

Jennifer L. Branch  
University of Alberta

## Using Think Alouds, Think Afters, and Think Together to Research Adolescents' Inquiry Experiences

*This article presents three research methods—Think Alouds, Think Afters, and Think Together—as ways of gathering data to describe the experiences of adolescents during instructional activities. These verbal report methods were used in two studies that examined the information-seeking processes of adolescents in Inuvik, Northwest Territories and Beaumont, Alberta. The first study revealed that participants needed both mediation (instruction and support) and practice to develop the skills and strategies needed for full-text searching of electronic encyclopedias. The second study revealed that students needed mediation (instruction and support) throughout an inquiry-based learning experience and that using Kuhlthau's (1993) Information Search Process model as a guide for cognitive and affective mediation was useful. The Think Alouds, Think Afters, and Think Together allowed the researcher to collect data about the adolescents' experiences of information-seeking; the data-gathering processes also provided the participants with a deeper understanding of their own experiences of instructional activities. I conclude the article with recommendations to enhance researchers' use of verbal report methods with adolescents.*

*Cet article présente trois méthodes de recherche – Think Alouds, Think Afters et Think Together (Réfléchir à haute voix, Réfléchir par la suite et Réfléchir ensemble) – comme façons de recueillir des données pour décrire les expériences que vivent les adolescents pendant des activités pédagogiques. Nous avons employé ces méthodes basées sur les rapports verbaux au cours de deux études portant sur les processus de recherche d'information auxquels ont eu recours des adolescents à Inuvik, aux Territoires du Nord-Ouest et à Beaumont, en Alberta. La première étude a révélé que les participants avaient besoin de médiation (directives et appui) et de pratique afin d'être en mesure de développer les habiletés et les stratégies nécessaires à faire des recherches en texte intégral dans des encyclopédies électroniques. La deuxième étude a révélé que les élèves avaient besoin de médiation (directives et appui) tout au long d'une activité pédagogique reposant sur l'enquête. L'emploi du modèle de Kuhlthau sur le processus de recherche d'informations comme guide lors de la médiation cognitive et affective s'est avéré utile. Les Think Alouds, Think Afters et Think Together ont fourni au chercheur les moyens de recueillir des données sur la recherche d'informations par les adolescents. La cueillette de données a également fourni aux participants l'occasion de mieux comprendre leurs propres expériences lors d'activités pédagogiques. Des recommandations quant à l'emploi, par les chercheurs, de méthodes reposant sur les rapports verbaux lors d'activités avec des adolescents viennent conclure l'article.*

Understanding how and why children and adolescents are learning something—whether it be when they are reading, problem-solving, learning cooperatively, or searching for and using information to create new meanings—often presents methodological challenges for researchers. A variety of

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Jennifer Branch is the coordinator of the Teacher-Librarianship by Distance Learning program. Her research interests include information-seeking behaviors, verbal protocols, and information literacy education for preservice teachers.

methods can be used to collect the data needed to gain insight into adolescents' understandings including classroom observations, journaling, interviews, and samples of student work. In this article, I present verbal reports—Think Alouds, Think Afters, and Think Togethers—as data-collection methods that can provide data about what adolescents are doing and thinking when completing a task. Researchers can combine Think Alouds, Think Afters, and Think Togethers with additional data-collection methods such as observations, audiotape recordings and/or video recordings to enhance the overall picture of adolescents' experiences during instructional activities.

Adolescents often need to find specific pieces of information to complete homework assignments, to write school reports, or to satisfy personal interests. At other times, adolescents are involved in more sustained inquiry-based activities where they use a variety of information sources to develop an understanding of a topic or issue. In this article, I reflect on two research studies in which I used Think Alouds, Think Afters, and Think Togethers to examine the information-seeking processes of adolescents as they searched for information in a school context.

