ISSUES IN EDUCATIONAL RESEARCH IX

STIMULATED RECALL METHODOLOGY

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Editor.

CONTENTS

STIMULATED RECALL METHODOLOGY

INTRODUCTION

While educational research during the past fifty years has been characterized by the study of teacher and student behaviours which are readily observable, researchers have long recognised the importance of the mental lives of classroom participants. However, methodological problems have always confronted those who were interested in what teachers and students think and feel during their classroom behaviour. Now the use of stimulated recall methodology seems to be associated with a renewed interest in covert mental activities and may contribute to a more balanced and realistic investigation into the teaching learning process.

In this paper both theoretical and practical aspects of stimulated recall methodology will be discussed. Initially the technique of stimulated recall is explained briefly. This is followed by a consideration of some of the context within which stimulated recall has emerged, including some philosophical issues about social behaviour research generally and some of the relevant trends of research in teaching. The issue of validity and reliability associated with this methodology is then discussed, followed by a description of some of the practicalities involved in the use of the technique within classrooms. Finally some of the analytical procedures and issues for handling the derived data are considered both in terms of quantitative and qualitative analyses.

WHAT IS STIMULATED RECALL?

According to Conners (1978 b:1), stimulated recall is "a branch of introspective methodology in which audio and/or visual cues are presented to facilitate a subject's recall of the covert mental activity which occurred simultaneously with the presented cue or stimuli."

Recall of what a person was thinking and/or feeling during an episode of their work, their life, or their play is stimulated by some means, usually with the use of audiotapes or videotapes. The thoughts and feelings as recalled are spoken aloud and recorded on audiotape. These reported thoughts are later transcribed, coded and analysed.

At the classroom level, stimulated recall methodology tends to involve the recording of a lesson or event. Classroom participants, either the teacher or the students or both, at a later point view and/or listen to the recording. The stimulus tends to assist the person in recalling the thoughts and feelings experienced in the actual lesson or event. The verbalized interactive thoughts are then recorded for later analysis.

Research into covert mental activities has commonly relied on introspective reports as a means of tracing the thought processes used by subjects as they solve problems, make decisions or process information. Bloom (1953, 1954) pioneered the use of stimulated recall in this research area. He described the basic idea of stimulated recall as one in which,

> a subject may be enabled to relive an original situation with vividness and accuracy if he is presented with a large number of cues which occurred during the original situation. (1953:161)

Visual stimuli were considered by Bloom as a means of representing the original event but were ruled out on the grounds that each individual has a unique view of the situation and that these could not all be captured on film. He argued, "the cues which would seem to be most attended to and which are almost equally available to all in the classroom are the auditory cues," (1953:161). Bloom's experimentation used sound recordings. Some ten years later Kagan, Krathwohl and Miller (1963), researching counsellor-education, introduced videotaped replays in Interpersonal Process Recall (IPR) as a means of maximising cues.

The use of stimulated recall seems thus far to have been limited to three areas. In studies of teaching and learning a variety of researchers have employed the stimulated recall technique including: Bloom (1954), Thought Processes of Students in Discussion; Krauskopf (1963), Student Recall (Written); Siegal, Siegal, Capretta, Jones & Berkowitz (1963), Student Thoughts During Class; Hudgins (1967), Student Attention; Bedics and Webb (1971), Self-Evaluation of Teaching Behaviour; Morine (1975), Teacher Planning and Decision Making; Clark and Peterson (1976), Teacher Decision Making; Marland (1977), Teacher Thought Processes and Decision Making; Conners (1978), Teacher Thought Processes, Beliefs and Principles; Nolan (1978), Language Development and Essay; Cooper (1979), Information Processing in Mathematics Lessons; King (1979), Attributional Analysis of the Expectancy Effect; Mireau (1980), Teacher Expectations; Tuckwell (1980), Impact of an Intervention Program on Teacher Thought Processes; and Wodlinger (1980), Interactive Decision Making.

A second area in which stimulated recall has been used is that of medical education, including Elstein and Shulman (1971), Elstein, Kagan and Shulman, Jason and Loupe (1972), and Shulman (1974). Stimulated recall has been used also in the area of psychotherapy and therapeutic counsellor education by such workers as Kagan, Krathwohl and Miller (1963), Kagan and Schauble (1969), Kagan (1972) and Kagan (1973).

In his discussion about the use of stimulated recall methodology Conners (1978 b:3) reports that physicians, school teachers, university students, students of elementary and high school levels, therapeutic counsellors and patients with mental health problems have all been subjects. While most work has occurred in laboratory and simulated settings, an increasing number of recent studies have used stimulated recall procedures in naturalistic settings.

The value of stimulated recall as a research, diagnostic and teaching tool has been reported positively by most users of the technique. In general the data and information derived are described as rich and interesting, and seem to be providing new and useful insights into the covert behaviour of the various participants. The promising potential of the technique is being recognised gradually and for the future may well add significantly to the investigation of human behaviour.

