

Project on Learning: Classroom Recording and Data Analysis

Graham Nuthall
Education Department
University of Canterbury

The purpose of this document is to provide those who might want to use the Project on Learning data with an understanding of how the data was obtained and processed.

It contains a description of the procedures that were used to obtain a detailed record of the classroom experiences and learning of individual students. These procedures were based on the procedures that were developed for the Understanding Learning and Teaching Project that I undertook with Adrienne Alton-Lee. There is also an account of the preliminary data analysis procedures used in predicting student learning.

Preparing and setting up

1. Preparing an Illustrated Booklet

Before beginning any of the studies, we prepared a small 16 page illustrated booklet describing the purposes of the research study, the procedures we were planning to use, the way we would be analysing the data, and the value of the results we planned to produce. There were also details of the way we would be ensuring the complete anonymity of the schools, teachers and students involved, and contact information for making further enquiries.

This booklet was given to school principals, teachers, and members of boards of trustees. A slightly simplified version of the booklet was prepared for sending to parents.

2. Contacting Schools and Teachers.

We selected schools in a variety of socio-economic areas so that our studies could represent a cross section of schools and students. Letters were written to the school

principals, with copies of the booklet. In this letter we explained what would be involved in participating in the project and the kinds of teachers whose classrooms we would like to work in. This letter was followed up with a phone call. If the principal indicated that she/he was willing to participate and believed there were teachers in the school who would be willing to help, a visit to the school was arranged.

In face to face discussion with the principal we discussed in more detail what the requirements would be for the teachers. We suggested that only teachers who were reasonably comfortable with their classes, and did not have seriously disruptive students, should be considered. We also discussed how the principal would like the research discussed with the board of trustees. Copies of the booklets were provided for the teachers and members of the board of trustees. If the principal was still convinced there were teachers in the school who would be willing and able to participate, arrangements were made to meet with the teachers. In each school we worked with two teachers.

3. Initial Discussion with Teachers

The initial discussion with each of the teachers was about what would be involved in participating in the research. In every case the teachers had already read the booklet and discussed their possible involvement with the principal. We talked through the problems of having videocameras and microphones in the classroom and tried to share with them our experiences from our previous five studies. We emphasised continuously that our primary focus in the classroom was on the students and their experiences and learning. We were not at all concerned with what the teacher did or how she/he did it.

The next concern was finding a topic in the science, social studies or mathematics areas that could be the focus of our research. We looked for a topic that the teacher intended to teach (i.e., was written in the school plan) and that the teacher expected would last from 3 – 6 weeks. Almost all the teachers had such a topic, although sometimes it meant delaying the study for two or three terms in order to fit in with their plans. We arranged to meet further with the teacher at the time she/he was planning the details and resources for the topic.

4. Topic Planning Discussion with the Teachers

We met with the teachers when they were carrying out their preliminary planning of the topic. The purpose of these meetings was to find out as much as we could about what the teacher intended the students to do and to learn from the topic. We usually offered to help with the identification and obtaining of resources, although always with the understanding that the teacher was in charge and should carry out the planning in their usual manner. There were usually several meetings of this kind as the planning progressed and details of activities and resources started to emerge.

5. Obtaining parent permission

Once it was clear that the school's governing body had approved the research, a letter and a copy of the booklet describing the project was sent out to the parents of every pupil in the class. A sheet was also included which requested the parents to sign that they had read about the project and were willing for their child to participate in the research. Any parents wanting further information were asked to contact the researchers. A study did not proceed if any parent did not provide written permission for their child to be involved.

6. Constructing the Topic Outcome Test

As we discussed the topic with the teacher, we started to construct sets of items for the outcome test. We tried to construct at least one item for every aspect of the content of the topic that the teacher hoped the students would learn. This involved specific propositions, definitions, concepts, explanations, principles, generalisations, and procedures. We also included any information, concepts, etc., we thought the students might learn independently from their use of the resources.

The test was made as attractive as possible by including illustrations and pictures, and by varying the item formats as much as possible (e.g., matching, multiple choice, short answer, drawing diagrams, completing sentences). Where the content being tested was complex (e.g. a generalisation) two or more items using different formats were included. Because the total number of items needed to cover all the content was large, in most of the studies the test was divided into two parts that were administered on different days.

The final version of the test also included small irrelevant activities (such as drawing smiley faces) to occupy those students who completed a page of items more quickly than other students.

Recording and observing in the classroom

7. Familiarising the teacher and students with the equipment

A week or more before the unit began, the recording equipment was installed in the class and discussions were held with the class about the nature and purpose of the research. We explained that we were interested in how pupils learned so that we could help their teachers become better teachers. We wanted to know what it was like being a pupil and what they thought about how they learned best.

During this time before the unit began, the pupils were introduced to, and practiced wearing their individual microphones. They were shown the switch on the top of the microphone and told that anytime they did not want to be recorded, they could switch the microphone off. The purpose of the videocameras was also explained and the pupils were shown recordings of their class made through the two cameras with the wide-angle lenses.

