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Tapping into the interpreting process: Using participant reports to inform the interpreting process in educational settings

Debra Russell
University of Alberta, Canada
debra.russell@ualberta.ca

Betsy Winston
TIEM Centre, United States
betsywinston@tiemcenter.org

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Abstract: This article presents the results of a Canadian study that examined the relationship of verbal reporting processes and the quality of interpretation. Two types of verbal reports, Think Aloud Protocols (TAPs) and Stimulated Recalls (SRs), were collected and analyzed to explore how TAPS and SRs might reflect the quality of interpreting provided in educational settings. Twelve interpreters working in educational contexts were recruited to participate in a multi-stage research process. Each interpreter was asked to perform a Think Aloud while viewing a sample of classroom discourse in preparation for interpreting it. Each interpreter then provided an interpretation, followed by a post-interpreting Stimulated Recall review of the interpretation. The standardized samples chosen were based on videotaped authentic classroom instruction and represented classes at the elementary, middle school and high school levels. A Deaf child was described for each level of interpreting so that the interpreters could target their interpretation. The results showed that those interpreters who demonstrated higher order cognitive thinking skills and attended to teacher intent and student language preferences provided more effective interpreting than the interpreters who focused primarily on linguistic choices and interpreting decisions. The findings have implications for interpreters, interpreter educators and mentors, and teachers working with interpreters and Deaf students in mediated learning environments. By exploring the ways in which attention to discourse features and teacher-student needs could be heightened, interpreters could enhance the quality of interpretation provided to Deaf learners.

Keywords*:* educational interpreting, Think Aloud Protocols, Stimulated Recalls, interpreters, American Sign Language, teacher intent, goals, classroom, student need, interpreting processing, role, preparation, linguistic

Introduction

Increasingly throughout Canada, the United States (US), and other countries outside of North America, Deaf children are accessing education in their local schools via an inclusive education model. The majority of these Deaf students use signed language interpreters, thus experiencing 'mediated education' (i.e., the information from teachers and students is mediated through an interpreter). The importance of effective mediated education has been well documented and numerous studies suggest the vast majority of Deaf students in the United States, Norway and New Zealand do not receive an equitable educational experience compared to their hearing peers, often due to ineffective linguistic access via interpreting services (La Bue,1998;

Locker-McKee & Biederman, 2003; Muruvik Venen, 2009; Ramsey, 1997; Schick & Williams, 2004; Schick, Williams & Bolster, 1999; Winston, 2004). In addition, even with qualified interpreters, Deaf children only *appear* to have access to the language of instruction through interpretation, as much of this linguistic input does not allow for meaningful inclusion, nor does it allow for Deaf students to fully access the learning environment. In effect, Deaf students have physical access to the inclusive environment, but not effective linguistic and curricular access, leading to an *illusion of inclusion*.

The increase in demand for qualified interpreters in educational settings has led to the implementation of accreditation systems. The Registry of Interpreters for the Deaf (RID) previously required educational interpreters to possess a two-year interpreting degree prior to being eligible to take the Educational Interpreter Performance Assessment (EIPA) exam, which is seen as the baseline credential for working in Kindergarten to Grade 12 (K-12) settings. It now requires a four-year degree prior to taking the exam, and there are increased numbers of US states that require the credential prior to working in a K-12 setting.

These changes led to recent research that examined how interpreters currently working in educational settings can be prepared in order to improve their score on EIPA, resulting in the development of an on-line training program (Bowen-Bailey, Gordon, Jones and Shaffer, 2013). Similar to other educational approaches, regardless of the length of the training program, this training model stresses grammar, sign to voice skills when working with children, vocabulary development and overall interpreting abilities. Similarly, many of the training programs for educational interpreters adopt a philosophical and curricular approach that reflects a conduit model of interpreting.

The impact of the conduit model is that interpreters believe that word-sign equivalents provided meaningful access to language and more importantly, to learning, which then influences the decisions they make about the interpretation product and the interpreted interaction. This approach is in sharp contrast to more current views of discourse and interaction that have led to programs to adopt a philosophical stance and make curriculum decisions that are based on evidence that meaning is being co-constructed by all discourse participants (Janzen & Shaffer, 2004; Roy, 2000, Wadensjo, 1998; Wilcox & Shaffer, 2005). How then might these very different ways of understanding the cognitive task of interpreting impact an interpreter's decisions and final interpretation product in an educational setting?

In this study we sought to examine the results of the cognitive strategies and decisions made by interpreters to address the challenges of interpreting classroom content and interaction, and the impact of mental preparation on the effectiveness of the interpretation product in an educational setting[1]. We then explored the critical analysis the interpreters brought to their own work after the fact. We did this through the use of verbal reporting strategies, by examining Think Aloud Protocols of experienced interpreters preparing for classroom interpreting, and Stimulated Recalls performed by those same interpreters immediately after delivering the interpretation.

Specifically, we wanted to learn where experienced interpreters focus their attention when dealing with the demands of classroom discourse and interaction, and whether they demonstrate cognitive strategies that result in more effective interpretation, thereby allowing for greater accessibility for deaf learners to the mediated learning environment.

This particular study was one aspect of a larger national Canadian

[1] For a further discussion of strategies and terminology in translation, see Gambier (2010).

research project that identified the key issues shaping the education of Deaf students within the inclusive setting. The larger study captured the perspectives of parents, teachers, administrators and students, and the results showed that administrators believe their schools are completely inclusive while teachers and parents identified several challenges that impact the education of deaf students (Russell & McLeod, 2009). The study also included an examination of more than 40 interpreters, who provided samples of classroom interpreting, which were analysed for several discourse features commonly found in teacher talk in a classroom (Cazden, 2001).

Given the disturbing results of the classroom interpreting data set (e.g. ineffective interpreting that was incomplete, and/or inaccurate, failure to recognize teacher discourse strategies that had specific educational functions, or interpretations delivered at a pace that it would not allow for intellectual, social or academic engagement of the Deaf learner), we expanded the study to learn in what ways interpreters cognitively engaged with the teaching and learning environment and teaching content, and identify strategies that may be linked to providing more effective interpreting.

The University of Alberta provided ethics approval along with individual school districts that chose to participate in the study.

Literature Review: Verbal Reports for Interpreting Research

We begin by examining the literature that frames this study. This research project focused on identifying cognitive strategies that interpreters use in educational contexts. Strategies, for the purpose of this study, are defined as the conscious problem solving approaches to dealing with the content of the text, the interaction among discourse participants, and decisions made by the interpreter that will influence the interpretation product. Since these strategies are not directly observable, the researchers needed to access the results of those strategies through the use of verbal reports from the interpreters.