THE RESEARCH CONTEXT FOR STIMULATED RECALL

As a research tool stimulated recall does not have a long history. This lack of intensive use can be attributed largely to a tradition of research skepticism held toward the use of introspective techniques in the behavioural sciences generally. Such opposition is epitomized by Neisser (1968), cited in Elstein, Shulman and Sprafka (1978), who argued that the very process of thinking aloud alters the content and process of thought. Radford (1974) alleged, however, that introspection provides information about experience, yielding data which are otherwise inaccessible, or as Smith and Geoffrey (1968:96) observe, "aspects of teaching which are frequently lost to the behaviourally oriented empiricist".

Marland (1977:37) notes also that the commonly expressed opposition to introspective techniques, which tends to focus on the potential for error in introspection, has been countered in part by recent developments in research, including the rise in interest of stimulated recall. Overall a gradually changing research attitude seems to be prevailing - one in which qualitative research seems now to have wider support. Magoon (1977:654) cites Cronbach's proposal that "researchers (should) simply but radically reverse the priority they have traditionally placed on building generalizations about effects of variables and give careful attention to particular cases first." Harré and Secord (1972) also call for an explanation of social behaviour by intensive study of individual cases. They state (1972:133) that the "generative mechanisms at work in social life" can only be discovered by accepting the notion that the processes which are productive of social behaviour occur in individual people - "it is there that the vitally important dimensions of spontaneity and idiosyncrasy occur". But this need for a consideration of individual cases is embedded in a deeper spectrum of research thought, notably the phenomenological tradition and the orientation referred to by Fay (1975) and Van Manen (1975), among others, as an interpretive science.

In Van Manen's (1975:6) terms, the interpretive orientation refers to all inquiry "which has as its main concern a systematic search for a 'deep understanding' of the ways in which man subjectively experiences ... the social world". Fay (1975:79) views an interpretive social science as one which:

> ... attempts to uncover the sense of a given action, practise or constitutive meaning, it does this by discovering the intentions and desires of particular actors, by uncovering the set of rules which give point to these sets of rules or practises, and by elucidating the basic conceptual scheme which orders experiences which the social scientist observes are made intelligible, by seeing how they fit into a whole structure which defines the nature and purpose of human life.

The constructivist notions for inquiry are elaborated further by Harré and Secord (1972). They advocate the use of collection and analysis of participants' accounts of social behaviour. These thoughts, feelings, and social perceptions enable the discovery of the rules, plans, conventions, images and so on underlying the social behaviour of individuals. Harré and Secord (1972:51) consider that "social behaviour is the result of conscious self-monitoring of performance by the person himself...(and) the presentation of an appropriate social self is one of the most important products of the self-monitoring of social performance."

These notions are based on a model of man in which people are treated for scientific purposes as if they were human beings as we know and understand them in everyday life.

> The Anthropomorphic model of man conceives of the subject of social investigation as a biological individual whose characteristically human actions are generated by the conscious self-monitoring of its performance in accordance with certain sets of rules which it represents to itself in the course of making anticipatory and monitoring commentaries upon its performance, and which it subjects to critical appraisal in retrospective commentaries. (Harré and Secord, 1972:93).

Wilson (1977), in a discussion of the uses of ethnographic techniques in educational research, points out that the phenomenological tradition requires that the researcher learns the meaning structures which determine each individual's behaviour. This is achieved by the researcher experiencing and

interpreting the behaviour partly from the perspective of the participant and partly from the perspective of an external observer. As Wilson (1977:250) states, "the researcher must develop a dynamic tension between the subjective role of participant and the role of observer so that he is neither one entirely."

These approaches to scientific inquiry underlie grounded theory as advocated by Glaser and Strauss (1976). From using a strategy for handling descriptive and interpretive data in research, theoretical conceptualizations are generated. Yinger (1978) considers such a method of theory construction to be very appropriate to the theory development and research in teaching. Ethnographic studies, such as those undertaken by Bremme (1976), Doyle (1977), Jackson (1968), and Smith and Geoffrey (1968), provide support to the usefulness and effectiveness of conducting this type of extensive descriptive and interpretive line of scientific inquiry. Many other descriptive type researches in teaching, while not ethnographic in character, nonetheless incorporate significant elements of the constructivist or interpretive approach to science.

Within this philosophical context there exists potentially an important role for stimulated recall methodology. As a means of gaining access into the covert mental activities of individual subjects, stimulated recall would appear to offer researchers one way of coming to terms with the meaning structures which determine each individual's behaviour - to discover something of the "generative mechanisms" of people at work, at play, at school.

APPLICATION TO RESEARCH IN TEACHING

After several decades, research in teaching is still in a state of evolution. While conceptualizations of research variables have continued to be modified and/or refined, and a variety of methodologies have been tried, few definite and pertinent findings have emerged. As Brophy and Evertson (1977:79) comment, "the number of teaching behaviors established as correlates of teaching effectiveness is still limited to a handful." Perhaps the failure to take account of Gage's (1963:132) comment that "the programs that teachers carry around in their heads need analysis" may explain the relative lack of return on the investment of research effort to date.

Not surprisingly, some redirection of research effort has now evolved. The National Institute of Education's Panel 6 Report (1975) expressed a commitment in future research to studies which seek to understand the mental life of teachers. As the report states, "What teachers do is directed in no small measure by what they think. Moreover, it will be necessary for any innovations in the context, practices, and technology of teaching to be mediated through the minds and motives of teachers (1975:1)." The report is adamant that the relationship between teacher thought and action cannot be overlooked.