The first study used Think Alouds and Think Afters to examine the information-seeking processes used by junior high school students from Inuvik, Northwest Territories when using electronic encyclopedias. The second study used Think Afters and Think Togethers to follow a group of grade 9 students in Beaumont, Alberta as they completed a large inquiry-based project using a variety of resources including online databases; online library catalogues; electronic encyclopedias; the Internet; and the print collections of the school, public, and academic libraries. The two studies differed in important ways: in the first, students used a controlled database of information, whereas in the second, the students used a variety of sources. Also, the first study took place outside a regular classroom context, whereas the second took place as part of a grade 9 language arts class. These studies offer varying examples of how verbal report methods might be used in research with adolescents.

#### *Related Literature*

Think Alouds, Think Afters, and Think Togethers are part of a long tradition of using verbal reports to understand how people do things. The key resource for this topic is the foundational text *Protocol Analysis: Verbal Reports as Data* by Ericsson and Simon (1993). Ericsson and Simon based their work on information-processing theory, specifically the constructs of short-term and long-term memory. They hypothesized that all human cognition is information-processing and “that a cognitive process can be seen as a sequence of internal states successively transformed by a series of information processes” (p. 11). Long-term memory contains a vast amount of knowledge, both procedural and factual, that can be accessed, but the information is transformed and organized in highly individualized ways as it is processed. Short-term memory, on the other hand, contains an extremely limited amount of knowledge; the information in short-term memory can be quickly accessed and reported (Pressley & Afflerbach, 1995).

Ericsson and Simon's (1993) verbal protocol analysis is a rigorous methodology for eliciting verbal reports of thought sequences as a valid source of data on thinking. The central assumption of protocol analysis is that it is possible to

instruct research participants to verbalize their thoughts in a manner that does not alter the sequence of thoughts mediating the completion of a task, and that these verbal reports can therefore be accepted as valid data on the participant's thinking. Ericsson and Simon distinguish between two forms of verbal reports: "concurrent verbal reports" where the information heeded during cognitive processes is verbalized directly by the participant and "retrospective verbal reports" where just after the task is finished, the information heeded successively while completing a task is accessed from short-term memory or retrieved from long-term memory and then verbalized by the participant.

Pressley and Afflerbach (1995) state that "spoken language is the data used in protocol analysis and the richness and variability of language are the greatest assets and liabilities of the verbal reporting methodology" (p. 2). Concurrent verbal protocols have been better received over the years by researchers than have retrospective verbal protocols, according to Ericsson and Simon (1993), because concurrent verbal reports provide more reliable data. Because retrospective verbal reports rely on the participant's memory, they are prone to errors and incompleteness. However, both concurrent and retrospective verbal reports, according to Russo, Johnson, and Stephens (1989), may be influenced by the motivational shift that can occur whenever people are informed that they are being observed.

Ericsson and Simon's (1993) verbal protocol analysis methodology is firmly set in the postpositivist paradigm, where there is a clear hypothesis, where a research method is chosen in advance, and where the researcher attempts to remain objective and removed from the research and the research participants. As a qualitative researcher, I hold that the design of the research may be emergent, that multiple methods are valuable and often necessary, that researcher and the research participants (in this case, the participant observer and the participants) interact and influence one another, and that the inquiry is value-bound.

Designing my studies in an interpretive paradigm, but drawing on research methods developed in a postpositivist paradigm, I have signaled this reframing of the research methods with the terminology that I use in referring to these research methods. I refer to concurrent verbal reports as Think Alouds, and I refer to retrospective verbal reports as Think Afters. Think Alouds are verbal reports that are gathered while individual participants are completing a task such as searching for information on the Internet. Think Afters are verbal reports gathered after individual participants have completed a task, for example, watching videotape of their electronic encyclopedia search and then being asked to recall their actions and thoughts while they were completing the task. I created a new term, Think Together, to refer to small-group concurrent verbal reports. Think Together are verbal reports gathered while a group of participants are doing Think Alouds together, for example, discussing their information-seeking processes as they are completing a group or individual project.

