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Telling, Writing and Reading Number Tales in ASL and English Academic Languages:

Acquisition and Maintenance of Mathematical Word Problem Solving Skills

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DEDICATION

It is difficult to imagine how I would have gone this far without the support of my family, friends, professors, teachers and classmates. They have encouraged me to pursue lifelong teaching and learning. They also have inspired me, helped me, supported me, and pushed me to become a best teacher as I can be. This thesis is dedicated to them.

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ABSTRACT OF THE THESIS

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One of the major goals in deaf education is to teach deaf and hard of hearing students the tools and strategies to solve mathematical word problems. A mathematical word problem curriculum was designed and implemented based on telling, reading and writing number tales in American Sign Language (ASL) and English. The learning experiences helped develop ASL and English academic language in deaf students across two domains: Literacy and Mathematics. The results suggested that the deaf students (1) acquired and maintained word problem solving strategies and tools that are critical for reading and solving math word problems, (2) used prior knowledge and daily experiences to connect with number tales, (3) increased their metalinguistic awareness of ASL and English, (4) developed mathematical academic language (or "math talk") in both ASL and English, and (5) gained confidence in their ability to read and solve mathematical word problems.

I.   Introduction and Overview

Considerable attention has been devoted recently to the pedagogy and language acquisition research exploring ways to improve English reading and writing literacy skills of deaf and hard of hearing students. Teachers are accountable for documenting progress in deaf and hard of hearing students' literacy skills. Equally important is the development of academic language in Mathematics. Thus, teacher-researcher designed an approach to develop American Sign Language (ASL) and English academic language in deaf and hard of hearing students across two domains: Literacy and Mathematics. The curriculum outlined in this thesis offered ways to teach both number sense and mathematical concepts through number tales, while at the same time improving ASL and English academic language/literacy skills of deaf and hard of hearing students.

In the field of deaf education, many teachers, including me, have observed a need for teaching deaf and hard of hearing students the tools and strategies to solve English word problems. Like hearing students, deaf and hard of hearing students often have a hard time with English word problems and many teachers and researchers (e.g., Holt, Traxler & Allen, 1997) often say that these difficulties can be attributed primarily to two things: inadequate reading and lack of knowledge of how to choose the correct operation to apply to these word problems. Some deaf and hard of hearing students are emerging bilinguals in ASL and English and encounter challenges of acquiring the necessary academic language to be successful in solving math word problem. Thus, a mathematical word problem curriculum based on telling, reading and

writing number tales in ASL and English was developed to further deaf and hard of hearing students' mathematical and literacy skills.

The curriculum incorporated four learning theories: multiple intelligences, cross-curricular learning, authentic learning and comprehensible input. These theories were applied to the curriculum in order to make the learning experiences relevant to deaf and hard of hearing students' needs. ASL-English bilingual teaching and learning practices were used to support the development of academic language. The development and use of both ASL and English academic language is a prerequisite for students to communicate and characterize complex and abstract concepts in mathematics. Using the academic language appropriately provided opportunities for the students to improve their number sense and understanding of key mathematical concepts. The students used appropriate academic language in telling, reading and writing ASL and English number tales. A "number tale" was any story, happening, event or facts that have number quantities or amounts embedded in the narrative. The curriculum mainly focused on the word problems, which were a variation of the number tales. A word problem is a mathematical problem that contains number facts and a question that has to be answered and is relevant to the word problem

There are four goals for this curriculum. The first of four goals is *to use students' prior knowledge and daily experiences to connect with number tales demonstrating how mathematics is involved in their everyday lives*. Number tales help support students' learning mathematical concepts by activating their prior knowledge and experience. Making connections between students' everyday life experiences and math concepts through telling, reading and writing will motivate the students.

The second goal is *to help students develop strategies and tools to use for reading and solving word problems*. Since mathematical word problems are a variation of the number tales, strategies and tools developed for understanding and mastery of number tales can also be applied to word problem in similar ways

The third goal is *to develop and increase students' metalinguistic awareness of both ASL and English through telling and comparing of ASL and English versions of stories incorporating numbers*. Having metalinguistic awareness of both ASL and English can be quite useful since analyzing ones' own knowledge of language and how to use it can help students deepen their understanding about number tales in addition to understanding word problems.

The fourth and final goal is *to develop students' mathematical language (or "math talk") in both ASL and English*. Development of students' mathematical language is vital for students to talk about their math thinking, representing it, and sharing it with others during mathematical activities. Students' mathematical language proficiencies may not always be equivalent in ASL *and* English. Some students maybe lacking proficiency in either or, worse, both of these languages. Hence, the importance of developing students' mathematical language in both of these languages through both number tales and word problems.

Each of the activities within the curriculum presented in this thesis addressed all of the five key learning theories and was designed to facilitate the achievement of all of the four goals listed above. The manner in which the activities in this curriculum were implemented was at the heart of this thesis: the bilingual-multicultural approach to deaf education. In the bilingual approach to deaf education, ASL serves as the

primary language of instruction supported by print English and oral English when appropriate. The following section addresses the research, pedagogy and socio-cultural factors that support a bilingual-multicultural approach to educating deaf and hard of hearing children.

II.   The Need for Bilingual Approaches to Deaf Education

Bilingual students find themselves in a wide variety of bilingual education programs, from those meticulously designed to meet their specific native linguistic and cultural needs to programs in which not much is done to address their needs. Grosjean (1992, 1996) defined bilingualism as the regular use of two languages, and a bilingual as a person who needs and uses two languages in his/her everyday life. "The bilingual is not the sum of two complete or incomplete monolinguals; rather, he or she has a unique and specific linguistic configuration" (Grosjean, 1992, p. 55). An example of the unique capabilities (or "unique and specific linguistic configuration") of bilinguals is their flexibility to activate both their languages in a given conversation, regardless of the actual language used in that conversation (Grosjean & Miller, 1994). The monolingual approach to the education of deaf and hard of hearing children may not take the full advantage of their unique capabilities as bilinguals. Only bilingual education is up to such task as it addresses these children's linguistic configurations.

The term "bilingual education" by and large refers to the use of at least two languages of instruction sometime in the student's academic career; so, bilingual education programs in the United States use two languages, one of which is English, for teaching and learning purposes. These programs come in many different forms, but the two common goals shared by all of these programs are acquisition of English literacy skills and meaningful learning of the core school subjects often through the students' heritage language.

There are two approaches that promote second language learning: additive bilingualism and subtractive bilingualism (Crawford, 1999; Cummins, 1986; Lambert, 1974, 1977). Lambert (1974, 1977) proposed that the social perception and treatment of primary and secondary languages are the roots of bilingualism, and distinguished between "additive" and "subtractive" forms of bilingualism. Additive bilingualism occurred when the students learn and add a second language (L2) to their repertoire, which does not interfere with the learning of their existing first language (L1) (e.g., Mahshie, 1995). In other words, the learning of L2 does not threaten to replace the existing L1. Unlike additive bilingualism, subtractive bilingualism referred to the form of bilingualism where L2 learning often meant interfering with the learning of a first language and replacing it with the second language (e.g., Wong-Fillmore, 1991). In this case, the learning of L2 competes with L1, threatening to replace it.

In a 1992 interview, Lily Wong-Fillmore stated that the social circumstances under he second language learning takes place strongly determine whether this learning is additive or subtractive (Hass, 1992). Wong-Fillmore added that if second language learning took place in a setting in which first and second languages were equally valued, then this learning had a possibility of being additive. However, if this learning happened in a setting where the only acceptable means of communication was English, then the second language learning would be subtractive. Cummins (2001) noted that there are about 150 empirical studies in the last 30, or so, years that had reported positive findings showing a definite correlation between additive bilingualism and bilingual students' linguistic, cognitive, or academic growth. This was also supported by several empirical studies (e.g., Long & Padilla, 1970; Dubé &

Hébert, 1975; Bhatnagar, 1980) showing evidence of bilingual students performing academically better when their L1 was valued and used than when L1 was neglected in the home and school. Because of its benefits, the additive bilingual education programs, whose prevailing goal is preservation of languages and culture, will be the focus of this thesis.

Krashen (1996) postulated that we all acquire language through comprehensible input (the "input hypothesis" (Krashen, 1985, 1994), where all information is both understandable and comprehensible. Through comprehensible input, the knowledge that children obtained through their primary language helped make English more comprehensible, and this resulted in more English language acquisition (Krashen, 1996). Crawford (1999) quoted Krashen stating that acquisition occurred in "one fundamental way": "We acquire language when we understand it" (p. 123). For instance, a bilingual student with background knowledge in mathematics developed by effective mathematics instruction in the primary language would be more than likely to understand mathematics taught in English than another student without background knowledge. Terrell (1991) speculated that for some people language acquisition might not be exclusively based on input. He furthered suggested that grammar instruction should be seen as an aid to the learner during the process of the language acquisition.

Krashen (1996) noted that literacy transfers across languages as demonstrated by high correlations between literacy development in the first language and the second language. The ability to solve problems or to clarify ideas in one language can be used in another language is an example of literacy transference. Cognitive academic

language proficiency (CALP) had been defined and characterized by Cummins (2001) as the combination of knowledge and literacy. CALP refers to grade-level fluency in academic target language in academic contexts (the "classroom language"), which, according to Cummins (2001), in general, takes five to seven years to develop. In addition to CALP, there is another type of language proficiency (Cummins, 2001): basic interpersonal communications skills (BICS). BICS refers to fluency in conversational aspects of the target language in social contexts, or the "playground language." BICS can be developed within a year or two of exposure to the target language. Cummins suggested that students could not develop CALP without having a strong foundation in BICS. Environment plays an important role in developing both BICS and CALP fluency in various situations and contexts (Cummins, 2001). Effective bilingual education programs provide opportunities for development in proficiency of both BICS and CALP skills in target language(s).

Keeping in mind the importance of the environment's role in the development of BICS and CALP, Cummins (2001) posited the linguistic interdependence or common underlying proficiency principle (CUP). The interdependence principle has been stated as follows: "To the extent that instruction in Lx is effective in promoting proficiency in Lx, the transfer of this proficiency to Ly will occur provided there is adequate exposure to Ly (either in school or environment) and adequate motivation to learn Ly" (Cummins, 1981, p. 29). The main implication of this principle is if a student is proficient in L1, then, with enough and appropriate exposure that proficiency will transfer to L2. This transfer is explained by Cummins' common underlying proficiency model, which states that proficiency in L1 and L2 are seen as

interdependent across languages because skills in different languages reside in the same area of brain, which enable facilitation of a ready transfer of academic skills. This is one explanation for why deaf children of deaf parents typically outperform deaf children of hearing parents in academic tasks and English proficiency. They have had the opportunity to develop literacy in a language (ASL) most accessible and natural for them as a first language.

Mayer and Wells (1996) challenged the applicability of Cummins' linguistic interdependence principle for deaf students. These researches stated that ASL and print English as a form of bilingualism does not meet the conditions set forth by Cummins' CUP model. In other words, that "there is no one-to-one correspondence between signed and written phrases, as there is between spoken and written phrases in English" (p. 102). They argued that it is impossible for deaf students to acquire proficiency in English literacy skills without some form of exposure to English in an accessible form. According to Mayer and Wells, an internal "oral" representation of English is a necessary condition for successful English literacy, which can only be created by acquisition of spoken English, signed English or both. However, English in any form is not as accessible as ASL is as a primary mode of communication for deaf children, and, yet, many deaf children continue to attain successful English literacy without ever acquiring either spoken or signed English as a primary language (Strong & Prinz, 1997; Lane, 1999). Deaf children of deaf parents and their success in attaining bilingual fluency, as shown by some studies (Strong & Prinz, 1997; Lane, 1999), seem to contradict the Mayer and Wells argument. There is also strong research evidence of correlation between ASL fluency and English reading

achievement (Strong & Prinz, 1997, 2000; Padden & Ramsey, 2000; Hoffmeister, de Villiers, Engen & Topol, 1997; Singleton, Suppalla, Litchfield & Schely, 1998).

While bilingual education in the United States often refers almost exclusively to the education of English language learners whose primary spoken language is not English, in deaf education, this model uses both the language of the ASL-signing deaf community and that of the English-speaking hearing. Despite the diversity of bilingual education programs for deaf children (Strong, 1995), the accepted idea of bilingualism in deaf children is to have ASL as a primary language and English as a second language.

The bilingual approach to the deaf education is not exclusive to the United States, or even the American continent, but is spanning the globe in the other countries. Before 1980, the educational approach to Swedish deaf and hard of hearing children was mostly strict oralism. The Swedish parliament passed a law in 1981 formally recognizing Swedish Sign Language (SSL) as one of the nation's minority languages and mandating that bilingual education be instituted in the nation's schools for deaf and hard of hearing children. All parents of deaf children were also required to learn sign language, and that they receive consulting services from immediately after the diagnosis of their children's hearing-loss.

Because of the law in 1981, major changes were made two years later to incorporate the bilingual approach in national curriculum policy governing deaf children's education. In Sweden, professionals, parents and the Deaf community work together as a resource network to provide the best possible environment and accommodations to capitalize on the critical period for language acquisition; thus

maximizing potentials for the academic achievement of deaf students. They make sure that the deaf students receive good comprehensible input available only through Swedish Sign Language, which in time translates into natural second language acquisition of written Swedish. As a direct result from parents receiving early supports, deaf children often enter school with fluent sign language skills and high reading levels.

While in Swedish school, Deaf students were required to study Deaf people's lives, language, history, and accomplishments as an obligatory part of their school curriculum. In learning about and gaining knowledge of historic deaf figures (e.g., the "Laurent Clercs" of our world), and their accomplishments as an individual or as a whole in their deaf history, deaf students gains ideas of possible lives that that they can lead and finds a basis for self-esteem in their hearing society. Being a well-informed adult means possessing one's knowledge about one's heritage as it provides a useful framework, as well, for organizing other knowledge (Lane, 1999). As a result of incorporation of the bilingual approach to educating deaf and hard of hearing children in Sweden, tests of Swedish and of mathematics administered to eighth grade orally taught Deaf children taught, before the bilingual approach were introduced and embraced in Swedish deaf education, were administered again to bilingually taught Deaf children in the late 1980's; these tests show that the latter group outperformed the earlier one by a wide margin, especially in Swedish proficiency (Allen, Rawlings, & Schildroth, 1989). Further evidence of the success of bilingual approach to deaf education in Sweden were the reading and mathematics achievement levels of the first Deaf students in bilingual classes that were comparable to those of hearing peers when

they graduated from high school (Stedt, 1992). In summary, the successful implementation of bilingual education for deaf children and its impressive results in Sweden shows that deaf children can and do benefit from the bilingual approach to teaching and learning.

An ASL-English bilingual approach has full support of many professionals in the field of deaf education and deaf adults within the deaf community (Livingston, 1997; Jacobs, 1989). Lane (1999) described the approach as "student-centered education" conducted using the child's "most fluent language" (ASL) while fostering child's literacy in English. Numerous recent studies of classes of deaf and hard of hearing students where bilingual classroom practices are being implemented have shown the successes (Coye, Humphries & Martin, 1978; Andrews, Ferguson, Roberts & Hodges, 1996; Allen, 1998).

In addition to the successes of the bilingual classroom practices in the deaf classes, a research examined the relationship between ASL fluency and English proficiency. Strong and Prinz (1997) examined the relationship between ASL skills and English literacy among deaf students between eight to fifteen years old. Their study has shown that deaf students benefit from fluency in ASL in achieving English proficiency (Strong & Prinz, 1997). This is evidence that ASL-English bilingual education can work for deaf children. Strong and Prinz (1997) also found that deaf children of deaf parents outperform deaf children of hearing parents in both ASL literacy and English literacy; this is also supported by many other studies (Strong & Prinz, 2000; Hoffmeister et al., 1997; Lane, 1999). Additionally, it was found that, in most cases, when ASL level was held constant, there was no difference between these two groups of deaf children

(Strong & Prinz, 1997, 2000). This is further indication that ASL is a factor in literacy development. It is possible for deaf children to have strong English literacy skills, regardless of whether their parents are deaf or hearing. Children with ASL fluency had early diagnosis of their hearing losses, had early access to sign language, and were continuously exposed to English early (Strong & Prinz, 1997; Padden & Ramsey, 2000). Rationally, having parents who sign during deaf child's early years, and giving that child enough comprehensible input, is as important as whether at least one of the parents is deaf or hearing, and can have a powerful impact on that child's ASL and English literacy development.

There is a general agreement that if learners are provided with enough comprehensible input, they can become successful with target language acquisition. The comprehensible input premise was put forth by Krashen (1985, 1994) to explain how the language learner acquires a target language. Interestingly, de Villiers, Bibeau, Ramos and Gatty (1993) conducted a longitudinal study of profoundly deaf children of oral deaf families and found that these children consistently outperform other deaf children of hearing families academically. This strongly parallels the way signing deaf children of deaf families have been seen to outperform signing deaf children of hearing families. These oral deaf children had sufficient comprehensible input from their parents because their parents made compensations for their deafness by heavily using gestures in communication to a greater extent than hearing parents of oral deaf children; and those children, in turn, took full advantage of the gestural medium in communication (de Villiers et al., 1993).

There is evidence showing the importance of deaf children's early, prolonged exposure to language as "individuals who are exposed to language at earlier ages consistently outperform individuals exposed to language at later ages for first and second language acquisition" (Morford & Mayberry, 2000, p. 111). Recognizing the need for early language experience in deaf and hard of hearing children's development as a literate person, Kassel, Osbrink and Zernovoj (2003) presented how their families supported literacy development in the home underscoring how any deaf child can develop into a successful, literate deaf adult, regardless of family backgrounds. Comprehensible input started at an early age for these three deaf adults. The families of these three adults used a variety of learning tools to support the education process and their successful literacy development. While Kassel, Osbrink and Zernovoj presented real life experiences, there is a study that demonstrated the impact of consistent linguistic input regardless of which language or mode of communication, can have on various academic and cognitive outcomes (Lou, Strong & DeMatteo, 1991).

Padden and Ramsey (2000) studied reading achievement in two groups of deaf children, one from a residential school and the other from a public school, whose early experiences involve exposure to and using sign language. Consistent with the findings by Strong and Prinz (1997), Padden and Ramsey also found that the three factors that correlate significantly with reading achievement are having deaf parents, hearing losses being detected early, and early exposure to English. In their studies, they looked at how ASL plays a role in reading development of deaf children by measuring ASL competence in deaf children testing their specific ASL skills, evaluating how well

these children knew the association between vocabulary of certain ASL initialized signs to their English word counterparts, and assessing their fingerspelling skills. They found that there is a strong relationship between ASL skills (and knowing specific ASL structures) and reading achievement in deaf students. They also found that these students "have made an alternate discovery in which they form association between elements of a signed language and elements of written language as they acquire the ability to read" (Padden & Ramsey, 2000, p. 168).

Padden and Ramsey (2000) noted strong relationships between fingerspelling and reading, and between initialized signs and reading. Padden and Ramsey concluded that "Deaf children seek links between accessible systems, not between words they cannot hear or speak, but between signs that have some tangible link to English print, in this case, fingerspelling and initialized signs" (pp. 184–185). Humphries and MacDougall (1997) described one such procedure as "chaining". In chaining, connections were made between ASL and English print using print, fingerspelling, pointing at words, and signs. In their observations of residential and public schools teachers' methods of teaching English, they noticed that residential school teachers fingerspelled more words and used chaining more often than public school teachers, and that deaf teachers also fingerspelled more words and used more chaining than hearing teachers. What this study showed was that deaf children received exposure to a culture of signing teachers that provided them tools to find links between ASL and print English. This made both systems fully accessible to deaf children, and helped them make sense of print English. In another study, Padden (1996) showed that deaf children actively seek to form correspondences between fingerspelling and written

spelling systems and ASL signing. This was evident in the uniqueness of the fingerspelled words and how they matched up to written English words during deaf children's early use of fingerspelling and written spelling.

Similar to Padden and Ramsey's (2000) study that showed deaf children are actively seeking links between ASL and print English to help them make sense of the print English, Singleton et al. (1998) had a similar finding when they investigated ASL-based techniques for learning print English. In their investigation of several studies, they found that when students receive ASL pre-reading lessons, their comprehension of the printed English text improved. They also found that in English translation activities, students improved their English writing skills after they produce ASL narratives and then write written English narratives using English glosses from their ASL narratives and use these same glosses to compare ASL to English narratives. Based on these findings, they concluded that paying attention to, analyzing and mastering the linguistic features of ASL is strongly connected to English literacy skills.

Continuing the theme of finding the link between ASL and print English, Hoffmeister et al. (1997) conducted a study assessing the students' primary language competence and comprehension abilities in both English and ASL. In the study, Hoffmeister et al. (1997) looked for the relationship among English literacy skills, comprehension and production of "through-the-air" English in simultaneous signed and spoken language, and comprehension and production of several syntactic and semantic features of ASL at four schools that use Total Communication in their classrooms. In their study, they found that in the deaf students, their knowledge of

English syntax facilitates the English reading achievement, and their mastery of high level skills in both ASL and English also makes possible the development of good English reading skills. Based on their findings, they posit that acquisition of more ASL fluency enables deaf students to reflect on language structures, thus facilitating their exceptional performance on tests assessing their English literacy skills.