Verbal reporting (Ericsson & Simon, 1987) is a type of introspective data collection, used when it is important to gain insight into problem-solving and decision-making processes. Data collected via verbal reporting is often used to reveal cognitive strategies relevant to learners of second and foreign languages, teachers in classrooms, and translators and interpreters. Gass and Mackey (2000) provide an extensive review of various introspective methodologies for gathering data, including verbal reporting methodologies, delineating the history, areas where they have been used, and in-depth reviews of both the benefits and cautions required if researchers are planning to use any type of verbal reporting. Used to better understand mental processes, introspective methods assume "that a person can observe what takes place in consciousness in much the same way as one can observe events in the external world" (Gass & Mackey, p. 3).

In education studies, for example, verbal reports have been used effectively to study adult learners' strategies for efficient reading. Berne (2004) used them to establish recommendations to increase adult reading proficiency. Researchers have employed verbal reporting techniques in L1 and L2 studies, using them to understand how learners perceive their language skills while performing tasks using new languages, and to analyse the thought processes of language users as they attempt to communicate, both orally and in written language (Bowles 2010; Gass & Mackey, 2000). Translation and interpreting studies (Gile, 1998; Jaaskelinen, 2010; Kiraly, 2000; Kussmaul & Tirrkonen, 1995; Li, 2004; Olk, 2002) used the verbal reporting to investigate the cognitive processes of novice and professional

translators and interpreters, as well as of second language students producing translations for their language classes.

Although the use of verbal reports is controversial in some arenas, and researchers must be careful regarding the validity of the reports themselves, the stringency of data collection methods, and the types of research issues that are most suited to the use of verbal reports as data, they also offer unique insights into the cognitive processes of interpreters, insights that can lead to improved preparation and services.

Verbal Reports as research data

Defining the Approach: Verbal Reports.

The value of verbal reports in general stem from a cognitive psychology point of view, in which verbal reports can be considered data and as accurate representations of the happenings of one's mind while completing a task (Ericsson & Simon, 1980). Broadly defined, verbal reports are "learner's comments recorded either while s/he completes a task or sometime thereafter." (Bowles, 2010:1). Depending on when the verbal reports are collected, they are classified as either concurrent or retrospective verbalization (Ericsson & Simon, 1980). These methodologies assume that there are different types of storage systems in the brain used to retain information, based on the differing lengths of time elapsing between acquisition and the recall of the knowledge (i.e. short- and long-term memory). If the information is being verbalized at the time the subject is completing a task, concurrent verbalization is taking place. Conversely, if the subject is asked to recall what he or she was thinking during a task, retrospective verbalization is taking place. Each type of verbal reporting method has advantages and disadvantages, depending on the type of activity being performed and the mode of reporting (spoken, written, signed, etc.)

Concurrent reports (also called think-alouds or talk-alouds). Concurrent reports, such as Think Aloud Protocols (TAPs), refer to tasks in which subjects must verbalize their thought processes while performing an activity (Bowles, 2012; Gass & Mackey, 2000; Simon & Ericsson, 1987). Berne (2004) notes that in general, subjects are given a task (or a goal to achieve) and then instructed to verbalize their thoughts, feelings, actions, and anything else that pops into their mind during task completion. Quite literally, the TAP is intended to accurately represent the thought processes of the subject while actively engaged in a task. The think-aloud session can be recorded, and a data collector often takes notes. Sometimes, the data collector engages in conversation with the participant, particularly if he or she requires guidance while completing a task. If a participant is having trouble thinking aloud, the data collector can also probe for more information, by asking questions such as, "What are you thinking about?"

There are several advantages to concurrent reporting. These reports are immediate accounts of current events and processes—there is minimal delay and therefore minimal loss of data due to memory loss. Additionally, there is less tendency for participants to engage in what Gass and Mackey describe as sense-making, i.e. the natural tendency of humans to provide plausible explanations of actions, whether such explanations are accurate or not.

Another advantage of TAPs is that they offer insight into the subject's immediate focus throughout the task, rather than evaluating cognitive processes by the final outcome. In other words, the protocol is process and not product oriented (Kussmaul & Tirkkonen-Condit, 1995). This leads to at least two pedagogical advantages: it allows the cognitive processes to become more tangible for students and teachers, and if students in an area of

study take part in TAPs they may indicate where problems occur in their learning and problem-solving strategies, allowing educators to better tailor their teaching strategies (Berne, 2004; Kussmaul & Tirkkonen-Condit, 1995).

Pushing this idea further, if the TAPs of novices and experts are compared, they can provide insight as to what characteristics are present in individuals that *can* perform a task when being compared to those that cannot perform the same task. Kiraly (2000) notes that translation students participating in a TAP become more aware of their metacognitive processes and develop insight into how they can improve in their work. Olk (2002) used TAPs with L2 learners to identify strategies they brought to translating texts (whether translation work is appropriate for language learners is a discussion beyond the scope of this paper) and found that the participants focused too closely on lower levels of translation (word-to-word equivalencies, grammatical parity) and did not look enough to the text as a whole-the underlying meaning, purpose, and context, to guide their translations. Of interest in the findings is that, while preparing translations, these less advanced language learners focused more on vocabulary and syntax rather than on text-level, cultural translation needs.

Another advantage of TAPs is that they provide high-quality and rapid feedback regarding completion of a task. Kussmaul and Tirkkonen-Condit (1995) point out that the researcher must have some notion of what he or she is looking for if the data is to be found relevant, but in general the TAP can provide insights into cognitive processes that would be practically unobtainable using, for example, a questionnaire.

While TAPs provide immediate concurrent reporting of cognitive processes, they can be problematic as well. Disadvantages include:

- difficulty performing a task and simultaneously verbalizing thoughts about it;
- use with speech and language tasks is especially problematic, since it requires simultaneous production of language for the performance and for the report;
- For some subjects, the process of verbalizing everything that passes through their mind may be perceived as unnatural or difficult to do (Kussmaul & Tirkkonen-Condit, 1995).

Some of these disadvantages may be counter-balanced with care in the planning and preparation of the data collection. It is possible to offer a warm-up phase for the subject, with the atmosphere of the testing environment being stress-free. If the data collector is to be present during the TAP, the warm-up phase should also have the data collector present in order to habituate the subject (Kussmaul & Tirkkonen-Condit, 1995). Above all, the subject should not feel as if his or her actions are being recorded for the purpose of later criticism; the fact that it is the process of thinking, and not the end result, should be emphasized.

Another problem with the usage of TAPs in research stems from Ericsson and Simon's (1993) work in which the assumption is made that verbalizing thoughts does not alter them. Most of the studies used to support this idea were studies that focused on the usage of TAPs and not of the methodology itself (Smagorinksy, 1998), which does not fully account for the possibility that TAPs may, in fact, influence the behaviour of subjects. In fact, subjects' thought processes may be very different from the norm if they are participating in a TAP. This is known as reactivity, which can take two forms (Smagorinsky, 1998). First, the researcher simply being present may influence the subject, and second, verbalizing thoughts may in fact alter how a subject goes about problem solving. Sasaki (2008) found that participating in a TAP caused subjects to tailor their responses to a listener, even if a listener was not present in the room. Ericsson and Simon (1993) recognized

this problem as well, and emphasized that the researcher must refrain from telling subjects *how* to verbalize, and simply allow them to speak their minds in order to avoid cueing specific thought processes. In addition, the removal of the researcher from the testing environment may reduce the effect of these confounds.

