality over the years, there still are major differences between these and the professional gear that are used to produce the images and sound that people are perhaps more familiar with from broadcast television. Most noticeable will be the differences in resolution; as measured by the number of distinctly resolvable horizontal lines within the visual field. Consumer gear typically weighs in at about 300 lines, the mid-range between consumer and professional, *prosumer* grade can typically resolve about 500 lines; the minimum standard used in typical broadcast cameras is well over 800 lines. Many factors influence this resolution, the electronics and optics involved being the major determinants of the eventual quality: generally, the larger the image sensor,[1] and the higher quality and size of the lens, the better the resolution. It is true that consumer cameras can produce somewhat comparable images, but such cameras usually have poor image latitude: the images produced are good only within a small range of conditions which have been pre-determined by the manufacturer to be typical uses of their product. Also, most consumer video cameras have lenses of long focal lengths, narrowing the field of view. Wide angle conversion lenses can be purchased as accessories and fitted on, but these lenses usually have the effect of reducing the resolution as they are most commonly made of inferior optical materials (sometimes, even plastic), and distorting the images much akin to what a fish-eye lens would do.

Audio also plays a significant, if not more important role in the interpretation of video, especially in classrooms where a great amount of interaction is in the form of talk. In the audio department, consumer cameras offer some problems due to their design: on-camera microphones are usually of the omnidirectional sensitivity type, receiving sound equally from all directions. In classrooms where the ambient sound field usually includes noisy fans, rumbling traffic, and the occasional jet engine or two, some form of directional bias would be necessary to isolate the voices of the speakers. Additionally, there is also no defeating the natural decrease in sound levels the further one is from the sound source; if the camera is placed in the back of the room, for example, the teacher's voice, will have to be very loud to be heard above the ambient noise levels. A solution for this would be to use a wireless microphone kit on the teacher, but

[1] what is usually known in modern video cameras as the Charged Coupled Device, or CCD

poses another problem whereby the audio source is exclusively from this wireless microphone, and therefore sounds incongruous to the image. Also, now the students' voices are effectively deleted as they are further away from this microphone. Most consumer cameras can only accept a single audio input even though there are two distinct audio channels recordable on tape. Although workarounds exist, unless the two channels are of comparable levels, the camera automatic circuitry would reduce the both signals equally, rendering the louder signal tolerable, and the initially weaker signal as inaudible. On the good side, the miniDV standard for audio recording specifies for 2 independent channels of 48kHz, 16 bit, uncompressed audio recording, which compares well with the single 44.1 kHz, 16 bit, compressed windows media audio format found in our audio recorders.

In summary, for video production, the technical challenges of acquiring high quality audio and video are often overlooked due to the ubiquity of professionally made television. Although needs for research are somewhat reducible, there are still significant challenges to be overcome in issues like editing, storage, and distribution that need to be considered. For now, let us consider *what* to point the camera at.

Methodological Issues

Framing

Video data is constrained by technical issues as introduced in the previous section. What is perhaps even more insidious, in the sense that most uncritical viewers are apt to miss, is the framing of the picture:

> For example, to place the camera at the back of a typical school classroom and shoot directly forward with the teacher full-face in the center of the frame and the backs of students' necks facing the camera implicitly constructs "teaching" as a process in which the teacher is the primary agent and students are relatively passive recipients of the activity of the teacher's instruction. To place the camera halfway along the side of the room, with the teacher and some of the students shown together in profile view is to emphasize reciprocal relations between the teacher and the students. To place the camera behind the teacher — as it were, over the teacher's shoulder, shooting the students full face — is to emphasize the listening reactions of students as the teacher talks to them. Still, wherever the camera is pointed it does not "perceive" as actively, as *prehensively*, as contemporary cognitive psychology shows that humans do in their ordinary processes of seeing and hearing. (emphasis in original)

(Erickson, In Press)

Hall (2000) adds that the framing of any activity of interest "must be rendered in ways that selectively delete or foreground aspects of the original setting", and argued that this was not due to any oversight by researchers, but by "technical arrangements for capturing human activity and by theoretical expectations about the boundaries of that activity." He demonstrates this with pictorial examples, where a pair of photographs of the same scene can be described in different ways, and concludes with the reminder that any choice of framing encodes with it a particular perspective, which, paradoxically, no one participant could ever have had. He cautions against thinking about claims that videotape provide "objective" or "realistic" records of human interaction, but at the same time highlights the previleged nature of video records:

