VERBAL PROTOCOLS:
WHAT DOES IT MEAN FOR RESEARCH TO USE SPEAKING AS A DATA COLLECTION TOOL?

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What does it mean for research to use speaking as a data collection tool?1

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In psychological research, we are interested in determining the processes individuals use when they engage in an activity. One source of information about those processes is the individual him/herself – who tells the researcher about what he or she is thinking during or after the activity. The data generated by this methodology are referred to as verbal protocols. The purpose of any data collection is to draw inferences from the data collected. Inference, in the context of the present chapter, deals with the type of interpretation that researchers can make with regard to verbal protocol data. In this chapter, I intend to discuss the different inferences that are drawn by information processing theorists and sociocultural (theory of mind) theorists from verbal protocols. My intent is to question inferences that are made within the more traditional cognitive paradigm, arguing for alternative interpretations of verbal protocol data based on sociocultural research and theory. I also consider the extent to which we can generalize from inferences drawn from local and situated contexts (Chaloub-Deville, 2003). The ultimate purpose of this chapter is to argue that we, as researchers, can no longer think of verbal protocols as a “neutral” methodology – that is, as a methodology that has no impact on our findings.

1 I would like to thank Micheline Chaloub-Deville, Louis Chen, Alister Cumming, David Ishii, Penny Kinnear, Jim Lantolf, Toshiyo Nabei, Sharon Lapkin and Harry Swain for reading earlier draft(s) of this chapter. Their comments led me to infer more and generalize less.
Gass and Mackey (2000) define verbal protocols as the data one gets “by asking individuals to vocalize what is going through their minds as they are solving a problem or performing a task” (p. 13). Verbal protocols can take the form of concurrent “think alouds”, where individuals say what is going through their mind while they are in the process of solving the problem or performing the task (e.g., Cumming, 1990). Or, verbal protocols can take the form of some sort of retrospective introspection, for example, a stimulated recall (e.g., Mackey, 2002; Swain & Lapkin, 2002). In a stimulated recall, individuals are provided with a stimulus which constitutes a bit of their past behaviour. For example, individuals may be shown a clip of a video in which they appear and are asked to talk about what was going through their minds at that particular time (e.g., Swain & Lapkin, in press).

The specific question I wish to address in this chapter is: 1) *What do these verbal protocols represent?* This is followed by a section on relevant research. The implications for research on the different interpretations of verbalizing (speaking) are considered at the end of the chapter. Overall, I attempt to answer what it means for researchers in second language learning to use speaking as a data collection tool.

**What do verbal protocols represent?**

I examine this question from the perspective of two different theories of human cognition: information processing theory (Ericsson & Simon, 1993; 1998) as representative of recent (last three decades) thinking in cognitive science, and a sociocultural theory of mind (e.g., Lantolf, 2000; Vygotsky, 1978; Wertsch, 1985; 1991; Wertsch & Tulviste, 1996). The issue which underlies the debate is no less than the relationship between language and thought – an issue that “has been little discussed in
recent decades, since many have thought the issue to be closed” (Carruthers & Boucher, 1998b: 2) because of the dominance of the computer metaphor for the mind in the cognitive sciences (see e.g., Searle, 2002 for a critique of the metaphor). In this view, language is “but an input and output module for central cognition” (Carruthers & Boucher, 1998b: 2). This view, however, is being challenged, even within the cognitive sciences as indicated by a recent book edited by Carruthers and Boucher (1998a) “Language and Thought: Interdisciplinary Themes.” Also, this view is being challenged by those influenced by Vygotsky (1978) and his colleagues and students (e.g., Gal’perin, 1969; Luria, 1973), whose writings have only reached North American second language theoreticians and researchers in the last decade or so (e.g., Lantolf, 2003; Lantolf & Appel, 1994).