Perhaps the biggest disadvantage to using TAPs is the inherent threat to validity. Kussmaul and Tirkkonen-Condit (1995) state that using TAPs can give us an approximation of thought processes (in their case, in translation studies), but there is no way to ascertain that what is being verbalized is, in fact, representative of cognitive processes in their entirety. Usually, in a study using TAPs, the verbalizing group is compared with a non-verbalizing group, and differences could be attributed to the process of thinking aloud when both groups are compared to a criterion, a measured account of the underlying process. However, such criteria often do not exist, which is problematic (Russo, Johnson, & Stephens, 1989). In addition, Gile (1998) points out that this is a difficult area to improve because "too little solid data are available for assertions to be made..." (p. 77).

Li (2004) points out the need for and application of safeguards to be established to ensure the validity of think-aloud protocols as a tool for data-based qualitative research of translation processes. He recommends several safeguards when considering the use of TAPs in translation research, including voluntary participation and guarantee of anonymity, purposeful sampling, triangulation, prolonged engagement, (near-) natural situation, peer debriefing with stepwise replication and intercoder reliability, member checks, and thick description. (Li, 2004: 303-305)

Li further breaks down the above eight safeguards and applies them to four stages of research: data collection, data analysis, reporting, and application. He evaluated the design of fifteen studies of translation processes to assess the use of safeguards to insure validity. Three of the safeguards were used in at least 50% of the articles: refraining from generalizing findings, triangulation of data-collection methods, and thick description. The remaining safeguards were either not used or not reported as being used in over 70% of the articles. This research suggests that much work needs to be done to ensure the reliability and trustworthiness of use of TAPs for qualitative research. While the information gleaned from TAPs is helpful, it should not be used to establish definitive conclusions on the translation process, but rather to lead to more research and study. (Li, 2004: 306-10)

An additional study demonstrated both the advantages and disadvantages of using TAPs in language and interpreting research. Roberts and Fels (2006) wanted to determine the usefulness of TAPs for collecting data from sign language users. They found that TAPS data from Deaf users paralleled that of hearing participants. However, their methodology used interpreters as intermediaries during the data collection, and they actually relied on interpretations rather than the primary data. Despite the myriad of mis-assumptions about language and interpreting itself, the practicality of using TAPs with signers was demonstrated.

Despite the care needed when using TAPs to gather data, they can help us gain a better understanding of cognitive processes. There are important implications for this type of research, and meaningful information can be obtained regarding how people go about problem solving. Following is a list of "best practice" points for the usage of TAPs that help minimize some of the methodological problems regarding its use in research (Pressley & Afflerbach, 1995).

i. The researcher must have direction and a purpose, with a specific task(s) the subject must accomplish during the TAP.

ii. The subject must understand what to do; emphasize that it is the process of problem solving that is being studied, and not the end result. Discourage the subject from explaining why they are doing something; make sure he or she understands to only verbalize his or her thoughts.
iii. Intervene only if absolutely needed; when doing so, avoid asking leading questions.
iv. If possible, avoid having a data collector in the testing room, and videotape or audiotape the subjects' responses.

Retrospective Reports. Retrospective reporting is another means of gathering introspective data from participants about their processes. As the label indicates, for retrospective reports researchers gather input from the participants after they have solved a problem or performed a task. Data can be collected either by simply asking the participant to recall their mental processes while performing, or they are presented with some type of concrete memory aid such as a video or audio recording of the performance. This second type of reporting, usually referred to as Stimulated Recall (SR), provides a memory prompt for the participant. Bloom (1954) used these in studying the recollections of classroom participants about events that occurred in the classroom, suggesting that such prompts offered an advantage over TAPs because TAPs rely on memory alone, and that they required less training and were somewhat easier than TAPS for some people to perform.

Using stimulus material such as videos of past performance, SRs are used to explore the types of knowledge structures, cognitive processes and learning strategies participants relied on during a performance, be they acting, teaching, speaking or writing. SRs are especially useful when the performance conflicts with the think aloud process, e.g. someone making a speech cannot simultaneously speak about the strategies used to speak. Thus a video of the speech, when shown to the speaker, can evoke memories of the cognitive processes used to produce the speech. Likewise, a teacher performing an SR of a teaching event can recall the cognitive strategies used during that teaching event.

Gass and Mackey (2000) describe at least four benefits to the use of SRs. They can allow the researcher to:

1. focus on sections of an overall performance and analyse specific linguistic choices or decisions and the type(s) of knowledge the participants apply to those decisions and choices
2. explore and identify the cognitive structures the participants bring to the organization of their knowledge
3. determine if or when specific cognitive structures are used for specific decisions (learners' strategies—see Cohen 1998 for more information)
4. correlated reporting with the specific behaviour stimulating the recall

As with the use of TAPs, the researcher must be cautious when using SRs, and attend to the potential confounding factors, including:

- participants may be unconscious of cognitive processes
- SR may not reveal the complexity of cognitive processes
- inaccurate reporting on the part of participants
- confusing of introspection and retrospection
- dependent on expressive language skills of participants
- for L2 research, the language of processing versus the language of reporting

There is great value to using verbal reports, both TAPs and SRs, to gain insight into learners' strategies, in this case the strategies used by experienced interpreters to prepare for, and subsequently discuss their interpretations. This literature review has provided a brief background, the advantages, the disadvantages, and some recommendations regarding use of verbal reports in research. However, despite methodological problems, verbal reports, both concurrent reports such as TAPs, and retrospective reports such as SRs, can provide illuminating data regarding the cognitive processes of subjects in a variety of problem-solving activities, if researchers take care to minimize confounding effects. Conducting this research we considered the recommendations for strengthening the validity, as outlined by Li: including voluntary participation and guarantee of anonymity, purposeful sampling, triangulation, prolonged engagement, (near-) natural situation, peer debriefing with stepwise replication and inter-coder reliability, member checks, and thick description (Li, 2004: 303-305). We are also careful to refrain from generalizing from these preliminary/pilot analyses, and encourage ongoing expansions of this study.

Method

Participants

Twelve interpreters participated in this study from three Western Canadian provinces. Ten females and two males were recruited, all of whom had a minimum of three years of experience in classroom interpreting, with the vast majority of them possessing over fifteen years, while two had worked as interpreters for over thirty years.