> [...] video records are plastic in ways that real-time experience is not: we can slow down videotape, we can watch multiparty interactions repeatedly, we can make video and audio recordings that contain more or different things than any single participant could see or hear, and we can hold our judgments about the actions of participants in the record accountable to other observers. (p. 658)

Of course, perhaps an obvious solution to this problem would be to interview the participants of the study, as in a stimulated recall setup. This has the advantage of telling about what happened being held accountable to what actually happened as captured on tape (Hall, 2000), but as a research design, this approach may become logistically unfeasible when the study is scaled up.

Camera Effects

Stigler, Gallimore, and Hiebert (2000) talks about the "camera effect" where it is by no means certain that teachers and students will behave as usual in the presence of the camera. Similarly, Ratcliff (2004) reports reactive effects — where children "made faces, grinned, used exagerrated movements, made obscene gestures, and even enacted for the camera" (p. 115). Closely allied with camera positioning would be the problem of camera pointing and the use of camera supports like a tripod. Although useful to steady the camera from small hand movements especially when using the lens at higher zoom settings, a large camera on a tripod can be intimidating, as in Andre Bazin's description:

> a sort of god ... just like a heathen altar ... [the researcher and camera operator become] high priests ... who bring victims before the camera, like burnt offerings, and cast them into the flames. And the camera is there, immobile — or almost so —

> and when it does move it follows the patterns ordained by the high priests, not the victims. (quoted in Ratcliff, 2004, p. 114)

But this should not give us pause for too long, for if we were to consider other conventional forms of data collection, the observer effects would similarly be present. Something innocuous like a survey form may seem like the epitomy of objectiveness, but even those instruments can be said to have a coercive effect in that it encourages the respondent to gives replies which do not deviate too far from the cultural norms. Granted, the camera and other instruments are likely to have a larger effect on the protagonists, but that by no means is necessarily a bad thing. The observer effect is considered in depth in the next section.

Documentation versus Documentary

McGrath and Johnson (2004) writes on the apparent rift in methodological approaches which is typically referred to as the qualitative-quantitative debate. Examining the issue, he identifies the positivistic versus what Henley (1998) would term interpretive approaches to data collection as divided along the lines of difference based on the status of facts and subjects with respect to the observer; the extent of essentialism decontextualisable from the phenomena, and the superiority of the experimenter with respect to the subject as knower and observer. The positivist approach is easily identifiable with the natural sciences approach toward data collection,[2] where the (questionable) assumption exists that one could approach phenomena, essentialise certain features based on a superior theoretical framework, and then measure these features objectively with perfect instruments.

Henley (1998), writing from an ethnographic/anthropological persepctive with reference to film making, observes a similar dichotomous relationship between visual data acquisition, with a general trend for the earlier ethnographic films to adopt the somewhat more positivist approach, in which precautions are taken by researchers to minimise their presence, via the elaboration of rules designed to maximise the effacement of the physical presence of the film maker during production, minimising the authorial signature of the film maker in the rushes (exposed film) through the avoidance of "dramatic camerawork", and a concern with typicality by the use of randomising strategies and/or appropriate detailing of the circumstances of production in an accompanying text, but:

[2]When the social sciences were seeking to establish itself as a serious field of study, the obvious choice was to model the scientific framework present during the time. Now even Physics, perhaps held up by many as *the* archetypal Science (with a capital S), has developed the Heisenberg Uncertainty Principle, where one of its claims is that the very act of measurement changes the state of the phenomenon.

> for others, all such strategies to ensure the objectivity if the cinematographic image are bound to fail. Even if it were possible, through some sufficiently ingenious or laborious means to produce film sequences that might be considered somehow to be an objective physical record of a cultural event, there would still remain the question of the meaning of that event, in the first instance to the protagonists, but also to the film-maker. This meaning, they would argue, can only be determined by means of an active engagement on the part of the film-maker with the protagonists of the film and this is bound to involve some measure of subjectivity. (p. 303)

The two great traditions in ethnographic film making are thus rendered, at two ends of the scale, as the desire for etic, positivistic documentation versus the emic, interpretive documentary which seeks to make meaning and understand the protagonists' perspective. Henley identifies movements like that which originated in the Soviet Union, *kinopravda*, which was later rendered to French *cinéma vérité* with the latter movement; and though it is now often used to refer to "fly-on-the-wall" documentary style, in its original inception, *kinopravda* referred "not to the truth of everyday reality, but rather to the particular truth of the cinema, which is quite different and, by implication, more profound." (p. 307) The camera, "far from being used simply as a passive means of recording visual data, the camera should be an active, catalysing element within the triangle of relationships between the film-maker, protagonists and audience, and should be used as such to generate meaningful events and interpretations." (p. 311) Thus, recommendations are made for the involvement of the protagonists in the construction of meaning in the film, the film-maker's provoking the action, and the audiences' latitude in constructing their own meanings.

Henley cautions however, that there remains strong critiques from those who remain suspicious of projects of collaboration with indigenous subjects; the range, at best, characterise such efforts as paradigmatic examples of the Gramscian hegemonic discourse, a "culturally specific construct that disguises itslef as natural, universal, historically inevitable. At worst, they are also a specialised form of pornography, sharing with films and literature more conventionally classified as such the combination of a voyeuristic interest in the intimate details of other people's lives with the maintenence of distance and, in a desperate search for a lost Eden, the fetishistic cathexis of the Other." (p. 314)

In summary, despite the acknowledged difficulties with trying to collect an objective record there are good reasons to believe that such attempts may be unnecessary, or even futile; and that there exists an alternative, interpretive framework to bring out, as it were, the voices of the

protagonists, to tell their story with their active particpation in the data record. This approach, however, needs to be balanced by the caution not to fantasise the protagonists' fulfilling preconceived notions of certain ideals we want them to be.

Analysis

Erickson (In Press) gives a good overview of video research methods, and introduces the terms molar and molecular to describe the type of analysis:

> There is a temptation to go for the large grain size of molar coding categories so as to avoid the labour intensive work of microanalysis and close transcription of short strips of tape as illustrative examples. And if one does the microanalysis, here is then a temptation to present illustrative instances as self-evidently representative without providing explicit evidence of those examples' typicality or atypicality — either choosing examples using no systematic sampling procedures at all, or keeping those procedures entirely implicit in the research reporting. At either extreme — molar coding or molecular microanalysis — one inadequately represents the range and frequency of anaytically significant variation in the phenomena being reported.

For the Core Project, the molar coding mentioned is already being carried out by Panel 3. Unless there is a desire to verify that Panel's work, molar coding might be a unnecessary duplication of resources, but on the other hand could be justified on the grounds that, as explained in Jacobs, Kawanaka, and Stigler (1999) and Hiebert et al. (2003), utilising video data for coding has the advantages that the data is available long after the event has passed, such that recoding based on categories developed through the initial phases of viewing is possible without significant expenditure of effort. With respect to the local coding scheme, video could be very helpful in improving inter-rater-reliabilty, especially of the higher inference items like the "social support"; it can also give more accurate quantitative figures for time spent in various types of talk.

Erickson summarises six approaches toward analysis as essentialised below:

1. Analysing video as a primary data source focussing mainly on subject-matter content: as interest in concpetually oriented instruction has developed — teaching for understanding, use of firsthand experience, for example, it has become apparent that close investigation of learners' ineraction with instructional materials and of details of their talk with one and others is necessary; video analysis facilitates this. This method takes advantage of the expertise of experienced teachers and teacher educators to critique the performances of the

teaching episodes but is limited to unexamined "common sense" notions about social interaction and about how meaning is communicated and how social influence happens within it; i.e. no notions of the "hidden curriculum" enters the analysis.

2. Analysing video from a neo-Vygotskian perspective: where the social interaction is seen as the fundamental medium within which learning takes place. Analysis would examine the changing patterns of participation in group interactions as "microgenetic" evidence for learning. A drawback to this method would perhaps be that there is very little in the literature that demonstrates how to infer what is "in the head" from the outward signs that video can only record.

3. Analysing video in molar categories as discussed above: perhaps the major advantage of coding from videotape is the inductive generation of categories, which unfortunately is not taken advatage of as major works were conceived for deductive use, and they presume that at a given moment in interaction, the actions of an individual have a single, primary meaning function rather than multiple, possibly contradictory meaning functions.

4. Analysis of video from the Conversation Analysis and Ethnomethodology in Sociology perspectives: a major interest in this approach is the elucidation of the "unwritten rules", as it were, that regulate speech. In a separate paper Goodwin (2000) writes at length about the ethnomethodological approach to visual analysis; the approach has, as its core, questions like how visual imagery translate to theory; how the changing images (which could be various postures of the body or signs, for example) in the semiotic field are influenced by and influence interaction.[3]

5. Analysis from an ethnography of communication/ interactional sociolinguistics/discourse analysis perspective: here, the approach is microanalytic, microethnographic, and is typically concerned with communicative styles in classroom interaction and its relations to the students' ethnic/racial/linguistic (e.g. ESL) minority background. While much of this research tradition is focussed on the verbal interaction, the availability of video records also allow the participants to engage in stimulated recall sessions or the display of these records to persons whose backgrounds are similar to those on tape.

[3] On somewhat of a tangent to this paper, but fascinating nonetheless, Goodwin's analysis of the Rodney King police brutality case gives a powerful example of how exponents in the field can use imagery (frame grabs of an amateur video) to infer the potential threat to the policemen of a prone and effectively defenceless man, leading to the acquittal of the defendants in the initial trial.

6. Context Analysis: Developed through the interdisciplinary collaboration of anthropologists, linguists and psychiatrists, the emphasis is on the simultaneous verbal and nonverbal conduct of all participants in an interactional event and the relations of mutual influence among the participants. Both verbal and nonverbal activity was considered equally important, as it tried to deal in an even handed way with implicit social meaning and explicit referential meaning.

What has been attempted

So as not to overextend this discussion, the following will only serve to give a flavour of the research conducted "out there". The reader is kindly advised to seek out the citations for further reference.

1999 TIMMS Video Study

Perhaps one of the most well known video studies in education, this study was also the most ambitious, with seven countries participating in the data collection, to "describe aspects of teaching that appear to be designed to influence students' learning opportunities." (Hiebert et al., 2003, p. 11). The sampling scheme used was a Probabilty Proportionate to Size (PPS) strategy, whereby the probability of the school to be sampled was proportional to the number of eligible students in the school. In all, about 50 (Japan) to 140 (Switzerland) schools per country were videotaped, one randomly chosen classroom and lesson per school, with a single camera set up to follow what a normal attentive student would be looking at; i.e. the teacher, or when presented, materials on the board or other audiovisual aids. To give the necessary background to the single observation, a survey instrument was also distributed to determine the teacher's professional training; the nature, context and goal of the lesson conducted; and the teacher's perception of the typicality of the lesson. The researchers then used an inductive method to derive macroscopic coding categories to describe statistically interesting phenomena. This study was assisted with the use of *vPrism*, a video encoding and analysis software (Knoll & Stigler, 1999).

Ethnography of Communication

Duff (2002) conducted an EC study of classroom interaction within a mainstream high school social studies class in Canada. Examining the macro- and micro-level context of communication, she focussed on discourse and interactional features of teacher-led whole-class discussions. For example, it was found that even though the teacher had wanted to focus on an inclusive environment whereby everyone's views could be heard, it did not quite turn out that way, for many of

the English as Second Language speakers, who potentially had more to contribute to the discussions regarding varied cultural customs, did not do so, in part, for fear of making mistakes in their communication, and in part due to their potential embarrassment in acknowledging relation to anachronistic practices of, for example, ancestor worship. An interesting point that arises from the paper seems to be that one should look deeper at the reasons for non-participation in classroom talk, by studying the ethnographic background of the protagonists — "Having students report on events, customs, and values in other countries or cultures in a personal, authoritative way can be counterproductive when students do not *want* to or are unable to speak about cultural practices with which they do not currently identify — or at least choose not to publicly identify in mainstream classroom contexts." (p. 305)