Various researchers have expressed strong support for the NIE's Panel 6 Report. Winne and Marx (1977:670) state that, "Specifically, we see the mental life of both teachers and students in classrooms as critical items to be studied if we are to understand the process by which teaching influences students' learning.." Such a view reinforces the emerging assumption that the behaviour of classroom participants is affected by what they think. As Clark (1978) indicates, research into how teachers gather, organize and evaluate information, plan, make decisions and solve problems should lead to some understanding of the uniquely human processes that guide and determine teacher behaviour. This cognitive information processing view of teaching is justified further by Clark and Yinger (1977:279).

> Teacher behavior that is sensible and effective in one setting may be inappropriate in a second, and it is the individual teacher who makes decisions about appropriateness and defines the teaching situation. So if research is to be put into practice - if the general case is to be applied in particular situations - then we must know more about how teachers exercise judgement, make decisions, define appropriateness and express their thoughts into actions.

The cognitive approach to teaching, therefore, is an emerging trend of research in teaching - not as an independent research thrust, but as an outgrowth of the research which focussed on classroom behaviour. The orientation is addressed by researchers who perceive the need to understand how classroom participants behave; not only what they do, but how they think, feel, deliberate, judge, make decisions and assess consequences. If in the past researchers have been reluctant to investigate the covert mental activity of teachers and students then the prime reasons appear to be methodological problems and a long standing aversion to the use of introspective data.

Now, within the context of a growing acceptance of qualitative research, the use of stimulated recall methodology would appear to be offering better access to what teachers and students think and feel before, during, and after learning sessions in the naturalistic settings of routine classroom life.

SOME ISSUES OF VALIDITY

Stimulated recall typically involves a subject whose thought processes are to be disclosed and an interviewer whose role is to facilitate that disclosure. A videotaped or audiotaped recording of an event is replayed and the subject is assisted in recalling the covert mental activity which accompanied the overt behaviour. The technique of stimulated recall is predicated on the assumption that subjects are both willing and able to recall and articulate their thought processes, and to do so as accurately and completely as possible.

Gaier (1954) suggested that all of an individual's thoughts and feelings would not be revealed through introspective techniques, claiming that the subject would censor what he is willing to verbalize. Bloom (1953:162) in acknowledging this, distinguished between an individual's ability to recall and his willingness to report his thoughts, noting "the extent to which a student will report the most private of his thoughts is largely a function of the rapport which is established in the interview situation." The characteristics of this rapport are identified as comprising communicated authenticity, positive regard for the other person and empathy. The issue of validity is considered from the perspectives of ability to recall, willingness to report completely and accurately, and familiarization procedures.

Ability to Recall

The ability to recall covert cognitive behaviour was inferred by Bloom (1953) from subjects' ability to recall overt activities with 95 percent accuracy within a time period of up to 48 hours.

> The inference that the recall of one's own private conscious thought approximates the recall of the overt, observable events has led to the anticipation that the accuracy of the recall of conscious thought is high enough for most studies. (Bloom 1953:162)

Gaier (1954) claimed that in the absence of a direct technique for establishing the validity of such reported thoughts, it was necessary to establish it by means of inference. This argument assumed a high correlation between the accuracy of the individual's recall of the overt checkable activity and the accuracy of the recall of conscious experience. Accuracy of recall of overt events was traced over a 16 day period with 94 percent accuracy reported after 2 days, declining to 65 percent accuracy after 16 days.

A second measure addressed by Gaier was the degree of confidence with which the subject reported his experiences. This was quantified as the number of "no recall" responses. In the first two days such responses were reported as being infrequent.

The issue of whether the thoughts reported in a stimulated recall session were those actually experienced in the original situation rather than those aroused by the interview was also investigated by Gaier. He monitored whether subjects reported thinking about information which was not available to them at the critical point under consideration.

More recently Shulman and Elstein (1975) reported medical research into the cognitive processes of physicians as they arrived at diagnoses. This study was carried out in a simulated office to avoid uncontrollable "noise" and data were collected by means of direct observation of the physician's actions in reaching the diagnosis, immediate introspections ("thinking aloud" technique), and stimulated recall. This complex tri-level protocol permitted cross referencing or triangulation on recall items. These researchers ensured that each formulation was consistent with the data base existing at the time; that stimulated recall data was consistent with accounts provided by the "thinking aloud" technique (and where these were in conflict they accepted the data generated through the "thinking aloud" technique); and they discounted introspective thoughts which used clues which were not available to the subject at that point of the diagnosis.

Willingness to Report Completely and Accurately

The willingness to report completely and accurately is predicated on the rapport which is established between the researcher and subject; rapport characterized by the acronym CARE, that is, communicated authenticity, positive regard for the other person, and empathy.