Two of the participants had graduate degrees, while the remaining had all graduated from a two-year interpreter education program or its equivalent. Six of the interpreters held national certification, with three of them possessing the Certificate of Interpretation (COI) from the Association of Visual Language Interpreters of Canada and three holding RID certification (CI/CT). Two of the interpreters were native ASL signers, while the rest learned ASL as adults and reported that English was their native language.

Every attempt was made to recruit research participants that did not have a prior or existing relationship to either of the researchers. The researchers have worked as interpreter educators, and as such, some of the potential participants may have been previous students. These interpreters were excluded from the sample.

Table 1: Participant Variables

Gender	ASL first language	Certified		Years of Experience				Graduate Education	Interpreter Education Program 2 years
		AVLIC COI	RID CI/CT	4-6 years	6-10 years	11-15 years	30-35 years		
F	1	2	2	1	1	7	1	1	9
M	1	1	1			1	1	1	1

Materials and Task

The stimuli for this study were videotapes professionally produced by the Northwest Connecticut Community-Technical College and the National Interpreter Education Project (Grant#H160C03000), and were authentic classroom samples with experienced teachers. The classroom samples chosen reflect elementary, middle school and high school classes. The subject matter included health, social studies, language arts and spelling, and a science lesson. By using professionally produced materials that showed

samples of authentic classroom discourse that were publically available, we alleviated the problem of getting actual classroom samples based on student privacy issues, and thus we were able to secure the participation of interpreters needed for the study.

We created a student profile for each level of school (i.e., a seven year old child who has Deaf parents and uses ASL in the home; an eleven year old deaf student who uses ASL, has parents that do not sign, and has attended a school for the deaf for three years prior to attending a mainstream middle school; a fifteen year old deaf student who uses ASL and has been mainstreamed with interpreters for their entire schooling and has a circle of Deaf friends who attend a school for the deaf); the interpreters were provided with the profile and instructed to use this description when constructing their interpretation.

By using a standard set of stimuli we could then contrast the work of the interpreter preparing for and interpreting the same material, followed by reflections about that interpretation. This also allowed us to avoid the challenges of obtaining classroom data from the schools where the interpreters worked, which would have required obtaining permission from each of the twenty-five to thirty parents who had a child in each classroom, regardless of whether their child's image would be visible on the video. It would also have required ethics approval across numerous school districts, and would have added the further confounding variable of twelve different deaf students for whom the interpreters would be targeting their interpretations.

After signing informed consent forms, the interpreters were individually given instructions in spoken English by the researcher or a research assistant (see Appendix 1 this article). The instructions were also printed in English and available to the participants. Before beginning the task the interpreters were informed that the study was being conducted to learn more about how interpreters describe their thoughts about interpreting requirements and challenges. TAPs were introduced as a methodology that can highlight awareness of features that could impact the interpretation, and SRs as a way to provide insight into the results of cognitive processes used by the interpreter while interpreting.

Participants were given the opportunity to ask questions prior to beginning each of the three phases of the research project (TAP, interpreting, SR). Prior to beginning the TAP they were instructed that they could use spoken English or ASL while conducting the Think Aloud, and that they could feel free to comment on any aspect that came to mind while watching the classroom sample, knowing that they would next interpret the same material. They were also informed that they could pause the stimulus classroom video at any time if they needed to add more of their thoughts. The interpreters were videotaped during the TAP process, with the researcher or research assistant turning on the camera and leaving the room prior to the interpreter starting the stimulus videotape.

The interpreters were permitted a ten minute break between performing the TAP, and providing the interpretation. During the break the researcher or research assistant reset the stimulus material to ensure that it was set to the same twenty-minute segment just watched. The camera was then restarted prior to the interpreter starting the stimulus tape and beginning the TAP process.

The researcher or research assistant was not present in the room during the taping of the interpretation. At the completion of the interpreting, the researcher or research assistant returned to the room, and was present with the interpreter as he or she viewed the sample of interpreting and performed the SR. The researcher or research assistant provided instructions for conducting the SR in English. These instructions directed the interpreter to

reflect on the interpretation and on their thoughts while interpreting the classroom video. Participants were able to pause the tape as many times as they wished in order to recall what they were thinking and how that may have affected the interpretation. They were also instructed that they could use spoken English and/or ASL during the SR. The stimulated recall was also videotaped for analysis purposes.

The interpreters were instructed to comment on any aspect of their work that stood out for them. Researchers asked questions about the comments, and stimulated input about specific areas if participants asked for more guidance, and invited the participants to address specific questions, which included the following:

- *How did you feel about the work?*
- *In what ways was the work effective?*
- *Were there segments where you felt the work was less effective?*
- *Can you recall what you were thinking in those effective and less effective segments?*

- *Do you think that the interpretation offered on tape was similar to your typical interpreting performance?*

- *Do you think performing the TAP impacted your interpretation?*
- *If so, in what ways?*
- *If not, can you say more about that?*

In total, eight interpreters performed the SR immediately, two interpreters performed it within 48 hours of completing their TAP and interpretation, and two interpreters performed the SR after 48 hours (delayed SR).

Data Analysis

The data were coded by first analyzing the TAPs, then the interpretation product was coded, and finally the SRs were coded. This process was completed a minimum of five times, at which point no new coding elements emerged.

Coding the TAPs and SRs. The researchers and one research assistant analyzed all three videotaped samples for each interpreter: Preparation TAP, interpretation of classroom dialogue, and stimulated recall of interpretation. The TAP and SR videotaped samples were coded using inductive qualitative approaches that identified themes and patterns arising from the data. Using Grounded Theory approaches (Glaser & Strauss, 1967) the data were coded for themes and constructs. The coding constructs that emerged from the TAP and SR data set were categorized into four major categories, each with sub-categories. These categories were also categorized according to the relative levels of thinking skills they represented, from lower to higher order thinking skills, cognitive processing and critical thinking.

Higher-order thinking skills refer to a concept based on learning theories such as Bloom's Taxonomy (Bloom, 1956). The premise is that some types of learning require more cognitive processing than others, but also have more generalized benefits. In Bloom's taxonomy, skills involving analysis, evaluation and synthesis (creation of new knowledge) are thought to be of a higher order, requiring different learning and teaching methods, than the remembering of facts and concepts. Higher order thinking involves the learning of complex judgmental skills such as critical thinking and problem solving. Higher order thinking is more difficult to learn or teach but also more valuable because such skills are more likely to be usable in novel

situations (i.e., situations other than those in which the skill was learned). Similarly, Brookhart (2010) suggests that higher ordered thinking includes the following aspects: analysis, evaluation, judgment, problem solving and creative thinking.

The coding categories that emerged from the data set and their relationship to the level of thinking demonstrated are described next.