The studies discussed in the previous section have shown that deaf children of deaf parents outperform deaf children of hearing parents in educational achievements. Lane, Hoffmeister and Bahan (1996) stated that it is because the deaf children of deaf parents have had opportunities to develop language using a naturally accessible language (ASL) to communicate with the members of their deaf families. The reality is about nine out of ten deaf children have hearing parents (Lane, 1999; Mayberry & Fischer, 1989). Deaf children of hearing parents often lack full, consistent communication with their hearing families for the first five or six years of their lives. Mayberry and Fischer (1989) estimated that about 92 – 97 % of deaf children are born into hearing families unfamiliar with any sign language, and most of them learn sign language outside their family home, frequently at an age beyond the critical language acquisition period. Consequently, these children often enter school lacking fluency in or without having ASL as their native language and English as a second language. Therefore, the moment they first enter the school, they begin trying to learn ASL as well as English simultaneously. Allen (2002) stated that deafness "does not recognize the cultural, economic, or linguistic diversity of families, and, therefore, creates classrooms of children from many different linguistic and cultural backgrounds" (p. 150). It is the school where cultural information and language has been for the most

part passed down from classmate to classmate rather than from parent to child (Padden & Humphries, 1988). Deaf children of hearing parents never enter school language-less because they are continuously exposed to their family language and start learning it to some extent before starting school. Deaf children of deaf parents and hearing parents that sign are exposed to and able to start learning sign language as a form of communication early on before they start school. Based on deaf children's varying family backgrounds, the ASL-English bilingual approach to teaching deaf children is the most viable option of deaf education because ASL, as a visual language, is most accessible to them. It gives them a communication tool, as well as a foundation, to help communicate abstract and complex information, which can aid in the acquisition of English along with good English literacy skills.

Bilingual education for deaf children is probably a main issue in deaf education today and is being actively examined by many directly and indirectly involved in the field. It is clear from the research done in the last few decades, there is evidence supporting the bilingual approach to deaf education. Many studies have shown that bilingual education can be effective if the program is well designed to help deaf children acquire academic English (Cummins, 2001; Krashen, 1996). There is evidence that reading ability transfers from any one language to another language (Cummins, 2001). In other words, literacy in first language can help in acquisition of literacy in the second language. As discussed earlier, ASL is one of the signed languages Deaf children have full access to because it provides visual access addressing their communicative and learning needs.

With ASL-English bilingual education, deaf children will be exposed to ASL and print English teaching and learning, thus giving them better chances for educational achievements because both of these languages are made accessible to them. They can make associations between these two language systems mainly using their ASL linguistic base to aid them in their development of English skills. As previously shown here in this section, research shows that ASL is not a deterrent, but rather an incentive, to acquisition of English literacy skills. Despite the fact that bilingual education is still relatively new in deaf education, and research on the bilingual approach is still young, bilingual education can help facilitate deaf students' grade level achievement by providing a fully accessible and comprehensible classroom language, ASL, as well as developing and promoting English literacy skills. The fact that a bilingual approach is gaining wider acceptance in deaf education offers hope that in the future educators will be able to freely develop effective bilingual programs, which will address deaf children's unique developmental pattern growing up bilingually and bi-culturally (e.g., Hamers, 1998) and help them learn and internalize English as children seem to do in Sweden with Swedish Sign Language and print Swedish.

III.   Assessment of Need

Deaf children need a rich learning environment where the language of instruction is most accessible to them, and it is clear from the previous discussion that the bilingual approach to deaf education covers this need. The curriculum developed and implemented used a bilingual approach to fill the need for deaf children to acquire language-based mathematics word problem solving skills. It is a well-circulated notion in the field of deaf education that the majority of deaf students read between third and fourth grades level when they graduate from high school (Allen, 1994; Center for Assessment and Demographic Studies, 1991; Gallaudet Research Institute, 1996). According to a national norms report published by Gallaudet Research Institute (1996), the median reading level for deaf students at 18 years of age was at the 3.9 grade level. In another report, Deaf 18-years-olds generally on average read at the same level as hearing fourth graders; this report added that only about 3 % of deaf 18-years-olds read at the same level as their average 18-years-old hearing counterparts (Center for Assessment and Demographic Studies, 1991). Paul and Jackson (1993) added that deaf students average six to seven years behind their hearing counterparts by the time they graduate from high school, and only seven percent of deaf students graduate with reading levels at the seventh grade level or above. There is little question that there is a need to create curricula that are designed to help deaf students develop their literacy skills in order for them to become literate in English.

With so many subjects to cover as required by state standards, teachers often do not have time to teach the whole curriculum in each of the subjects at the expense

of spending significant amount of time and energy to produce any kind of increase in the achievement levels of their students' English literacy. Because of this, the nature of the curriculum I have developed, the focus was on both mathematics and English literacy skills. Pau (1995) noted that most of the mathematics difficulties for deaf students concern understanding and solving written English math word problems. "When asked about the problems their pupils are having with mathematics, teachers of deaf children seem to have an intuitive feeling that language is at the heart of their difficulties" (Barham & Bishop, 1991, p. 180).

Adding urgency to the need for more and better new research-based approaches to develop mathematical word problem skills in deaf students, there has been a national call for increased importance of math word problem solving and general reasoning skills. They were emphasized as critical areas of focus in mathematics education of deaf students (Daniele, 1993; Dietz, 1994; Pagliaro, 1998). Kelly, Lang and Pagliaro (2003) found that deaf students generally are not being adequately engaged in cognitively challenging word problem situations regardless of instructional setting. With proper instruction (including modeling of the strategies for solving word problems), deaf students can acquire proper word problem solving skills and strategies to improve their performance in word problem solving tasks (Mousley & Kelly, 1998). Clearly, there is a need for development of new and improved instructional practices that promote acquisition and mastery of mathematics word problem solving skills in deaf students.

Because of the English linguistic content of mathematical word problems, one can envision how deaf students may have difficulties with English word problems.

Holt, Traxler, & Allen (1997) noted a strong correlation between deaf students' reading comprehension and their mathematical word problem solving. Several other studies suggested that deaf students' English literacy skills do directly influence their performance on mathematical word problem solving tasks (Mousley & Kelly, 1998; Kelly & Mousley, 2001; Kelly, Lang, Mousley, & Davis 2003).

Mousley and Kelly (1998) provided students with mathematical word problems and solutions in both sign language and English written form. The students were asked to explain their mathematical thinking. The results showed that the reading levels of deaf students had a bearing on both coherency and accuracy of their explanations. This was demonstrated by the significant difference in the written performance between students with higher reading levels than those with lower levels. Students with both higher and lower reading levels seemed to perform equally well in their signed performance. Mousley and Kelly (1998) noted that "The results seem reasonable in that the students in the higher reading group should, logically, better comprehend and be more comfortable with the language of the math word problem, and, thus, would be able to explain more clearly in either sign language or written form their understanding of, and solution to, the problem" (p. 4).

Based on these findings, deaf students' reading comprehension of a given text seems to be tied to their ability to solve word problems correctly (Kelly et al., 2003; Pau, 1995). However, it is important not to jump to conclusions and keep in mind that Kelly and Mousley (2001) noted that the deaf students' difficulties with complex word problems with added computational information could not be fully attributed to their poor English reading literacy skills. The complexity and readability of content of

these word problems also contributed to difficulties as it did in similar ways for their hearing counterparts.

Adding further correlations between English reading literacy skills and mathematical word problem skills, Kelly and Mousley (2001) studied reading comprehension of mathematical word problems in both deaf and hearing students. They found that even though deaf and hearing students performed comparably in solving the numeric problems and least complex set of corresponding word problems. With more linguistically complex word problems and increasing computational information, there were significant decreases in the deaf students' problem solving performance that were below the performance of their hearing counterparts. Fueled by their difficulties with mathematical word problems, deaf students clearly exhibit negative avoidance attitudes toward word problems. This was evident by the various negative remarks the deaf students said about the word problems (Kelly & Mousley, 2001), e.g. "When I see a word problem, I won't do it."; "I don't understand the word problem and I won't do it."; and "There are too many words. It confuses me more." If the deaf students were having less difficulty with mathematical word problems, they may be less inclined to say negative things about it.

Barham and Bishop (1991) attributed the difficulties deaf students were having with mathematical word problems to both its linguistic content and their English literacy skills. English words that carry different meanings in mathematics with multiple ways of expressing a single mathematics concept, contributed significantly to deaf students' difficulties with word problems (Kidd & Lamb, 1993; Kidd, Madison & Lamb, 1993). Deaf students were not the only ones having difficulty with

mathematical word problems; hearing students' had similar difficulty with word problems. Cummins, Kintsch, Reusser and Weimer (1988) stated that "word problems are notoriously difficult to solve."

There is a need for the development of instructional methods to improve student mathematical achievement in word problem solving. I conducted a search in the literature for existing word problem curricula and materials. This was done to determine what already exists before proceeding with my goal of creating a new mathematical curriculum that would be responsive to the learning needs of deaf students. The curriculum would become a tool for teachers to support a further deaf students' understanding about word problems. The result of this search is reported in the next section.

IV.   Review of Existing Materials and Curricula

My search for existing materials and curricula started with the ERIC database, UCSD libraries, professional journals related to deafness, the Internet, and my personal collection of textbooks, articles, papers and schoolwork. I looked for existing relevant materials and curricula that would help inform the development of the curriculum in this thesis project.

The research began first by browsing through the ERIC database using all the possible combinations of some or all of the main keywords: mathematics, math, word problem, deaf, and bilingual. Many other keywords were tried, as an experiment, to manipulate search results through trial and error. For instance, the use of the terms English and curriculum were used briefly, but later dropped because they were considered too broad. Some studies, but no curricula, were found that are deemed relevant to this thesis.

From the same search through ERIC database above, it seemed that the general description of successful instructional practices for teaching word problems was to be student-centered mainly consisting of teacher modeling, visualization and analysis, and hands-on authentic opportunities. Through modeling, students were exposed to general word problem solving strategies and skills in action. Through visualization and analysis, students learned the linguistic features of mathematical word problems and worked to fully understand and accurately solve these problems. They did this instead of taking literal meaning of words in the problems. They attacked word problems looking for keywords to determine which mathematical arithmetic

operations to use and then compute (e.g., "If I see the term *less than* in the word problem, then the arithmetic operation involved in it must be subtraction. Therefore, I will go ahead and solve the problem by finding two numbers in it to plug in the subtraction operation, and then compute these two numbers together"). Providing opportunities for students to work with word problems in authentic situations meant they were not being drilled or performing repetitive, rote tasks in practicing with word problem exercises. Instead, they got authentic opportunities to work with mathematical word problems, and practiced to solve the problems through their personal connections (e.g., applying to the real world).

Several studies (Bebout, 1993; Chen & Brenner, 1998; Maikos-Diegnan, 2000; Monroe, Black & Buhler, 2002) found in the ERIC database had interesting material that proved to be useful in the construction of my curriculum. Because of the nature of the designs and use of materials in these studies, the materials from these studies all were not directly ported and modified into this curriculum, but rather informed the creation of this curriculum by serving as a model and supplying ideas for the material for this curriculum.

In first study reviewed, Bebout (1993) explored the relationship between basic fact knowledge and success in solving addition and subtraction word problems. This study demonstrated the negative effect of weak relationships between knowledge of basic fact knowledge and success in performing word problem solving tasks. This helped inform the design of my curriculum by influencing me to take into consideration creating and implementing activities at the start of and throughout the implementation of this curriculum that developed mathematical basic fact knowledge.

Additionally, this study presented examples of the types of addition and subtraction word problem, which were used along with other examples in other studies. They served as models for creation of word problems for this curriculum.

Chen and Brenner (1998) compared the word problem solving abilities of second-grade Taiwanese with their American counterparts. It was suggested that success in solving word problems depends on how well integrated are the collective basic knowledge to the processes in solving word problems (Chen & Brenner, 1998). Taking this study into account in design of this curriculum meant providing instructional activities that required different kinds of intelligences (Gardner's Multiple Intelligences Theory), as well as prior and present knowledge. Students needed multiple ways of using all of their different kinds of knowledge to solve word problems.

In another study, Doby (1992) attributed the difficulties fourth-grade students had to solve mathematical word problems to both poor reading comprehension of word problems and their negative attitude toward solving these problems. She then presented a curriculum-like program designed to address these difficulties. This program mainly involved instructional activities focusing on word problems, and teacher-guided writing activities where students undertook sequential steps of pre-writing, writing, conference, revision and, finally, publication of word problems. It contained a wealth of sample surveys, assessment tests and worksheets, but did not contain student-produced artifacts. Artifacts would have provided an example of what the writing process and its results looked like. Because of the monolingual nature of this program, this program could not be directly applied and used in teaching bilingual

deaf students. Instead, it served as a model for the creation of some portions of the bilingual curriculum I designed. For instances, the things that were applicable from the Doby's study were the five stages of writing process (prewriting, writing, conference, revision and publication), and the word problem survey and test (pretest and posttest). They served as models for the design of parts of my curriculum.

In yet another study, Maikos-Diegnan (2000) showed the importance of reading in mathematics. The study showed that students who erred in solving word problems either struggled with the vocabulary within these word problems or were generally unable to comprehend these problems. When vocabulary was explained, students were able to understand and solve these same problems (Maikos-Diegnan, 2000). The implication of this study is that there must be instructional activities included within the curriculum design that involve modeling and discussion of word problems to help students develop the strategies and skills they need to use to solve word problems.

In the last study found in ERIC reviewed here, Monroe et al. (2002) investigated the use of third-graders' oral retellings in solving mathematics word problems. Monroe et al. (2002) revealed that retelling word problems proved to be a challenge for third-graders, and that only with enough storytelling experience from extensive instruction and practice were they able to fully retell word problems. From this study, it appears that instructional activities focusing on storytelling itself and the skills and strategies involved are critical for my curriculum. Bilingual deaf students need to be able to retell written English word problems in ASL. This in turn could help influence the students' ability to retell their ASL signed word problems in written

English form. These two skills are closely interwoven with each other as parts of different kinds of knowledge as suggested in the study by Chen and Brenner (1998). This study along with the three others above serve as the research foundation underlying the creation and implementation of the curriculum I described.

After obtaining general information about research and practices that dealt with teaching and learning of mathematical word problems with deaf and hearing learners, an attempt was made to narrow my search to focus on bilingual practices. I was unable to turn up any existing materials and curricula related to teaching deaf bilingual students with varying levels of fluency in ASL and English.

Based on the students' need for acquisition and mastery of English literacy skills and mathematical word problem solving skills, the next step was to decide on which learning issues and theories I would use to construct the curriculum. After reviewing research, I identified several key learning theories. Four key theories were selected and used to form the foundation of the curriculum: multiple intelligences, cross-curricular learning, authentic learning and comprehensible input.

V.   Key Learning Theories and its Relevant Research

It is well known that people, especially students in schools, do not all learn in the same way; how they learn depends on their individual cultural and social upbringings (National Research Council, 2000; Siegler, 1998). Thus, it is important to develop a culturally and linguistically sensitive curriculum that provides a wide variety of learning activities designed to support the learners' diversified learning approaches thus maximizing their learning and understanding.

My curriculum was based on four key learning theories, which serve as a foundation for the learning activities provided within the curriculum. These four learning theories are multiple intelligences, cross-curricular learning, authentic learning and comprehensible input, each of which is covered in detail in the subsequent paragraphs.

Gardner defined intelligence as "the capacity to solve problems or to fashion products that are valued in one or more cultural settings" (Gardner, 1983; Gardner & Hatch, 1989). Being intelligent means to have an ability to "solve problems" or to "fashion products" that are of consequential importance in a given cultural setting. According to Gardner (1983, 1987, 1991), there are seven intelligences in which culture plays a large role: linguistic, logical-mathematical, spatial, musical, bodily-kinesthetic, interpersonal and intrapersonal. Labeling of each of the seven intelligences does not necessarily mean that individuals can solely rely on any one of their intelligences to solve a certain problem or to create a particular product that is of value to a given culture. It requires a combination of two or more intelligences to be

able to do such things. Gardner acknowledged that we do not develop and use intelligence in vacuum, and that his theory of multiple intelligences does not account for cultural differences. Regardless of its limitations, Gardner's intelligences enables the teachers to identify and categorize students' strengths and weaknesses and their learning needs, and work around them accordingly creating different ways for them to learn and master a given concept or skill successfully.

The cross-curricular curriculum in this thesis engages the multiple intelligences (Gardner, 1983, 1987, 1991; Gardner & Hatch, 1989) by providing a variety of learning activities across academic content areas that support students' individual strengths. This helps the students make connections between the concepts and skills found across different content areas. The curriculum also works with their weaknesses and "multiple entry points" to enhance their understanding of a given mathematics or English concept or skill they are learning.

In early twentieth century, Dewey (1938) emphasized the importance of the connectedness between various learning experiences. He maintained that we base our learning of new concepts and skills on existing experience and make connections between them. Numerous research studies showed that new learning and understanding depended upon previous, relevant learning experiences (National Research Council, 2000; Siegler, 1998). Without making connections among the core subject areas, understanding unconnected topics and memorizing isolated facts from across the core subject areas would become more difficult. Damian (2004,) found that when students immerse themselves in learning, they recognize and make connections between various subject areas. She added stating that the "students who have cross-

curricular learning experiences are better prepared for standardized tests--and for life!" (p. 1).

Since the development of skills and knowledge in any given content area is often related to learning in other areas, the curriculum in this thesis provide cross-curricular learning activities coordinating the teaching and learning of given contents related in two subject areas, mathematics and English.

My curriculum also makes these activities authentic. Authentic learning is the process or experience of gaining knowledge or skill that is significant and meaningful. By making curriculum activities authentic, students get chances to improve their learning and understanding through instruction that let them connect the given concepts being taught to the real world. Like cross-curricular learning, authentic learning is an exciting and worthwhile learning experience for students offering them unlimited possibilities to learn and understand a given concept, whether it is in mathematics or English.

Newmann and Wehlage (1993) set forth five standards for authentic learning: higher-order thinking, depth of knowledge, connectedness to the world beyond the classroom, substantive conversation, and social support for student achievement. These five areas are essential to authentic learning.

Higher-order thinking "requires students to manipulate information and ideas in ways that transform their meaning and implications" (Newmann & Wehlage, 1993, p. 1). It allows students to discover new meanings and understandings in their learning of given concepts. Depth of knowledge considers the level of knowledge "shallow" to "deep." Having "deep" knowledge allows students to "make clear distinctions,

develop arguments, solve problems, construct explanations, and otherwise work with relatively complex understandings" (p. 1), whereas having "shallow" knowledge does not. As for connectedness to the world, the more learning a given concept connects to the real world beyond the school in which students reside, the more authentic this concept becomes. Having substantive conversations creates discourse in which a given concept is being talked about and enables students to learn more about that concept. The three equally important features of substantive conversation include interaction and sharing of the ideas about a given concept, and dialogue that build articulately on those ideas to encourage improved collective understanding of a given concept.

Finally, social support for student achievement is necessary in authentic instruction, as it requires high expectations, respect and inclusion of all students in the learning process. Should any aspect of that social support be lacking, it gets harder for students to learn given concepts. These five standards of authentic learning set forth by Newmann and Wehlage (1993) provide a framework for instruction through the generation and presentation of materials within this curriculum.

Because of the bilingual nature of the approach to teaching and learning of deaf students in this curriculum, comprehensible input (covered in detail in Section II) plays a huge role in this curriculum. Krashen's comprehensible input theory (Krashen, 1982) was derived from Vygotsky's concept of the Zone of Proximal Development (Vygotsky, 1978).

Vygotsky (1978) defines the zone of proximal development where learning occurs as: "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined

through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). What this means for comprehensible input is the learner requires guidance of someone "capable," in this case a teacher implementing this curriculum, to provide input that is comprehensible to that learner based on the learner's actual development and potential development levels. According to Krashen, "we move from i, our current level, to $i + 1$, the next level along the natural order, by understanding input containing $i + 1$;" He continues, "We are able to understand language containing unacquired grammar with the help of context, which includes extra-linguistic information, our knowledge of the world, and previously acquired linguistic competence" (Krashen, 1985, p. 2). The abbreviations i and $+1$ represents input at learner's current level of linguistic proficiency and the challenging level that is bit beyond the learner's current level of proficiency, respectively (Krashen, 1982). While identifying i and $i + 1$ in any child can be problematic, one must develop an intuition for appropriate input for a child knowing how to give that input in a way that is understood.

The main implication of the input hypothesis for my curriculum is that only the "capable" teachers with sophisticated target language skills need to provide a comprehensible input in the target language when implementing this curriculum. Cross-curricular and authentic learning of specific concepts and skills from this curriculum rely on the comprehensible input. Without it, this curriculum would be rendered useless, as everything in it will truly be incomprehensible to the deaf learners, regardless of the innovative nature of teaching and learning in this curriculum.

Through the application of Gardner's multiple intelligences theory, my curriculum provides "multiple entry points" for students to learn and understand a given concept using a combination of some, or all, of their intelligences. Again, recognizing and applying the multiple intelligences theory, the cross-curricular nature of this curriculum give students ways to understand a given concept in not only one discipline, but through multiple disciplines. This curriculum provides ways for students to learn and connect a given concept to the real world to make their learning more meaningful. And applying Krashen's comprehensible input theory to the curriculum involves designing the information in the curriculum, which will be presented in the target language, to be not only comprehensible, but also contain structures that challenge the students' current level of understanding, thus giving opportunities to those students to reach that next level.

VI.   Curriculum Framework

In this curriculum, "Telling, Writing and Reading Number Tales in ASL and English Academic Languages: Acquisition and Maintenance of Mathematical Word Problem Solving Skills," the framework of the units and lessons were structured to allow teachers to use the materials quickly with ease. This curriculum enables teachers to help students acquire and maintain the necessary skills to understand and solve mathematical word problems. This mainly is done through student creation of their own tales that incorporate numbers in both ASL and English.

This curriculum can be found in Appendix A. It consists of three units of lessons, and in each unit, there are five lessons. There are fifteen lessons altogether in the curriculum. For each lesson plan in any given unit, there is a specific objective and aligned with the New Mexico content standards (where the curriculum was evaluated), and could be easily modified to align with any state standards or frameworks. The guide for teacher implementation mainly consists of Motivation, Procedure and Closure sections in each of the lesson plans. An assessment section at the top of each lesson plan helps teacher measure the students' knowledge during and after implementation of each lesson plan.