In the research into teaching conducted through the Centre for Research in Teaching at the University of Alberta the following measures have been developed as the basis for such rapport:

(i) opportunity should be taken to engage in social interaction so that the researcher is perceived as an interested colleague;

(ii) anonymity must be guaranteed and the subject assured that no administrative use would be made of the videotapes of the lessons or the audiotapes of the stimulated recall interviews;

(iii) the broad objectives of the study should be made known to the subject to reduce the danger of his constructing his own theory about the researcher's intentions and so distorting data, for as Marland (1977:40) points out,

> ...if not told, (subjects) may construct their own theory about the interviewer's intentions and could respond accordingly in ways which may distort the data, and subvert, unintentionally, the investigator's purposes.

(iv) assure the teacher that the researcher is not being evaluative either of the lesson or of the reported thoughts;

(v) every effort must be taken to ensure that the situation is perceived as non-threatening.

Familiarization Procedures

Familiarization procedures are the measures undertaken by the researcher to ensure that the technique of stimulated recall does not intrude into or interact with the situation, so serving to change it.

The concept of familiarization is one which has been well considered by investigators. Kagan, Krathwohl, and Miller (1963:239) observed that,

> apparently the subject feels removed enough from the image of himself on the television screen so that he is able to think of the 'person' on the screen as being well known to him, yet not quite he.

Fuller and Manning (1973) report however, that the viewing of a videotape of one's self involves intense focusing on the self which is emotionally arousing. Stress and anxiety may result, and in some circumstances the playback may be thought of as a threatening message which may inhibit the subject. Dawson, Dawson, and Forness (1975) claim that self-viewing informs the teacher of how much he differs from his self-expectations.

From research findings, Fuller and Manning (1973) report that self viewers initially focus on "physique cues". Bedics and Webb (1971) report reaction from student teachers viewing videotaped replays of their classroom behaviour. On the first viewing attention was focused on themselves, but by the third lesson concern centred on the teaching act.

In the classroom situation, before stimulus lessons are videotaped, a period of familiarization should be observed in a bid to minimize the obtrusiveness of the researcher and the videotaping equipment in the classroom, the potential impact of this on both teacher and pupil behaviour, and also to reduce the emphasis on physical cues. The practical aspects of such a familiarization period are described later in this paper.

In summary, to maximize the accuracy and completeness with which thoughts are reported the user of stimulated recall methodology should:

(i) establish rapport with the subject and conduct the interview in a non-evaluative, non-threatening environment where privacy is assured;

(ii) observe a comprehensive period of familiarization in order to lessen observer obtrusive effects and the tendency for subjects to focus initially on physical characteristics; and

(iii) conduct all stimulated recall interviews within 24 hours of the recording of the stimulus lesson or event.

While there is no single way to establish the validity of the individual thoughts, Marland (1977:227) reports that a logical consistency tends to be perceived between interactive thoughts and events on videotape. Conners (1978) also conducted a number of the checks suggested by Gaier (1954) which enable a researcher to infer the validity of the individual's reports. As with Marland, Conners was able to infer that acceptable validity was established.

Therefore, as Marland (1977:227) concludes, "validity and reliability can be assumed but not demonstrated or guaranteed."

Test-Retest Reliability

It is obvious that the test-retest reliability technique is not available to the researcher as a means of confirming the veracity of the subjects' reported thought processes recorded through stimulated recall. However, the reliability of the coding of data will be addressed when content analysis is considered later in this paper.

PRACTICAL ASPECTS OF STIMULATED RECALL METHODOLOGY

The use of stimulated recall methodology for classroom research tends to involve a number of stages, each serving a necessary function and characterized by specialized practical requirements. Following a period of familiarization the data collection phase consists of recording lessons or events, previewing the recorded material, and the actual stimulated recall interviews, structured around some specific guidelines.

Familiarization

The familiarization phase of classroom research using stimulated recall methodology is highly significant. The methodology's effectiveness is dependent on the quality of the relationship between the researcher and the subjects essentially for reasons pertaining to the validity of the data. Hence the establishing of a positive rapport with the subjects is a matter of high priority and the researcher tends to find this costly in time and effort. Likewise, the attitude of the subjects toward the research is an important determinant of the usefulness of stimulated recall.

Experience would indicate that the familiarization phase should include the following steps and strategies.

1. The researcher needs to introduce himself as a visitor to the classroom - one who will be in a researcher role and who will be getting to know all class members. The initial contact should be used to introduce the research, what the research entails for the subjects, and in broad general terms what the research might achieve.

2. The researcher should familiarize himself with classroom routines, schedules and resources, with teaching styles and management techniques of the teachers, and with students' names and characteristics.

3. The videotaping equipment should be introduced into the classroom in order that the teacher and students become accustomed to it well in advance of the data collection phase. Several lessons should be recorded and opportunities provided for the teacher and students to view the tapes. This procedure seeks to reduce the awareness of being observed effects and the tendency reported for people to concentrate initially on physical characteristics when first viewing themselves on television.

4. The researcher should undertake sufficient field experimentation and testing with the videotape equipment so as to ensure competence with the technology and to gain recordings which best serve the objectives of the research. Location of camera(s) and microphone(s) need to be trialled in this respect.

5. The researcher should orientate the intended subjects to the interview situation. There is a need to outline the roles of the teacher or the students in the interview setting. Guidelines for these orientations are specified later in the paper.

6. The researcher should rehearse the research procedure a number of times prior to the data collection phase for purposes of familiarizing self and the subjects to the setting, practising interviewing techniques, checking timelines, and such.