- *Teacher Intent Informs Interpreting (TII):* Interpreter's TAP demonstrates awareness of the teacher's goals and/or intent, instructional style and approach to structuring the learning, and relationship with students. This was coded as the highest order of processing skills.
- *Student Needs/Preferences Inform Interpreting (SII):* Interpreter's TAP demonstrates awareness that the student's needs and preferences will influence the interpretation; This category was considered to reflect high order processing skills, only slightly lower than TII.
- *Interpreting Process Informs Interpreting (I):* Interpreter's TAP demonstrates awareness of how various interpreting aspects will influence the interpretation (ex: interpreting process, interpreter's role, classroom logistics, matching teacher intent, etc.); This category fell on the lower end of the processing levels, as it relates more directly to the activity.
- *Linguistic Issues Inform Interpreting (LII*): Interpreter's TAP demonstrates awareness of specific linguistic issues when working between English as ASL and how those will influence the interpretation (ex: sign choices for introducing unfamiliar vocabulary, use of name signs, use of fingerspelling, etc.). This category was considered to require the least amount of/ lowest level of cognitive processing skills, because they related to language use needed prior to interpreting.
- *Red Flags (RF*): Interpreter's TAP demonstrates comments in which the interpreter's meaning is not immediately clear, thus requiring either a closer look or double-checking of intent with the interpreter. These comments do not fit in other coding labels and appear to be outside of interpreting process.

Coding the Interpretations. The interpretation samples were assessed using a scale for overall effectiveness of the interpretation, ranging from Effective, Mostly effective, Mostly Ineffective, and Ineffective, by using a propositional analysis approach (Dillinger, 1994; Russell, 2000). The stimulus texts were transcribed and the major propositions were identified, and the interpretation product was compared to the propositions in the source text for accuracy. Further, the discourse analysis focused on several aspects of interpreting, including the depth of information processing (lexical, phrasal, sentential, discourse), content accuracy, contextual information, affect, register, speaker/signer style, and grammatical features of English and ASL (see Appendix 2 for a detailed description).

A four-point scale was used, with a rating of "four" representing consistently effective interpreting and "one" representing consistently ineffective interpreting. The effective and mostly effective interpreting performances showed an ability to manage both student and teacher discourse patterns, in order to represent English to ASL meaning-based work (i.e. not relying solely on lexical processing). Consistently, the performances represented the teacher's intent and goals, while allowing for teacher-student engagement and teaching strategies to emerge.

By contrast, the mostly ineffective and ineffective interpreting samples provided a lexical representation of the teacher's words, with frequent

grammatical errors, content errors and/or significant omissions. As such, the panel of experts determined that it would be very difficult for a Deaf student to access the teaching content and educational strategies used by the teacher to deliver the content, as well as to follow and participate in the student interactions with the teacher.

Results

The following tables show the range of interpreting performances as confirmed by an expert panel of four interpreter educators. The data revealed that comparing the results of the twelve samples of preparation TAPs (pre-interpreting) with the subsequent interpreting performances, the interpreters that demonstrated the greatest ability to reflect critically on the categories of Teacher Intent Informs Interpreting, Student Needs Informs Interpreting, and Interpreting Process Informs Interpreting also demonstrated the most effective interpreting performances.

The five samples that were coded as effective or mostly effective showed preparation TAPs that had reflective comments specifically recognizing the teaching goals, classroom strategies, and interaction patterns between teachers and students (Teacher Intent Informs Interpreting (TII) the higher order processing skills. These interpreters also commented frequently on elements associated with the category of Student Needs Inform Interpreting Process (SII) and Interpreting Process Informs Interpreting (I).

The strongest interpreting samples had very few instances of the interpreters commenting on Linguistic Issues Inform Interpreting (LII). This was in sharp contrast to the seven weaker interpreting performances that had greater emphasis on Linguistic Intent and very infrequent noting of Teacher Intent Informs Interpreting. Across all performances, the least often cited categories were Student Needs/Preferences Inform Interpreting and Interpreting Process: Role.

We approach the discussion of the data from several perspectives. First, we compare the levels of effectiveness of the interpretations to the overall number of comments that reflect higher to lower order thinking skills. In the TAPs of those interpreters who produced more effective interpretations, there were more instances of higher-level analysis (TII) and fewer instances of lower level analysis (LII). In contrast, the TAPs of those interpreters who produced less effective interpretation included fewer items reflecting higher-level analysis (TII), and more instances of items reflecting lower level analysis (LII). Second, we compare number of comments produced by all interpreters that interpreted the health and social studies texts.

Effective interpretation

Three out of the twelve participants (25%) deemed to be "expert" or "very experienced interpreters" had a much better understanding of the text structure and applied more selective listening to the text; they also seemed to be much more selective about what to attend to in the interpreting task, focusing on Teacher Intent Informs Interpreting (TII) rather than Linguistic Issues Informs Interpreting (LI), and they demonstrated much greater self-awareness of the task of interpreting overall.

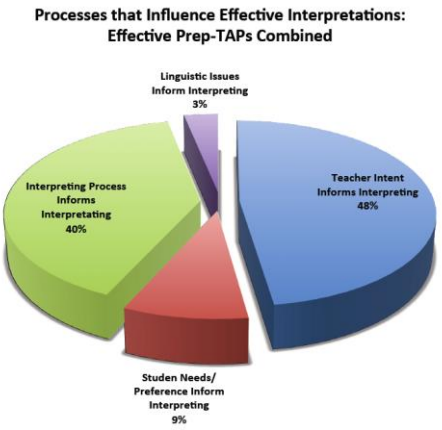

Figure 1: Processes that influence Effective Interpretation

These interpreter's strategies in both TAP and SR represented an awareness of the teacher's semantic based intent vs. providing a lexical or transcoded version of the source message, and they were able to process longer chunks of information (processing time checks of 8 to 12 seconds). The expert performances also showed the interpreters were aware of the broader world knowledge in supporting the interpreting, drawing on this as an internal resource.

Finally, there were significant quantitative differences between the number of comments made by the effective interpreters and those who were unable to provide effective interpreting. Analysing the range of comments produced by interpreters whose work was effective, the greatest percentage of comments fall into the highest order of thinking skills, Teacher Intent Informs Interpreting (48%). Comments related to Interpreting Process factors constituted 40% of their TAPs, and to Student Needs 9% of their TAPs comments. These interpreters produced items related to linguistic factors, the lowest order of skills, only 3% of the time. Further, when comparing the TAPs of the same interpreter whose interpretations were deemed effective for two of the texts (Social Studies and Health) we find that the number of overall comments was 46 and 31 respectively. An example follows:

> Effective: Interpreter One. *I think the teacher is using that language to really create a relationship with the students and her goal is to bring them into her topic by thinking about what they already know. I think she is linking this to previous knowledge and wants them to question what they know about drug use*… (Teacher Intent Informs Interpreting; 46 total comments in SS and 31 in Health)

Table 2: Interpreter One: Total Coded Utterances

Name	TI	SII	I	LII	RF		Person Total
Interpreter One – Social Studies	27	3	16	0	0		46
Interpreter One – Health	17	4	9	1	0		31

***Mostly effective*.** Two out of the twelve participants (16%) whose interpreting products were deemed as mostly effective are similar to those who produced effective interpretations. The chart demonstrates that during their TAPs, these interpreters produced many instances of the higher order items. Teacher Intent Informs Interpreting (TII) across these interpreters was 34%; Interpreting Process Informs Interpreting was 42%, and Student Needs Inform Interpreting was 9%. Items falling into the Linguistic Issues Inform Interpreting category constituted 15% of the total number of instances.