Verbal report methods take advantage of strategies that are already in children's and adolescents' repertoires in everyday school life as the following examples illustrate. In mathematics, individual children are often asked to problem-solve aloud so that their teacher can understand their thought proces-

ses. This activity is similar to Think Alouds. After working on an inquiry-based project, students may be asked to reflect individually on their experiences, their learning, and their inquiry process. This practice is similar to Think Afters. Students working in cooperative learning groups may problem-solve together so that they can learn from others in their group how to approach a new problem. This sharing or dialogue represents the core idea of Think Togethers.

The verbal protocol analysis methodology has been used with a wide range of research topics, from writing (Hayes & Flower, 1983; Ransdell, 1995) and text comprehension (Whitney & Budd, 1996), to grocery shopping decision-making process (Murtaugh, 1984), to phobias and test anxiety in clinical and counselling psychology (Cacioppo, von Hippel, & Ernst, 1997).

Verbal protocol analysis has also been used to examine information-seeking behavior. Yang (1997) used verbal protocol analysis and observation to study six cases of information-seeking behavior in university students as they accessed information in the Perseus Hypertext System. Yang had her participants practice thinking aloud, and then asked them to think aloud while working on an information-seeking problem. Hughes, Packard, and Pearson (1998) also used the think-aloud method in looking at reading in a hypertext environment. They introduced the think-aloud method to the participants using a video of other computer tasks so as not to suggest strategies related to the questions that were to be asked by the researchers. Xie and Cool (1998) used think-alouds to study end-user online searching. Using this method, they found that "much insight is gained into the problems encountered by searchers and the adaptive strategies they employ in such situations" (p. 329).

In the last few decades, researchers exploring the information-seeking behavior of children and adolescents have relied heavily on qualitative methods (Hirsh, 1999; Hughes et al., 1998; Kuhlthau, 1983; McGregor, 1993; Xie & Cool, 1998; Yang, 1997). For the qualitative researcher, the choice of research methods depends on the questions being asked and the context of the research (Denzin & Lincoln, 1998). The use of multiple methods to obtain the most complete, rich, and in-depth data is fundamental to qualitative research. For understanding more about the learning processes and decision-making steps of children and adolescent information seekers, researchers have found verbal protocol analysis to be particularly helpful. Across the two studies of adolescents' information-seeking discussed in this article, I used multiple methods to gather data, including observations and three types of verbal reports used in conjunction with video-recording and audio-recording.

### *Overview of the Two Studies*

#### *Study 1: Searching Electronic Encyclopedias*

In the first study, I examined adolescents' information-seeking processes in the context of electronic encyclopedia use. Twelve junior high school students from Inuvik, Northwest Territories were selected by their classroom teachers to represent varying reading and academic abilities, language and travel experiences, ethnic and Aboriginal backgrounds, and an equal gender split. The six male and six female participants ranged in age from 11 to 15. Eight of the participants were Aboriginal; one was Cree, two were Gwich'in and five were Inuvialuit. Six were born in the Northwest Territories, four were born in other

parts of Canada, and two were born in other countries (South Africa and the United States).

The Think Alouds and Think Afters took place in a small classroom equipped with a computer, a television, and a video camera. The participants' searches of the electronic encyclopedia were recorded both on videotape and audiotape. Videotaping the computer screen provided a record of the participants' information-seeking processes and allowed them to review their experiences. The decision to videotape the participants' searches was based on earlier work with Mackey (2002); it provided a simple way to replay the search for participants so that we could discuss their information-seeking processes. At the beginning of each data-gathering session, each of the participants was given a general introduction to the electronic encyclopedia. The participants then were asked to think aloud while searching an electronic encyclopedia, and their talk was recorded. After completing each of their searches, the participants watched a videotape of the search and were encouraged to add comments about their information-seeking processes. Both the Think Alouds and the Think Afters were recorded on audiotape.