There are four curriculum goals for this curriculum. The goals are:

1. *To use students' prior knowledge and daily experiences to connect with number tales demonstrating how mathematics is involved in their everyday lives.*

2. *To help students develop strategies and tools to use for reading and solving word problems.*

3. *To develop and increase students' metalinguistic awareness of both ASL and English through telling and comparing of ASL and English versions of stories incorporating numbers.*

4. *To develop students' mathematical language (or "math talk") in both ASL and English.*

Before implementation of the curriculum, the first step to take is to administer both mathematical word problem survey and pretest. The survey and pretest helped to determine the students' views regarding word problems, and to assess their cumulative knowledge, skills and tools they use for understanding and solving word problems. At the end of the curriculum, students take the same survey and posttest to show if their views have changed, and what knowledge, skills and tools they have acquired because of the implementation of this curriculum.

The first unit of this curriculum focuses on cooperative skills needed for partner and whole group settings. These cooperative skills are prerequisite for a successful implementation of the curriculum. Students practice working together as they learn to (1) compare tales to word problems, (2) plan and create ASL tales that incorporate numbers, (3) give and receive feedback and suggestions on ASL tales, and (4) revise ASL tales based on the given feedback and suggestions. Throughout the first unit, students work together to come up with individual ASL tales that incorporate numbers based on their real life experience. During the planning and creation of number tales, students learn (1) how to think critically, (2) know appropriate word (or

sign) choice used in the given tale, and (3) how to evaluate their number tales as well as others'. Teacher and student creation of the ASL tales are videotaped. ASL videotaped tales are later used to support the students in the writing of their English version.

The second unit of this curriculum mainly focuses on reading and solving word problems based on their prior knowledge and experience. In this unit, students learn necessary mathematical concepts develop number sense. Word problem solving tools and strategies to read and solve English word problems are also emphasized. A variety of number tales, and how they are related to each other, will also be discussed along the way. These tales will be connected to students' everyday lives through their prior knowledge and experience. Additionally, they learn to use, manipulate and write out arithmetic sentences complete with both mathematical symbols and numerical symbols that represent these addition and subtraction-based number tales.

In the third unit of this curriculum, students revisit their ASL videotaped tales and retell them in English. Students compare both ASL and English versions of number tales, and discuss similarities and differences. These discussions result in the development of metalinguistic awareness of both ASL and English in students. In addition, the students also discuss what makes a good English number tale, plan and write retelling the English versions of their ASL tales, and edit their English writings. In the end, students produce an ASL and English number tales cumulative project, which include both videotape of students' ASL number tale creations, and their written English versions of their ASL creations accompanied by their drawings.

Throughout the three units of this curriculum, students develop their ASL and English mathematical language (or "math talk") by learning key mathematical vocabulary words and phrases throughout the curriculum. Many of the lessons spread throughout the last two units of this curriculum have a mini-lesson focusing on a tool, strategy or word problem solving skill students need to solve a given word problem. Additionally, students learn mathematical symbols and its associations with key words and phrases above. Through the number tales, they learn and understand key mathematical concepts, e.g. addition and subtraction.

VII. Curriculum Implementation

Description of Field-Test Site

During Spring 2005, I field-tested the curriculum during a student teaching practicum in the fourth grade classroom consisting of six deaf and hard of hearing students. I was placed at a state residential school for the deaf where most of the staff was deaf. This school was known for its innovative ASL-English bilingual approach to educating deaf and hard of hearing students. One of the students was a third grader while the other five students were fourth graders. Out of six students, there were four girls and two boys. The one student in this classroom was Caucasian, and rest of the students were either of Hispanic or Native American descendent, or both. All were fluent ASL signers, and half of them came from Deaf families that used ASL as the main mode of communication. The other students had hearing families whose immediate family members (mainly, parents and siblings of the student) signed well enough to communicate on an everyday basis.

The cooperating fourth grade teacher was also Deaf with native fluency in ASL. All six students stayed in this classroom for fourth grade lessons: Morning Meeting, Literacy Center, Accelerated Reader, Sign Aloud, Writer's Workshop, Science and Social Studies. The school structured mathematics classes according to each student's cognitive level. Hence, my cooperating teacher retained two of her fourth graders students while receiving two fifth-grade students from another classroom. For mathematics, she taught third grade curriculum to those four students. The classroom itself was an English print-rich environment consisting of word walls,

labels and other information on the walls. English-print children books, dictionaries and other reading materials were all over the classroom, mainly on the shelves.

The curriculum implementation was conducted in this classroom during mathematics period. Within the classroom, there were a wide range of manipulatives and other materials. Many of the students relied on their fingers to do mathematical computations while others could perform the same computations in their head. Some students effortlessly computed big numbers over ten in their head while others became overwhelmed when computing larger numbers. Some students required more simplistic and explicit instruction than others in order to comprehend the given mathematical concepts.

Individual Student Notes

Presented below were the descriptions of the four students to help provide the readers with a full picture of what the students were like in the classroom during the implementation of the curriculum.

Student #1 was able to comprehend all new mathematics lessons only with a great deal of teacher guidance. At first, she would show the class how she came up with an answer to a given problem if asked. As the student became comfortable and confident, she voluntarily showed us how she solved the problem. She solved the problems primarily using her hands. She understood multiplication concepts, but she had not memorized the basic multiplication facts. As for the word problems, she often was eager to solve any given word problem independently. Sometimes she solved the

problem incorrectly because she misunderstood the English. If someone signed the English word problem to her in ASL, she would solve the problem accurately.

Student #2 did exceptionably well learning new mathematical concepts. She could explain her computation process in given multiplication problems. In explaining her computation process, she could show how she used a variety of strategies such as using her hands, papers, or manipulatives. She had some difficulty reading directions and word problems. To understand these English texts, she needed someone to sign it to her in ASL.

Student #3 was able to follow through many lessons with teacher guidance. Frequently, she could do mathematical problems easily on most days, but, on the other days, she struggled with the similar mathematical problems even though she was able to do them before. When she struggled with mathematical problems, she would become frustrated. On other days, she would solve the problems easily, demonstrating confidence in doing these problems. She sometimes worked slowly and carefully at her own pace to solve problems and double-checked them. She loved receiving math homework. Because of her level of reading, word problems continued to be a challenge for her.

Student #4 had proven ability to acquire and learn new mathematical concepts. He was able to show the concept of multiplication and how it worked when asked. If he were not reminded to work on given problems carefully, he would rush through problems making careless mistakes. He often appeared to be frustrated whenever he was asked to redo the mistakes. He also had a habit of "forgetting" to do his homework. He used his hands as a counting tool. He was occasionally encouraged to try a different strategy (e.g., adding up numbers on a scrap of paper instead of using his fingers to reduce the mistakes), but he still preferred to use his hands as a counting tool over any strategy suggested to

him. For student #4, reading English word problems independently was still a difficulty for him, unless someone signed them to him.

The Implementation

Friday, April 15, 2005 – Unit 1, Lesson #1

I began the first lesson in the first unit by writing on the chalkboard "Telling, Reading and Writing Number Tales." I announced to the students that we would begin a fun and exciting mathematics unit. I pointed to what I wrote on the chalkboard and referred to it as the title of the unit. I asked students what they thought the title of the curriculum meant and what they might be doing later. Student # 3 raised her hand and stated, "I think that we will be working with stories that have numbers in it." No one raised his or her hand when I asked for another opinion. I then asked if anyone agreed with Student #3's comment, and they signed, at the same time, that they agreed. I told them that we would be working with many different number tales in both languages: ASL and English. I then asked them exactly what we would be doing with the number tales; and no one offered an answer. I then offered a hint by pointing to each of the three action verbs in the title. All of them immediately raised their hands. I called on single students and had them offer their answers. They all indicated that we would read and write many different tales as well as signing them in ASL. I asked them if these two languages are related to each other. Only student #3 said yes while others said no. Student #3 offered an explanation when I asked her why she said yes. In her explanation, student #3 said that we use both ASL and English for communication.

Student #2 then raised her hand and said that ASL was for signing and English was for speaking, reading and writing.

I explained to the students that they would be creating a cumulative project. The cumulative project would be in the form of a mathematics class book filled with student-created English number tales. This project would also include videotape containing their student-produced ASL versions of their written English number tales.

I then moved on to ask them questions about cookies including whether they liked cookies or not and then discussed their answers (see Unit 1, Lesson #1 for sample questions which I asked in class today). I then showed them my bag of Oreo cookies, and told them that I wanted to share this bag of cookies with everybody in class. We discussed and agreed on evenly distributing the cookies among six people in the classroom: four students and two teachers. I then told them that I would be creating and signing a number tale involving my bag of cookies. After doing so, I re-told the same tale in English writing on the board (Figure 7.1).
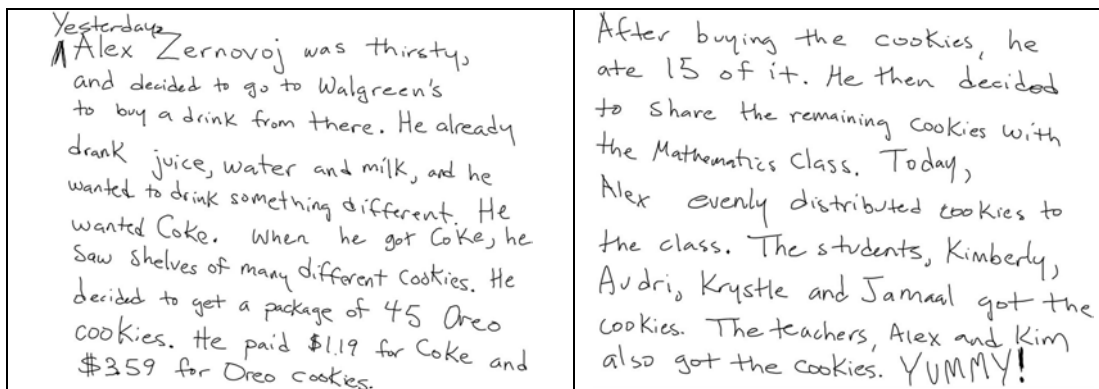

Yesterday, Alex Zernovoj was thirsty, and decided to go to Walgreen's to buy a drink from there. He already drank juice, water and milk, and he wanted to drink something different. He wanted Coke. When he got Coke, he saw shelves of many different cookies. He decided to get a package of 45 Oreo cookies. He paid $1.19 for Coke and $3.59 for Oreo cookies.

After buying the cookies, he ate 15 of it. He then decided to share the remaining cookies with the Mathematics Class. Today, Alex evenly distributed cookies to the class. The students, Kimberly, Audri, Krystle and Jamaal got the cookies. The teachers, Alex and Kim also got the cookies. YUMMY!

Figure 7.1. **The "Oreo cookies" Tale**

I asked them if this was a close English representation of my ASL tale, and they all said yes. I told the students that they would be doing exactly the same task over the

duration of this curriculum. I asked the students if they felt that they were able to understand the "Oreo cookies" tale because of their prior experience with Oreo cookies. I explained what "prior experience" meant by providing an example. I stated that it meant having experience of seeing and eating cookies. In addition, I also asked if they understood the mathematical concepts behind the story (subtraction & division). All said yes because it, in their words, "helped them understand the number tale easier." Student #2 added that if she had not seen or eaten cookies before, then she would not have understood the "Oreo cookies" tale. I asked if this number tale is relevant in their real world experience. They all said yes. I asked if mathematics is connected to many things in their lives. Three students said sometimes and one said always. After they gave their answers, I asked if it helped to use their prior real world knowledge and experience to connect with number tales in addition to understand how mathematics is involved in their everyday lives. They all said sometimes yes. I asked why "sometimes" and no one offered an answer.

After the "Oreo cookies" number tale and discussion that followed, time ran out before I was able to administer both the word problem survey and the word problem pretest, but I waited until the next time we met to administer them.

Tuesday, April 19, 2005 – Unit 1, Lesson #1 continued, and Unit 1, Lesson #2

I administered the *Word Problem Survey* and the *Word Problem Pretest*. I signed the survey in ASL and explained what each question required the students to do. Upon the completion of the *Word Problem Survey*, I administered the *Word Problem Pretest*. I did not sign the pretest to the students, as I knew that signing the pretests to them in ASL would influence their scores. I only wanted the results to fully

reflect their ability to read and solve English word problems. I left the students on their own to try their best to independently read and answer the questions on the pretest. I told them that I wanted them to take their time and to do their best, as I would administer this again at the end of the curriculum to compare how much they improved from the beginning.

After administering the survey and the pretest, I chose to skip the rest of the first lesson of Unit 1 (the *Working Together* mini-lesson and the *Student Interview* activity) after I learned that the students have had considerable experience working together and all had been doing a good job over the course of the school year. I confirmed their ability to work together after observing their previous mathematics activities before the implementation of this curriculum. I immediately moved on to the next lesson (Unit 1, Lesson #2). Note, I did not administer Unit 1, Lesson #1 rubric because it focused on working together, which I skipped.

I showed students the "Oreo Cookies" number tale created from the previous lesson. They all remembered the tale, and they each were able to summarize what happened in that tale. I added a few mathematical questions at the end of that tale and asked them to solve them (Figure 7.2). They all were able to solve these questions.

Figure 7.2. **Questions for the "Oreo cookies" Tale**

I then showed the students the Word Problems K-W-L chart (Figure 7.3). I explained to them what we would put on the chart. I asked the students what they know and want to know about the word problems. I listed students' comments on the chart. I told them that we would revisit the chart later at the end of the curriculum to list what they learned from this curriculum.

Figure 7.3. **K-W-L chart for Word Problems**

I proceeded to tell them that we would be comparing tales and word problems defining the similarities and differences between the two. I presented "Tales versus Word Problems" in a Venn diagram and told the students that we would be using it to compare tales and word problems (Figure 7.4).
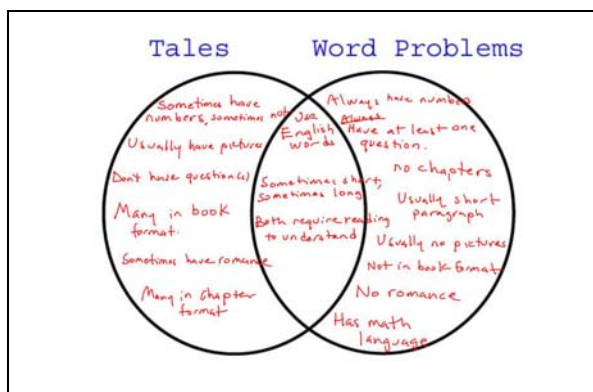

Figure 7.4. **Venn Diagram of Tales and Word Problems**

I asked them to think of the of first thing that came to mind about how word problems are the same and/or different from tales. No one had a clue! I decided to help by asking the class this: "What is it that you see in every single word problem? It is one of several things that the word problems all have in common." Student #2 raised her hand and said that word problems all have numbers. I told her that she was right and wrote her comment in the right circle of the Venn diagram (Word Problems area). I then asked if tales always have numbers. Students all said not all, but some. I immediately wrote that answer in the left circle (Tales area). After students began to get the idea, I paired students with their partners and asked them to think about and list the similarities and differences between tales and word problems in their Venn diagrams. I gave one book and a word problem to each group and told them they could peruse the book to get some ideas so that they could identify more similarities and differences.

During partner activity, I noticed that they put down some irrelevant comments, e.g. "This tale has rabbits in it and this word problem don't." I had to stop the activity and clarify that I was not asking them to compare what was in the tale they were given to the given word problem. I also said that I was not interested in knowing what each of the tales and word problems were about because I was interested to find out how general tales and word problems were same and different. I gave each group ten additional books that I randomly selected from the classroom library. I also gave them 10 additional word problems. After they began to understand how they were supposed to compare tales to word problems as a whole, I again excused them to do their partner activity. They did exactly what I wanted them to do. After the partner work activity, I regrouped the class and discussed together the similarities and

differences between tales and word problems. I listed them on the "Tales versus Word Problems" Venn diagram. Time ran out before I could finish the second lesson, so I chose to wait until we met again to finish the lesson.

Wednesday, April 20, 2005 – Unit 1, Lesson #2 continued, and Unit 1, Lesson #3

We began class by reviewing the Venn diagram. After the review, I showed them "What makes a tale good?" poster and then asked them what makes a tale good (Figure 7.5).
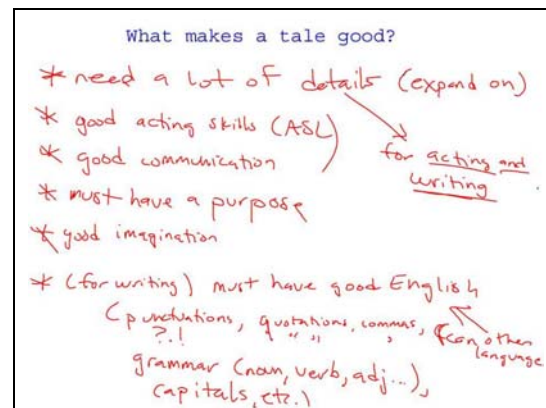
Figure 7.5. **"What makes a tale good?" Poster**

Students did not have any answers for my question at first, but after a few reminders, they were able to brainstorm and offer some ideas about what makes a tale good. I told them a vague story lacking any details about a person. I told them that person was very cool and that what that person did was very awesome. I asked them if it made any sense. They all said no. I then asked them if it was a good or bad story. They all said that it was a bad story. They knew it was a bad story because they said it did not have enough details, particularly with who and what. I then told them another story; this time including some details about that person, who he was and why that person was cool in addition to describing what actions that person did that I thought was

awesome. I asked them if it was a good story. They all said yes because it had plenty of details. After this example, they were able to start brainstorming some ideas about what makes a tale good. I wrote their ideas on the poster as shown in Figure 7.5.

After doing so, I introduced students to the mathematics word wall. I told them that for every English word used in mathematics that we encountered, we would list that word and its meaning on the word wall. I asked students why it is a good idea to have a word wall. Student #1 raised her hand, and said that each time they forgot the meaning of the word; they were able to look at the word wall to find out. I asked students if we could use the word wall to help us work with and solve word problems easier. One person answered, "maybe," and did not offer an explanation why.

To wrap up this lesson, I administered the *Unit 1, Lesson 2 Student Performance Rubric for Students* sheet. I read it aloud in ASL and explained what each part meant to the students as they fill it out one step at a time. Like this rubric, all of the rubrics were administered at the end of every lesson from this lesson to the end of the curriculum, unless otherwise indicated. There were two separate sets of rubrics, one for teacher use and one for student use. These two sets provided a complete picture of the student progress during the teaching and learning activities. A comparison between the teacher rating and the student rating indicated when there was a difference between the ratings, which further helped to monitor the student progress.

After administering the rubrics, I analyzed the rubrics and found that nearly all of the students gave themselves high marks as displayed in Table 7.1. Half of the students rated themselves as being "excellent" (four points) and the other half as "good" (three points) in their knowledge of how each tale was similar or different

from the word problem. Most of them rated themselves as "excellent" (four points) in their ability to explain the relationship between each tale and the word problem. This was also true for their ability to explain what makes a good tale. Table 7.1 was corroborated by the data from the *Student Performance Rubrics for Teacher* for Unit 1, Lesson 2 (Table 7.2).

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I know how each tale is similar or different from the word problem.	Student #2 Student #4	Student #1 Student #3		
I can explain how each tale is related to the word problem.	Student #2 Student #3 Student #4		Student #1	
I can explain what makes a good tale.	Student #2 Student #4	Student #3	Student #1	

Table 7.1: Unit 1, Lesson 2 *Comparing Tales to Word Problems* **Student Performance Rubric for Students**

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Explain the relationship between tales and word problems.		Student #2 Student #3	Student #4	Student #1
Explain what makes a good tale.		Student #2 Student #3 Student #4	Student #1	

Table 7.2: Unit 1, Lesson 2 *Comparing Tales to Word Problems* **Student Performance Rubric for Teacher**

Instead of being rated "excellent" (four points) as the students thought of themselves, most of them were rated "good" (three points) in both their ability to explain both the relationship between tales and word problems, and what makes a good tale. Looking at Tables 7.1 and 7.2, it is evident that the data in Table 7.2 generally is one point lower

than the data in Table 7.1. Tables 7.1 and 7.2 shows that most of the students have a good sense of the relationship between tales and word problems in addition to what makes a good tale because of their rating of "good" or better.

After completing the second lesson, I realized that I had plenty of time left, so I immediately moved on to the next lesson (Unit 1, Lesson #3). I asked students what helped them to plan and create a story. They again did not have any answers for my question. I provided an idea for planning: the four squares method. They knew what it was as they have already experienced using it in the past. Students immediately begun to have some ideas, and they then offered these ideas. I listed these ideas on the board as shown in Figure 7.6.
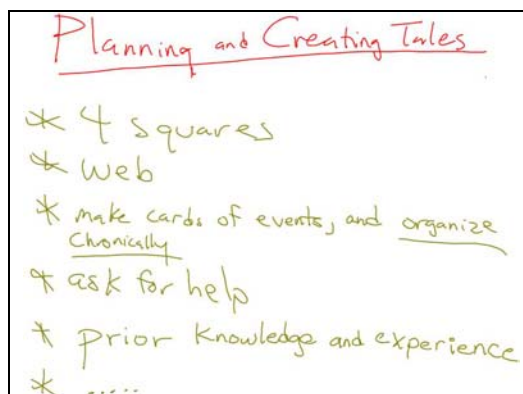

Figure 7.6. **"Planning and Creating Tales Strategies" Poster**

The ideas I listed on the board include: using web diagram, making and organizing cards each containing an event in a chronicle order of events, and asking for help. I told them that I was going to create a tale and that I would use the four squares to model the planning and creation of that tale. I asked for their ideas for a topic, and the ideas they offered were dogs, pizza, Doritos and noodle. We selected pizza as the topic of my tale. I then drew four squares on the board and modeled

thinking aloud for my story. Figure 7.7 shows my teacher-created four squares creation.
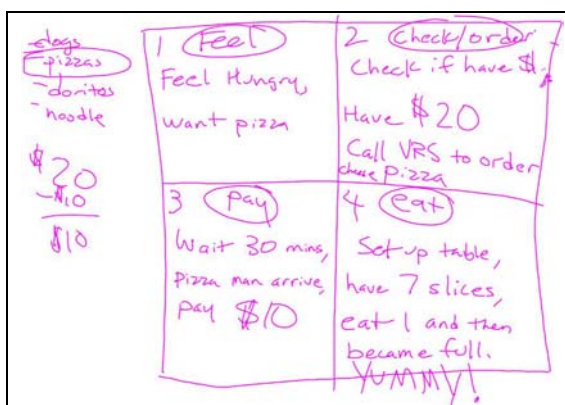

Figure 7.7. **Planning of the "Pizza" Tale using the Four Squares**

After planning and creation of my Pizza tale, I reviewed my plans and modeled the story signing it in ASL. I asked if the story was clear, and students said yes. We then discussed the idea of adding a question to make it a word problem. One student was able to solve the problem of "How much money do I have left?" I asked them to work as partners, but each person had to write their own story. They could ask their partner for help.