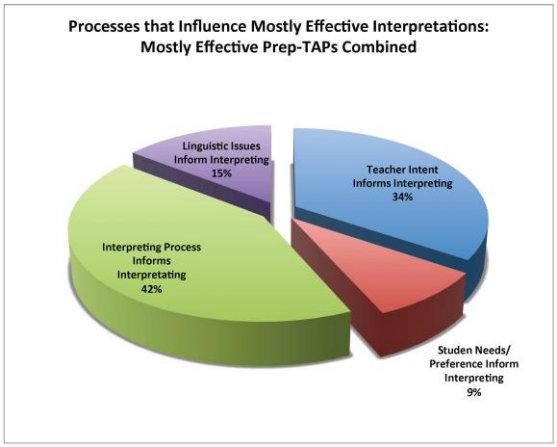

Figure 2: Processes that Influence mostly Effective Interpretations

An example follows, highlighting the comments of an interpreter that reflect his or her conscious attention to the teacher's purposeful use of language, the impact on the Deaf child accessing learning via the interpretation, the interpreting process and the linguistic choices they will make in this section of the text.

> Mostly effective: Interpreter Two. *I want to be able to use a comparative structure because that is what the teacher is doing, by contrasting the two political systems and I will need to pause to let the child think about what they know before I move on which may mean stopping the teacher*… (Interpreting Process Informs Interpreting; 27 comments in Social Studies and 27 in Health)

Table 3: Interpreter Two: Total Coded Utterances

Name	TI	SII	I	LII	RF		Person Total
Interpreter Two – Health	11	2	14	0	0		27
Interpreter Two – Social Studies	9	3	13	2	0		27

Ineffective Interpretation

By contrast the four interpreters (33%) who were unable to provide effective interpretation struggled to reflect beyond lexical level of processing and seemed to have little awareness of the interaction demands and of overall text structure. Their comments in both the TAP and SR focused on classroom logistics - where to stand, sit - and about individual lexical items without an understanding of the classroom teacher's goals and the purposeful language being used to realize teaching goals. These interpreters often spoke of just needing to prep (relying on external sources) but didn't mention their own background knowledge as one of the cognitive resources available.

Mostly ineffective. Focusing on the TAPs of the three interpreters (23%) who produced "mostly ineffective" interpretations, the interpreters focus was opposite from those who produced effective interpretations. Items reflecting higher order thinking (TII) constituted only 13% of their TAPs, with no focus on Student Needs, 53% being focused on Interpreting Needs, and 34% on linguistic needs, LII.

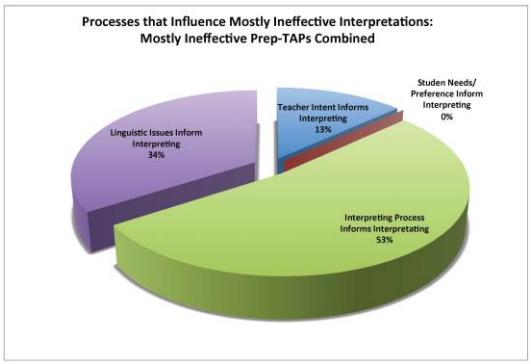

Figure 3: Processes that Influence mostly Ineffective Interpretations

An example follows from Interpreter Three's coded data, where the emphasis is on individual lexical items and the where the interpreter should stand or sit in the classroom, without identifying strategies to deal with the problems (e.g. the noise levels) that may arise during interpreting the text.

> Mostly ineffective. Interpreter Three: *I might have to fingerspell all of the names of the drugs and find out it if there are any signs for them…also the teacher is moving around the room a lot, so should I stand or sit, or move around the room. It's pretty noisy so I am missing some of the stuff…*

Table 4: Interpreter Three: Total Coded Utterances

Name	TI	SII	I	LII	RF		Person Total
Interpreter Three – Health	2	3	14	5	0		24

Ineffective. The TAPs of the three interpreters who produced "ineffective" interpretations (25%) extends the patterns of those judged "mostly ineffective." Items reflecting higher order thinking (TII) constituted only 8% of their TAPs, with another 8% on Student Needs. Items reflecting Interpreting needs constituted 40% of the TAPs, and items related to Linguistic Issues Informs Interpreting constituted 44%.

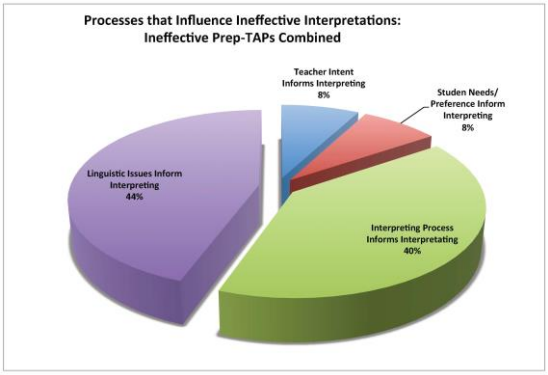

Figure 4: Processes that Influence Ineffective Interpretations

An example follows from Interpreter Four's data, revealing comments that bring attention to individual linguistic items (words or signs) and a lack of background knowledge.