7. The researcher should develop the vital personal relationship with the teacher and/or the students, by interfacing and talking in a variety of situations and venues.

The duration of the familiarization phase tends to be determined by readiness - readiness on the part of the researcher, the subjects, the interviewing situation, and the nature of rapport prevailing between the researcher and subjects.

Data Collection Phase

The research procedures involved with recording the lessons, previewing the videotapes, and interviewing involve a variety of specific requirements and strategies and these are explained in the following sections:

A. Videotape recording of the lessons: The usual practice seems to consist of recording a lesson and conducting the stimulated recall interview on the same day. Regarding equipment, experience has established that adequate recordings can be made from one videocamera, one videotape recorder unit, one small television monitor, a multi-directional microphone in a fixed position and/or a cordless microphone worn by the teacher, if needed an audio-mixer for blending incoming sound onto the videotape, and a set of headphones for the researcher to monitor the recorded sound. The researcher is well able to operate all the equipment himself and thereby forego the necessity of bringing another researcher such as a technician into the data collection process.

Depending on the purposes of the study the camera may be located in various parts of the classroom. Where the teacher is the main subject researchers tend to place the camera at the rear, whereas if the students and teacher are the subjects the camera is often located in the front side position. Some classrooms offer the advantage of being able to place much of the recording equipment in an alcove or behind a screen with only the camera and part of the researcher readily observable to the students.

The purpose of the study will determine the use of zooming for close-ups. Some studies have avoided close-ups but instead maintained a regular panning of the camera across the class in general. This regular panning does facilitate any later coding of classroom participants' overt behaviour should it be so desired.

During the recordings most researchers are able to compile a kind of lesson overview describing the sequence of happenings throughout the lesson. These overviews might include the progression of teaching ideas, changes in lesson activities, significant or intriguing questions or comments from either the teacher or student, and every dyadic public and private interaction between the teacher and the student concerned. Such an overview, when recorded against the VTR counter reading and the time on the clock assist in the location of potential stimulus points for the later stimulated recall interviews.

B. Previewing the videotapes: By previewing the recording of the lessons the interviewer is able to identify those segments which appear most significant for investigating the thought processes of the student or teacher. While many of these features may have been noted already on the lesson overview, nevertheless previewing often brings to mind other significant aspects which the interviewer may wish to investigate.

C. The interviews: Procedures for the conducting of stimulated recall interviews were developed largely by Marland (1977) who provided some guidelines to be followed. In detailing these procedures Marland was concerned about the validity of the resulting data as much as developing a set of practical suggestions for enhancing consistency of research technique. The points which follow are drawn from those guidelines which Marland developed and which were later adapted by Cooper (1979) to accommodate students.

It is recommended that stimulated recall interviews are conducted on the same day as the lessons are recorded, certainly within 24 hours. With teacher subjects the interviews often occur during the lunch break or after school and range in duration from 30 to 60 minutes, or even longer, depending on length of lesson, extent of verbal reporting, subject fatigue, or other related factors. Student subjects are often withdrawn from later classes with interviews ranging in duration from 20 to 40 minutes in general.

The interviews should be conducted in a room away from the classroom and free of the distractions of school life. The VTR unit and monitor are placed on one table with the interviewer and subject facing from a comfortable distance. The use of a remote control handpiece facilitates the stopping, starting, pausing of the videotape. A cassette recorder is placed between the subject and interviewer for recording the discussions of the stimulated recall interview. In general the interview situation should be arranged so that the subject can look directly at the monitor and not be distracted by the interviewer or the audio recording equipment.

As a consequence of the familiarization procedures subjects, on entering the interview situation, should be aware that they may stop and start the tape as often as they wish. They would also know that the interviewer may also stop the tape on some occasions to ask if they can recall their thoughts, feelings, reactions, etc. in relation to certain classroom events.

Similarly, subjects should have a clear understanding of the purpose of stimulated recall interviews and what is required of them. As they relive the lesson by viewing the videotape, the subjects are invited to provide a detailed account, to talk aloud, about the thoughts, feelings, and moment-to-moment reactions experienced during the lesson. In addition subjects are asked to indicate when conscious decisions were made (that is, when they chose to do or say one thing rather than other things, or when they chose to say or do nothing), the alternatives they considered before making a choice, and the reasons for choosing to do or say that particular thing. While viewing the tape, subjects should be aware that they may probably form new impressions of the lesson and of events which occurred during the lesson, and think of other things that they might have said or done. Therefore, the subjects should distinguish during the interview between the thoughts and feelings they had during the lesson and those they had after the lesson or when watching the videotape.

In their guidelines for stimulated recall interviews both Marland (1977) and Cooper (1978) emphasize the importance of discussing the goals of the research with the subjects. While broad aspects of the research are shared with the teacher and the students when the researcher introduces himself to the class, a

real need exists for some of the general intentions and directions of the research to be detailed to those involved. The teacher's and the students' levels of participation tend to be the more profitable when they are aware of some of the "whys" of the research. At all times fairness and honesty should be intended and maintained, with explanations cast in the form of generalities rather than as deceptions.