During this time, two or three of us also sat for several hours in an out-of-the-way area of the classroom making observational notes. This gave us an opportunity to learn the names of all the pupils in the class as well as giving the pupils a chance to become familiar with our presence. It was also a time for the pupils to clarify for themselves our role in the class. During formal class times, we did not interact with the pupils and diverted any attempts they made to get us to help with their class work. Outside formal class times we were happy to interact with them and discuss anything they wanted to talk about.

8. Selecting the case study pupils

During the Project on Learning we selected four students in each class for focused observation and recording. This was done on the basis of the school records of the PAT standardised achievement and aptitude test results for each student in the class. All the schools had the results of reading comprehension, reading vocabulary, and mathematics for all of their pupils. The results for listening comprehension, TOSCA (scholastic ability), and

various study skills tests were available in some of the schools. An average percentile for age score was calculated for each student, based on as many related test results as were available. This average percentile for age score was used to divide the students up into a high achievement/aptitude group and a low achievement/aptitude group.

The teacher was asked if there were any pupils in the class that she or he would rather we did not observe. These pupils (usually two or three) were removed from the selection process.

Within each achievement/aptitude group, one girl and one boy was randomly selected. These four pupils were the case study pupils for a unit. Where a second unit was studied in the same classroom, the process was repeated with the original case study pupils eliminated from the selection.

Neither the teacher nor the students were informed about who had been selected, until after the unit was over. The teacher was informed that we would be focussing on some students and not others (when we asked if there were any she/he would rather we did not observe). During the debriefing after the unit we found that neither the teachers nor the students had been aware who were the case study pupils.

9. Setting up the recording equipment.

Six miniature videocameras were used in each of the classrooms. All were mounted on the ceiling of the classroom. Four of the videocameras had zoom lenses that allowed them to provide an up-close view of a pupil on the opposite side of the classroom. There was one camera for each of the case study pupils. It was focused so that it included the case study pupil and the pupils sitting on each side of the case study pupil. It was mounted on the ceiling as far as possible away from the pupil it was focused on. This gave the impression that these four cameras were recording the whole class from different angles.

The other two videocameras had wide-angle lenses and were located on the ceiling in opposite corners of the classroom. Each provided a view of the entire classroom from opposite vantage points.

A bank of six stereo videorecorders was set up in a hidden corner of the classroom (e.g., behind a bookcase) or in a cupboard or connected storeroom. Attached to this bank of videorecorders was a time-code generator, a receiver with antenna for picking up the microphone signals, a mixer and a video-monitor for checking the focus of the videocameras.

During the unit, each of the pupils and the teacher wore a miniature broadcast microphone. Only the microphones worn by the case study pupils and the teacher were live and broadcast to the recording equipment. The signal from each case study pupil's microphone was recorded on the videorecorder dedicated to that pupil's videocamera, along with the time code generated by the time-code generator. This time code was also recorded visually on the videotape.

10. Pretesting.

Three or four days before the unit began, the outcome test was administered to the class by the researcher. This took two separate sessions when the test consisted of two parts. The test was read aloud to the class, in order to equalise differences in reading ability and speed. The pupils were instructed not to turn each page until they were asked to do so. This was done to make it easier to monitor the performance of the pupils and to keep them motivated and focused on the content of the items.

11. Recording during the unit.

For most of the units that we studied, the class spent one or two hours a day on the unit, occasionally missing a day and occasionally taking less or more time. Before class each day we tested to see that the recording equipment was working perfectly, using the monitor to check the focus of the cameras. Before the day's work on the unit began, the microphones were handed out (each microphone had been personalised with the pupil's name on it) and the recording equipment turned on. A final check was made to see that each live microphone was sending a signal.

12. Observing and photographing during the unit.

During the unit, two or three of us kept a written record of the behaviour of the case study pupils. The observation system was designed so that a record of the pupil's behaviour was made every 15 seconds on a specially prepared observation sheet divided up into 15 second intervals. When one observer was recording the behaviour of two pupils, the observations alternated from pupil to pupil every 15 seconds.

In order to coordinate the observations with the other recording equipment, stopwatches were used that were calibrated with the time-code generator at the beginning of every recording session. These stopwatches were attached to the observation sheet folder.

The pupil's behaviour was recorded using a set of behaviour codes. A list of these codes is attached to this document as an appendix. In addition, any resources that the student was looking at or using in any way were described. A space was also provided for recording any contextual details that might have influenced to pupil's behaviour in any way.

Segment of the observation sheet used by observers (for use with two pupils)

STUDY	ROOM	Page No		
Observer	Date	PUPIL A	PUPIL B	
Time	Context (I, G, C)	Resources	Behaviours	Observer notes
Pupil A 00				
..... 15				
Pupil B 30				
..... 45				
Pupil A 00				
..... 15				
Pupil B 30				
..... 45				

At the end of each recording session, the observers filled out a sheet summarising the activities that the pupil had been engaged in, the times the activities began and ended, and general comments on the way the pupil had been engaged in the activities.

Also at the end of each recording session, or the next available time when the pupils were not in the classroom, copies were made (by photographing or photocopying) of everything the pupil may have looked at, read, written, or drawn.