I decided to save this lesson's *Using Prior Knowledge and Experience in Tales* mini-lesson for the next day because I wanted them to be engaged in doing math rather than listening to me for the entire mathematic class period.

After students started planning their stories, all of the students were nearly finished when time ran out. I told them that they could finish planning on Friday.

Friday, April 22, 2005 – Unit 1, Lesson #3 continued

Before I let students continue planning their tales, I initiated *Using Prior Knowledge and Experience in Tales* mini-lesson in Unit 1, Lesson #3 by asking

students how they learn new things. Student #4 said that we learn through reading and writing in classes. I told him that is correct, but there is more. No one answered when I asked for additional examples. I then said that we always are learning all the time inside and outside of school. I gave them an example. I asked them if they all knew how to use calculators. They all said yes. I asked them if they could figure out how to use a given new upgraded calculator, designed in a different way with so many new fancy features, which they have not seen before. They all said yes. I asked why? Student #2 said it is because they learned how to use a basic calculator and they could use a variety of calculators. I then explained that the ability to use an upgraded calculator is possible due to their prior knowledge and experience and their ability to learn new things.

After the calculator example, I asked the students for a different example of using prior knowledge and experience. No one offered an example, so I gave an example of a recent story I told in ASL (ASL storytelling period). I said, "Suppose I started talking about a horse and a cowboy, and the cowboy got on that horse and rode it." I then asked them if they knew what horses looked like and how people ride them. Student #3 said yes because she had seen both horses and horse riding in person. Student #4 said he had also seen cowboys riding horses on television and begun to talk about the plot on the western show, which he watched on the television. I had to tell him that he can tell us more about the plot later, and redirected the students to focus on using prior knowledge and experience to learn new things. I asked them if the cowboy riding the horse situation I just described to them was a good example of using their prior knowledge and experience to learn new things. They all said yes. Student #1

raised her hand and said that we all use prior knowledge and experience to understand mathematical concepts everyday. Upon her saying this, I took the opportunity to ask the students if doing that helped them connect with number tales. They all said yes. I asked them if it also helped them see how mathematics is involved in their everyday lives. They all said yes. Student #2 raised her hand and said that when she read number tales, she could understand them because they are based on real life experiences. I told her that was exactly right and asked if anybody agreed or disagreed with her. They all said they agreed. After they agreed, I asked them if using their prior knowledge and experience helped them to see how mathematics is involved in their everyday lives. Student #4 said yes and raised his hand and said that whenever he buys something, mathematics is involved because he has to count, adding or subtracting, his money to buy something. I asked the class if they have same experience as student #4. They all said yes.

I moved on to another point of using prior experience and knowledge to create number tales; I then asked about my "Oreo cookies" tale. I asked them if there is mathematics involved in it, they all said yes. I also asked them if I used my prior experience and knowledge to make this tale. They all answered signing yes. After I asked them how, student #4 raised his hand and said that because I bought and ate some cookies, I used that experience to write a tale about the experience. I told the class that student #4 was correct, and I added that was another good planning strategy to plan and create a number tale. I added "using prior knowledge and experience" to the "Planning and Creating Tales Strategies" poster (Figure 7.6). I told them to try to use their prior knowledge and experience to plan and create their tales and excused them to continue planning their stories.

Ten minutes later, students finished planning their story, and the mathematics class time was spent on my video recording all of the students' signed tales. Other students who were waiting their turn to be recorded were practicing signing their story to each other. During the recording of the students' tales, I noticed several things in students' signing of their number tales that needed to be improved. Student #1 was signing her number tale word for word in English word order. Student #2 signed her number tale in English word order incorporating in her ASL several SEE (Signing Exact English, a signed "language" with no relation to ASL) signs like "I" and "IS." Student #2 also were fingerspelling some of the English words that were not needed in ASL, such as "was" and "the." Student #3 were signing her number tale more in English word order than in ASL word order. Student #4 was signing his number tale in a very ASL manner, but he forgot to set the topic sign before referring to it when he used the spatial signs. I made note of these observations and planned to provide feedback to the students during the revision process in the next lesson.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I have a clear plan for creating my number tale.	Student #1 Student #2 Student #4	Student #3		
I can explain how I plan and create my number tale.	Student #2 Student #4	Student #1 Student #3		
I can use my prior knowledge to make my number tale and to connect to any number tale I read. I can see how mathematics is involved in my everyday life.		Student #1 Student #2 Student #3 Student #4		

Table 7.3: Unit 1, Lesson 3 *Planning and Creating ASL Tales* **Student Performance Rubric for Students**

Table 7.3 shows that all, but one, of the students rated themselves as "excellent" (four points) in having a clear plan for creating their own number tale. Half of the students rated themselves as "excellent" (four points) and the other half as "good" (three points) when asked whether they could explain how they planned and created their tale. All four students viewed themselves as "good" (three points) in their ability to use prior knowledge to make their number tale and to connect to any number tale they read.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Develop and explain a clear plan for creating an ASL number tale		Student #2 Student #3 Student #4	Student #1	
Make full use of prior knowledge to create number tales as well as to connect to number tales. Explain math's involvement in everyday lives.			Student #1 Student #2 Student #3 Student #4	

Table 7.4: Unit 1, Lesson 3 *Planning and Creating ASL Tales* **Student Performance Rubric for Teacher**

The data from Table 7.4 showed that the students were rated either "good" (three points) or "okay" (two points) in each category, but never were rated "excellent" (four points). All, but Student #1, were rated "good" (three points) in their ability to develop and explain a clear plan for creating an ASL number tale. Unlike other students who were rated "good" (three points), Student #1 was rated "okay" (two points) in her ability to develop and explain a clear plan. As for the use of prior knowledge to create number tales as well as to connect to number tales in Table 7.4, all students were rated "okay" (two points). Comparing Table 7.4 to Table 7.3, the scores assigned to each student by the teacher clearly was generally one scale point

below the students' self-assigned scores indicating that the teacher and the students differed on their opinions of how the students performed. The students had a higher opinion of themselves than the teacher did of them in this lesson.

Monday, April 25, 2005 – Unit 1, Lesson #4

I skipped most parts of the motivation, which focused on working together to give and receive feedback and suggestions well. We discussed how to give and receive good feedback and suggestions with no hurtful criticisms. Student #1 said that we needed to be nice to each other to share good feedback and suggestions.

I moved on to review "What makes a good tale?" poster (Figure 7.5), with the students and then showed them a videotape of my signed teacher-created "Pizza" tale. They all said it was very good and did not offer any feedbacks or suggestions. I told them to try harder this time looking more closely at my "Pizza" tale. After doing so, student #1 raised her hand and said that I was signing too fast. Student #2 next raised her hand and said that I was rocking my chair too much when I was signing, so I should sit up straight or stand up straight when I sign the tale. I asked them what about my ASL tale itself. They all said it was very good and that it did not need any changes. I played my "Pizza" tale again and stopped at the point where I said I was "thirsty" and wanted to eat pizza. I asked them if it was the right sign if I wanted to eat something. Student #4 immediately raised his hand and said that I should say I want to drink something if I was thirsty. I then asked the students what if I want to keep the story about ordering and eating pizza, and asked them how I could change that sign. Student #3 raised her hand and said that I should say I was "hungry" instead of "thirsty." I thanked her for the good feedback, and asked the students for more

feedback as I once more played the video again. Other students caught other things on the video that I needed to improve on. For instances, they said I need to be more explicit on how I set up the table instead of just saying I set up the table to eat the pizza, and ordering one pizza of even slices instead of seven slices as it is mathematically impossible since slicing a pizza always come out even.

I thanked the students for the feedback and suggestions and told them that I will fix my number tale and show the revised version to them tomorrow. I presented the "Giving Feedback and Suggestions" poster to the students and discussed it with them (Figure 7.8). After completing the chart, I told the students to keep the suggested ideas that were compiled on the list in mind when they begin giving feedback and suggestions to their partners. I excused them to begin partner activities. Time ran out when they were in the middle of their partner activities. I told them that we would finish up tomorrow.

Figure 7.8. **"Giving Feedback and Suggestions" Poster**

Tuesday, April 26, 2005 – Unit 1, Lesson #4 continued

After the students finished giving feedback and suggestions to each other, I told the students that they would begin revising their tales tomorrow, and dismissed them.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I give helpful feedback and useful suggestions to my partner	Student #2 Student #4	Student #1 Student #3		
My feedback and suggestions are dignified and given in a nice way.	Student #2 Student #3 Student #4	Student #1		
I can use my prior knowledge to make my number tale and to connect to any number tale I read. I can see how mathematics is involved in my everyday life.	Student #3 Student #4	Student #1 Student #2		

Table 7.5: Unit 1, Lesson 4 *Giving Feedback on ASL Tales* Student Performance Rubric for Students

After Unit 1, Lesson 4 were implemented, Table 7.5 shows the tabulated data from the student performance rubrics that students completed today. Students viewed themselves as either being "excellent" (four points) or "good" (three points) in their ability to give helpful feedback and useful suggestions to their partner. Just about all of the students thought that they did an "excellent" job (four points) in giving feedback and suggestions, both of which were dignified and given in a nice way.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Provide constructive and dignified feedback and useful suggestions.		Student #1 Student #2 Student #3 Student #4		
Accept feedback from partner willingly.	Student #2 Student #3	Student #1 Student #4		
Make full use of prior knowledge to create number tales as well as to connect to number tales. Explain math's involvement in everyday lives.	Student #2 Student #3	Student #1 Student #4		

Table 7.6: Unit 1, Lesson 4 *Giving Feedback on ASL Tales* Student Performance Rubric for Teacher

The data from Table 7.6 for the most part, corresponds to the data in Table 7.5. Approximately half of the scores given by the teacher for the students in Table 7.5 were the same as the scores the students gave for themselves. The rest of the scores given by the teacher was generally one scale point below the scores given by the students in the area of feedback and useful suggestions. Comparing Tables 7.3 and 7.4 and Tables 7.5 and 7.6, there was a one-scale improvement in the scores given for students' use of prior knowledge. Instead of viewing themselves as being "okay" (two points), half of the students now viewed themselves as being "good" (three points) in their use of their prior knowledge, while the view of the other half remained the same. Instead of the teacher-assigned "okay" (two points) rating for all four students for their prior knowledge use, half of the students were rated "excellent" (four points) and the other half "good" (three points). In other words, these tables showed, based on the rubrics with optimistic ratings, the students seemed to be improving in their use of the prior experience.

Wednesday, April 27, 2005 – Unit 1, Lesson #5

I opened the lesson by asking students what was the next step after they gave and received feedback and suggestions from each other. Student #3 raised her hand and said that the next step is to begin revising their tales. I asked them why we should always revise our tales. Student #2 said the reason for revisions is to improve tales. I then asked how revisions could improve the tales. No one offered an answer, so I listed some of the reasons for revisions on the board (Figure 7.9). Note that these reasons were the same as listed in the lesson plan.
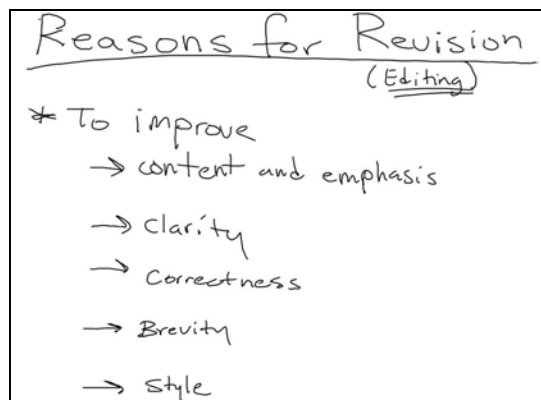
Figure 7.9. **"Reasons for Editing" Poster**

Before I excused the students to begin revising their tales, by planning and then creating their tales again, I showed them a video of my revised tale and showed them where the content has been improved based on their feedback from the previous day. I asked the students if the tale improved, they all said yes. I showed them "What makes a tale good?" poster (Figure 7.5) again and then showed the students my video again to see if they have further feedback and suggestions. They did not have any, so I reminded them to give feedback and suggestions in a way that was dignified as I showed the Giving Feedback and Suggestions poster (Figure 7.8) again to them. After the reminder, I excused the students to begin revising their tales.

They all finished their revised tales, but I did not have enough time to record any of the new revisions, so I told them that, tomorrow, I will record all of their revised tales.

In Table 7.7, two out of four students rated themselves as being "excellent" (four points) in both their making modifications to their number tale, thus improving it, and in their incorporating feedback and suggestions from their partner in the revision of their tales. Instead of "excellent," Students #1 and #3 evaluated themselves as being "good" (three points) in doing those things.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I make modifications to my number tale to improve it.	Student #2 Student #4	Student #1 Student #3		
I use feedback and suggestions from my partner to revise my tale.	Student #2 Student #3 Student #4	Student #1		
I can use my prior knowledge to make my number tale and to connect to any number tale I read. I can see how mathematics is involved in my everyday life.	Student #2 Student #3 Student #4	Student #1		

Table 7.7: Unit 1, Lesson 5 *Revising ASL Tales* Student Performance Rubric for Students

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Revise the tale making modifications that to a great extent improve the tale, and incorporates feedback and suggestions in the revision.	Student #2 Student #3	Student #4	Student #1	
Make full use of prior knowledge to create number tales as well as to connect to number tales. Explain math's involvement in everyday lives.	Student #1 Student #2 Student #3 Student #4			

Table 7.8: Unit 1, Lesson 5 *Revising ASL Tales* Student Performance Rubric for Teacher

The data in Table 7.7 is almost comparable to the data in Table 7.8. Two out of four students were rated "excellent" (four points) and one student "good" (three points) for the modifications made that incorporate the feedback and suggestions from their partner. Showing a continued improvement for the use of prior knowledge to create number tales as well to read and connect to other number tales, three of students and one student rated themselves as being "excellent" (four points) and "good" (three points), respectively, for their use of prior knowledge as shown in Table 7.7. As for Table 7.8, it shows that all students were rated "excellent" (four points) for their use of prior knowledge, which nearly corresponds to the data in Table 7.7 as three out of four

students rated themselves "excellent" on prior knowledge use. Looking at the last few tables, these Tables 7.7 and 7.8 clearly showed that the students' view of their skills in using the prior knowledge have continued to improve, which suggested that they were becoming more comfortable with using their prior knowledge.

Thursday, April 28, 2005 – Unit 1, Lesson #5 continued

Today, I recorded all of students' revised tales individually. Before I started recording their revisions, I told the students that after I record their tales, I would show their signed tales to the class. Each time I record each student's tale, I had others keep practicing their tales. As for the students who finished signing their tale in front of the camcorder, I let them help me record other students' tales. To wrap up this unit, I showed their videotaped tales on the board, and told them that we would set aside these tales for the time being, as we would focus more on word problems starting tomorrow.

Friday, April 29, 2005 – Unit 2, Lesson #1

I announced in class that for the next few weeks, we would be working on word problems in addition to learning useful word problem-solving strategies.
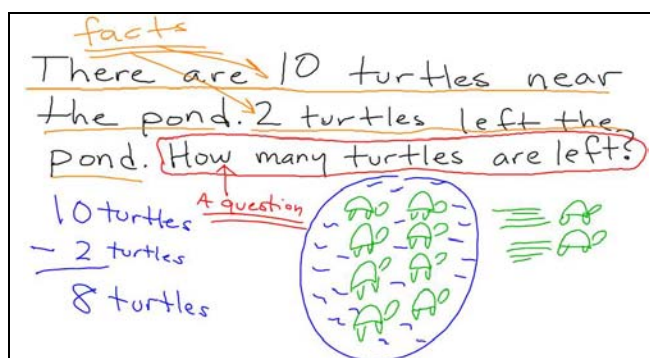

Figure 7.10. **Unit 2, Lesson #1 "Turtles" Word Problem**

After the announcement, I presented one simple English word problem about the turtles swimming in the pond (Figure 7.10). All students immediately knew the answer upon reading the presented word problem. I first asked them what kind of operation did this word problem require, and they all answered saying that it required subtraction. I then asked them to tell me what was the answer at the same time, and they all said eight, which was the correct answer. I asked the students to take turns explaining how they knew the answer was eight. They each explained, in their own words, how the actions described in the given word problem led to a decrease in the number of turtles. In other words, they noted that at the start, there were ten turtles but two of them left, so two need to be deducted from ten to obtain the answer. In their explanations, they noted that the action of "leaving" meant a decrease in the number of turtles, and, also, that meant subtraction was the correct operation because it takes away something from a given number rather than adding to it, and, so, they concluded that ten minus two equals to eight.

After I was satisfied with their explanations, I asked them which parts of that word problem were facts and which part was a question. They all knew which part was a question. I asked them how they knew. They all, at the same time, pointed out to the question mark at the end of the sentence, and said that it was obvious that that part was a question because all questions always have a question mark. They did not offer any additional explanations for why they knew it was a question. Only one student answered when I asked them to identify which parts were facts. Student #3 said that since facts are information, then the first two sentences of the word problem must be facts.

Figure 7.11. **"Reading Word Problems Strategies" Poster**

I presented the blank "Reading Word Problems strategy" poster and told them to think about how they solved the presented problem and share it with the class (Figure 7.11). All of them raised their hands, so I called on every single student in the order they were sitting. They all said the same thing in their own words. They said that they read the word problem carefully once or twice, looked for numbers and looked for keywords that indicate if it is an addition or subtraction problem. I told them that their strategy to reading and solving word problems is pretty good, and wanted to expand on it a little bit more, one step at a time, using the information listed on the lesson plan.

I asked the students what they could do if they came across certain math words that they do not understand. Student #4 raised his hand and said that they could ask other students and me, the teacher, to explain what these words meant. I told him he was correct and then asked the class what else they could do. Student #1 raised her hand and said that we could look up the words we do not know in the dictionary. I told her she was correct and then again asked the class what else they could do. No one offered an answer, so I hinted to an answer by pointing at the word wall. Student #3

immediately raised her hand and said that we could check the word wall to find out what the keyword she did not know meant, which could indicate which arithmetic operation (e.g., addition or subtraction) that word problem required. I then followed up on that by asking what the students could do if the word was not on the word wall. They said look up the word in the dictionary and ask the teacher for the definition. I told them they were correct and said that every time they come across an important mathematical keyword that was not listed in the word wall we can add it to the word wall.

After the word wall discussion, I skipped the acting out activity to save time. Acting out the word problems would be too easy for these students.

I realized that I had some time left (approximately ten minutes), so I distributed homework and let students do it in class. All of them finished it before the end of class.

Question	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can act showing the audience what happens in my number tale, and I did not tell them what happens in my number tale.	N/A			
I can use acting to visualize and solve any word problems.	N/A			
I can explain the strategic steps in solving word problems.	Student #2 Student #4	Student #1 Student #3		

Table 7.9: Unit 2, Lesson 1 *Acting Out ASL Addition Number Tales* **Student Performance Rubric for Students**

The data from the today's administered rubrics were tabulated in Table 7.9. Table 7.9 shows students' rating of their ability to explain the strategic steps in solving word problems. Table 7.9 shows that half of the students rated themselves as being

"excellent" (four points) and the other half as being "good" (three points) in their ability to explain the strategic steps in solving word problems. Table 7.10 supports the data in Table 7.9 as all four students were rated "good" (three points), for their ability to explain the strategic steps. What these tables show was that the students and the teacher have optimistic view of the students' ability to explain the strategic steps, which also showed that the students seemed to be doing well in giving an explanation.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Act, rather than tell, what happens in the number tale.	N/A			
Explain the strategic steps in reading and solving word problems.		Student #1 Student #2 Student #3 Student #4		

Table 7.10: Unit 2, Lesson 1 *Acting Out ASL Addition Number Tales* Student Performance Rubric for Teacher

Monday, May 2, 2005 – Unit 2, Lesson #2

I opened with a word problem from the "Joining To Strategy" mini-lesson (Figure 7.12).

Figure 7.12. **"Joining To" Word Problem**

I asked students to read and solve it in their heads. The following was a dialogue between the students and based on my mental notes, which illustrate their mathematical thinking and discussion:

(After a short pause of reading and thinking, Student #1, #3 and #4 each answered, "three." Student #2 answered, "seven.")

Teacher (to student #2):   How do you know there were seven boxes?
Student #2:   Jennifer had two boxes and she got five more boxes. (She underlined "two boxes" and "five boxes.") Two and five is seven.
Teacher (to rest of the students):   Okay, now how do you know there were three boxes?
Student #3:   I see that Jennifer had two boxes, and then she has five boxes. I was going to add, but I read the question where it said how many boxes Megan gave her. So, five minus two are three.
Student #4:   Jennifer had two boxes and now she has five boxes. The question said how many boxes Megan gave her, so five minus two are three. That is how many Megan gives her.
Student #1:   I was going to say same as Student #3 and #4.
Teacher: Okay good. The answer is three. Is there anything else in the word problem beside the question that tells you to subtract two from five to get the answer three?

(No one raised hand.)

Teacher: Okay, look at the second sentence. "Megan gave her some more." What did you notice about the words "some more"? What does it mean?
Student #3:   It means that Megan gave Jennifer "some more" boxes and we don't know how many more.
Teacher: Good. What is the question saying?
Student #3:   The question is asking us to find out how many boxes did Megan give her Jennifer?
Teacher: So, those boxes Megan give to Jennifer is the same as "some more" boxes Megan gave to Jennifer? Correct?

(All nodded yes.)

After the dialogue, I wrote the answer, including the steps, to solve the problem below the word problem that I wrote on the board. I also added the phrase, "some more," under subtraction heading on the word wall.
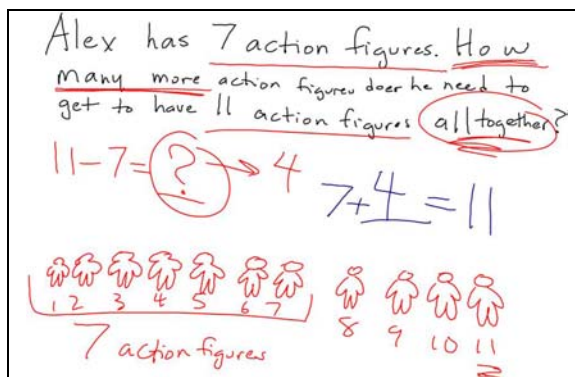
Figure 7.13. **Second "Joining To" Word Problem**

I then presented another word problem (Figure 7.13) to give the students more practice with a variety of similar situations where this strategy is applicable. After a short pause reading and thinking, Student #2, #3 and #4 each knew the answer, which was four. Student #1 thought the answer was eighteen. All of them knew that they had to subtract seven from eleven because the question stated "how many more action figures," more particularly the words "how many more" that led them to subtract seven from eleven. After student #2, #3 and #4 each explained their answer, which was the same, in their own words. Student #1 immediately changed her answer and explained why the answer was four, in her own words, after listening to others' explanations. After doing so, I then pointed at the phrase "all together," and asked them to sign it in addition to telling me what they think it meant. They all signed it in two ASL signs, "ALL TOGETHER," and did not offer a further explanation. I then signed the same phrase in one sign, "ALL+TOGETHER" (which is also the same ASL sign for "SUM"), and told them that this was a correct sign for the mathematical concept.

I asked them what other English words they could think of and fingerspell that have the same meaning when I sign "ALL+TOGETHER." Student #3 fingerspelled

"addition." Student #4 fingerspelled "sum" and "total." Students #1 and #2 also fingerspelled all the same words as students #3 and #4. I told them that they were good words, and asked them how they came up with these words. They all said that it was because of the way I signed "ALL+TOGETHER." They were able think of other English words with the same meaning when I asked them to, such as "sum," "total," and "addition."

I modeled how to do the "ASL Number Tales with Cubes" activity and then excused them to begin doing the activity with their partners. During the activity, all, but student #1, student appeared to know what they were doing. After student #1 finished making the poster, she struggled to do the activity with her partner, student #3, and commented to me that she did not understand what she was supposed to do. I pulled her aside, and explained and modeled the activity to her to show what she was supposed to do. Once she understood, I had her join her partner and continued working on the activity.

Table 7.11 shows that all, but one, of the students rated themselves as "excellent" (four points) in all categories. Only Student #1 rated herself as being "good" (3 points) in all categories. Student #1 was known to be less optimistic about herself and abilities than other students in her class, which may have accounted for her rating that was one scale below other students' ratings in all categories of Table 7.11. These students' self-ratings were supported by the tabulated data from the *Student Performance Rubrics for Teacher* (Table 7.12). Table 7.12 show that all students were rated "excellent" (four points) in just about all categories, but Student #1 was rated "good" (3 points) in her ability to show and solve the process of addition using

manipulatives. Despite that favorable rating that differed from others, Student #1 still

was "excellent" (four points) in other categories her abilities dictated that: using the

"Joining To Strategy," and selecting and using appropriate strategies to read and solve

certain word problems.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can use cubes to show the process of addition in any word problems.	Student #2 Student #3 Student #4	Student #1		
I can use cubes to represent and solve any addition word problems.	Student #2 Student #3 Student #4	Student #1		
I can use the *Joining To* strategy to read and find solutions to given word problems.	Student #2 Student #3 Student #4	Student #1		
I can select and apply appropriate strategies in finding solutions to certain word problems.	Student #2 Student #3 Student #4	Student #1		

Table 7.11: Unit 2, Lesson 2 *Using Cubes for ASL Addition Number Tales* **Student**

Performance Rubric for Students

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Show and solve the process of addition using manipulatives.	Student #2 Student #3 Student #4	Student #1		
Use the *Joining To* strategy to read and solve given word problems.	Student #1 Student #2 Student #3 Student #4			
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.	Student #1 Student #2 Student #3 Student #4			

Table 7.12: Unit 2, Lesson 2 *Using Cubes for ASL Addition Number Tales* **Student**

Performance Rubric for Teacher

Wednesday, May 4, 2005 – Unit 2, Lesson #3

I opened with a word problem from the "Joining All Strategy" mini-lesson
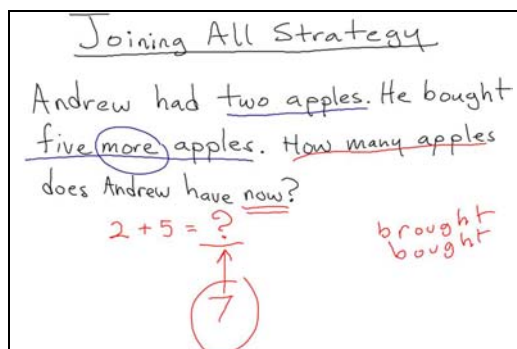
(Figure 7.14).

Figure 7.14. **"Joining All" Word Problem**

I asked students to take a few minutes to read and solve the problem in their heads.

The following was a dialogue between the students and I based on my mental notes,

which illustrate what they were thinking mathematically.

After a short pause reading and thinking, all students answered the same,
"seven."

> *Teacher (to all students):*   How do you know the answer is seven apples?
> *Student #4:*   Andrew had two apples and he bought five more apples.
> *Student #2:*   The word problem said that he had two apples (she underlined it on the board) and he bought five more apples (also underlined it on the board). The word problem asked how many apples he has now (underlined the question). Therefore, two and five is seven.
> *Student #3:*   (She circled the word "more" in the word problem) He had two apples and now he got five more apples. The word "more" tells me that I need to add two numbers together. That is two plus five equals seven.
> *Student #1:*   There are two apples and there are five more apples. So there are seven apples now.
> *Teacher:*   Great. All of you are correct. The answer is seven. Now, I noticed that all of you signed "brought" in ASL for the English word "bought" in the word problem. This word actually means this (I signed the word "bought" in ASL as I pointed at the English word "bought"). You signed this word (I wrote the word they signed "brought" on the board and

signed it exactly as what they signed at first). They are spelled nearly the same, but have different meanings. Understand?

(All nodded yes and they then nodded no when I asked them if they have any questions about these words.)

After our discussion about how to solve the word problem, I wrote the solution to it including the steps involved in solving it on the board (Figure 7.14).

I presented the students with another word problem (Figure 7.15) to practice with a variety of similar situations where this strategy can be applied.
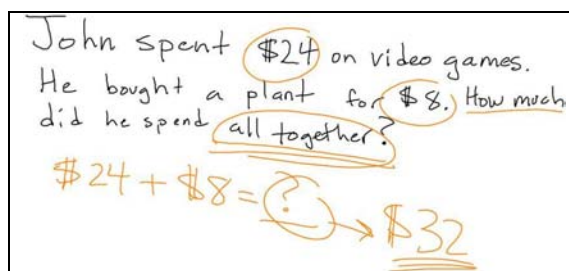
Figure 7.15. **Second "Joining All" Word Problem**

After a short pause to read and think, all the students immediately knew the answer was $32. They, each in their own words, all said the same thing: John was shopping and he paid $24 and $8 for video games and a plant, respectively, and the question asked how much money he spent altogether. I later pointed at the phrase "all together," and asked them if they remember what it meant. They all signed "ALL+TOGETHER," which was the correct sign and said that it means total. I asked them how they knew that. They said that they remember from the discussion from the previous mathematics period. I asked whether having this phrase in the question made a difference in telling us what kind of arithmetic operation we were supposed to do. No one said yes or no. I then explained to them how by having this "phrase" in the

question, we knew that it is an addition word problem. After the discussion, I added the phrase, "all together," under addition heading on the word wall. After discussing the phrase, "all together," I then pointed at the phrase "how much," and told them that I noticed some of the students were signing it more English-like in two signs ("HOW MANY"). I told them that there is a more accurate way to sign it in ASL, and showed it to them signing it in one sign, "HOW+MANY." I told them that the meaning behind this sign was more accurate for the mathematical concept.

To see whether students could distinguish the differences between given word problems, I presented the following word problem from the previous lesson (Unit 2, Lesson #2), which they had not seen before (Figure 7.16).
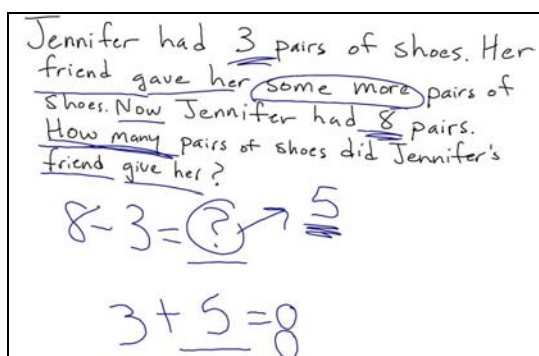

Figure 7.16. **Review "Joining To" Word Problem from Unit 2, Lesson 2**

Students #2 and #4 knew that the answer was five. Students #1 and #3 thought the answer was eleven. I asked Students #1 and #3 why they thought the answer was eleven. They both said that they saw numbers three and eight, so they added them together. When I asked them if they were sure, they said yes. I then asked Students #2 and #4 why they thought the answer was five. They both pointed at the "Joining To Strategy" poster and explained that her friend gave her "some more" shoes. They did not know how many shoes her friend gave Jennifer until they noticed that Jennifer

now had eight. They followed the strategy to find out how many shoes were "some more" her friend give to Jennifer. Immediately after their explanation, students #1 and #3 both raised their hand and said that they wanted to change their answer to five and gave the same explanation as the other two students did. I asked the students if they could use the "Joining All Strategy" they learned today to solve this problem (Figure 7.16), and they all said "no."

I modeled how to do the "Recording Number tales Symbolically" activity and then asked them if they had any questions. They did not have any, so I excused them to begin doing the activity with their partners.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can write correct number sentences to represent any addition word problems.	Student #2 Student #4	Student #1 Student #3		
I can solve number sentences representing any addition word problems.	Student #2 Student #3 Student #4	Student #1		
I can use the *Joining All* strategy to read and find solutions to given word problems.	Student #2 Student #3 Student #4	Student #1		
I can select and apply appropriate strategies in finding solutions to certain word problems.	Student #2 Student #4	Student #1 Student #3		

Table 7.13: Unit 2, Lesson 3 *Formulating Arithmetic Sentences for ASL Addition Number Tales* **Student Performance Rubric for Students**

Students #2 and #4 rated themselves as being "excellent" (four points) in their ability to write correct number sentences, to solve them, to use the "Joining All Strategy" to read and find solutions to given word problems, and to select and apply appropriate strategies in finding solutions to certain word problems (Table 7.13). Student #1 rated herself as "good" (three points) in all of the listed abilities the other

two thought they were excellent (four points) in. Student #3 considered herself as either "excellent" (four points) or "good" (three points) in all of those categories indicated above.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Write out and solve addition number sentences that represent given word problems using correct mathematics terminology and notation.	Student #1 Student #2 Student #3			
Use the *Joining All* strategy to read and solve given word problems.	Student #1 Student #2 Student #3			
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.	Student #1 Student #2	Student #3		

Table 7.14: Unit 2, Lesson 3 *Formulating Arithmetic Sentences for ASL Addition Number Tales* Student Performance Rubric for Teacher

As for the data from Table 7.14, it showed that students generally were given higher scores than the students did for themselves. Table 7.14 shows that all four students were rated "excellent" (four points) in all categories, but Student #3 were rated "good" (three points) for her ability to select and use appropriate strategies to read and solve certain word problems. These favorable ratings in Tables 7.13 and 7.14 showed that the students are confident in their newly acquired ability to use the "Joining All" strategy to solve word problems and to select and apply appropriate strategies to solve certain word problems.

Friday, May 6, 2005 – Unit 2, Lesson #4

I opened with a "Separating From Strategy" word problem (Figure 7.17).

Figure 7.17. **"Separating From" Word Problem**

I asked students to take a moment, read the word problem, and solve it in their heads.

Here is another dialogue between the students and myself, which illustrate what they

were thinking mathematically:

> After a short pause reading and thinking, all students answered the same, "five," which was the correct answer.
>
> *Teacher (to all students):*   How do you know the answer is five?
> *Student #1:*   There were seven boys, but two of them went home. (She underlined the phrases, "went home" and "still playing.") Therefore, it is a subtraction problem. Seven minus two are five.
> *Student #2:*   I thought same thing. The question asked how many boys were still playing. Therefore, that means how many boys are there now after two left to home.
>
> (Students #3 and #4 said same things as student #2 said.)

After our discussion, I wrote the answer on the board including the problem solving

steps, below the word problem.

Figure 7.18. **Second "Separating From" Word Problem**

I presented the students with a similar word problem for more practice (Figure 7.18). Only student #2 was able to answer this word problem correctly. Student #3 knew that it was a subtraction word problem, but she was having difficulty computing it because she did not have enough experience with the decimal numbers, which were the numbers that use the decimal point. Students #1 and #4 thought it was an addition word problem, since they did not seem to fully understand what they read. I had to sign this word problem to them, explaining only the first two sentences. I pointed at the question as I asked them what the answer was. When they read the question, students #1 and #4, who did not get it the first time, immediately knew that it was a subtraction word problem, but, like student #3, had difficulty subtracting $27.26 from $30. After our discussion, I realized that they subtracted "26" from "30" which led them to get the wrong answer because they did not have enough experience with decimal numbers. After realizing this, I then explained to the students how to solve this problem by first adding ".00" to the rightmost end of $30 before subtracting $27.26 from it to get the correct answer.

Remembering the discussion on how to sign the English phrase "how many" in ASL from the previous lesson, I pointed at the phrase "how many" in the word problem above on the board and asked them how to sign it. The students all accurately signed it in one sign in ASL, "HOW+MANY." I told the students that that was correct.

I modeled how to do the "ASL Subtraction Number Tales with Cubes" activity and then excused them to begin doing the activity with their partners.

Table 7.15 shows that in Unit 2, Lesson 4, students gave themselves high marks (mainly, "excellent" (four points) for using cubes to show the process of subtraction and to represent and solve any subtraction word problems, and for using

the "Separating From Strategy" to read and solve given word problems. The difference

this time was they were working with subtraction instead of addition today. Only one,

Student #1, continued to rate herself as being "good" (three points) for doing these

same things. Most of the students rated themselves as being "good" (three points),

which was a drop from the rating "excellent," (four points) for their ability to select

and apply appropriate strategies to find and solve certain word problems. Table 7.16

show that the ratings given to the students were nearly identical as the ratings students

gave themselves in Table 7.15.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can use cubes to show the process of subtraction in any word problems.	Student #2 Student #3 Student #4	Student #1		
I can use cubes to represent and solve any subtraction word problems.	Student #2 Student #3 Student #4	Student #1		
I can use the *Separating From* strategy to read and find solutions to given word problems.	Student #2 Student #3 Student #4	Student #1		
I can select and apply appropriate strategies in finding solutions to certain word problems.	Student #4	Student #1 Student #2 Student #3		

Table 7.15: Unit 2, Lesson 4 *Acting Out and Using Cubes for ASL Subtraction Number*

Tales **Student Performance Rubric for Students**

What was interesting about Tables 7.13 and 8.14, and Tables 7.15 and 8.16 was that

they showed a drop in rating of students' ability to select and use appropriate

strategies to read and solve word problems. That was a one scale down from

"excellent" (four points) (Tables 7.13 and 7.14) to "good" (three points) (Tables 7.15

and 7.16).   This occurred after the "Separating From Strategy" was learned and added

to their repertoire, which showed that at that time, the students were not used to having several different options of which strategy to use. Despite that, they had favorable ratings in Tables 7.15 and 7.16 for their ability to use the "Separating From" strategy.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Show and solve the process of subtraction using manipulatives.	Student #2 Student #3 Student #4	Student #1		
Use the *Separating From* strategy to read and solve given word problems.	Student #2 Student #3 Student #4	Student #1		
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.		Student #1 Student #2 Student #3 Student #4		

Table 7.16: Unit 2, Lesson 4 *Acting Out and Using Cubes for ASL Subtraction Number Tales* **Student Performance Rubric for Teacher**

Monday, May 9, 2005 – Unit 2, Lesson #5

Today, I learned that student #4 is absent today. My mentor teacher informed me that when he is absent on Monday, he is typically absent for the remainder of the week. In addition, I also found out that student #1's last day of school is a week earlier than the last school day of the year, which is on Friday, May 20. Student #1 and her family are planning to go on a vacation. Because of that, I had to plan for that day, May 20, to be the day I wrap up this curriculum.

Figure 7.19. **"Separating To" Word Problem**

I opened with a "Separating To Strategy" word problem (Figure 7.19). I asked students to read and solve it in their heads for a few minutes. Here is a dialogue between the students and myself, which illustrated what they were thinking:

After a short pause reading and thinking, all students knew the answer.

Teacher (to all students): How do you know the answer is eighteen?
Student #2: He had twenty-five dollars, and he then spent some of it. He now had seven left. So, twenty-five minus seven are eighteen dollars. He spent eighteen dollars.
Student #3: Yes. The question asked how much money did he spend, and he started with twenty-five dollars and had seven dollars left and the spending. So I knew this word problem is a subtraction problem, the answer is twenty-five minus seven.
Teacher (to student #1): What do you think? Are they correct?
Student #1: Yes, they are correct.

(Student #1 gave an explanation that was nearly the same as student #3's.)

Instead of presenting another word problem that is related to the previously stated problem, I presented the following word problem that required a different strategy the students learned in one of the previous lessons (Figure 7.20).
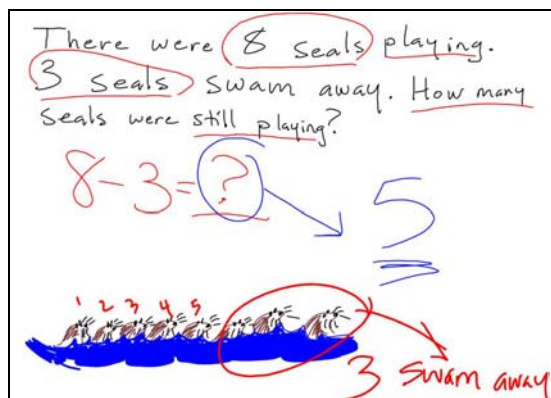

Figure 7.20. **Second "Separating To" Word Problem**

I did not indicate whether it required a strategy different from today's lesson. I wanted to see if they could read this word problem and know that it required a different strategy. Students #1 to #3 were able to solve this word problem correctly. They knew

that it required the "Separating From Strategy" from the previous lesson. They explained that in this word problem, the answer was an unknown, which was not the same as the word problems that required the "Separating To Strategy" because their answers were known.

I modeled how to do the "Recording ASL Subtraction Number Tales Symbolically" activity and then excused them to begin doing the partner activity.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can write correct number sentences to represent any subtraction word problems.	Student #2 Student #3	Student #1		
I can solve number sentences representing any subtraction word problems.	Student #2	Student #1 Student #3		
I can use the *Separating To* strategy to read and find solutions to given word problems.	Student #2 Student #3	Student #1		
I can select and apply appropriate strategies in finding solutions to certain word problems.		Student #2 Student #3	Student #1	

Table 7.17: Unit 2, Lesson 5 *Formulating Arithmetic Sentences for ASL Subtraction Number Tales* **Student Performance Rubric for Students (Note that Student #4 was absent)**

Table 7.17 shows that, at the end of the lesson, the results were mixed. Student #2 saw herself as being "excellent" (four points) in her ability to write out correct number sentences to represent any subtraction word problems, to solve number sentences representing any subtraction word problems, and to use the "Separating To strategy" to read and find solutions to given word problems. Student #3 felt that she was "excellent" (four points) in writing out correct number sentences and in using the Separating To strategy, but was "good" (three points) for solving number sentences

that represent given subtraction word problems. What this meant is the students were confident with using the "Separating To" strategy to solve word problems.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Write out and solve subtraction number sentences that represent given word problems using correct mathematics terminology and notation.	Student #1 Student #2 Student #3			
Use the *Separating To* strategy to read and solve given word problems.	Student #1 Student #2 Student #3			
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.		Student #1 Student #2 Student #3		

Table 7.18: Unit 2, Lesson 5 *Formulating Arithmetic Sentences for ASL Subtraction Number Tales* **Student Performance Rubric for Teacher (Note that Student #4 was absent)**

Table 7.18 show all students were rated as "excellent" (four points) in all, but one, categories, and that is an improvement over the students' initial evaluation of themselves. Note that Tables 7.17 and 7.18 show that both of the ratings that Student #2 and Student #3 gave themselves and were given to remained the same, "good" (three points), as those in Tables 7.15 and 7.16. However, in Table 7.15 Students #2 and #3 rated themselves as "good" (three points) for their ability to select and apply appropriate strategies. Student #1 rated herself as "okay" (two points) for this ability. Table 7.16 showed that all of these three students were rated "good" for this same ability. Comparing these Tables 7.17 and 7.18 to Tables 7.15 and 7.16, these ratings showed that the self-ratings of students #2 and #3 remained the same while student #1 experienced a one-scale point reduction in her rating. This showed that having another

strategy in her repertoire to select from and work with added to her confusion, thereby affecting her self-confidence.

Tuesday, May 10, 2005 – Unit 3, Lesson #1

I started with a word problem from the "Compare Strategy #1" mini-lesson (Figure 7.21) without Student #4 who was absent again today.