For the student an explanation of the research may contain the following:

> Little is known about the student's thought processes during instruction. Since individual student talk constitutes such a minor portion of classroom interaction, even the most perceptive observer cannot detect his/her emotional and intellectual reactions to classroom events; nor can the student's enjoyment of the lesson, understanding of the content and awareness of many classroom events always be inferred from his/her verbal and non-verbal behaviour. So the goal of this research is to find out the thoughts, feelings, reactions, and perceptions of the student during the instructional process. It is considered that a study of these processes could yield insights which would assist in the development of theories of instruction which in turn could lead to the improvement of teacher education programmes.
>
> How well the student behaves or how well he achieves is not the focus of the interview. The student will know that the stimulated recall interview is not a memory test nor a test of any kind. He should consider the recorded lesson as an ordinary lesson and behave or react as he would naturally.

For the teacher the goals of the research and the role of the teacher as interviewee may be explained as follows:

> At the present time very little is known about the thought processes of those involved in the classroom teaching-learning situation. These processes are the focus of interest of this research project. The goal of this research is to find out what information the teacher and the students use during instruction and how they process this information. The interactions between the teacher and the students are of special interest.
>
> It is considered that a study of these processes could yield insights which would assist in the development of theories of teaching and learning and which would lead eventually to the improvement of teacher education programmes and school curricula. How well the lesson was taught and how well the student learned is NOT the focus of the interview.
>
> The method used in this research project to obtain data on teachers' information processing during instruction is called "stimulated recall." Asking teachers to recall after a lesson the thoughts and feelings they experienced while actually teaching the lesson has not proved very satisfactory. Recall of thoughts and feelings is facilitated when teachers are shown a videotape of the lesson. Seeing events in the lesson on videotape helps to trigger or stimulate recall - hence the term "stimulated recall."

Whereas it is possible to have people in some professions "think out loud" about their professional duties because they are not interacting with other people, it is not possible to do this with teachers because it would interfere with the instructional process.

We know that the mind works faster than the voice. As teachers interact with children in the classroom they:

- become aware of many more classroom events than can be inferred from their verbal and non-verbal behaviour;
- react to classroom events emotionally and intellectually in ways which even the most perceptive observer could not detect because they are internal - many reactions are not revealed to the observer;
- make numerous decisions about what to do and say next or at some future point in the lesson, or what not to do or say. The alternative courses of action considered, the reasons for the final choice of action are frequently not declared or revealed; the observer is not privileged with this "inside" knowledge and with the various rationales.

In their guidelines for stimulated recall interviews Marland (1977) and Cooper (1979) also set out details for the role of the interviewer. Essentially the interviewer functions to assist the student or teacher to recall and verbalize the covert thoughts and feelings experienced during the lesson which has been videotaped. To facilitate as complete and as accurate recall as is possible the interviewer ought to:

- try to establish a relaxed, friendly, supportive atmosphere prior to and during the interview;
- try to facilitate and encourage self-discovery; it is important for the interviewee to believe that he/she is capable of telling about inner processes without the interviewer telling the interviewee what they were;
- avoid making interpretations of, and judgement about, what appears on videotape; ask questions requiring elaboration or clarification but avoid questions answerable by "yes" or "no";
- assume a respectful set towards the student or teacher and the videotaped material; communicate to the interviewee that he/she is being taken very seriously;
- keep the student's or teacher's attention focused on the TV image; refrain from unnecessary activity as such activity may actually interfere with recall;
- encourage the interviewee to talk; don't have the student or teacher become so engrossed in listening to you that the person forgets what he/she is reliving; the interviewee is the authority - you are that person's interested listener;

- be patient; give the interviewee a chance to become involved in reliving the recorded lesson;

- immerse yourself in the interviewee's communication rather than trying to figure out what to say next;

- keep the student's or teacher's discussion focused on what transpired in the actual videotaped lesson and, in particular, on the student's or teacher's covert thoughts, feelings, and the sources of these; conscious decisions and reasons for making those decisions;

- stop the tape (if the student or teacher has not already done so) at points in the lesson where it appears likely to be profitable for purposes of this research and at the following points identified during a preview of the videotape:

  1. When the teacher asks a question of the student (or another student).

  2. When the student's (or another student's) answer to a question is part-correct or incorrect.

  3. When a student-initiated question (relevant) occurs.

  4. When a student-initiated comment (relevant) occurs.

  5. When the teacher responds to a student's answer.

  6. When there is a behaviour-related teacher-afforded warning.

  7. When there are non-verbal cues suggesting that the teacher (or student) is anxious, annoyed, perplexed, excited, enthusiastic, etc.

  8. When the lesson is not running smoothly.

  9. When the student interacts with other students.

- ask probing questions to facilitate maximum disclosure by the student or teacher, for example:

  What were you thinking, feeling at that point?

  What did you say, do ....?

  Did you have any reasons for saying, doing ....?

  Did you understand what the teacher was saying, doing ....?

  What did you think the teacher was wanting, thinking ....?

  Can you recall any other kinds of thoughts you had?

  Were there any fantasies (daydreams) going through your mind?

  Was there anything that you did not want to happen?

  Was there anything that you wanted to do at that time?