Assessing learning and preparing data

13. Post-testing

About a week after the completion of the unit, the outcome test was administered for the second time. Again, the test was read aloud to the students and care taken to try to get the students to focus on every aspect of each item.

14. Individual interviews.

As soon as possible after the post-testing, the case study pupils were interviewed individually about their knowledge of the content of the test. During these interviews an unanswered copy of the test was open in front of the student. For each item in the test, we asked each student to describe the correct answer, to recall how she or he had learned that answer and to recall any experiences or activities that were relevant to learning the answer.

We tried to construct the interviews around the belief that we were interested in how each individual student experienced the classroom. During the early part of the interviews we encouraged the student to say anything that came to mind as they answered the questions, any mental pictures, feelings or thoughts.

Interviewer: Now what I want you to do is, all the thinking that you do, think aloud, so that you can start talking as you're thinking – even if things are jumbled up or whatever – so that I can understand. (Excerpt from interview with Tui, Study 4)

Typically the questions asked for each item were (a) How did you learn (know) that? or Where did you learn that?, (b) Do you remember that coming up in the unit? or Was there anything said or done about that in the unit? or Where would you have seen (heard about) that?, and (c) Did you know that before the unit? or Did you learn that during the unit? We used probing questions and tried to run the interview on each test question until we had exhausted the student's recollections. The following excerpt from the interview with Joy

(Study 6) about a question on frostbite illustrates how extended this process could be when a student had little or no recollection.

Interviewer: How did you learn that?

Joy: Um, I just know it.

Interviewer: Ok. You just know about frostbite? Do you think you knew that before the unit?

Joy: Mmm.

Interviewer: Yeah. Did it come up during the unit?

Joy: Um, yeah.

Interviewer: Any clue about frostbite? Tell me what you remember.

Joy: Umm. Nothing much.

Interviewer: Is there a picture in your mind?

Joy: No.

Interviewer: Do you remember someone saying something about it?

Joy: No.

Interviewer: No. Just a vague memory that it did come up?

Joy: Mm.

Each interview was carried out over two or three separate sessions (each about 45 minutes) and was conducted in a quiet room in the school. The interviews required considerable effort from the students and we used several procedures to motivate their involvement. The students appeared to enjoy most of the time spent in the interviews and to gain status among their peers for being selected for interview.

15. Initial data preparation

The initial step in the preparation of the data for analysis is the transcribing of the audiotape recordings. Because videorecorders do not have the facility for rapid backwards and forwards movement of the tape, the audiorecordings on the videotapes had to be copied onto standard audiotapes. These were played through a multiple channel tape deck that allowed the time signal to be visible as the tape was being transcribed.

We found transcribing to be a very time consuming process because of the high ambient noise in some classrooms and because there are almost always several students talking whose voices need to be distinguished. The observer notes provided a valuable guide to the context (e.g. what was being looked at) and who was talking. The original videotape could also provide important assistance.

The transcriptions and the observer notes were copied into a computer data base that was divided up into 15 second segments (one record per 15 seconds) . A simplified copy of the 15 second record is set out below.

Simplified copy of the 15 second record

School & class code	Day	15 second time code	segment number
Transcript of teacher's talk and whole-class discussions talk occurring during the 15 seconds with observational notes of teacher behaviour and whole-class resources			
Transcript of pupil A with observer notes on behaviour & resources occurring during the 15"	Transcript of pupil B with observer notes on behaviour & resources occurring during the 15"	Transcript of pupil C with observer notes on behaviour & resources occurring during the 15"	Transcript of pupil D with observer notes on behaviour & resources occurring during the 15"

The second step in the initial data analysis was to search the data base for every reference to the content of every item in the test. These references were then broken up into every reference to the content of a single item for each of the individual students. A list was then made of every 15 second interval that contained any reference to each of the individual items for each of the individual students. The list of 15 second intervals for a single item for a single

student was referred to as a “concept” or “item” file. These “concept files” were then coded using the coding procedures described in the Coding Manual.

Appendix: Codes used in observing pupil behaviour

<i>Code</i>	<i>Description</i>
<hr/>	
<u>Context</u>	
C	whole class
G	group
I	individual
<hr/>	
<u>Behaviours</u>	
LT	listening to (or overhearing) teacher
LP	listening to (or overhearing) peer
TT	talking to teacher
TP	talking to peer
TS	talking to self
NVC	non verbal communication
W	watching
WT	watching (looking, glancing) teacher
WP	watching (looking, glancing) peer
R	reading
ROW	reading own work
Dr	drawing
Wr	writing
T pg	turning page
G obs	glancing at observer
M	moving
St	standing
H	hand raised
<	desk open, finding equipment
G	looking around
	laughing, smiling
	dislike, pulling face
?	thinking, puzzled
Y	yawning, bored, sleepy
org	organising books, equipment
f	fiddling
<hr/>	
<u>Source or resource</u>	
T	teacher
Bk	book
Wk	work, worksheet, instruction sheet
Bb	blackboard
Wb	whiteboard
OHP	overhead projector
mic	microphone
pic	picture
Q	research question
<hr/>	