All participants began their searches by typing something into the search box of the electronic encyclopedia. Entry of the search term into the encyclopedia resulted either in a list of topics or the message "no topics found." The latter caused some participants to be frustrated or confused, and some asked for help in generating a new search term. When participants retrieved a list of topics, most skimmed through the list looking for a topic that seemed relevant. Once in an article, participants either skimmed or read the article depending on its length. Several participants used highlighted terms as guides to locate the answers. Once in the appropriate article, the participants usually found the answer to the question they had been asked to find. The participants tended to perform three main processes. They entered search terms; skimmed through the list of retrieved topics to find a relevant article; and read, skimmed, or scanned through article outlines and articles to find the answer. The information-seeking processes were the same over the three search sessions. Navigation and confidence improved over time.

Factors that influenced the information-seeking processes of the participants included finding the right key word or phrase; knowing when to narrow or broaden the search term; and having time, patience, and persistence when searching. Other factors included previous computer experience, asking questions of others, reading ability, skimming and scanning skills, and having an understanding of what information is contained in an electronic encyclopedia. The study confirmed the findings of other researchers: participants tended to use the same strategies during searching, and those participants who tended to use simple search terms continued to do so throughout the searches (Bilal, 2000; Tenopir Nahl-Jakobovits, & Howard, 1991); participants were frustrated when results were not as expected (Hirsch, 1999; Fidel et al., 1999); and participants had trouble finding answers when they had to search through a great deal of text (Bilal, 2000; Gross, 1999). In general, the participants' experiences of information-seeking were consistent with Kuhlthau's (1998) Information Search Process model. The findings of this study indicated that junior high

students need mediation (instruction and support) from teachers and teacher-librarians if they are to learn to access information efficiently and effectively.

*Study 2: Completing an Inquiry-Based Project*

In the second study, I examined adolescents' information-seeking processes in the context of a large inquiry-based project using a variety of resources. Over a two-month period (18 class periods), each of the students in a grade 9 class completed a research project on a topic of his or her own choice. During this time, the class received instruction from the teacher-librarian on topics such as research process; planning a project; critical thinking; and Webbing and searching various resources, for example, Electric Library, University of Alberta library, and the Internet. The students also shared their information-seeking strategies and their reflections on the research process with the teacher-librarian and their classmates. I observed and participated in most of the 18 class sessions.

I also followed a small group of four students over the course of the inquiry project. The four research participants were selected by the teacher-librarian to represent an equal gender split and a variety of ability levels. The teacher-librarian also chose students who she felt would enjoy participating in the research project. The four participants were asked to do Think Togethers, sharing their ideas, processes, resources, and plans with each other and with me as the researcher. The Think Together sessions took place in the school library office, with the students and me sitting on the floor in a circle. At each session, I referred to the Information Search Process Model (Kuhlthau, 1993) and used this as a starting point to talk about feelings, thoughts, and actions. At five points during the research project, participants were asked to respond individually to questions about their research process and their feelings about the research project. These Think Afters were recorded by the participants using personal tape-recorders.

The four participants were open to sharing information and ideas in the Think Together situations and reported that they found the discussions helpful to the planning and organization of their inquiry. Students appeared comfortable with their fellow participants and used each other's ideas and comments as springboards for their own ideas and concerns. Only two of four participants were successful in completing the whole research task: researching their topic and completing a PowerPoint presentation. Three participants successfully located appropriate information on the topic of their choice and were able to formulate a focus for their presentation. The participant who never really found a focus for his research spent most of his time looking at general information about several topics. In a study similar to mine, Bilal (2002) found that only 73% of students were successful when searching for information on a topic of their own choice and reported that several students in her study did not "possess a clear focus about their information need, despite the fact that the researcher and the school librarian assisted them in clarifying specific topics" (p. 1176). Formulation of focus for many of the students in the class happened during the eighth class (near the halfway point of the project timeline), and this was an exciting time to be working with the class. The findings of this study indicated that students completing inquiry-based projects need emotional support as well as instruction (affective and cognitive mediation).