NOTE: Questions should be brief and should create an intense awareness in the student or teacher of himself/herself. Avoid questions which are suggestive of, or imply criticism, incredulity, disagreement, disapproval, etc.

- check frequently that the student or teacher is differentiating between interactive thoughts and feelings and those subsequently formed.

The interview session is the component of stimulated recall methodology which is highly dependent on the quality of relationship established between researcher and subject. The rapport between the persons involved should be characterized by a state of relaxation, "person-to-person-wise". The nature and extent of disclosure by the subject, indeed the quality of reported thoughts, seem to be related directly to the subject's feeling of trust in the professionalism of the researcher. Researchers have found that once student subjects come to trust that the researcher "does not talk (to teachers, parents, other students)" then the quality of reported thoughts is greatly enhanced.

The level of trust extended by student subjects to the interviewer reflects aspects of the potential role conflict likely to exist in such research. For students the potential conflict tends to lay between the interviewer as teacher/adult (someone who tells them what to do) and the interviewer as researcher. Over time, as students tend to perceive the interviewer more as researcher, they provide more personal responses by relating aspects of their private and personal ideas and views.

Personal responses by student subjects tend not to be dependent only on trust between subject and interviewer. Most students are not accustomed to expressing thoughts and discussing ideas about themselves, especially with an adult figure. The establishing of the personal relationship between the interviewer and the students also needs to take this problem into account.

ANALYTICAL PROCEDURES OF STIMULATED RECALL PROTOCOLS

When the verbatim recordings of the stimulated recall interviews are transcribed the researcher is in possession of an immense amount of data and is faced with the task of organising it into a manageable form. Both quantitative and qualitative analyses of the covert behaviour data are possible. In this section of the paper the usual approach to quantification is described and this is followed by one form of qualitative analysis, namely, attributional analyses of covert behaviour.

The Quantification of Covert Behaviour

Where organizing of the stimulated recall protocols takes the form of quantification, content analysis is the technique most likely used. According to Holsti (1968:597) content analysis is a "multipurpose research method developed specifically for investigating a broad spectrum of problems in which the content of communication serves as the basis of inference."

Holsti (1969:3) identified three generally agreed upon characteristics of content analysis; objectivity, system and generality.

1. Objectivity stipulates that each step must be carried out according to explicitly formulated rules and procedures to minimize the possibility that the findings reflect the analyst's subjective predisposition rather than the content of the material under analysis.

2. Content analysis must be systematic, which means that content or categories are included or excluded according to consistently applied criteria.

3. Generality requires that the findings have theoretical relevance.

A. Coding: Content analysis involves coding which Holsti (1969:94) described as "the process whereby raw data are systematically transferred and aggregated into units which permit precise description of relevant content characteristics." When applied to stimulated recall protocols coding involves three operations:

1. The differentiation between interactive and non-interactive data. Despite the fact that the subject is asked to report the thoughts and feelings which he can recall experiencing in the situation recorded on the screen, the interview protocols contain a great deal more than interactive thoughts. Subjects often reflect on the recalled thoughts, amplify them and engage in rationalization and justification, probably because a recording often presents a somewhat different perspective of an event to that which the subject remembers experiencing.

To differentiate between interactive and non-interactive thoughts it is necessary to employ a set of guidelines which can be applied objectively. Marland (1977), Conners (1978), King (1979), and Tuckwell (1980) developed and modified such a set of guidelines in which the thoughts were considered non-interactive where the subject:

(a) is recalling what he was saying, rather than what he was thinking,

(b) is showing awareness of what he is doing, rather than what he was thinking,

(c) engaging in general discussion about teaching or learning, situations in teaching or learning, teaching techniques, etc.

(d) providing a reason, explanation or rationale for what he was doing or saying,

(e) summarizing, restating, reviewing what has been said previously,

(f) if a teacher, is commenting on pre-instructional planning or is discussing background characteristics of pupils, and

(g) expressing uncertainty about whether the thoughts and feelings are interactive.

A further guideline to be applied is that where the researcher is in doubt as to whether a segment of the transcript is interactive or not then he should classify it as non-interactive.

2. Unitization. The unit of analysis used by Bloom (1954:27) was the thought or ideational unit which he defined as "that proportion of the report which is centred on a single idea, activity or thought." Taba, Levine and Elzey (1964:115) defined a thought unit as "a remark or series of remarks which expresses a more or less complete idea and serves a specified function." A thought unit may comprise a single word, a part of a sentence, a sentence or an entire paragraph.

3. Categorization. The development of a category-set, in Guetzkow's (1950:48) terms, comprises the identification of a number of classes or "pigeon-holes" into which the units of qualitative data may be placed. Definition of categories requires that they:

(i) reflect the purpose of the research,

(ii) be exhaustive so that all relevant data can be classified, and

(iii) be mutually exclusive so that no unit can be placed in more than one category.

With respect of category size, Guetzkow (1950:49) noted, "when richness of data is lost by the lumping of many units into a single broad category, the simultaneous employment of subcategory-sets along with the exhaustive supraordinate category-set is advantageous." Subcategories facilitate finer analysis of the substantive components of subject thought as described in particular categories, and also provide a means for the identification of change in thought processes over time.

A category set is generated through the process of:

(i) reviewing the related research literature,

(ii) considering the major research questions addressed in the specific study, and

(iii) examining the stimulated recall data.

B. Reliability of coding: The confidence which can be placed on the analysis of the data depends upon the reliability with which the coding was carried out. As Conners (1978:107) stated,

> ...errors in distinguishing between interactive and non-interactive data, in unitizing and in classifying (categorizing) can have compounding effects that will affect the final reliability figure of the content analysis system.

Researchers tend to employ both intracoder and intercoder reliability checks. In order to determine the reliability with which the developed content analysis system is applied to the data, intracoder reliability may be calculated; this reflects the stability with which the researcher codes data on two occasions separated in time. Likewise to provide a measure of the reliability of the content analysis system itself, intercoder reliability may be calculated.

All three operations in the development of the coding system are open to reliability checks:

1. To determine the consistency with which interactive thoughts are differentiated from non-interactive thoughts, a coefficient of reliability which reflects the ratio of coding agreements to the total number of coding decisions can be calculated (Holsti, 1969:138):

$$C.R. = \frac{2M}{N1 + N2}$$

where M is the number of coding decisions of which the two coders are in agreement, and N1 and N2 refer to the number of coding decisions made by coders 1 and 2 respectively.

2. The reliability with which the interactive thoughts contained in the protocols are identified as constituting thought or ideational units is established using a formula developed by Guetzkow (1950) who contended that the reliability of the unitizing process can be determined by expressing the difference between the coders as a percentage of the sum of the number of units obtained by each coder:

$$U = \frac{O1 - O2}{O1 + O2}$$

where O1 represents the number of units obtained by the first coder and O2 is the number obtained by the second coder. Perfect agreement is represented by a coefficient of zero.

3. Scott's coefficient expresses the reliability of categorization. Holsti (1968) notes that this index of reliability corrects not only for the number of categories in the category-set but also for the probable frequency with which each is used. The Scott coefficient is:

$$\text{Reliability} = \frac{Po - Pe}{1.00 - Pe}$$

where Po represents the agreement between two observers and Pe represents the agreement between two observers that occurs simply by chance (Ober, Bentley and Miller, 1971:80).

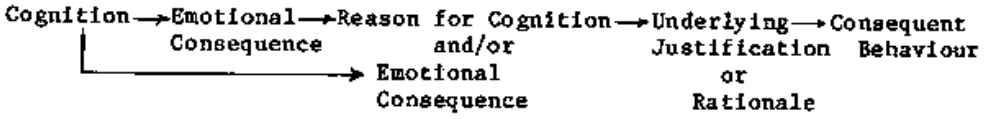
Intracoder and intercoder reliability coefficients should be calculated for the three operational stages involved in coding.

C. Presentation of the data: Following the coding of the data the researcher is able to present the information in a form which is appropriate to the purposes of the study. The more common presentation mode appears to consist of percentage distributions of subjects thoughts over the categories of the content analysis system or, at the more specific level, within-category percentage distributions of sub-categories of subject thought categories of the content analysis system.

Qualitative Analysis of Covert Behaviour

Depending on the purposes of the research various forms of qualitative analyses of the stimulated recall protocols are possible. One form of qualitative analysis which has interested researchers is an attributional analysis of a subject's behaviour. Such an analysis of the data may seek to identify the causal explanations of a subject's expression of thoughts and feelings in the classroom, and the characteristics of a subject's underlying ideas, views, beliefs, emotions, and lines of reasoning, that is, the base which seems to influence the causal derivations of behaviour. When quantitative and qualitative analyses of a subject's behaviour are combined researchers tend to be able to infer and "piece together" some of the more significant characteristics of that subject's conception of self-functioning, for example, a student's conception of self-performance during the learning of mathematics.

One pattern for undertaking an attributional analysis of stimulated recall protocols was derived by inductive means. Following examination of all transcripts the researcher found that causal explanations of subject behaviour could be described according to identified chains of comment, usually linked in the following pattern:



After collating chains of subject comments which more or less matched the evolved patterns, the researcher then placed into clusters those chains which were related. From these clusters, evidence of consistencies in the causal explanations of a subject's behaviour could be discerned. Weiner (1979) has recently supported this idea that in achievement-related contexts actors progress through a form of cognition-emotion sequence in their covert mental activity.

In addition to causal explanations of behaviour, examination of the transcripts is likely to reveal a variety of generic-like ideas, beliefs, views, emotions, and lines of reasoning from which seem to originate all other thought and action pertaining to self-functioning. Some of these subject ideas and beliefs are integrated into a kind of implicit theory about aspects of living and working while other underlying thoughts of subjects reflect a single, discrete idea. Descriptions of the phenomena of underlying subject covert behaviour yield a number of insights into the "generative mechanisms at work" (Harré and Secord, 1972:133) of people in classrooms.

SUMMARY

The theoretical base and the practicalities of using stimulated recall methodology are still in a state of emergence. Presumably numerous discussions about the place of the technique and many refinements in its application to classroom research are to be anticipated. To this point of time, the view that the methodology has yielded wider and more useful insights into the behaviour and actions of classroom participants is now recognized more widely and, for this reason, stimulated recall techniques must continue to be used.

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