I asked students to read and solve it in their heads for a few minutes. Here is a dialogue between the students and myself that occurred today, which illustrates what the students were thinking mathematically. After a short pause reading and thinking, all students could not offer an answer, so I signed the word problem aloud together with the students and discussed what each sentence in the word problem meant.

Teacher: How many more brothers does Tom have than Juan?

(All students knew the answer after I signed the English question in ASL.)

Student #3: The answer is three.
Teacher: Why?
Student #3: Tom has five, and Juan has two. The question is asking how many more brothers Tom has than Juan. Therefore, that is … three… four… and five. The answer is three. (She counted using her hand starting with two fingers)
Student #2: See the phrase in the question "how many more," so that is a subtraction problem. Five minus two are three.
Student #1: Tom has five. Juan has two. Tom has how many more than Juan? That is three.
Teacher: Who has more brothers, Tom or Juan?

(All students said Tom because he has a bigger number of brothers than Juan.)

Students did not know what to do after reading the word problem on their own unless I signed it to them in ASL. Based on the dialogue, they seemed to know how to compare the number sizes.
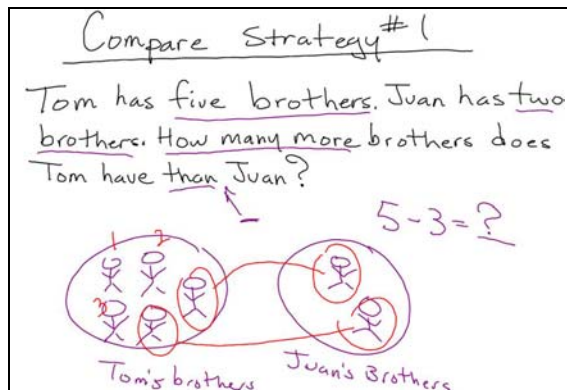
Figure 7.21. **"Compare #1" Word Problem**

I presented another word problem that was similar to the previous problem so that the students could practice some more with this type of word problem (Figure 7.22). They all immediately knew the answer to this problem, which was "four." I asked them how they knew the answer, and they all said that this word problem, including its question, is similar to the one I presented before this one. In addition, they said that since Mark has three books and Sally has seven books, Sally has more books than Mark, and the question asked for how many more books Sally had, so seven minus three is four.
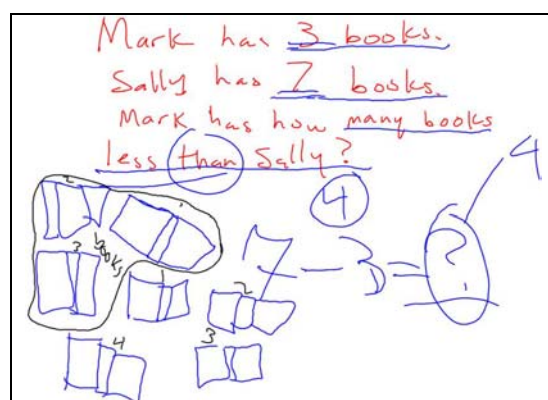
Figure 7.22. **Second "Compare #1" Word Problem**

We reviewed what we knew about what makes a good tale. During the review, we looked at "What makes a good tale?" poster (Figure 7.5). We listed what makes a good English tale (not ASL tale) on the bottom of that poster. I showed them a video of a good ASL-signed number tale, which I signed (another variation of the "Pizza" number tale with so many details). We discussed if this number tale was good. We used the "What makes a tale good?" poster as a guideline to determine whether this tale is good or not. In the end, we all agreed that it was a good tale.

Time ran out before we could finish making comparisons between ASL and English tales.

Wednesday, May 11, 2005 – Unit 3, Lesson #1 continued

Today, student #4 was absent for the third straight day, and we continued comparing ASL and English tales.

We reviewed the "What makes a tale good?" poster (Figure 7.5) and then discussed what we remember about the "Pizza" number tale we saw yesterday and why it was a good tale. After reviewing, I presented the students with a well-written version of the ASL signed number tale that we viewed yesterday. Using the poster again as guideline, we discussed whether it was a good tale or not, and we all agreed that it was a good tale because it met all the criteria for a good tale.

After discussing the English tale, we immediately started comparing between the ASL-signed and English-written versions of the good "Pizza" number tale. We concluded that there was not much difference between these tales. That was except for the way these tales were told. All students stated that the differences we found were

that the ASL-signed version was signed through the hands and that it had completely different structure than the English-written version.

Realizing that we had some time left in this mathematics period, I took this time as an opportunity to have students set up their laptops so that I could download their individual videotaped ASL-signed number tales onto their laptops for use in the next few lessons when they write their English versions as they view these ASL-signed tales.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can explain how ASL tales are related to English tales.	Student #2	Student #3	Student #1	
I can show how ASL tales and English tales are similar and different.		Student #2	Student #3	Student #1
I can use the *Compare* strategy #1 to read and find solutions to given word problems.	Student #2 Student #3		Student #1	
I can select and apply appropriate strategies in finding solutions to certain word problems.		Student #2 Student #3	Student #1	

Table 7.19: Unit 3, Lesson 1 *Comparing ASL and English Tales* Student Performance Rubric for Students (Note that Student #4 was absent)

After the implementation of Unit 3, Lesson 1, Table 7.19 shows that the results were uneven. The rating that the students gave themselves for their ability to explain how ASL tales are related to English tales ranged from "excellent" (four points) to "okay" (two points), and the rating for their ability to show how ASL tales and English tales are similar and different ranged from "good" (three points) to "need work" (one point). It was the use of the "Compare Strategy #1" that most students considered themselves to be "excellent" (four points) in. Student #1 thought that she

was "okay" (two points). The ratings that the students gave themselves and were given to for their ability to select and apply appropriate strategies to reading and solving certain word problems were the same in Tables 7.19 and 7.20 as those in several previous Tables.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Explain how ASL tales are related to English tales in terms of similarities and differences.		Student #2 Student #3	Student #1	
Use the *Compare* strategy #1 to read and solve given word problems.	Student #1 Student #2 Student #3			
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.		Student #1 Student #2 Student #3		

Table 7.20: Unit 3, Lesson 1 *Comparing ASL and English Tales* Student Performance Rubric for Teacher (Note that Student #4 was absent)

The ratings given to the students, as shown in Table 7.20, were slight more consistent than those ratings that the students gave to themselves, but also were loosely related to them as seen in Table 7.19. Looking at Tables 7.17 and 7.18 and comparing them to Tables 7.19 and 7.20, all of the students' ratings remained the same. This showed that all of the students have had yet to neither improve nor worsen their view of their abilities.

Thursday, May 12, 2005 – Unit 3, Lesson #2

The prediction for student #4 being absent for the entire week was becoming true as he, again, was absent today.

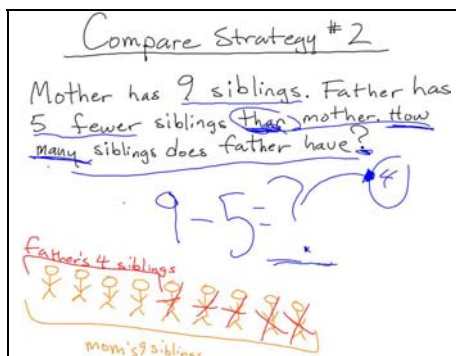I started this lesson with a word problem from the "Compare Strategy #2" mini-lesson (Figure 7.23).

Figure 7.23. **"Compare #2" Word Problem**

I asked students to read and solve it in their heads for a few minutes. The following is

a dialogue between the students and me:

> (After a short pause reading and thinking, the students could not offer an answer like the previous lesson, so I read the word problem aloud together with them and discussed what each sentence in the word problem meant.)

> Teacher: Mother has nine siblings. Father has five fewer siblings than mother. How many siblings does father have?
> Student #1: What does the word siblings mean?
> Teacher: It means brothers and sisters. Can anyone solve this word problem?

> (All students nodded no.)

> Teacher: Okay, let's solve this one step at a time together. How many siblings does mother have?

> (All students said, "nine.")

> Teacher: Okay, good. Father has five fewer siblings than mother. What does this mean? (When no one answered, I added what does the word fewer mean.)
> Student #3: It means lesser.
> Teacher: That is right.
> Student #2: Father has five less siblings than mother. Mother has nine; so nine minus five are four.
> Teacher: How do you know that you needed to subtract nine from five?
> Student #2: The words fewer and less usually mean subtraction. I was right then the question asked how many siblings father has.

> (The two other students, students #1 and #3, raised their hands and gave a nearly identical explanation as student #2 gave.)

Unlike the previous lesson where the students did not know what to do with the given

English word problem they read until I signed it to them in ASL, they still could not figure

out what to do with the word problem even after I signed it in ASL. Based on the dialogue above, it seemed that the words "siblings" and "fewer" probably confused them.

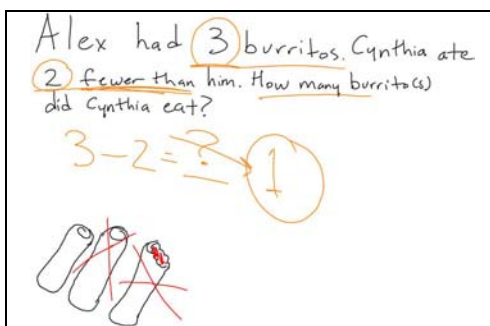For more student practice, I presented another word problem as shown below, which is identical to above (Figure 7.24).

Figure 7.24. **Second "Compare #2" Word Problem**

All students knew the answer to this word problem. I asked them how they knew the answer. They told me that it was similar to the "Siblings" word problem above, and they said that they knew what to do with this second word problem because we discussed how to solve the first word problem earlier in this lesson. What had happened at that time also happened in the previous lesson plan.

Because of both time constraints and the fact we already discussed what makes a good tale during our comparison of the ASL and English tales in the previous lesson plan, I decided to skip the rest of the lesson plan today.

There was a uniform distribution of students' self-assigned ratings in Table 7.21. Table 7.22 showed different results as those in Table 7.21. All students were rated "good" (four points) for ability to explain what makes a good English tale, and to select and use appropriate strategies to solve certain word problems. Most students were rated "excellent" (four points) for their use of the "Compare Strategy #2" to

solve given word problems. Comparing Tables 7.19 and 7.20, only student #3's self-rating changed while others' remained the same. Her rating for selecting and applying appropriate strategies jumped one scale point up from "good" (three points) to "excellent" (four points), which showed that her self-confidence with these strategies generally improved. This was probably because her strategy skills had improved, thereby increasing her self-confidence.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can explain what makes a good English tale.	Student #2	Student #3	Student #1	
I can use the *Compare* strategy #2 to read and find solutions to given word problems.	Student #3	Student #2	Student #1	
I can select and apply appropriate strategies in finding solutions to certain word problems.	Student #3	Student #2	Student #1	

Table 7.21: Unit 3, Lesson 2 *Modeling a Good English Tale* Student Performance Rubric for Students (Note that Student #4 was absent)

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Explain what makes a good English tale.		Student #1 Student #2 Student #3		
Use the *Compare* strategy #2 to read and solve given word problems.	Student #1 Student #2	Student #3		
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.		Student #1 Student #2 Student #3		

Table 7.22: Unit 3, Lesson 2 *Modeling a Good English Tale* Student Performance Rubric for Teacher (Note that Student #4 was absent)

Friday, May 13, 2005 – Unit 3, Lesson #3

Student #4 was absent today, so he had missed an entire week of this curriculum's implementation.

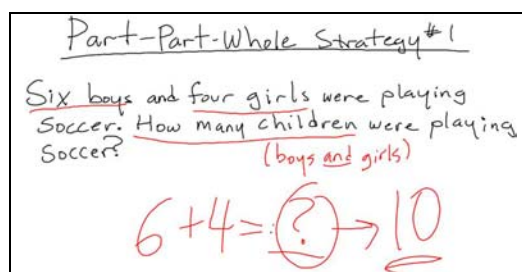I opened with a "Part-Part-Whole Strategy #1" word problem (Figure 7.25).

Figure 7.25. **Part-Part-Whole #1 Word Problem**

I asked students to read and solve it in their heads for a few minutes. Immediately following the pause, there was a dialogue between the students:

> After reading and thinking, all students immediately knew the answer, which was "ten." They did not need to pause for a moment to think about how to solve this word problem.
>
> *Teacher (to all students):*   How do you know the answer is ten?
> *Student #3:*   Children are both boys and girls. There are six boys and four girls, so there are ten children altogether.
> *Student #1:*   Six and four is ten. The answer is ten children because there are six boys and four girls.
> *Student #2:*   Right, six plus four is ten.

Immediately after the previous dialogue, I presented the students with another word problem that required the same strategy above for more practice (Figure 7.26).
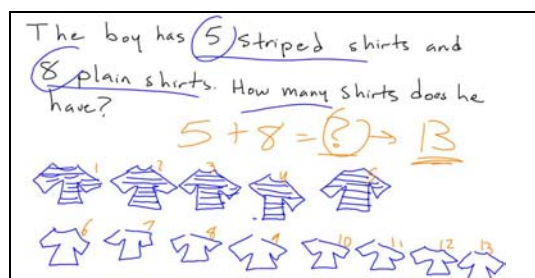
Figure 7.26. **Second Part-Part-Whole #1 Word Problem**

The students understood the total to be thirteen shirts, which is the correct number of shirts. I asked them how they knew the answer. The students said that whether the shirt is striped or plain, it is still a shirt even if they were of different shapes or colors.

For simplicity and to save time, I decided not to make and show a videotape of the teacher-signed tale to the students. Instead, I used example ASL signs as shown in step 3b of the procedure. I listed the following words on the board (Figure 7.27): Where? When? Who? What?
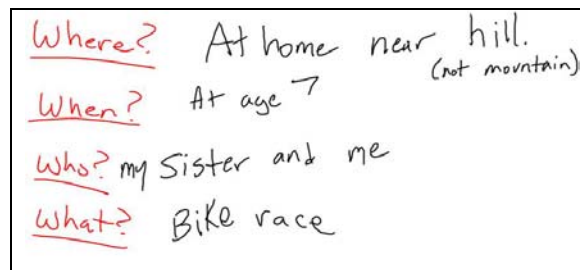
Figure 7.27. **"Where? When? Who? What?" Poster**

I then had students copy these words on their papers. I then signed the example ASL signs, and had them list their answers next to the w-questions on their paper. We discussed each question one step at a time. I then asked them to try to make one or two English sentences based on what I just signed in ASL. After they did, I listed their English sentences on the board (Figure 7.28). We discussed which sentences were more ASL like, and which sentences were very English like. We also discussed which sentences looked like a mixture of ASL and English to us. From the discussion, there was a general consensus among all of the students that: the fourth sentence at the bottom of Figure 7.28 was most English like of all. It was agreed that it was because of its structure and its organization. For instances, the students noticed that the first sentence at the top was most ASL like of all because it read exactly like how we

signed and contained no English words. They also noticed that the second and third sentences in the middle looked like a mixture of ASL and English because some parts of them were organized in ASL-like and other parts in English-like manners and they had English words,
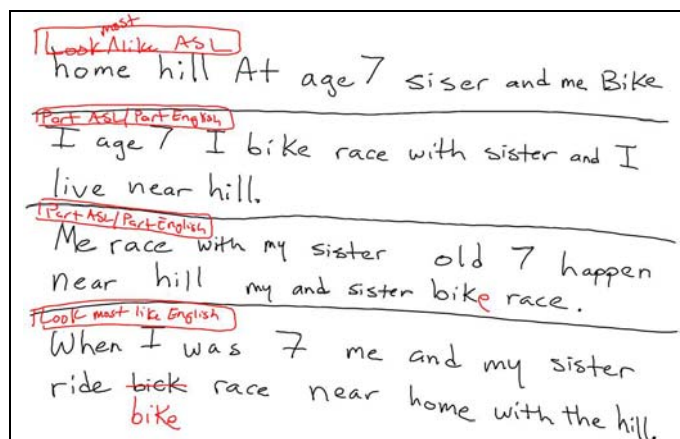

Figure 7.28. **Students' English Sentences of my ASL**

Continuing the trend from the previous lesson, there was a uniform distribution of ratings, in which students gave themselves, as shown in Table 7.23. It seem that in Table 7.23, the students' rating, which they gave themselves, for their ability to select and apply appropriate strategies in finding solutions have generally dropped from "good" (three points) to "okay" (two points). However, this differed from the ratings that were given to them, which generally were "good" (three points) in Table 7.24. Note that, in Table 7.23, the ratings given to the students for their development and explanation of their plan for creating an English version of their ASL tales were rated "excellent" (four points), which generally were higher than the ratings that the students gave themselves on their development of a clear plan as shown in Table 7.23. The Interesting thing about Table 7.23 was it showed that both students #2 and #3 thought

they did "okay" (two points) with the strategies selection and application, and student #1 thought she did "good" (three points). Table 7.23 also showed that The students' self-rating for the new strategy acquired that lesson were Identical as their self-rating for the last strategy previously acquired ("Compare Strategy #2) shown in Table 7.21.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I have a clear plan for creating an English version of my ASL number tale.	Student #1	Student #2	Student #3	
I can explain how I will create an English version of my ASL number tale.		Student #1	Student #2 Student #3	
I can use the *Part-Part-Whole* strategy #1 to read and find solutions to given word problems.	Student #3	Student #2	Student #1	
I can select and apply appropriate strategies in finding solutions to certain word problems.		Student #1	Student #2 Student #3	

Table 7.23: Unit 3, Lesson 3 *Planning and Writing English Tales* Student Performance Rubric for Students (Note that Student #4 was absent)

The ratings in Table 7.24 showed that the students generally were rated higher than they rated themselves. In Table 7.24, all students were rated "excellent" (four points) for development and explanation of a plan and "good" (three points) for both the use of the "Part-Part-Whole Strategy #1," and appropriate strategies selection and application. The rating assigned to the students was slightly more consistent and favorable than the students rated themselves. These tables indicated that the students were less optimistic this time around because the strategies being added to their repertoire were increasingly becoming more complex. The most important thing that shown in these tables were that the students neither felt nor were viewed that they

needed some work on any given ability. Additionally, Table 7.23 showed that the students # 1, #2 and #3 felt that they did "excellent," "good" and "okay," respectively, In planning. This diversified rating differed from Table 7.24, which showed that they all were rated "excellent."

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Develop and explain a clear plan for creating an English version of a given ASL number tale.	Student #1 Student #2 Student #3			
Use the *Part-Part-Whole* strategy #1 to read and solve given word problems.		Student #1 Student #2 Student #3		
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.		Student #1 Student #2 Student #3		

Table 7.24: Unit 3, Lesson 3 *Planning and Writing English Tales* Student Performance Rubric for Teacher (Note that Student #4 was absent)

Monday, May 16, 2005 – Unit 3, Lesson #4

Student #4 had finally showed up to class today after a weeklong absence. For the rest of the week, I plan to occasionally pull him from the student activities to do one-on-one tutorial sessions with him to help catch him up with the others. To my dismay, I found out that there would be a Track and Field event for a few hours in the morning of Friday, May 20, 2005, which overlapped with my Mathematics class period. As a result, I had to plan for Thursday, May 19, instead of Friday, May 20, to be the day I wrap up this curriculum.
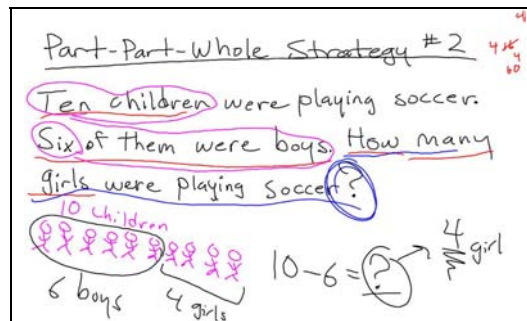
Figure 7.29. **"Part-Part-Whole #2" Word Problem**

I opened with a word problem from the "Part-Part-Whole Strategy #2" mini-

lesson (Figure 7.29). I asked students to read and solve it in their heads for a few

minutes. Here is a dialogue between the students and myself:

> After a short pause reading and thinking, all, but one, knew the answer, which
> was, "four." Student #4 at first thought the answer was sixteen.
>
> *Teacher (to student #4):* Why do you think the answer is sixteen?
> *Student #4:* There are ten children and six boys playing soccer, so there are
> sixteen.
> *Teacher (to other students):* Why do you think the answer is four?
> *Student #1:* There are ten children. That is boys and girls together. Six of
> them are boys and four of them are not boys, so the answer is four because
> they are girls.
> *Student #2:* Out of ten children, there are six boys. So ten minus six are
> four. The answer is four girls.
> *Student #3:* Right. Six of them are boys, so the answer is ten minus six are
> four girls.
>
> (After students #1, #2 and #3 each gave their own explanation; student #4
> changed his answer to four and gave an explanation that is nearly identical as
> others'.)

Following the dialogue above, I immediately prompted another identical word

problem to the students (Figure 7.30).
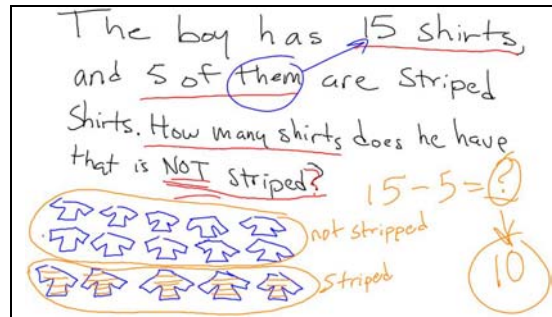
Figure 7.30. **Second "Part-Part-Whole #2" Word Problem**

Only students #2 and 3 got the answer correct, which was "ten." Students #1 and #4 got the answer wrong because of the way the first sentence of the word problem was phrased in English. It let Students #1 and #4 to think that there were two independent sets of shirts: fifteen shirts and five striped shirts. As a result, Student #4 thought that the answer was a sum of these two sets (his answer was "twenty"), and Student #1 thought that the answer was the number of shirts from the first of two sets (her answer was "fifteen"). After I signed the English word problem in ASL and explained it, the students who got it wrong immediately changed their answer to the correct one.