Ineffective. Interpreter Four: *I don't know the sign for Ireland and democracy… I would need to look on a map and see where Ireland is. I don't know anything about political systems*… (Linguistic Issues Inform Interpretation)

Table 4: Interpreter Four: Total Coded Utterances

Name	TI	SII	I	LII	RF		Person Total
Interpreter Four– Social Studies	0	5	11	7	1		24

Stimulated Recalls

When the interpreters conducted their Stimulated Recall, a pattern emerged that was similar to the TAPs, in that the interpreters whose interpretations were effective also had more comments assessing their work as successful as they were able to realize the teacher's goals and teaching strategies. These same interpreters appeared to have a range of strategies, drawing on their background and experiences within the Deaf community. Their focus was much more attuned to the teacher's style and classroom dynamics for all learners. The following examples of quotes illustrate these aspects:

Effective. *CD: I think, again, it's about me really figuring out the teacher's style and to find ways to fit into that classroom with how the teacher teachers the class. …I think that's a huge challenge in terms of agreeing with the teacher's style and approach, so figuring out what her goals are, what are the dynamics in the classroom, and what she wants to have happen*… (Teacher Intent Informs Interpreting)

TM: I think the teacher is using that language to really create a relationship with the students and her goal is to bring them into her topic by thinking about what they already know. I think she is linking this to previous knowledge and wants them to question what they know about drug use… (Teacher Intent Informs Interpreting)

Mostly effective. *KF: I was able to draw from a lot of background experiences and figure out how to configure that in ASL… there are a lot of "ologies" – so I cannot just fingerspell those – like if I do that then imagine why Deaf kids struggle...*

The interpreters that did not provide effective interpretation had fewer comments in their SRs than the effective interpreters and focused on very different elements when viewing their work. For example, one interpreter recognized that the interpreting was not effective and was far less agentive in their language when reflecting on this (i.e. didn't appear to have strategies or choices that could have addressed the problem; didn't appear to take responsibility for the ineffectiveness of the work) for example:

Mostly ineffective. *DM: I couldn't hear the kids and the teacher pulled down a map that I couldn't see so I didn't know what he was referring to at all…*

The following quote also appears to suggest that the interpreter was lost in the words and was not attending to what the teacher and students were doing, but rather were focused on their own intrapersonal dialogue.

Ineffective. *CM: I was so lost and there was just so much going on in my head – it was pretty busy up there…*

Next we discuss these findings and identify areas for further research.

Discussion of Results

The data reveal a pattern of interpreting success when interpreters think critically about teacher intent, classroom strategies and student engagement, as well as interpreting process matters. The contrast in the data set show that interpreters who do not reflect this same higher order thinking when approaching their work are either inconsistently effective or not effective and, reflecting a focus on lexical based interpreting.

The interpreters who were aware of the broader context of teaching and learning environments and who appreciated what the teacher was doing with language were successful in providing meaning-based interpreting. The successful interpreters made very explicit connections between what the teacher was doing and the subsequent decisions they would have to make during the interpretation. The interpreters who produced effective work revealed an ability to analyse discourse and recognize the interpreter's role as a co-constructor of meaning in the classroom.

Comparing the effective and ineffective interpreters, there was a marked qualitative difference in their TAP and SR comments, both in length and the quality of critical thinking that consistently was linked to making the connections to the interpreting task within the context of the classroom. Unlike the interpreters that produced ineffective interpretations, they did not focus on words or discreet elements. These same interpreters also commented in the SRs that they found the TAP process helpful in preparing to interpret, and to activate their metacognitive processes about the task at hand.

The interpreters who focused primarily on lexical matching strategies (e.g. "what's the sign for…") produced work that was unsuccessful, was not meaning-based, and did not realize the teaching goals and processes. These same interpreters also focused on Interpreting Processes without being able to produce successful work. Their view of interpreting appeared to be grounded in the conduit model of seeing themselves as "transcoders" without an appreciation of the impact that philosophical approach has on the interpreting, and ultimately, on the deaf child's access to the classroom content and learning experience. We think this finding has interest for educators and interpreters alike, in terms of how we are training interpreters to view the task of interpreting, and to ultimately perform the task in complex settings like an educational context.

The types of texts chosen for the study represented typical classroom content; however when assessed for level of difficulty, the texts did not contain information that interpreters who have worked in educational settings would not have been exposed to in their work. The information from the spelling lesson presented the challenge of dealing with homonyms; however interpreters are often tasked with dealing with sound-based references in their work. The science class focused on photosynthesis, while the health class address teenage drinking and choices. The most challenging text was the social studies text in which the teacher contrasted governments in Ireland and the US. However, given the content was aimed at middle school, we would argue that the information was possible to understand and interpret.

While the interpreters in this study did not have access to reading materials and classroom lesson plans, the TAP process revealed that 5 of the 12 interpreters were able to actively use their background knowledge and experience in order to manage the information successfully. Seven interpreters said in the SR that reading the information would have been helpful to them; however these same interpreters appear to default to a transcoding approach to interpreting, despite the student profiles that

stressed the Deaf child's language was ASL, so it is questionable that this would have produced different results.

All 12 interpreters had access to a student profile; however there were very few TAP and SR comments that linked to the student profile. This may have been different had we shown a videotaped introduction of the Deaf student, providing a more realistic link to the Deaf child for whom they would be interpreting, and it is something to be done in the next phase of this research.

The aspects of interpreter role did not emerge as a significant feature. This may be because of the text selected for this study, as there were no obvious role conflicts in the interaction, e.g. the teacher didn't ask the interpreter to leave the room to photocopy. It could also be that because all twelve interpreters have between 3 and 30 years of experience, they were clear about their role in the classroom context.

Finally, we had a category that we called Red Flags and there were only three utterances that had this code. The three comments represent anomalies not related to interpreting, for example, they were descriptive and judgmental comments on the teaching and/or classroom. While not significant they may illustrate what the interpreters were attending to while interpreting, and that mental energy was being deflected from the task of interpreting.

Although a small sample, these results reflect that effective interpretations were characterized by more higher-order analysis during TAPs and less lower-order analysis. The "expert" or "very experienced interpreters" demonstrated a much more complex understanding of the interpreting requirements and applied more highly analytical cognitive processes when preparing (TAPs) to interpret. They also seemed to be much more selective about what to attend to in the interpreting task, focusing on higher order analysis of Teacher Intent vs. lower order analysis of Linguistic Issues, and they demonstrated much greater self-awareness of the task of interpreting overall. Their strategies in both TAP and SR represented an awareness of semantic based intent vs. lexical processing and they were able to process longer chunks of information with an understanding of a broader range of interpreting factors.

The expert performances also showed the interpreters accessed broader world knowledge when preparing to interpret, drawing on this as an internal resource. Finally, there were significant quantitative and qualitative differences between the number and quality of comments made by the effective interpreters and those who were unable to provide effective interpreting.

Conversely, ineffective interpretations were characterized by more lower-order analysis during TAPs and less higher-order analysis. By contrast, the interpreters who were unable to provide effective interpretation struggled to identify beyond lexical level of processing and seemed to have little awareness of the interaction demands and of overall text structure. Their comments in TAP during preparation focused primarily on classroom logistics - where to stand, sit - and on individual lexical choices without demonstrating an understanding of the classroom teacher's goals and processes to be used to realize goals.

These interpreters often spoke generally of just needing to prep (relying on external sources) but did not mention their own knowledge as one of the cognitive resources available.

The data suggest that interpreters who see interpreting as an act of co-creating meaning among all the participants – teacher, students, interpreter – and apply discourse analysis strategies to uncover the purpose or intent behind spoken utterances and the function of the teaching discourse, produced more effective work. Those interpreters who focused on word-sign

equivalents seemed to be operating solely as a conduit for the information, and the result was mostly-ineffective or ineffective interpreting.