Carruthers and Boucher (1998b) suggest that there are roughly two opposing camps among those who are interested in the place of language in cognition. There are those who see “the exclusive function and purpose of language to be the communication of thought, where thought itself is largely independent of the means of its transmission from mind to mind” (p. 1). Information processing theory falls into this camp. Alternatively, there are those who see language as “crucially implicated in human thinking….that language itself is constitutively involved in [some kinds of thinking]” (p. 1). Language is not simply a vehicle for communication, but plays critical roles in creating, transforming, and augmenting higher mental processes. Sociocultural theory of mind falls into this second camp. The different assumptions underlying the two perspectives – information processing theory and sociocultural theory – lead to different interpretations of the data elicited in verbal protocols (Smagorinsky, 1998).
According to information processing theory (Ericsson & Simon, 1993), think alouds are a report of the (oral) contents of short-term memory, and represent a trace of the cognitive processes that people attend to while doing a task. In a stimulated recall, as Gass and Mackey (2000) point out, “the use of and access to memory structures is enhanced, if not guaranteed, by a prompt that aids in the recall of information” (p. 17). In both cases the assumption is that verbal protocols provide data for investigating cognition direct from memory. According to Ericsson and Simon (1993: 222), the verbalization “is a direct encoding of the heeded thought and reflects its structure”. The data tell us “what information [individuals] are attending to while performing their tasks, and by revealing this information, can provide an orderly picture of the exact way in which the tasks are being performed: the strategies employed, the inferences drawn from information,…” (pg. 220). In this way, verbal protocols provide the evidence from which models of human cognitive processing are generated.

Ericsson and Simon (1993) make a distinction between instructions to participants to verbalize thoughts per se, what they refer to as Type 1 and Type 2 verbalization, and instructions to verbalize specific information, such as reasons and explanations (Type 3 verbalization). Type 1 and Type 2 verbalizations do not, they claim, change the sequencing of the cognitive processes, but the time to carry them out may be longer as a result of the verbalizing. As for Type 3 verbalization, they summarize their review of the research literature as: “…directing subjects to engage in specific thought activities with associated overt verbalization changes the cognitive processes and thus alters concurrent and retrospective performance.” (pg. xix) They continue, that “…the effects of directing verbalization do not involve any magical influences but can be understood in terms of the
changes induced in the associated cognitive process by the instructions.” (pg. xix) (my italics). In other words, Ericsson and Simon understand the instructions as causal, not the verbalization.

…in the review of studies comparing different instructions to verbalize, we found substantial evidence that differences in performance were induced by telling the subject how to verbalize. In order to verbalize the information called for by the instructions, instead of the information he would normally have attended to, he had to change his thought processes. (Ericsson & Simon, 1993: 107).

As Vygotsky (1986: 218) asked, however, “Does language only reflect thought (memory) or can it change thought (memory)?” Vygotsky believed that “thought is not merely expressed in words; it comes into existence through them” and that “thought undergoes many changes as it turns into speech: it finds its reality and form” (p. 219). “The process of rendering thinking into speech is not simply a matter of memory retrieval, but a process through which thinking reaches a new level of articulation.” (Smagorinsky 1998: 172-3). Ideas are crystallized and sharpened, and inconsistencies become more obvious. Smagorinsky (2001) makes clear the implication of this position: “If thinking becomes rearticulated through the process of speech, then the protocol is not simply representative of meaning. It is, rather, an agent in the production of meaning” (p. 240). (See also Vygotsky, 1997).

In a sociocultural theory of mind, verbalization is conceived of as a tool that enables changes in cognition. Speech serves to mediate cognition. Initially an exterior source of physical and mental regulation, speech takes on these regulatory functions for the self. One’s own speech (through a process of internalization) comes to regulate, organize, and focus an individual’s own mental activities (e.g., Luria, 1959; 1973; Sokolov, 1972). Clark (1998) refers to this role of language in human cognition as
“attention and resource allocation” (p. 172): speech helps us to focus our attention, monitor and control our behaviour.

Another way in which language intersects with the activities of the mind is that it allows ideas to be retained and held up for inspection by the self and others; it allows ideas to move between people. Such movement allows for “the communal construction of extremely delicate and difficult intellectual trajectories and progressions…moreover, the sheer number of intellectual niches available within a linguistically linked community provides a stunning matrix of possible inter-agent trajectories” (Clark, 1998: 172)\(^2\). This is what Vygotsky (1978) meant by proposing that the source of learning is social; and what Salomon (1993) and others mean by “distributed cognition”\(^3\).

Vygotsky (1987), Barnes (1992), Wells (1999), and others argue that speech can serve as a means of development by reshaping experience. It serves as a vehicle “through which thinking is articulated, transformed into an artifactual form, and [as such] is then available as a source of further reflection” (Smagorinsky, 1998: 172), as an object about which questions can be raised and answers can be explored with others or with the self. Language is data, and with language we are able to manipulate ideas, re-organize them, reshape them, transform them, and construct new ones. “The process of linguistic formulation creates the stable structure to which subsequent thinkings attach” (Clark, 1998: 177). As Vygotsky (1987) argued, language is a tool which permits our mind to engage in a variety of new cognitive operations and manipulations. “It enables us, for example, to pick out different elements of complex thoughts and to scrutinise each in turn.

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\(^2\) Clark is essentially a connectionist. In this regard, it is interesting how closely many of his claims (1998) echo the words of Vygotsky.

\(^3\) Even in the case of a person acting alone, cognition is still distributed because of internalization. This is not a point forcefully made in Salomon (1993). (Personal communication, Lantolf, December, 2003)
It enables us to ‘stabilise’ very abstract ideas in working memory\(^4\). And it enables us to inspect and criticize our own reasoning in ways that no other representational modality allows” (Clark, 1998: 178).

This being so, verbal protocols – which mediate the articulation of cognition – have the power to influence cognition. They exert this influence in three ways. First, the process of verbalization itself transforms thought, drawing attention to some aspects of the environment and not others, solidifying meaning, and creating an observable artifact. Secondly, as an observable artifact, it can be reflected upon, questioned, manipulated and restructured. And thirdly, internalization of this now differently understood externalized artifact may occur. What this implies is that verbal protocols not only potentially transform thinking, focusing it in highly specific ways, but also are the sources of changes in cognition. In other words, speech mediates learning and development.

**Some relevant research**

In recent research, we have been attempting to demonstrate that speaking mediates second language learning. Our initial work in this area with grade 7 and 8 French immersion students has shown that speaking in the form of dialogue mediates second language learning (e.g., Swain & Lapkin, 1998). We have called the particular form of dialogue we have been investigating “collaborative dialogue”\(^5\). We have shown that through collaborative dialogue, learners come to know what they do not know or know only partially about language, focus their attention on aspects of language that are

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\(^4\) Clark (1998) suggests that “for certain very abstract concepts, the only route to successful learning may go via the provision of linguistic glosses. Concepts such as charity, extortion and black hole seem pitched too far from perceptual facts to be learnable without exposure to linguistically formulated theories. Language may thus enable us to comprehend equivalence classes that would otherwise lie forever outside our intellectual horizons” (p. 170)
problematic for them, raise questions about those problematic aspects of language and respond to those questions (formulate and test hypotheses), and, in so doing, consolidate their existing knowledge or create knowledge that is new for them.

In our more recent work (e.g., Swain & Lapkin, 2002; in press), we have added stimulated recalls to our research procedures to try to understand learning processes better from the learners’ perspectives. We have also incorporated a pretest/posttest design. This is shown in Table 1. Between the pretest and posttest, students (Grade 8 French immersion students) examine a reformulation of a story they have written and are asked to notice what differences there are between the story they wrote and the reformulated version of their story. While the students are engaged in noticing the differences, they are video-taped. Next, the students see themselves noticing the differences between their own story and its reformulated version, and the tape is stopped each time the students noticed something and asked to tell what they were thinking at the time.

An example of what happens is shown in Table 2. In their story, Nina and Dara, two grade 7 French immersion students, had written “...elle s’endore sans bruit” – meaning “she fell asleep without a sound” and the reformulator changed this to “...elle s’endore dans le silence” – meaning “she fell asleep in the silence”, which altered the meaning of Nina and Dara’s original story. Nina and Dara’s version puts the emphasis

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5 Collaborative dialogue is dialogue in which speakers are engaged in problem-solving and knowledge-building – in this case, solving linguistic problems and building knowledge about language.
on how the girl in their story falls asleep, that is, without a sound; and the reformulator’s version highlights the state of the room, which is silent. Nina and Dara noticed this change, and during the stimulated recall, Nina articulates the difference in meaning. She says: “I think *sans bruit* is more, she, she fell asleep and she didn’t make any noise. But *silence* is like everything around her is silent.” Here she puts into words the difference in meaning between their version and the reformulator’s version, and when they later individually rewrite their story, although they make use of the reformulator’s word, “*silence*”, they cleverly manage to preserve their original meaning, Dara by using “*silencieusement*” and Nina by using “*en silence*” – both meaning “silently”. Later, when interviewed, Nina makes the more general point about the feedback that they received through the reformulation, “…some of them [the reformulations], they seemed like they changed the story sort of and it wasn’t really ours.” – which explains why and how they used this specific aspect of the reformulator’s feedback.

The key point here is that by verbalizing the difference in meaning between the two versions, the students were able to accommodate the feedback they received, yet preserve their own meaning – a complex cognitive task. Their final written versions (posttests) would seem to have been affected by both the reformulation itself, and a clear articulation of the differences between their meaning and the one that they felt was being imposed on them. It seems likely that what the students said affected their posttest results. However, our research design did not let us separate out the effect of the feedback from that of the stimulated recall – something that will need to be done to understand the effect of such verbalization.
In a recently completed Ph.D. study, because of the vagaries of doing classroom research in real time, Nabei (2002) separated the effects of the feedback (oral recasts from the teacher) from the stimulated recall. An overview of her study is shown in Table 3. As shown in Table 3, Nabei videotaped the teacher-student interaction in an EFL college class in Japan and took note of all the recasts that the teacher made of student utterances. Based on the specific recasts that occurred, she developed test items that she then administered to the students. After that, she held a stimulated recall session with each student individually in which she showed each student each recast episode and asked them what they were thinking at the time. But, due to time constraints, it was not always possible to show each and every recast episode. This cycle of videoing the class interaction, developing and administering posttest items based on the specific recasts provided by the teacher, then conducting stimulated recall sessions was repeated weekly for 6 weeks. Three weeks after completing these 6 cycles of data collection, Nabei gave the students the same test items again – constituting the second posttest – in order to determine if the immediate learning from the recasts was maintained over time. Because some recast episodes were not shown to the students in their stimulated recall sessions, this means that in this second posttest, some of the items were ones where students had spoken about the episode from which the test item was constructed, while for other items, no such stimulated recall took place.
The results are shown in Table 4. In the first posttest, given prior to any stimulated recall, there are two findings. On the items for which there was never any associated stimulated recall, the average correct score was 68%, whereas on the items on which there was later related stimulus recall data, the average correct score was 57%. This suggests that the items where the learners provided a stimulated recall protocol may have been those that were more difficult for them. The reason I suggest this is that, in the second posttest, on the items where the learners had provided a stimulated recall protocol, their average correct responses went from 57% to 64%; whereas on the items where a stimulated recall had not taken place, the learners’ average correct responses went from 68% to 44%. This suggests that the stimulated recalls not only helped the students to maintain over time what they had learned from the recast feedback in class, but also to further develop their knowledge.

Adams (2003) replicated the Swain and Lapkin (2002) study with university students of Spanish using a research design which made it possible for her to separate the effects of task repetition alone (students only wrote the pretest and the posttest), noticing (students, after writing the pretest, compared their writing to that of a reformulated version, then wrote the posttest), and stimulated recall (students wrote the pretest, noticed
the differences between their writing and the reformulation of it, and then immediately after the noticing session, the students recalled what they were thinking at the time of their noticing, stimulated by listening to a recording of their noticing session). The posttest score for each learner was calculated as a proportion of reformulations that were incorporated in a more target-like form to the total number of reformulations. Both the Noticing Group and the Noticing + Stimulated Recall Group significantly outperformed the Task Repetition Group. In a further analysis, when the proportion of more target-like incorporated reformulations to reformulations that the learners had reported noticing were calculated, the Noticing + Stimulated Recall group significantly outperformed the Noticing Group. These findings suggest that noticing the feedback provided by the reformulation had an effect on the final scores students obtained, and that the stimulated recall had an impact above and beyond that of noticing the feedback.

What these results show is that speaking, in the form of a stimulated recall, positively affected the performance of language learners. Information processing theory might claim the results are explained by the participants having had more “time on task” and during that time on task, they were given an additional exposure to the information about the correct response and they attended to that information, strengthening their memory traces. For example, Ericsson and Simon (1993) reported on a study on vocabulary learning (Crutcher, 1990) where half the items where followed by retrospective reports, and the findings showed that retention was better for those items that called for retrospective reports during learning. “This finding was expected, as the retrospective reports involve an additional retrieval of the memory trace linking the
vocabulary pair and hence serve as an additional rehearsal and strengthening of the memory trace” (Ericsson & Simon, 1993: xxi).

Sociocultural theory claims the results find *their source* in the verbalization itself. Speaking was not just a report of thought (memory), but it shaped and brought thought into existence.

In other educational domains such as mathematics and science, language has been shown to mediate the learning of conceptual content (e.g., Newman, Griffin & Cole, 1989). The Russian developmental psychologist, Talyzina (1981) demonstrated in her research the critical importance of language in the formation of basic geometrical concepts. Talyzina's research was conducted within the theoretical framework of Gal'perin (1969). With Nikolayeva, Talyzina conducted a series of teaching experiments (reported in Talyzina, 1981). The series of experiments dealt with the development of basic geometrical concepts such as straight lines, perpendicular lines, and angles.

Three stages were thought to be important in the transformation of material forms of activity to mental forms of activity6: a material (or materialized) action stage; an external speech stage; and a final mental action stage. In the first stage, students are involved in activities with real (material) objects, spatial models or drawings (materialized objects) associated with the concepts being developed. Speech serves primarily as a means of drawing attention to phenomena in the environment (p. 112). In the second stage, speech "becomes an independent embodiment of the entire process, including both the task and the action" (p. 112). This was instructionally operationalized

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6 i.e., internalization – conversion of objective to idealized activity (Gal’perin, 1969).
by having students formulate verbally what they carried out in practice (i.e., materially) – a kind of ongoing think-aloud verbalization. And in the final mental action stage, speech is reduced and automated, becoming inaccessible to self-observation (p. 113). At this stage, students are able to solve geometrical problems without the aid of material (or materialized) objects or externalized speech.

In one of the series of instructional studies conducted by Talyzina and her colleagues, the second stage – the external speech stage – was omitted. The students in the study were average-performing, grade five students in Russia. The performance of students for whom the external speech stage was omitted was compared to that of other students who received instruction related to all three stages. The researchers concluded that the omission of the external speech stage inhibited substantially the transformation of the material activity into a mental one. They suggest this is because verbalization helps the process of abstracting essential properties from nonessential ones, a process that is necessary for an action to be translated into a conceptual form (p. 127). Stated otherwise, verbalization mediates the internalization of external activity.

Holunga (1994) conducted a study concerned with second language learning that has many parallels to those carried out by Talyzina and her colleagues. Holunga's research involved adults who were advanced second language learners of English. The study was set up to investigate the effects of metacognitive strategy training on the oral accuracy of verb forms. The metacognitive strategies taught in her study were predicting, planning, monitoring and evaluating (Brown & Palincsar, 1981). What is particularly interesting in the present context is that one group of her learners was instructed, as a

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7 The difference is that in a think aloud the individual is asked to say what they personally are doing, but in Talyzina the individual’s speech is supposed to reflect the conceptual understanding of the process.
means of implementing the strategies, to talk them through as they carried out communicative tasks in pairs. This group was labelled the metacognitive with verbalization, or MV, group. Test results of this MV group were compared to those of a second group which was also taught the same metacognitive strategies, and which carried out the same communicative tasks in pairs. However, the latter group was not instructed to talk about the metacognitive strategies as they implemented them. This group was called the metacognitive without verbalization, or M, group. A third group of students, included as a comparison group (C group), was also provided with language instruction about the same target items, verbs. Their instruction provided opportunities for oral language practice through the same communicative tasks completed by the other students, but the students in this group were not taught metacognitive strategies. Nor were they required to verbalize their problem-solving strategies. Each group of students in Holunga's study received a total of 15 hours of instruction divided into 10 lessons. Each lesson included teacher-led instruction plus communicative tasks to be done in pairs.

The students in this study were tested individually, first by being asked a series of discrete-item questions in an interview-like format, and secondly by being asked three open-ended questions in which learners would give their opinions, tell a story and imagine a situation. The questions were designed to elicit specific verb forms concerning tense, aspect, conditionals and modals, and were scored for the accuracy of their use. A pretest, posttest and delayed posttest were given. The delayed posttest was administered four weeks after the posttest.

The data were analyzed statistically as four separate tests: The analyses revealed that the MV group made significant gains from pre- to posttests in all four tests; the M
group made significant gains in only the discrete-item questions. And the C group showed no improvement on any of the four tests. Furthermore, both the MV and M groups' level of performance at the posttest level was maintained through to the delayed posttests four weeks later. A second set of analyses indicated that both experimental groups performed better than the comparison group on all four tests. Furthermore, the MV group's performance was superior to that of the M group.

In summary, although those students who were taught metacognitive strategies improved the accuracy of their verb use relative to a comparison group that received no such instruction, students who were taught to verbalize those strategies were considerably more successful in using verbs accurately.

Interpreting these findings through the lens of Talyzina's theoretical account suggests that for the MV group, external speech mediated their language learning. Verbalization helped them to become aware of their problems, predict their linguistic needs, set goals for themselves, monitor their own language use, and evaluate their overall success. Their verbalization of strategic behaviour served to guide them through communicative tasks allowing them to focus not only on "saying", but on "what they said". In so doing, relevant content (i.e., the artifact that speech produces) was provided that could be further explored and considered. Test results suggest that their collaborative efforts, mediated by dialogue, supported their internalization of correct grammatical forms. (See also Huang, 2004; Negueruela, 2003; Swain, 2005.)

The studies reviewed above suggest that verbalization (speaking), particularly the verbalization that takes place as one reflects (the "saying") on the artifact created by
speech (the “said”) plays a significant role in the development and learning that was demonstrated to have taken place.

**Implications**

What are the implications for research of the different interpretations of verbalizing (speaking) made by information processing and sociocultural theorists? The inferences one anticipates drawing from verbal protocols are not dissimilar across these two theoretical perspectives. Both aim to develop claims about the higher mental processes participants make use of in carrying out a specific task, e.g., solving a mathematical problem, a logical reasoning problem, or a language problem. Information processing researchers use verbal protocols to develop and test “detailed information processing models of cognition, models that can often be formalized in computer programming languages and analyzed by computer simulation” (Ericsson & Simon, 1993: 220). Sociocultural theorists also use verbal protocols to discover mental processes underlying task performance (Wertsch, 1980; Donato & Lantolf, 1990; Swain, 2000; 2001). Both research agendas try to explain how and why people think and act: information processing by prediction (projecting into the future based on current behaviour); sociocultural theory by genetic analysis (analysis of the process(es) being formed).

Information processing theorists view verbal reports within the limited constraints of individual task performance, seeking to identify similarities within or across group behavior, whereas sociocultural theories take a broader perspective on such data, attempting to explain them in reference to long-term personal histories. Looking at
verbal reports from this broader perspective, temporally and circumstantially, people are interacting and changing with all they say and think, regulating themselves and the world around them. Verbal reports as indications of what people are attending to as they try to complete a short task make people seem static and disembodied from their long-term individual development and their social relations, and focused just on the goals associated with that task. Both theories are concerned with learning, but the extent of the perspective each adopts is different (Cumming, personal communication, November 25th, 2003).

The heart of the matter lies in what is considered to be the relationship between thought and language. For information processing theorists, the two are the same, and verbal protocols are a direct encoding of the heeded thought (Ericsson & Simon, 1993). For sociocultural theorists, thought is mediated by the cultural artifacts of our situated being. One of the most important cultural artifacts is language. Through the process of speaking – the articulation and completion of thought – our attention may be refocussed, the boundaries of thought may be expanded or limited, new ideas may be created, etc. In other words, verbalization changes thought, leading to development and learning.

Returning now to the original question, what do verbal protocols represent? Do they represent cognitive “dumps”? or are they, instead, part of the process of cognitive change, that is, of learning and development? Information processing theory supports the former view. The research I presented in this chapter suggests that the latter view is a strong possibility. It is certainly a matter that needs to be closely studied. If, as I have suggested, speaking and cognitive change can be closely allied, then this needs to be

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8 What is going on in speaking is a genetic process and so we should be able to improve this process by modifying the things that people say about what it is they are doing (Gal’perin, 1967). He argues that
taken account of in any study which makes use of verbal protocols. Verbal protocols cannot be used neutrally as a method of collecting data, but instead they need to be considered as part of the “treatment” when making claims about learning and development. Research tools such as think alouds and stimulated recalls should be understood as part of the learning process, not just as a medium of data collection (Smagorinsky 1998; Swain 2005). Think alouds and stimulated recalls are not, as some would have it, “brain dumps”; rather they are a process of comprehending and reshaping experience – they are part of what constitutes development and learning.

through conceptualization, materialization, verbalization and internalization we can hasten development.
References


Table 1: Overview of Swain and Lapkin’s 2002 Study

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Table 2: sans bruit/dans le silence: Nina and Dara

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<td>Stimulated Recall</td>
<td>Posttests</td>
<td>Interviews</td>
</tr>
</tbody>
</table>

*italics = what students and reformulator wrote*
Table 3: Overview of Nabei’s 2003 Study

<table>
<thead>
<tr>
<th>Cycle repeated six times</th>
</tr>
</thead>
</table>

| Teacher-Student in-class interaction videotaped | Teacher recasts of student utterances (recast episodes) isolated. | Test items developed based on recast episodes. | First posttest administered. | Stimulated recall session. Students shown recast (and other) episodes. - due to time constraints not all recast episodes were shown. | Second posttest (combination of all first posttests) administered 3 weeks after end of 6th cycle. |
Table 4: Percentage Correct Items on Posttests

<table>
<thead>
<tr>
<th></th>
<th>Items with no associated stimulated recall</th>
<th>Items with associated stimulated recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posttest 1</td>
<td>68% (19/28)</td>
<td>57% (78/138)</td>
</tr>
<tr>
<td>Posttest 2</td>
<td>44% (12/28)</td>
<td>64% (88/138)</td>
</tr>
</tbody>
</table>