We discussed reasons why we should edit English tales. During the discussion, we reviewed the "Reasons for Editing" poster (Figure 7.9). The reasons we covered were practically the same as in Unit 1, Lesson 5. It was not a very long discussion, as students already knew the importance of editing since we covered it in the first unit of this curriculum. Instead of presenting an intentional grammatically incorrect English number tale as suggested in the lesson plan, we edited all of students' English sentences of the example ASL signs I signed in the previous lesson (Unit 3, Lesson #4). At that time, I chose to use their writings from the previous lesson plan because I

felt it would be more interesting if students and myself could edit their writing together instead of a sample random English number tale.

With half of the class period remaining, the students began to write up their English version of their ASL-signed number tale.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I make modifications to my English tale to improve it.	Student #4	Student #1 Student #2 Student #3		
I use feedback and suggestions from my partner to revise my English tale.	Student #4		Student #1 Student #2 Student #3	
I can use the *Part-Part-Whole* strategy #2 to read and find solutions to given word problems.	Student #3	Student #1 Student #2 Student #4		
I can select and apply appropriate strategies in finding solutions to certain word problems.		Student #1 Student #2 Student #3	Student #4	

Table 7.25: Unit 3, Lesson 4 *Editing English Tales* Student Performance Rubric for Students

Table 7.25 shows that students generally felt they were "good" (three points) at making modifications to their English tale to improve it, using the Part-Part-Whole strategy #2 to read and solve given word problems, and selecting and applying appropriate strategies to find solutions to certain word problems. However, students #1, #2 and #3 felt that they did "okay" (two points) with using partners' feedback and suggestions. Student #4 felt that he did "excellent" (four points) with the feedback. This showed that the students would have benefited more from practicing how to incorporate the feedbacks. Student #4 was known to give inflated self-ratings, so it probably did not reflect his ability. This was supported by his "okay" (two points)

rating assigned to him in Table 7.26. Students' ratings they assigned to themselves for their ability to select and apply appropriate strategies to read and solve certain word problems have improved from Table 7.23 to Table 7.25.

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Edit the English tale making modifications that to a great extent improve the tale, and incorporates feedback and suggestions in the revision.		Student #1 Student #2 Student #3	Student #4	
Use the *Part-Part-Whole* strategy #2 to read and solve given word problems.		Student #1 Student #2 Student #3 Student #4		
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.		Student #1 Student #2 Student #3	Student #4	

Table 7.26: Unit 3, Lesson 4 *Editing English Tales* Student Performance Rubric for Teacher

As for Table 7.26, all students were rated "good" (three points) in all categories. In addition, Table 7.26 shows that students' ability to select and use appropriate strategies to read and solve certain word problems remained the same from Table 7.24. Seeing how the students, for the most part, were rated "good" (three points) for their use of the "Part-Part-Whole Strategy #2" and their selection and application of different strategies, this showed that the students learned well enough to have enough confidence to give optimistic rating for these abilities.

Tuesday, May 17, 2005 – Unit 3, Lesson #5

Today, I opened by saying that this would be the last lesson I taught to them, and, as a result, they will have more time to focus on their cumulative project. I made my expectations very clear, as for what the students need to produce for their cumulative project: (1) To produce a written English version of their ASL-signed number tale created way back in the first unit of this curriculum; (2) to create illustrations to accompany their finished written product; and (3) to put them together in their mathematics book accompanied by their videotape of ASL-signed number tales.

After having made my expectations clear to them, I excused the students work on their English versions of their ASL-signed number tales. By the end of the class, all of the students finished their first draft and most are close to finishing their second draft.

Wednesday, May 18, 2005 – Unit 3, Lesson #5 continued

Today, students continued working on the English versions of their ASL-signed number tales. When time ran out, all, but Student #4, have finished typing up their third draft. Student #4 was half way through in typing up his third draft.

Thursday, May 19, 2005 – Unit 3, Lesson #5 continued

Today, I went over students' third draft with them on an individual basis. We discussed and edited it together. We added few math questions to these number tales to turn them into word problems. After meeting with me, the students retyped their third draft, producing their fourth and final draft (Figures 8.1 to 8.4). After doing so, they began to create their individual math book. When the class time was nearly over, most of the students were still working on their book. Student #1 finished her book. I told the students that they could finish it next time.

Friday, May 20, 2005 – Unit 3, Lesson #5 continued

Today was Student #1's last day of school, so I had her complete three different sheets during her free time: the *Unit 3, Lesson 5 Student Performance Rubric for Students* sheet, the *Word Problem Survey* and the *Word Problem Posttest*. I also asked her to present her math class book to me by signing her number tale in it to me. I noticed that her signed word order has improved from being very English-like to more ASL-like. She used the English words less this time around, and she showed less English-words-order in her signing the story. After her signing, we realized that the first of her two questions was unanswerable ("How many men were working in the forest?") because she wanted to create a second question, so she deleted a part of the sentence ("but 3 were too late") from the third draft when she typed up her final draft. That part was crucial to answering the first question. She did not have enough time to fix that error, so we left it alone as is.

Monday, May 23, 2005 – Unit 3, Lesson #5 continued

After the students finished their projects, I had them present their math class book, signing in ASL their number tale to the class. I noticed that all of the students have improved in their ASL signing of their number tales. Student #2 eliminated almost all SEE signs and did not fingerspell English words that were not used in ASL. Student #3 has improved from reading and signing word problems/number tales from in English-like order to in ASL-like order. Student #4 improved his skills in using the spatial agreement signs. In his presentation, I noticed that he always set the topic sign before referring to it.

After wrapping up the curriculum, Table 7.27 showed that half the students felt that they did "excellent" job (four points) making their mathematics class book, while the other half felt they did a "good" job (three points) with it. Interesting, Table 7.27 shows that most of the students felt that they did "excellent" (four points) with selecting and applying appropriate strategies to certain word problems, which were an improvement over the "good" rating (three points) that persisted for number lessons.

Questions	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I made a class book that has everything it needs in it.	Student #2 Student #4	Student #1 Student #3		
I can select and apply appropriate strategies in finding solutions to certain word problems.	Student #2 Student #3 Student #4	Student #1		

Table 7.27: Unit 3, Lesson 5 *ASL and English Number Tales Cumulative Project* **Student Performance Rubric for Students**

Area	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Produce a mathematics class book that includes all the required elements.	Student #1 Student #2 Student #3 Student #4			
Select and use appropriate strategies, skills, methods, and/or concepts to read and solve certain word problems.		Student #1 Student #2 Student #3 Student #4		

Table 7.28: Unit 3, Lesson 5 *ASL and English Number Tales Cumulative Project* **Student Performance Rubric for Teacher**

However, Table 7.28 showed that the rating given to the students remained the same at "good" (three points). These ratings in Tables 7.27 and 7.28 showed that at the end of the curriculum, the students felt and were rated that they did either "good" or "excellent" job with the mathematics class book. The students' ratings seemed to

reflect that they felt and appeared they learned enough and were confident enough to select and apply appropriate strategies from their repertoire after enough teaching and learning activities.

To wrap up this lesson and curriculum, I administered the *Word Problem Survey* and the *Word Problem Posttest*, which were the same as those administered in way back at the beginning of this curriculum implementation in Unit 1, Lesson #1. I also administered them in the same way I did in Unit 1, Lesson #1.

VIII. Curriculum Evaluation and Data Results

Evaluation Plan

This section outlines three evaluation methods used to assess the results of my implementation of this curriculum. This evaluation plan is the key to determination of whether the curriculum is effective or not. Therefore, I conducted an evaluation of the curriculum in which I used three particular methods of data collection: field observation notes, student performance rubrics and student-produced artifacts. I selected these three out of a wide variety of data collection methods to evaluate the effectiveness of this curriculum and whether the goals it set forth were attained during the implementation phase. The curriculum goals were:

1. *To use students' prior knowledge and daily experiences to connect with number tales demonstrating how mathematics is involved in their everyday lives.*

2. *To help students develop strategies and tools to use for reading and solving word problems.*

3. *To develop and increase students' metalinguistic awareness of both ASL and English through telling and comparing of ASL and English versions of stories incorporating numbers.*

4. *To develop students' mathematical language (or "math talk") in both ASL and English.*

On each day of the implementation of this curriculum, I wrote field observation notes later in the day after the completion of the teaching and learning

activities provided by this curriculum. During field note taking, I wrote brief comments deemed to me to be relevant to this curriculum during the implementation, and they mainly served as reference materials for later in the day, when I found time to sit down and produce fully detailed documentation. I documented everything that I thought to be notable ranging from individual and whole group learning progress of the participating students to any observed circumstances that at least may have directly or indirectly influenced both the implementation of this curriculum and its effectiveness.

When I documented individual and whole group learning processes, I focused on each student, monitoring and evaluating his or her individual activities, regardless of whether it was learning-based or not, during implementation of the lessons. Considering that one of the features of the curriculum requires collaboration and cooperation, it was imperative to note areas of concern not only in the nature of the academics but also in student interactions. Overall, these field observational notes provided evidence of positive learning development in several areas of learning covered later in this section.

In addition to the field observation notes, I used student performance rubrics, some of which I designed for teacher use, while others I made for students to use. I created these rubrics for two purposes: to inform me of progress in student learning on both an individual and whole group basis, and to give my students feedback on their work. I used teacher rubrics during the activities set forth by this curriculum to help me effectively assess students' academic learning performance during these activities. As for the other rubrics, they were mainly created for the students, I asked

participating students to complete these rubrics. During that process, they were able to reflect on their learning through scoring their perception of their performance. The main reason I created two separate set of rubrics, one for teacher use and one for student use, was to compare them to get a complete picture of the student progress during the teaching and learning activities. It was essential for this curriculum to permit students to assess themselves as individuals so that they could see for themselves their strengths and weaknesses in addition to their areas of learning growth and needs. Both teacher and student rubrics were filled out during and at end of lessons. These rubrics also were useful as important reference materials in the writing of my field observation notes and they provided evidence of student progress. Another reason why teacher rubrics were also used was that sometimes the students may have missed or were not seeing what the teacher was saw in themselves. That was why it was important to have two sets of rubrics and compare them against each other for reliability and to find out if there were any correlations, discrepancies or any other relationships in the self-assigned and given ratings.

Besides field observation notes and student performance rubrics, artifacts were important and useful evidence that helped me determine the extent of the progress of student learning throughout the implementation phase of this curriculum. These artifacts included student work samples, teacher and student co-created posters and pictures as well as all other kinds of work products. Student work samples mainly were in the form of the ASL-signed and English-written versions of student-produced number tales and its arithmetic sentence. I collected all of the student work samples during the lessons that produced them because they showed evidence of quality of

work and completion of student required tasks. I also collected posters because they were co-created and used by both the teacher and students as evidence of students' coming up with and solving word problems. These posters also were useful for another purpose: to build on students' prior knowledge from the previous lessons in the curriculum that was designed to work in a spiraling fashion. As for the pictures, they captured both some of the moments that unfolded during the implementation of the curriculum and images of some of the artifacts from this implementation, all of which, if not for the photographs, would have been difficult to show in this thesis other than in the form of descriptions.

In addition to the above forms of data collection, at the beginning of the curriculum, I administered a pretest assessment. This was done to determine the level of each of the students' knowledge of word problems and his or her mastery of the word problem solving skills both as individuals in comparison to each other in the class and together as a whole in this class. After nearly completing the implementation of this curriculum, I again administered a posttest assessment with content the same as the one given as a pretest in the beginning to find out whether their understanding and solving of word problems had improved or not. The pretest and posttest results were presented and analyzed later near the end of this section.

All these methods of data collection listed above played a crucial role in my analysis of this curriculum and in assessing its effectiveness. These methods also provided different sources of data collection that together show multifaceted evidence of progress in individual and group student learning plus achievement of the learning goals set forth in this thesis.

Evaluation of the Curriculum Based on the Key Goals

Analyzing the data collected from the daily observational notes, rubrics for students and teacher, and artifacts helped determine whether each of the four goals of this curriculum was met. The compiled data shown below provided evidence that this curriculum's goals were met in a variety of ways. In this section, each goal and the outcomes for that goal were discussed.

This curriculum's first goal was *to use students' prior knowledge and daily experiences to connect with number tales demonstrating how mathematics is involved in their everyday lives*. This goal was met and confirmed by the teacher observation notes, student performance rubric for students and teacher, surveys and student work products.

Students were twice asked whether they use their prior knowledge and experience to connect with word problems in the same survey twice administered on different dates. When the survey was first administered at the beginning of the curriculum on April 19, 2005, all four students were given a choice of three answers to the question above: "yes," "sometimes," and "no." They all picked "sometimes." When the survey was administered again at the end of the curriculum on May 20, 2005, they all chose the answer: "yes." Reviewing Tables 7.3 to 7.8, there was an increase in both teacher-assigned and student-self-assigned ratings over the last three lessons of Unit 1. Table 7.3 showed all four students rated themselves as being "good" (three points), when they filled out their student performance rubric for students at the end of Unit 1, Lesson 3, in their ability to use their prior knowledge to make their number tale and to connect to any number tale they read. After another lesson (Unit 1, Lesson 4), two students' self-ratings improved to "excellent" (four points) while the

other two remained the same, which meant that those two still considered themselves "good" (three points) as seen in Table 7.5. By the time the third lesson (Unit 1, Lesson 5) was completed, which wrapped up the first unit of the curriculum, three out of four students considered themselves "excellent" (four points) and the remaining one to be "good" (three points) (Table 7.7). Additionally, the data from the teacher-completed student performance rubrics in Table 7.4 showed all four students being rated as "okay" (two points), which was one scale point below the ratings that the students gave themselves in Table 7.3. By the end of the second lesson, the teacher-assigned ratings improved to two four points ("excellent") and two three points ("good") as shown in Table 7.6, which were identical as the ratings that the students gave themselves (Table 7.5); thereby making these ratings reliable because the teacher was evidently seeing what the students saw in themselves. Table 7.8 showed that all four students were rated four points ("excellent"), which were just about the same as what students rated themselves in Table 7.7. In summary, Tables 7.3 to 7.8 revealed positive progresses in students' learning and using their prior knowledge to make their number tale as well as to connect to any number tale they read, based on student and teacher evaluations.

As shown in the teacher implementation notes, several discussions emerged about students using their prior knowledge and experience to create their number tales as well as to connect to any number tale they read.

On Friday, April 15, 2005, in the teacher implementation notes (see previous chapter), after creating the "Oreo cookies" tale in Unit 1, Lesson 1, I asked the students if they were able to understand the tale because they have prior experience

with Oreo cookies. I said that it meant having experience of seeing and eating cookies. The students all said yes because, in their words, it "helped them understand the number tale easier." Student #2 mentioned that if she did not see or eat the cookies before, then she would have not understood the "Oreo cookies" number tale.

On Friday, April 22, 2005, in the teacher implementation notes (see previous chapter), students at first did not know what to say about prior knowledge and experience and how they could use it. A discussion emerged about how students could figure out how to use a new calculator they had never seen before because they have a prior knowledge and experience of using a different calculator. They said that they would use their prior knowledge to help guide them figuring out how to use the new calculator. After that discussion, students were able to provide some examples of their use of prior knowledge and experience. Student #4 was able to point out to how they could mathematically add and subtract because they have had experience of doing the process of adding to or removing from a group of objects on numerous occasions in their life. Student #4 also was able to point out to how prior experience and knowledge of purchasing, eating and sharing the Oreo cookies were used as a basis to write and create the "Oreo cookies" number tale in Unit 1, Lesson 1.

In addition to the surveys, rubrics and teacher notes above, there were student work products, which stood out from other evidences above, as these work artifacts were proof that strongly reflected students' use of their prior knowledge. All students drew on their own life experiences and knowledge to come up with their own number tales. Student #1 was fond of Irving's classic tale called "The Legend of Sleepy Hollow." She remembered it from both the teacher's ASL storytelling of that tale in

class and from numerous viewings of Disney's short cartoon film adaptation of that tale over time. She used her experience of being exposed to that tale as a basis and an inspiration for her to create her own number tale about the three pumpkin ghosts chasing after several workingmen (Figure 7.31). Student #2's favorite snack food was Doritos chips, so she wrote about her experience of getting and eating Doritos chips to create her number tale (Figure 7.32). Student #3 loved puppies so much, and she had her own puppies. She used her prior knowledge about puppies to write her number tale based on her real life experience (Figure 7.33). Student #4 was very fond of pizzas, so he used it as a main topic of his number tale by writing about his pizza experience (Figure 7.34).

The Sleeping Moonlight Pumpkin

Long time ago during nighttime, there were some men working in the forest. They were speechless when they saw 3 pumpkin ghosts, and then they ran away to the bridge. They knew that if they arrive at the bridge, they will become really safe. They ran and ran to the bridge, but some were too late, and only 1 was lucky to make it to the bridge. How many men were working in the forest? How many did not make it to the bridge?

The End

By

Student #1

May 20, 2005

Figure 8.1. **Student #1's Final Draft**

Student #2   May 19, 2005

Doritos

I was so very hungry that I am in mood for Doritos chips. I went to the store to buy chips. Chips cost $15.00. I checked if I have money. I got money out of my pocket to check. I had $20.00. Perfect! I paid woman $20.00 for Doritos chips, and got Doritos and some money back. I told her, "Thank you!" I Opened bag and there were 60 triangle chips. I ate ½ of chips and saved the rest for my sister. YUMMY!

How much money woman give me back? How many chips did my sister get?

Figure 8.2. Student #2's Final Draft

PUPPIES

THE MOTHER DOG HAD 10 PUPPIES.

5 PUPPIES DRANK MOM'S MILK
WHILE 5 PUPPIES WERE SLEEPING
ON THEIR BED.

3 PUPPIES WORK UP AND LEFT
THEIR BED.

7 PUPPIES LEARNED HOW TO WALK
WHILE 1 PUPPY SAT WATCHING.

TOMORROW, ALL PUPPIES
HUGGED THEIR MOTHER.

HOW MANY PUPPIES WERE STILL
SLEEPING?

THE END

Student #3

May 19, 2005

Figure 8.3. Student #3's Final Draft

5-19-05 "Pizza" Student #4

I was so hungry that I want to eat pizza. I checked to see if I have money. I had $60, so I went ahead and ordered pizza. I called VRS and signed ordering one pizza with 5 toppings: black olive, ham, pepperoni, cheese and sausage. After I finished ordering, I waited 30 minutes before the pizza man finally arrived. He said I owe $50. I said, "Fine", and paid $60. I got pizza and some money back. When I opened the pizza box, I saw that I have 4 slices of pizza. I ate 3, and gave rest to my friend. We watched the movie *Harry Potter 3*. Pizza was yummy!

How much money did I get back after paying the pizza man? How many slices of pizza did my friend get?

Figure 8.4. Student #4's Final Draft

The second goal in this curriculum was *to help students develop strategies and tools to use for reading and solving word problems*. This goal was met and confirmed by the teacher observation notes, student performance rubric for students and teacher, surveys and student work products.

Students were twice asked whether they have strategies to read and solve word problems in the same survey twice administered on different dates (Table 8.7). When the survey was first administered at the beginning of the curriculum on April 19, 2005, students were given a choice of three answers to the question above: "true," "sometimes true," and "false." Students #1, #3 and #4 picked "sometimes true" and student #2 picked "false" when asked whether they have strategies to read and solve word problems. After completing the implementation of the entire curriculum in which this thesis is based on, the survey was administered again on May 20, 2005, students #3 and #4 picked "true" and students #1 and #2 picked "sometimes true" when asked whether they have strategies to read and solve word problems. Only student #1's answer remained the same when the survey was administered again.

Reviewing Tables 7.9 to 7.28, one will notice an overall positive progress in both teacher-assigned and student-self-assigned ratings over from the first lesson of the second unit (Unit 2, Lesson 1) to the last lesson of the third unit (Unit 3, Lesson 5). In Unit 2, Lesson 1, after being taught, two students felt that they can do an "excellent" job (four points) in explaining the strategic steps in solving word problems, while the other two felt that they can do a "good" job (three points) at it (Table 7.9). Table 7.10 corresponds to Table 7.9 by showing that the teacher-assigned ratings were just about the same; all four students were rated "good" (three points) for

their ability to explain the strategic steps in solving word problems. This shows that by being able to explain, they have already acquired and internalized the strategic steps in reading and solving word problems.

When students did a self-evaluation of their ability to acquire and use a new strategy each time, they all generally either rated themselves as being "excellent" (four points) or "good" (three points) after they learned and used a new strategy each time (Tables 7.11, 7.13, 7.15, 7.17, 7.19, 7.21, 7.23 and 7.25). The only times a rating was not either "excellent" (four points) or "good" (three points) was when Student #1 rated herself "okay" (two points) twice. That was when she was learning the "Compare strategies #1 and #2" (Tables 7.19 and 7.21). When students did a self-evaluation of their ability to select and use an appropriate strategy from their repertoire of strategies to solve certain word problems, they started strong by mostly rating themselves as "excellent" (four points), the other being "good" (three points), in the first self-evaluation (Table 7.11). Their ratings fluctuated between "excellent" (four points) and "okay" (three points), but never were at the level of "need work" (one point) (Tables 7.13, 7.15, 7.17, 7.19, 7.21, 7.23 and 7.25). Their ratings seemed to drop each time they learned and added a new strategy to their repertoire, but their ratings gradually rose back to mostly "excellent" (four points) (Table 7.27) after continuous practice that occurred at the same time new strategies were being introduced over time. These students' self-ratings were supported by nearly identical teacher-assigned ratings as shown in Tables 7.12, 7.14, 7.16, 7.18, 7.20, 7.22, 7.24, 7.26 and 7.28. This showed that after acquiring new word problem-solving strategies, these strategies stayed with

them in their repertoire of strategies. Seeing how the ratings in these tables supported each other, the ratings became reliable.

Each time students acquired a new strategy; they seemed to have done a good job of learning and using it. There were several discussions, which were written about in the implementation note, which showed students acquiring and adding to their repertoire new strategies taught at the beginning of each lesson.