Jaaskelainen (2010) summarizes the findings of Jakobsen (2003) who determined that experienced translators deal with larger translation units than those of students, that more experienced translators draw on a wider knowledge base than those who treat translation as a linguistic code switching operation (Jaaskelainen 1999), and that practitioners with greater experience demonstrate higher problem-awareness, sometimes resulting in more processing activities (Jaaskelainen 1999). The results of this current study are similar, extending the literature to include signed language interpreters.

As educational interpreters do prepare for classes in similar ways as the process used in this data collection (i.e. previewing videos that will be shown in class and/or reading and activating their background knowledge about a topic), the results may help interpreters to move their preparation strategies to a more refined level by focusing on higher order thinking strategies. As interpreter educators and mentors to educational interpreters, the data invite us to consider whether we should be teaching interpreters to use tools such as TAPs and SRs, and assessing interpreters based on their ability to produce higher order reflections.

Given the insights of experienced interpreters, and the ways in which they focused their attention on aspects that resulted in more effective interpretation, and the manner in which they subsequently discussed their work, these may be helpful to model for interpreters who are struggling to perform in educational settings. These results may point to a broader and more general approach to assessing and predicting successful interpretations based on the use of TAPs and SRs in classroom activities that teach interpreting processes and decision-making.

Should we be actively teaching students how to critically reflect on these more complex factors, thereby moving them more quickly toward effective interpreting and away from attending at only the lexical level of a text? Is it possible to teach these? Can interpreting students learn to self-assess using these same approaches? Does higher order reflection predict successful and effective interpreting skills? These questions could be addressed by further research.

These findings also raise questions about the ways we offer feedback or assessment, and whether that feedback triggers higher order cognitive issues (e.g. identifying teacher intent/goals/classroom processes) or speaks only to lower order cognitive issues (e.g. individual lexical choices). We need to explore how we are teaching interpreters to manage the cognitive demands of educational discourse, and any discourse, in order to produce effective interpretations. Would the labels and categories identified in this preliminary/pilot study be useful for people preparing to interpret in educational settings?

Other questions that need further exploration include asking what models of interpretation are educators drawing upon in their own interpreting work, as well as when they are teaching the task of interpreting?

Conclusion and Recommendations

The goal of this study was to explore the ways in which participant reports may reveal the strategies interpreters use to solve interpretation challenges and produce effective interpretation. Data revealed that interpreters who focused their cognitive attention on the aspects of teacher intent (purpose behind the words) and interpretation processes demonstrated more effective

interpretation than those interpreters whose cognitive attention focused on lower order thinking processes, such as individual lexical items.

While this study focused on interpreters and educational settings, it would be interesting to see if similar results would emerge in other settings, such as dealing with legal or medical discourse and settings. This study has not examined the usefulness of using introspective methods in teaching interpreting. Further research could involve an experimental study, examining the impact of teaching introspective methods on interpretation and contrasting that with the results from a group that do not receive explicit teaching on this method.

Acknowledgements

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Appendix 1: Instructions for Think Aloud Protocol (TAP) and Interpretation Sample

Task One: Provide a TAP of your preparation:

General info:

- You may use either ASL or spoken English throughout this TAP (if you use ASL make sure it is legible on the camera), although it is preferable if you use English for this portion to describe your thought process more accurately.
- The goal of this TAP is to get as close to an accurate representation of your cognitive/thought processes as possible; so do what you would normally do in the process of preparing to do a simultaneous interpretation.

Recording your TAP:

- Start the video sample, and review it for 20 minutes total, while providing commentary on your thought processes on what you would do for the interpretation process, how you would convey the meaning of the classroom lecture to the student, etc.
- Basically the goal is to express anything and everything that is going through your mind while you review the classroom interactions, and preparation that might have been done prior to the lecture/during the class. These thoughts might span various stages of the process: audience/context, comprehension, analysis, assigning meaning, source/target representation, letting go of form, composition, any of the setting factors that may impact the interpretation, etc. Feel free to just let your thoughts run free without the worry of producing complete sentences.
- You may pause the video to add your thoughts, or you may speak/sign while the stimulus material is playing.

Task Two: Provide an Interpretation of the source (the video sample provided)

Begin interpreting, matching your target language to the student needs. Start the video sample from where you stopped it, and for the next 20 minutes, provide an interpretation of the classroom lecture and interactions.

Task Three: Provide a TAP while you review your work sample

General Info:

- You may use either ASL and/or spoken English throughout this TAP (if you use ASL make sure it is legible on the camera)
- The goal of this TAP is to capture an accurate representation of your cognitive processes as you conduct a self-assessment of your work.

Recording your TAP:

- Basically the goal is to express anything and everything that is going through your mind while you review your work sample. These thoughts might span various stages of the process: audience/context, comprehension, analysis, assigning meaning, source/target representation, letting go of form, composition, any of the setting factors that may impact the interpretation, etc. Feel free to just let your thoughts run free without the worry of producing complete sentences.

Appendix 2: Interpreter Assessment Form (Debra Russell)

Interpreter: _____
Sample Segments: _____
Assessor: _____

Rating System

4 = Effective	Few errors/no problem patterns
3 = Mostly Effective	Occasional errors
2 = Mostly Ineffective	Consistent errors/little control
1 = Ineffective	Not able to retrieve meaning

Understands & Represents Goals

Goal clearly represented/changed as needed _____
Cohesion/Dynamics Maintained _____

Scores _____

Interprets Meaning:
Essential Elements & Supporting Detail

Equivalency of meaning to the original SL text _____
Framing for culturally rich ideas _____
Main point/supporting detail _____
Visual Sense/Conceptual Accuracy _____
Register _____
Affect _____
Style/Metanotative Qualities _____

Scores _____

Interpreting Process

Depth of Processing
(Lexical, Phrasal, Sentential, Textual) _____
Comfortable to watch/listen to - composure _____
Monitor/Feedback loop working _____

Scores _____

Target Language: English	II
Adequate variety in lexicon	
Grammar	
English discourse/cohesion strategies	
Complete sentences	
Emphasis: volume, enunciation	
Register	
Boundary marking via pausing & phrasing	
Scores	

Target Language: ASL or Contact Sign	
Adequate variety in lexicon	
Grammar	
TL Discourse/Cohesion Strategies	
Complete Sentences	
Articulation, stress and emphasis	
Register	
Boundary marking via pausing & phrasing	
ASL Features:	
Fingerspelling	
Numbers	
Classifiers	
ASL Features Continued:	
Non-manual signals	
Negation	
Distributed action	
Temporal aspects	
Modulation	
Hand dominance	
Scores	

Overall Error Patterns	
Deletions skew meaning	
Additions skew meaning	
Substitutions skew meaning	
No major error patterns	
Total Scores	

Results/Comments: