Educational Records of Practice: Preservation and Access Concerns

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ABSTRACT
Researchers in information science are placing increased attention on data reuse and on what must be preserved with that data to enable meaningful use by scholars within and across disciplines. Although the focus has been on scientific or quantitative data, this paper expands the discussion to qualitative data – specifically digital video records of practice in the field of education. This is an interesting case because researchers and diverse education professionals are interested in reusing this content, though their needs differ. We focus on three issues that raise challenges for preservation and access: file format, context, and dissemination.

General Terms
Institutional opportunities and challenges; Frameworks for digital preservation; Preservation strategies and workflows

Keywords
Data reuse; Qualitative data; Educational records of practice; Digital preservation; Video preservation; Data access

1. INTRODUCTION
Researchers in information science are placing increased attention on data reuse and on what must be preserved with data to enable meaningful use by scholars within and across disciplines. Yet, most of that focus has been on scientific or quantitative data. Less emphasis has been placed on qualitative data, and when it has been considered, the focus has been on textual data. This paper expands the discussion, looking at preservation and access challenges posed by image-based qualitative data – specifically digital video records of practice in the field of education.

In education, records of practice are "detailed documentation of teaching and learning…taken directly from teaching and learning, without analysis, which enable (people) to look at practice" [5]. In many cases, these records are videos of classroom instruction and student activities, which may or may not be accompanied by contextual information such as lesson plans and seating charts.

2. LITERATURE

2.1 Qualitative Data Archiving and Reuse

2.1.1 Curation & Archiving
"The growing inter-disciplinary use, complexity and size of video data make it important for research data services to understand and support it" [33, p. 4]. One of the earliest examples of preservation and archiving of qualitative data is from the UK. Data from a 1930s social research project known as 'Mass-Observation,' was placed at the University of Sussex in the 1970s [14]. Even today, there are few archives that preserve and provide access to qualitative research data. One of the best known sites for qualitative data is the UK Data Archive, which traces its roots in collecting and curating qualitative data back to the early 1990's with the QualiData Project at the University of Essex. While qualitative data archives are more formalized in Europe [26], qualitative data in the US is often hidden in personal collections of faculty papers [6] [25].

Corti [13] has identified key issues for data archives dealing with qualitative data: (1) setting priorities for acquisition, (2) procedures and standards for processing data, (3) metadata standards for documentation, (4) access procedures for safeguarding data, (5) format, (6) researchers, and (7) funding. She argues that these issues are not unique to qualitative data archives, but that for qualitative data "there is more groundwork to be done" [13]. Although this quotation from Corti is from 2000, fifteen years later the groundwork for many types of qualitative data is still lacking. All of these issues have implications for preservation and access.

2.1.2 Reuse
In spite of the fact that few disciplines have established archives for qualitative data, multiple fields have demonstrated interest in preserving and reusing this type of data. Researchers in such diverse disciplines as nursing [21], history [6], geography [24], anthropology [25], sociology [26], psychology [2], and education [15] have all expressed interest in reusing qualitative data and have outlined disciplinary challenges for reuse.

Among these studies of qualitative data reuse, the focus has been mainly on text- rather than image-based data [3]. However, the use and reuse of video data is increasing as tools become available [33]. In this paper, we present results from a preliminary investigation into preservation and access issues surrounding qualitative data in education, specifically video records of practice that are often contextualized by diverse forms of documentation.

3. Records of Practice in Education
Records of practice in education consist of a wide variety of materials in a number of analog and digital formats. These records include student-, teacher-, and researcher-generated data. Student-generated data includes class work products, such as homework or in-class assignments and assessments. Teacher-generated data includes lesson plans, curriculum excerpts, blank assignment papers and assignment instructions, as well as posters, slides, or whiteboard images displaying work produced during and for lessons. Researcher-generated records include videos of classroom or learner activities and observation notes. They also comprise analytic supports such as transcripts and seating charts and products of analyses such as annotations and coding. The key characteristic

of educational records of practice is that they are "artifacts and documentation drawn directly from teaching or classroom interactions, including video representations of teachers' work with students in classrooms" [4, p. 12].

While educational records of practice come in many formats, image-based recordings of educational settings have been used for over 50 years [9]. The methods of recording have changed and moved from analog to digital, a transformation that has increased the potential for data sharing and use in educational settings, as well as added curation and preservation challenges. Nevertheless, the authentic and first-hand nature of these video-based records of practice makes them uniquely valuable. Marsh and Mitchell [23] identify two primary benefits of video-based records of practice: 1) they capture the complexity of classroom activities and preserve the activities for future reuse that would not otherwise be possible, and 2) they foster dialog and thought for viewers.

3.1 Collections of Digital Educational Records of Practice

There are approximately a dozen collections of digital educational records of practice in the United States available for limited access and use by researchers and/or education practitioners. Some are part of formal repositories, others are curated by private organizations or the data producer. Repositories include the Inter-university Consortium of Political and Social Research (ICPSR) that houses the Measures of Effective Teaching (MET) data representing a longitudinal study of 3,000 teacher volunteers in six different school districts and the Teaching and Learning Exploratory (TLE) at the University of Michigan School of Education which curates a variety of collections, such as the Grand Rapids Elementary Mathematics Laboratory 2012 (GREML2012) collection that documents an intensive a week-long summer mathematics laboratory. Both ICPSR and TLE present unedited or minimally edited data. The National Board for Professional Teaching Standards hosts a highly curated collection of videos of skilled expert teachers drawn exclusively from the board certification process while the Teaching Channel produces thousands of edited videos to highlight different facets of teaching and learning and a few "uncut" videos for special licensing or customers using their paid platform, "Teaching Channel Teams." This brief glimpse shows how repositories apply various strategies for selection and curation. They also have different approaches to access as well as *how* they contextualize the video collections.

For the field of education in particular, the capture of digital records of practice of teaching is rooted in a long history of using videos for teacher education as well as a shorter history of using video in research to capture classroom activities for study – including inquiries into teaching practices, cognitive processes, learning trajectories, and socio-environmental interactions.

3.1.1 Educational Use

Video records of practice are used for a variety of educational purposes. Video-based case studies are used in teacher education and professional development to help to establish "professional vision, which consists of socially organized ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group" [16, p. 606]. The use of video data to establish professional vision in education has been well-documented [7] [20] [29]. Video-based cases help pre- and in-service teachers develop capacities necessary for teaching such as noticing and knowledge-based reasoning [7] [31] [19] [23].

3.1.2 Research use

Researchers collect and use video data, but are less likely to share it or reuse data from others due to difficulties in navigating the required processes to share data (e.g., issues with permissions for sharing video data), and also the lack of infrastructure to enable sharing video data (e.g., very large files sizes [33]. However, reuse is emerging as a viable alternative or complement to data collection as more collections of video data become available. In spite of these gains in making educational records of practice available, preservation and access issues persist.

4. Preservation and Access Issues for Educational Records of Practice

Data reuse is easier when data circulate within a community of practice rather than across communities [32]. Researchers who share and reuse data within a particular community benefit from shared understandings of context and disciplinary traditions. "Disciplines' histories as well as the configuration of their research communities are factors that can impact their capacity to contextualize and document their data and processes appropriately" [11, p. 645]. However, educational records of practice are created and used by many professional and disciplinary communities. This presents a unique challenge. Researchers from education as well as other fields such as psychology and sociology seek to reuse educational records of practice. A broad range of educational practitioners (e.g., classroom teachers, school administrators, teacher educators) are also interested in these records. There are few shared understandings and traditions among these groups.

Of the seven issues Corti raises [13], we focus on three particularly pertinent for educational records of practice: format, metadata standards for documentation, and access procedures for safeguarding data. Carlson and Anderson assert "the obstacles … are less technological than social, ethical, legal, and institutional" [11, p. 636]; we find that the issues with qualitative data intertwine the technical, social, ethical, and institutional factors.

4.1 Format

Qualitative data formats can present unique challenges to long-term preservation and access [12]. We focus on key two issues for educational records of practice. First, the sheer number of different file formats represented in a single collection poses difficulties. Second, the commercial or proprietary nature of some data and data analysis systems – along with their file formats – creates difficulties in assuring long-term preservation.

4.1.1.1 Multiplicity of Formats

Collections of educational records of practice contain data in a multiplicity of formats. For example, researchers and educators using video records have moved from watching recordings of classrooms to interacting with video "embedded in complex multimedia databases and accompanied by a variety of instructional materials" [28, p. 38]. A collection of educational records of practice might include video in one or more formats, textual and still image data, and spreadsheets or other analysis outputs. This has implications for repositories and users. For repositories, formats often have to be transformed into preservation formats; for users, files must be converted into more commonly used formats.

Gracy [17] argues that archiving and preserving digital video presents new challenges unique to this material. Gracy [17] and Harvey [18] cite key factors as format obsolescence, authenticity, scalability, and economic incentives to provide preservation services. The resources required to support preservation and access of video data are more substantial than other types of digital data.

These include server space and maintaining video editing, authoring, and annotation software [33, p. 30].

4.1.2 Proprietary and Custom-made Systems

A second format issue arises from the use of homegrown and commercial systems, which rely on proprietary formats for data analysis and access. This impedes future reuse and preservation as the data are often only renderable with particular software which is difficult or costly for a repository to maintain. In contrast, reusers of statistical data benefit from open formats (e.g. csv). Video records of practice in these highly customized homegrown or commercial systems cannot take advantage of this efficiency.

4.2 Metadata Standards for Documentation and Other Means of Creating Context

We expand Corti's approach to describing qualitative data, and address metadata as well as contextual information, which is necessary to enable reuse of both quantitative and qualitative data. Video records of practice are interesting because they are themselves contextual information about the classroom, but they also require additional context for analysis, "Videos allow teachers to peer vicariously into real classrooms, which is the context within which teaching ultimately takes place" [8].

Scholars have noted differences between big data and small data. Abreu and Acker [1] argue that context is more important for small data as it is difficult to regain when lost. We enlarge Corti's discussion of metadata to include contextual information more broadly. Contextual information is necessary to enable reuse of both quantitative and qualitative data. Educational video records of practice are interesting because they are a context but often require additional context to be analyzed.

Carlson and Anderson (2007) [11] describe qualitative data reuse in their comparative case study of four projects across the qualitative-quantitative spectrum. Regarding qualitative data, they conclude that "the one who collected the data and the one who interpreted them were the same person, and this had implications for the potential to meet data reuse requirements, because many assumptions, procedures, processes, and decisions often remained undocumented tacit knowledge" [11, p. 646]. For qualitative data, and educational records of practice specifically, context takes two forms: context as metadata and context as data.

Metadata preserves context, including the technological context for preservation actions and decisions, and the research context for reuse decisions. There are a number of promising possibilities for capturing and making this information available. For example, many digital video educational records of practice are created using the MP4 video format, which has implicit metadata containing details about the file author, the software used in its creation, and the time and date in which it was created, often structured in XMP format. Along with this, there are several metadata standards for describing digital educational materials, such as the *IEEE Learning Object Metadata Standard* [10] and the Learning Resources Metadata Initiative (LRMI). However, these standards have had limited adoption so far. In addition, there are no agreed upon standards or guidelines among educational records of practice producers for recording information about the files. The information applied by the data producers varies widely and is a major concern. Currently repositories often have to apply a substantial amount of metadata to provide access to the digital video records of practice, to make them discoverable, searchable, and useful. This metadata includes (1) descriptive metadata about the content captured on the video (e.g. information about the district, school, classroom, lesson, and students); (2) technical information about the video (e.g. descriptions of the available audio tracks, camera angles, and synchronized text-based tracks); and (3) specialized tags that map the video files or segments *within* the videos to relevant professional standards, frameworks, or rubrics.

Context is also preserved by associated documentation that accompanies the digital video. The amount of context provided varies, depending on the producer's original purposes and designs. Contexts can range from a transcript of the classroom video (e.g. the dataset, *Towards Dialogue: A Linguistic Ethnographic Study of Classroom Interaction and Change* found in the UK Data Service repository[1]) to abundant documentation including lesson videos (recorded from multiple angles) accompanied by a variety of classroom artifacts and supporting documents, such as video "table of contents," transcripts, student written work, lesson plans, classroom images, seating charts, and tags for the applicable standards and key teaching practices (see the *Grand Rapids Elementary Mathematics Laboratory 2012 Collection* in the TLE).

The amount and kind of contextual documentation available influences the types of reuse that are possible. In most cases, research reuse (as opposed to educational reuse) requires more documentation. Educators often focus on the teacher and the teaching techniques of a particular grade level, or content, and may want access to an assignment. Researchers are more likely to be interested in broader contextual information, such as school demographics (e.g., SES of the district, demographics about race or ethnicity of students). The amount of associated documentation has preservation implications. Diverse documentation increases the number of file formats and the number of files which must be tracked in the archival and dissemination information packages. This creates greater complexity in maintaining relationships between individual files as well as their relationships to the collection as a whole (e.g., maintaining links of work from one student). Finally, since data producers often combine external documentation (e.g. demographic or student test scores from the school district) with the video records of practice, intellectual property issues, discussed in the next section, may be important.

4.3 Access Procedures for Safeguarding Data

Dissemination and access are difficult for digital records of practice in education for two reasons. First, logistics can be complicated. Second, confidentiality and privacy issues abound, particularly since many videos feature minors or teachers whose practices data producers do not want scrutinized or harshly judged.

4.3.1 Logistics of access

Two issues stand out in the logistics of access for video records of practice in education: (1) different repository access environments, and (2) data reusers' preferences about how video is presented.

The preservation and access environments for digital educational records of practice are often different. Access environments almost always require transformation or special processing to create a usable dissemination information package. For example, the TLE uses the Kaltura video platform for disseminating streaming videos. Due to the costs, only highly compressed videos optimized for streaming delivery are stored in the Kaltura Cloud. Source files and large derivative files are stored in less expensive, less accessible offline and online locations for preservation purposes. Since video source files tend to be large, many repositories compress and stream

[1] http://dx.doi.org/10.5255/UKDA-SN-850448

video rather than pay to store large source files in high-capacity access systems or try to deliver them over the internet.

Repositories do not always receive source video files. Large file sizes and limitations of bandwidth, time, and other resources frequently result in decisions to compress source videos files – creating entirely new files – prior to delivering them to a repository. In such instances, the original video metadata can be lost if not carefully preserved prior to the compression process. This can create fidelity and integrity issues for researchers. Video compression can also create quality issues for other types of reuse (e.g. (re-)editing videos for new products).

For data reusers interested in using educational records of practice in teaching, there is demand for videos that support different pedagogies. For example, teacher-educators want to use digital video in class as well as have students view, annotate, and integrate parts of the videos into assignments completed outside of class [27]. This range of uses raises issues about the level of data services provided by the repository and the allowable uses given the confidentiality and privacy issues we address next.

4.3.2 Confidentiality/Privacy

Problems around confidentiality and privacy can be more challenging for video than other types of data. Whyte writes, "Legal and ethical issues affect video data more acutely, although they fall into similar categories as for other media; those associated with gathering data and those with making it available for reuse, the distinction also known as 'rights in' and 'rights out'. In both cases the main issues surround rights and responsibilities to privacy and property" [33, p. 33]. Parry and Mauthner [26], Lin [21], and Cliggett [12] all discuss data management issues associated with qualitative data, such as confidentiality, ownership, and anonymity. Confidentiality issues are common in all types of data reuse. For qualitative data (interview, focus group, video) there are particular issues: (1) anonymizing the data, (2) third party information, and (3) the increasing accuracy of facial recognition software.

Qualitative data is harder to anonymize than statistical data. In statistical data, repositories can more easily identify fields most likely to contain confidential information, and assess whether the aggregation of information could lead to loss of confidentiality. In qualitative data there is no demarcation, the entire text or video requires assessment at a more granular level.

Qualitative data contains information about the study participant, but may also reveal information about others. Third party disclosures raise privacy concerns. For example, a video focusing on a teacher may show students or teacher aides. An interviewee may discuss how to handle particular learning problems in a classroom that reveals the identity of a student.

Privacy and confidentiality require special responses from repositories. For example, curators at ICPSR ask data reusers to sign a confidentiality agreement to use the MET data. Then, the video data is delivered through a web browser requiring secure login and non-video data is delivered in the virtual data enclave (VDE), which allows access to confidential data through a virtual machine. When using the VDE, the researcher accesses and manipulates data on a remote server using his or her own computer. This isolates the data from the researcher's computer because the researcher cannot download, copy, or remove data from the secure environment. In the ICPSR system, the researcher can run analyses on the virtual server and share relevant analytic files with team members [22].

Data reusers are also affected by privacy and confidentiality concerns. Sometimes contextual information is prevented from being shared. "When archived qualitative data are used for secondary analysis, there should be little doubt that the context that informs the data can never be fully disclosed. Thus, "reality" is in some ways lost for a secondary researcher" [3, p. 17].

Finally, the increasing accuracy in facial recognition software and image-based search is making anonymity and confidentiality more difficult. For example, researchers have found Facebook's facial recognition software, DeepFace, to be over 97% accurate [30]. Although all the repositories with educational records of practice involving actual video classroom data require registration and a confidentiality agreement, the potential harm of disclosure increases as facial recognition technology develops and spreads.

5. Conclusion

Our investigation into the long term curation and preservation of educational records of practice is just beginning. This paper provides a broad view of the landscape and points to how key issues of file format, context, and access procedures are linked to both preservation and access activities. Our next steps are to examine the dynamics of using the data from the perspectives of data reusers and to probe more deeply into how the preservation issues are being addressed by the different repositories.

6. Acknowledgements

This research is funded by the Institute of Museum and Library Services # LG-06-14-0122-14.

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