Interaction Analysis

Jordan and Henderson (1995), in a well cited introduction to this field, gives an excellent background into the aims and methodological structure for Interaction Analysis (IA). In short, IA appears to be concerned with what people *do* instead of what they *say* they do. The authors claim "discussions of the specific methods used for analysing videotapes do not yet exist. This is due, at least in part, to the fact that practioners are still much more concerned with the practice of doing Interaction Analysis than with the process of describing it." (p. 56) Howevever, a method described appears to have great potential, will make good use of the nature of modern digital video: the authors describe the practice of joint viewing, whereby the videos will be separately watched by individual researchers, and marked up for interesting phenomena based on the timecode on the video. Subsequently, researchers get together to view the videos together, and the researcher is allowed to "pontificate", as it were, on the interesting phenomena, but only for a limited time. These sessions are further audio recorded, and analysed by the initial researcher, a process called "cannibalising the audiotape". In this manner, researcher biases are exposed, there is joint construction of what entails a significant event, and other researchers are able to point out events missed by the original viewer. This short review does not do justice to the 64 page paper; the reader is strongly encouraged to refer to the orignal source.

Videopapers

Highlighting the apparent gulf in the traditions between educational research and practice, Olivero, John, and Sutherland (2004) introduces the *videopaper* as a new genre to serve as a medium between the traditions. Noting that prior research has shown that, among teachers:

> Academic discourse, in particular, with its specialised tropes, schemas and termi-

> nology was seen as a major obstruction to both reading and understanding. Many teachers also expressed concerns about the believabilty of many of the research findings they encountered, given the overt ideological assumptions that appeared to dominate many of the studies. (p. 180)

The authors therefore propose a means of communication that takes advantage of the current advances of digital video and the ubiquity of web access; quite briefly, a *videopaper* is a website with video content. However, the beauty is in the details — the video clips are not arbitrarily located on the website, but deliberately linked to text in such a way as to encourage readers' interaction with the text, participant control of what text is read, and linking of videos to text in a separate frame to aid navigation and simultaneous viewing. Teachers who used the site reported positive reactions, with the authors highlighting comments regarding the "real-ness" and relevance of the research, and the explicatory power of images and sound over just plain text.

Video Diaries

Noyes (2004), eschweing positivistic, etic perspectives that "ignore the big picture", set about to perform a Bourdieuan field analysis surrounding the activities in a Mathematics classroom. Interested in the cultural capital that the students embodied, he sought observable evidence in the form of children's dress, mannerisms, bodily hexis, among others. Producing video diaries, he claims, "provide such data and add to what is already accessible in the classroom. Secondly, diary entries provide narratives of family practices, or of relations within the peer group, and therefore offer a means of accessing the effect of social fields upon the children's dispositions to learning, schooling and the study of mathematics." (p. 195) A room was arranged for the students to record their diary entries in a style reminiscient of *Big Brother*, a television programme in the UK. Rules were suggested by the students and the cooperating teachers to schedule access to the room, and an agreement was made among the participants to talk about themselves, rather than about others, and about their feelings, descriptions of what they had been doing, points of view and thoughts about other people. The videos thus produced managed to provide data that was of considerably greater depth than any structured interview, to the extent that they were even described as poignant. Data analysis was via a critical incidents method using NVivo as an analysis tool.

Conclusion

Videographic methods, as subset of the already limited field of image-based research, still has much to progress before it becomes a respectable data source for qualitative research. Quite paradoxically, while many qualitative techniques in anthropology and sociology utilise "seeing", few research traditions incorporate visual methods into their mainstream practice or reporting, for reasons totally unrelated to any of its potential weaknesses as a method (Prosser, 1998). It is therefore not surprising that within education, purposive use of visual methods are seldom pursued, let alone taken advantage of. It is hoped that this paper has served as a useful introduction to video based research, and to conclude, though there are admitted shortcomings of visual methods, these are largely known, and can be managed to acceptable levels such that more users should approach it with greater enthusiasm. At least this author eargerly awaits such a day.

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