*New Understandings about Think Alouds, Think Afters, and Think Togethers*  
*Study 1: Searching Electronic Encyclopedias*

When using Think Alouds as a way of gathering data with adolescents, researchers need to keep in mind that adolescents are unique and bring to each task their own skills, experience, and vocabulary. In the study of information-seeking in electronic encyclopedias, some of the participants had difficulty doing Think Alouds. Stratman and Hamp-Lyons (1994) call this the “reactivity problem” (p. 90). They suggest five factors that may cause reactivity in concurrent verbal protocols:

- Experimental task directions to participants that elicit an inappropriate level of verbalization;
- Limited short-term memory capacity for talking and attending at the same time;
- Hearing one’s own voice;
- Learning that occurs because thinking out loud increases participants’ critical attention to their activities; and
- Direct or indirect experimenter influence through verbal or nonverbal cues (p. 95).

Another important factor, which I explored in an earlier article (Branch, 2001), is the participant’s learner role or “phase of self-direction” (Meichenbaum & Biemiller, 1998). This factor might explain why some adolescent research participants experienced difficulty generating complete Think Alouds while searching for information on electronic encyclopedias. Meichenbaum and Biemiller (1998) have identified “three phases of self-direction: *acquisition*, *consolidation*, and *consultation*” (p. 75). In the *acquisition* role, the learner “observes, imitates and acts under the guidance of the instructor” (p. 75). In this role, learners are less likely to be able to do the task and also to be able to talk about it at the same time. In the *consolidation* role, the task begins to become more automatic. This automaticity “reduces the attentional and memory load associated with the skill, freeing up cognitive capacity to attend to other features of the task or to talk or think about the task while doing it” (p. 76). In the *consolidation* role, the learner becomes more able to plan and ask questions, and as a result becomes more efficient. Learners who have reached the *consultation* role “can perform requisite skills and plan specified applications, provide assistance to others as needed, collaborate effectively with others in planning large tasks, and consult with themselves when they encounter difficulties or problems in accomplishing tasks” (p. 77)

Those research participants who are not in the consolidation or consultation role in relation to the given task may have difficulty generating Think Alouds. Therefore, to get the best and most complete data, researchers must ensure that participants are given time to become familiar enough with the task that they can speak about what they are doing. However, they must not be so familiar with the task that it becomes automatic. It is a delicate balance that must be reached by a researcher and obviously one that is difficult to do with junior-high aged adolescents.

Biemiller and Meichenbaum (1992) also suggest that “teachers and more advanced peers sometimes ‘think for’ less self-directed children” (p. 77). It may be unreasonable to expect those other-directed students to generate complete

Think Alouds. Some students have spent seven or more years in school becoming other-directed. These learners come to depend on others to act as their support systems. Others in the classroom end up doing the defining, planning, and monitoring activities for the less self-directed learner. As a result, this becomes a “self-maintaining cycle” (p. 77). The researcher can inadvertently *think for* the other-directed adolescent research participant directly or indirectly, as Stratman and Hamp-Lyons (1994) suggest, the participant’s generation of Talk Alouds. One example of this can be seen in the following transcript excerpt with Dave.

RESEARCHER: Alrighty, so now who was the first man in space? So you’ve had some experience with this. What are you going to type in?  
DAVE: I am typing in the first man in space. There’s no topics found.  
RESEARCHER: Okay, so now what are you going to try?  
DAVE: Who was the first person in space?  
RESEARCHER: What else do you know? What other topics might it be under? Try search by word rather than go. So no matches found. Okay. So close that with the x and find to search again. Try something else. Delete that and try something else.  
DAVE: (types in who was the first man in space)  
RESEARCHER: Okay, what other words can you try? So, who was the first man in space isn’t working. Where else might you try? Any ideas? What’s going through your head? What other words are you thinking about? Or are you thinking about other words you can try? Do you know the names of any astronauts?  
DAVE: Neil Armstrong.  
RESEARCHER: Why don’t you give it a try? He may not be the first but he may be a place to start, eh?  
DAVE: (types in Neal Armstrong)  
RESEARCHER: Just try Armstrong or maybe you spelled Neil wrong.  
DAVE: Neil A. Armstrong.  
RESEARCHER: Try that. Okay, that’s his picture. Go back and see if there’s an article or you can see. What does this say? So who was he?  
DAVE: He was man on the moon.

This learner was experiencing difficulty with the search. Dave was a less self-directed learner, and I as the researcher began to act as a mental crutch for Dave, giving him verbal cues as he searched. Lynn’s transcript reveals another pattern. This exchange between researcher and participant was quite different from the exchange with Dave. Lynn was highly self-directed and quite familiar with the task.

RESEARCHER: I want to know what the cardinal looks like, the bird looks like.  
LYNN: A cardinal?  
RESEARCHER: Umm.  
LYNN: I don’t know if this is going to work but I will try it again. (types in bird, cardinal) So just the appearance?  
RESEARCHER: Um hum.  
LYNN: Okay.  
RESEARCHER: Just the appearance.  
LYNN: Is this a picture?  
RESEARCHER: I think so. Then you can click on cardinal, I think.  
LYNN: It gives the sound or something.



RESEARCHER: Yeah, I think it does.

LYNN: Cool.

RESEARCHER: Um hm.

LYNN: So is that all you need?

RESEARCHER: Yup.

Biemiller and Meichenbaum (1992) suggest that “teachers should strive to systematically monitor their students’ social and self-discourse in order to infer the children’s level of knowledge, strategies, and motivation” (p. 77). These are important clues to each student’s level of competence and expertise. A researcher should do the same thing. Time should be spent observing and listening to the self-talk of individual students as they complete a task so as to infer what stage they are in. Those students who were in the consolidation or consultation role would then be ready to generate Think Alouds. However, those students in the acquisition role should be allowed more time to become familiar with the task before being asked to do Think Alouds.

Biemiller and Meichenbaum (1992) suggest that “students who are more expert have the ability to nurture their own self-regulatory skills” (p. 77). Because teachers often provide planning and monitoring information, they may not “provide the less competent child with the same opportunities or tasks to practice to develop his or her self-regulatory competence” (p. 77). There is no way to know whether the ability to generate Think Alouds in this research study can be attributed only to the learner role of the participants, that is, acquisition, consolidation, or consultation. In addition to learner role and to the factors suggested by Stratman and Hamp-Lyons (1994), many other factors may have influenced the participants’ ability to generate Think Alouds while searching electronic encyclopedias, including sex, computer experience, ethnicity, background knowledge, intellectual ability, or memory. Task directions may have created confusion as to what the researcher wanted when asking for the participant to Think Aloud. The cultural difference between the researcher and some of the participants may have influenced the Think Alouds. There may have been gender issues or learning style issues that influenced the Think Alouds. Any or all of these may have contributed to incomplete Think Alouds, and these factors are some of those that researchers should consider before using any type of verbal reports (including Think Alouds, Think Afters, or Think Togethers).

### *Study 2: Completing an Inquiry-Based Project*

The insights gained in Study 1 about Think Alouds and Think Afters and about the information-seeking processes of adolescents guided the design of Study 2. A third type of verbal report was developed for the second study, Think Togethers, which involved participants completing Think Alouds in a small-group setting. The Think Together sessions were spread over a two-month period; this allowed participants time to begin to feel comfortable with the inquiry task and with the Think Aloud process. The Think Alouds generated in the Think Together sessions were more complete than the Think Alouds in Study 1. In each Think Together session, one or two participants tended to have quite a lot to say, whereas the others were quieter. However, each of the participants had a least one session where they had much to say about their research process. Participants were also asked to generate Think Afters in their

out-of-school time. Over the duration of the research project, I asked the four participants to reflect on a series of questions that I asked and to record their Think Afters on audiotape. Allowing the students to take home the questions and tape-recorders and to do the Think Afters on their own time resulted in richly detailed reflections on the discussions that took place during Think Togethers and also on their own particular challenges and successes while doing their inquiry project.

The Think Togethers allowed the four participants to spend time talking about the information search process during various stages of the inquiry. Most of their discussion focused on the feelings that were being experienced during the current stage of inquiry, that is, excitement, frustration, relief, anxiety, information overload, and so on. During each Think Together session, I encouraged students to look at Kuhlthau's Information Search Process model (1993) to locate their current feelings and to talk about their progress on their inquiry in relation to the six stages of the model. Participants reported that being able to discuss being through one stage and onto the next was a helpful activity for them. Time to talk about the process and to relate their feelings to a model was also encouraged by the teacher-librarian during instructional times. The teacher-librarian encouraged an open and safe atmosphere and provided opportunities in large-group discussions for students to reflect on the process throughout an inquiry. The teacher-librarian's attitudes and practices in relation to inquiry-based learning, as evidenced through her work with the class as a whole, contributed to the success of the Think Togethers and Think Afters used as research tools with the four participants. In this study, my research methods were similar to and consistent with strategies that were already in the repertoires of the four participants' everyday school life.

#### *Considerations and Recommendations for Researchers*

For researchers interested in getting to the heart of students' learning and of students' experiences of their learning, Think Alouds, Think Afters, and Think Togethers can be particularly helpful data-gathering methods. However, there are some important things to consider when using these methods.

Think Alouds work well with students who are already familiar with the task being assigned and who feel confident about doing the task. Some of the students who were new to electronic encyclopedia searching were unable to complete the task and verbalize about the task at the same time (Branch, 2001). The work of Meichenbaum and Biemiller (1998), which explores metacognition and adjusting task difficulty based on the needs of young children, was instrumental in helping me to understand more about how to get adolescents to generate the best possible Think Alouds.

Some students are more comfortable with talking aloud about their experiences than are others, but in most situations, practice sessions for research participants will be helpful in ensuring that participants are comfortable with the verbal report method being used and that they are able to generate reports that are adequate to the research purpose. Some of the students in my studies were not experienced in problem-solving aloud, so doing Think Alouds or Think Togethers seemed strange and awkward to them. This will probably be true of children and adolescents who have learned to problem-solve in their heads or those who are in classrooms where transmission-style teaching is the

norm. However, there has recently been a focus on oral problem-solving, especially in mathematics classrooms, so perhaps in future students will be more comfortable when doing Think Alouds and Think Afters.

Children and adolescents may have varying preferences related to Think Alouds, Think Afters, and Think Together. Researchers need to take into consideration the preferences of the young people with whom they are working and try to offer choices to participants. Think Alouds may better suit the learning styles of children who are best able to work through a problem by talking about it. Think Afters may be more suited to other children, especially when they are dealing with complex problems. Using Think Together as a way of talking about both the affective and cognitive experiences of completing a learning problem has some of the elements and advantages of both Think Alouds and Think Afters. The talk required for verbal reports in my studies allowed students to recognize that their feelings and cognitive struggles and successes were a natural part of the inquiry process. Students listening to each other's Think Alouds (Think Together) may gain alternative perspectives on an issue or new ways of approaching a problem.

Finally, although Ericsson and Simon's (1993) seminal work on verbal protocol analysis methodology proposes that the researcher be as invisible as possible and that the participant generate verbal protocols in a laboratory environment to prevent outside influences, qualitative researchers will find other approaches to using Think Alouds, Think Afters, and Think Together. Qualitative researchers probably will choose to be participant observers, researching with (rather than on or about) their research participants. In my experience using Think Alouds, Think Afters, and Think Together, some of the best data came when students engaged in a discussion with me or with other participants about a particular aspect of the task. Several times the students in my two studies stopped their Think Aloud or Think After reports to relate an experience, to ask for clarification, or to explain a new understanding. Using Think Alouds, Think Afters, and Think Together alone or in conjunction with other research methods provides data suitable for rich description of learning situations. Verbal report methods are useful for researchers interested in getting real-time data about students' experiences of instructional activities. However, more research needs to be done to examine the use of verbal report methods in research with children and adolescents. Research is needed to see what effect experience and instruction might have on the generation of detailed Think Alouds and Think Afters. Other factors that might be examined in relation to this question include age, sex, and culture or ethnicity (and the interaction of these characteristics of researchers and participants).

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