On Friday, April 29, 2005, in the teacher implementation notes (see previous chapter), the students discussed the ways to read and solve word problems effectively, and outlined them on the "Reading Word Problem Strategies" poster (Figure 7.11). After that day, I noticed that the students consistently utilized the third step from the "Reading Word Problems Strategies" outlining all of the facts/numbers and questions to help them solve given word problems. For example, each time I introduced the students to a new strategy by prompting them a word problem on the board that required that strategy, when the students were asked to explain how they solved given word problems, they underlined the numbers/facts and questions and explained them (Figures7.12, to 7.26 and 7.29 to 7.30). The students also had been consistently utilizing another step from the "Reading Word Problem Strategies." For example, they looked for the keywords (the fourth step on the "Reading Word Problem Strategies" poster). This was exemplified in Wednesday, May 4, 2005's dialogue between the teacher and the students recorded in the teacher implementation notes (see previous chapter). The students were asked to explain how they solved a given word problem that required the "Join All Strategy." Student #3 pointed out to the word "more" in the word problem, which indicated that the word problem was an addition-based because

there was more to add to the initial set. In the dialogue between the teacher and the students on Friday, May 6, 2005, when the students were asked to explain how they solved the prompted word problem that required the "Separating From Strategy," Student #1 underlined the phrases "went home" and "still playing." She said that she noticed that there were several boys playing tag and that some of them "went home." She knew that it was a subtraction-based word problem because the question asked how many boys were "still playing" soccer after a few "went home," which meant that there was a reduction from the initial set of the boys playing tag.

On Monday, May 2, 2005, in the teacher implementation notes (see previous chapter), the students learned the "Joining To Strategy," and after the students learned the "Joining All Strategy" on Wednesday, May 4, 2005, I presented a word problem that they had not seen before. I did not tell them that it required a different strategy from the previous day's lesson. Only students #2 and #4 immediately knew that it required the strategy that they had learned from the previous lesson to solve the problem, and was able to explain why it needed the "Joining To Strategy." After the explanation, Students #1 and #3 agreed with their explanations. When Students #1 and #3 agreed, it was not to simply to agree because their homework showed that they did use the strategy later independently. These examples above show that the students have been developing the strategies and tools for reading and solving word problems.

In addition to the surveys, rubrics and teacher notes above, there were student work products. These work artifacts strongly reflected all students' development and use of their strategies and tools to read and solve word problems. These student work

products were in the form of the daily math homework the students received after the end of each lesson of the curriculum.

Student #1 typically solved most of her problems correctly, which showed that she had learned and used strategies taught to her. In first worksheet, she got all eight problems answered correctly. In second worksheet, she got only one out of five problems solved correctly. After talking to her about this worksheet, it seemed that she rushed through it because she got all of the answers correct after I told her, which answers explain why these answers were wrong. In third to ninth worksheets, she got majority of the practice and review problems correct. In these worksheets, she got five out of six, six out of seven, eight out of eight, six out of nine, five out of ten, nine out of eleven, six out of twelve, respectively. In the tenth worksheet, which was a collection of review problems, she got twelve out of sixteen problems right.

Like Student #1, Student #2 and Student #3 also acquired and maintained the use of strategies taught in the class. Student #2 get the majority of her problems solved correctly. In these worksheets, she got five out of six, seven out of seven, eight out of eight, eight out of nine, eight out of ten, nine out of eleven and twelve out of twelve, respectively. As these tables showed, she occasionally got only one or two problems answered incorrectly. Student #3 occasionally answered few more problems answered incorrectly than Student #2 did. However, she still managed to get the majority of her problems answered correctly. In these worksheets, she got six out of six, seven out of seven, eight out of eight, eight out of nine, eight out of ten, ten out of eleven and eight out of twelve, respectively.

As for Student #4 usually solved most of his problems correctly, which at least show his knowledge and use of strategies he picked up in class. In first worksheet, he got all eight problems solved correctly. In second worksheet, he got three out of five problems right. In third worksheet, he got four out of five problems and one review problem right. In the fourth worksheet, which was the last one he turned in, he got all five problems right, but did not do two review problems. He did not turn in any further worksheet because he had been absent for a week, and there were only few days of curriculum implementation left after he returned from his absence.

In addition to the first two goals above, the third goal of this curriculum was *to develop and increase students' metalinguistic awareness of both ASL and English through telling and comparing of ASL and English versions of stories incorporating numbers*. This goal was met and confirmed by the teacher observation notes, student performance rubric for students and teacher, and the surveys.

Students were twice asked two questions whether they (1) know how ASL and English versions of word problems are related to each other and (2) know how mathematical English language differs from regular English language in the same survey twice administered on different dates. During the administration of the survey at the beginning of the curriculum on April 19, 2005, a choice of three answers to each of both questions above: "true," "sometimes true," and "false" were given to the students. All four students picked "sometimes true" when asked whether they knew how ASL and English versions of word problems are related to each other. As for the second question, Students #1 and #4 picked "sometimes true" and Students #2 and #3 picked "false" when asked whether they knew how mathematical English language

differs from regular English language. When the survey was administered again on May 20, 2005, Students #1, #3 and #4 answered "true" and Student #2 answered "sometimes true," when asked if they knew how ASL and English word problems were connected to each other. Also, Students #3 and #4 answered "true" and Students #1 and #2 answered "sometimes true" when asked if they knew the differences between the mathematical English language and the regular English language. Students #2 and #1 gave same response to the first question and second question, respectively, when asked again.

In the beginning of the curriculum, all students read and signed both number tales and word problems word for word in English word order. By the time the curriculum was over after so many discussions, and reading and signing practices, all students improved to being able to read and summarize both number tales and word problems in ASL.

Having the students read and sign number tales and word problems during the strategy mini-lessons and other times helped students and myself to recognize and discuss important linguistic elements that needed improvement. Each time a linguistic element needing improvement was identified, a teachable moment occurred when I took opportunity to point out to that linguistic element and discuss it with the students. That happened in several discussions. For instance, in the discussion between the teacher and the students regarding their solving the prompted word problem on Monday, May 2, 2005, I noticed that the students were signing the English phrase "all together" as two signs in ASL, "ALL TOGETHER." After correcting their signs by discussing with the students how to sign the English phrase more accurately in ASL,

they were consistently signing it as "ALL+TOGETHER" (the same sign used for "SUM" that also has the same meaning as "ALL+TOGETHER") like on Wednesday, May 4, 2005. On that day, I noticed that the students signed "ALL+TOGETHER" instead of "ALL TOGETHER" when I pointed to the English phrase "all together" and asked them to sign it again. This demonstrated that the students improved on their metalinguistic awareness of how the phrase "all together" in ASL and English are related to each other. On Wednesday, May 4, 2005, some of the students were not signing the English phrase "how many" in ASL accurately, because they signed it in an English-like manner "HOW MANY" rather than "HOW+MANY," so we discussed how to sign the English phrase "how many" in ASL. I noticed that the students have begun to sign "how many" more accurately in ASL ("HOW+MANY") as seen in Friday, May 6, 2005, when I asked the students to sign this phrase two days later.

Student #1 initially tended to sign given number tales what she read precisely word for word in English word order (see Friday, April 22, 2005, notes). When she signed the number tale/word problem in her mathematic class book at the end of the curriculum on Friday, May 20, 2005, her signed word order changed improving from being very English-like to more ASL-like.

At first, whenever Student #2 was reading a given number tale or word problem, she signed it in English word order. She incorporated in her ASL several SEE (Signing Exact English, a signed "language" with no relation to ASL) signs like "I" and "is," and fingerspelling some English words, which are not used in ASL, like "was" and "the" (see Friday, April 22, 2005, notes). When she presented her mathematic class book and signed the number tale/word problem in it in ASL on

Monday, May 23, 2005, she were signing in ASL word order, and she eliminated almost all SEE signs and did not fingerspell English words that were not used in ASL.

At the start of the curriculum, Student #3 was signing word problems more in English word order than in ASL word order (see Friday, April 22, 2005, notes). When asked to sign her number tale in ASL on Monday, May 23, 2005, she signed it more in ASL word order than in English word order.

In the beginning and end of the curriculum, Student #4 were reading and signing word problems and number tales in ASL without any English influence. Student #4 improved spatial agreement in his ASL signs. At first, he occasionally forgot to set the topic sign before referring to it (see Friday, April 22, 2005, notes). Now, he always set the topic sign before referring to it (see Monday, May 23, 2005, notes).

The fourth and final goal of this curriculum was *to develop students' mathematical language (or "math talk") in both ASL and English*. This goal was met and confirmed by mainly through the teacher observation notes. All of the recorded dialogues between the teacher and the students in the implementation notes part of the previous chapter (e.g., Monday, May 2, 2005, and Wednesday, May 4, 2005) show that the students have actively been developing and increasing their academic language in ASL by discussing how they solved a given word problem and what strategy they used. For instance, in the transcript from Monday, May 2, 2005, the students and I discussed how to solve a given "Joining To Strategy" word problem, and during that discussion, the students used their mathematical academic language to articulate how they solved a problem. Students #3 and #4 compared how many boxes

Jennifer had before and after she received more boxes. They stated that when Jennifer had two boxes and when she had five boxes after receiving more boxes and they read the question asking how many more boxes Jennifer got. They also said that they knew that the two sets (two and five) needed to be compared and that they needed to subtract one set from another set to get the difference, which was the answer. After comparing and computing, they concluded that the answer was three, which was a correct answer. They were using mathematical language when they offered their mathematical reasoning and articulated how they solved the "Joining To Strategy" word problem, and when they compared and contrasted the numbers in the problem during their verbal mathematical reasoning. Additionally, the students were using a lot of math keywords from the mathematical vocabulary during the same discussion as shown in the transcript, such as number words, "more than," "minus," "subtract" and "add," all of which evidently showed that since they were using these words, they were using mathematical academic language in the discussion.

In other discussions regarding the given word problems, some parts of ASL grammar were discussed with the students so that they could sign a given word problem/number tale more accurately in ASL. For instance, on Monday, May 2, 2005, and Wednesday, May 4, 2005, we talked about signing the English phrases "all together" and "how many" in ASL. After the discussion, the students were able to sign these phrases more accurately in ASL.

The students developed and increased their English academic language. The students' planning, creating and editing of their written English version of their ASL number tales made this development and improvement possible. When editing their

English tales, the students worked with their partners reading and giving feedback on their English versions of their ASL tales. They helped each other picking the specific English words and phrases that closely represent the meaning of their signed ASL phrases. Through editing their work with their partner's and my help, the students were able to build on their English vocabulary and their English skills. Looking at the students' initial and subsequent drafts up to their final draft of English writings, it was apparent that the students increased their academic language in English since these drafts show growth in their English writings.

In closing, students' pretests and posttests captured improvement in all four students' overall word problem test scores. On the pretest, Student #1 got 8 out of 15 problems right (53.3%), but on the posttest, she got 12 out of 15 problems right (80%). Student #2 got 10 out of 15 problems right (66.6%) on her pretest, but on the posttest, she got 13 out of 15 problems right (86.6%). Student #3 answered 9 out of 15 problems right (60%) on her pretest, but she improved a lot answering 13 out of 15 problems right (86.6%) on her posttest. Student# 4 did not do well on his pretest, getting only 4 out of 15 problems right (26.6%), but he did much better on his posttest. He got 9 out of 15 problems correct (60%) on the posttest. These gains in student scores on the pre- and post-tests from the beginning to the end of the curriculum reflected the success of the students' overall learning as they acquire and maintain their word problems solving strategies and tools from this curriculum.

IX. Conclusion

The curriculum field-tested was a result of my two-year accumulation of knowledge and experience from the researching and reading materials on bilingual teaching methodologies and theories, student teaching placement experiences and teacher education training. My evaluation shows that the curriculum's results were remarkable. Because of this curriculum, the students with whom I used it successfully acquired and maintained word problem solving strategies and tools, and were more confident in their ability to read and solve addition- and subtraction-based word problems. This was evident in all four students' gains in their word problem test scores from their pretest to posttest. Students used their prior knowledge and experience to create their own number tales/word problems, and to connect with number tales/word problems they read. Additionally, the students also developed and increased both their metalinguistic awareness of ASL and English, and their proficiency in ASL and English mathematical language, or "math talk". Based on the quality of their self-produced mathematic class books, the students demonstrated their learning from this curriculum. The results of the student performance rubrics for the teacher and the students further confirmed this.

During the implementation, I found that the students would have benefited a lot from their homework doing review of word problems that required the strategies they had learned in the previous lessons. With more time to implement this curriculum, the students could have had more opportunities to practice review word problems. This may have furthered their learning to acquire, master and maintain the

use of the word problem solving strategies and tools taught in this curriculum. More time would have allowed longer discussions about the word problems in order to find out more about what they were thinking when they did the word problems.

In addition to the rubric results, the surveys show that before the curriculum were implemented, most students hated the word problems, but by the end of the experience most of them like the word problems (Table 8.1). Table 8.4 also showed that the students' view on whether they understood how to work word problems generally improved from being negative to positive. At first, the students were generally negative about the word problems. At the end of the lessons, they thought the word problems were okay, and were more optimistic about their word problem solving skills. Regardless of their positive views, the students still regard the word problems as being "a little hard to do" (Table 8.3). This demonstrated that many students need more practice with the word problems. Overall, I am proud of the improvements in the students' attitude toward the word problems and in their ability to read and solve word problems.

In reflection, I asked myself: "Was the curriculum successful?" Based on data collected and analyzed, my answer is yes. This curriculum is flexible enough to be used with students at different levels, and can be modified introducing other mathematical concepts (e.g., multiplication- and division-based word problems). I am hopeful that others will implement the curriculum. I also plan to continue field-testing this curriculum with my future students for further evaluation of what works and does not work.

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Appendix A

Curriculum Lessons

Telling, Reading and Writing Number Tales
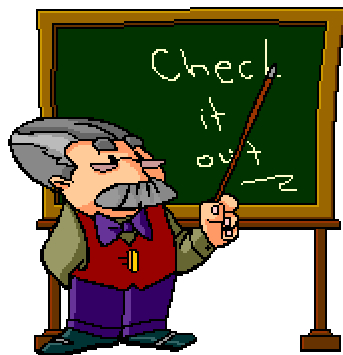
A Note for Teachers:

You can use the following framework as a guide when you implement this curriculum. There are two specific goals in each of the curriculum lesson plans (one for mathematics and one for language arts). In each of the lesson plans, there are guides to help you prepare for and implement the. All of the lessons have extension activities and suggestions for grade-level modifications. The format for each lesson plan looks like this:

> **Unit 1, Lesson 1:** (title of the lesson)
> > **Goal:** (New Mexico State Dept of Ed & National Council of Teachers standards listed)
> > **Objective:** (What we want students to learn)
> > **Assessment:** (Shows how we can know if students have met the objective of this lesson)
> > **Materials needed:** (What we need for this lesson)
> > **Motivation:** ("Hooks" the students for this lesson before implementing the procedure below)
> > **Procedure:** (Step-by-step instructions on implementing this lesson.)
> > **Closure:** ("Wraps up" this lesson by discussing what students have learned after implementing the procedure above.)
> > **Extension idea:** (What we can do to further support students' learning)
> > **Grade level modification suggestion:** (What we can do to make this curriculum work for students of different grade-level learning skills)
> **Unit 1, lesson 2:** (title of this lesson)
> > **………**

Many of the lessons use at least one new poster and re-use some of the posters used in the preceding lessons and these posters all are shown inside lesson plans as examples. Any forms (e.g., pretest, posttest, survey, worksheet, etc.) that the teacher need for the lessons are located in Appendix B. All of the lessons use rubrics, which all can be found in appendix C. For your convenience, the lessons, forms (e.g., pretest, posttest, survey, etc.), and rubrics are listed at the beginning of each of the three appendixes (Appendixes A, B, and C, respectively) to help you locate them. Have fun implementing this curriculum!

Telling, Reading and Writing Number Tales Curriculum

Unit 1 – Back to the Basics

Unit 2 – Telling Number Tales in ASL

Unit 3 – Re-telling ASL Number Tales in English

UNIT ONE:

BACK TO THE BASICS

Unit 1, Lesson #1:

Working Together

Note: Some of the material for this lesson is derived and modified from Lesson Activity 1.1 of Melissa Herzig's "Creating the Narrative Stories" Curriculum

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Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Use language to: Present information and ideas clearly and concisely; Interview; Solve problems; and/or Make decisions (Grade 4, Reading and Listening for Comprehension K–4 Benchmark II-A, Language Arts Performance Standards).

Demonstrate and describe varying rates of change in relation to real-world situations (e.g., plant growth, students' heights) (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given a "Working Together" poster and interview questions, the learners will practice working together and then reflect on their experiences working together as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following thing:
  - Working together
- Student performance rubrics for teacher assessing the following thing:
  - Working together
- Teacher field observational notes on the basic skills acquired and used through this lesson, which include the following thing:
  - How students interacted with each other while working together

Materials needed

Bag of Oreo cookies, chalkboard, "Working Together" poster, Word Problem survey and Word Problem pretest (See Appendix B), papers, pencils/pens, and lesson #1 student performance rubrics for students and for teacher (see Appendix C)

Motivation

1. Announce to the students that we will begin a fun and exciting mathematics unit together. Write on the chalkboard "Telling, Reading and Writing Number Tales," and ask students what they think the title of the curriculum means and what kind of activities they think they will be doing.

   Explain to them what they will be doing for the duration of this curriculum. Note in explanation that the end result is a cumulative project in the form of a math class book filled with student-created English number tales accompanied by a videotape containing student-created ASL number tales.

2. Present a simple real world problem for students to solve, as partners, like below for example.

   Warm up students by asking questions for them to answer like, "How many of you like Oreo cookies? If not, what kind of cookies do you like? Did any of you ever have to share your cookies with anyone?" First write these questions on the chalkboard for students to see and read in English, and then sign them out in ASL (the language of instruction). Keep in mind that the students' answers to the questions above will vary.

   Now, show students your bag of Oreo cookies you bought from the store, and tell them that you already ate some of it, but want to share this bag of cookies with all of them. Before you go any further, make sure to ask students to each discuss with one of their classmates beside them each time you ask them each of the following questions below one at a time. Now, ask them the following questions one at a time both in writing and signing (like above): "Will it be fair if some of us have more cookies than others? (The answer should be no.) How can we be fair? (The answer should be through even distribution of cookies.) How do you propose that we evenly split these cookies in this bag? How many of us are in this classroom? How many should each of us get?" Discuss and then write their answers below the questions listed on the board.

   Now, tell the students that we together will be creating a number tale involving my bag of cookies.

   Tell them your teacher-created number tale in ASL about what happened to the bag of cookies from the moment you (the teacher) bought this bag of cookies to the moment students ate these evenly distributed cookies to the students after you chose share these cookies with them. Make sure to discuss how to write this signed tale in English and then write on the chalkboard at least one sentence/phrase at a time. After completing the writing of this number tale, title it the "Oreo Cookies" for future reference in later activities.

Procedure

1. *Motivation (< 5 minutes)*

2. *Word Problem Survey (< 5 minutes)*

   a. Administer Word Problem survey (see Appendix B).

   b. Tell students that this survey will be administered again at the end of the curriculum implementation. The goal for this is to see whether students' attitudes toward word problems have changed from before to after implementing this curriculum.

3. *Word Problem Pretest (< 15 minutes)*

a.   Administer Word Problem pretest (see Appendix B). Tell students to do their best on the pretest and not to rush through it.

b.   Do not go over pretest with the students during and after administration of the pretest as it will be re-administered as a posttest after the completion of this curriculum.

4.   *Working Together Mini-Lesson (< 10 minutes)*

a.   After the completion of Motivation section, ask them what they remembered about working together when you asked them how they were able to discuss with one of their classmates beside them the answers to the teacher-generated questions.

b.   Tell students that they will often be working together with their classmates for the duration of this curriculum. Note that as they work together, they will help each other with their number tales.

c.   For discussion, Ask students these lead questions:
      i.   How can you work together with someone effectively?
      ii.   What happen if you cannot work together with someone successfully?
      iii.   What were your previous experiences (positive or negative) of working together with someone like?
      iv.   How do you take turns (talking and paying attention) in communication while working together?

d.   Some important discussion main ideas about working together successfully include:
      i.   Be an active, not passive, listener.
      ii.   Wait until the person you are listening to is finished talking, before you say anything.
      iii.   Respond to the other person's comment and ideas with your own comments and questions.
      iv.   Try not to divert attention away from the person who is talking to you.

   Ask them how they would feel if the persons they are trying to work together do none of above.

e.   Write on the "Working Together" poster (up to the teacher implementing this curriculum for creative poster design) the students' ideas and suggestions on how to work together. For example:

	Working Together	
Looks Like	Signs Like	Feels Like
* Leaning forward * Eyes to signer	* Asks questions about the person * Give positive comments (write examples)	*Helping *Nice

f.   Explain to students that for this activity, we will practice working together through interviews.

5.   *Student Interview Activity (< 25 minutes)*

a.   Tell them that they (the students) will begin practicing these working together skills by interviewing their partners and then introducing them to the class with information

from the interview. Tell them to pretend that they are meeting someone for the first time when they interview their partner even though they already know that person (interviewee).

b. Have students brainstorm interview questions together as a class before excusing them to do their interviews with their partners. Write the questions students came up with on the chalkboard and ask them to copy these questions on their paper. Questions may relate to family members, pets, hobbies, sports, etc.

c. Remind them that when they interview their partners, they should take notes to help them remember information when they present their partners to class.

d. Pair up and excuse students to start interviewing their partners.

e. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

f. At the end of the activity, round up the class, and have students present to the class information about their partners.

6. *Closure (< 5 minutes)*

7. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask them questions including the following: Do you feel that you did a good job working together? Did you listen and take turns with your partner well? What did you notice when you work together with your partner? Ask them if they have any questions. Model how to fill out a student performance rubric for students (see Appendix C), and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class. You have the option to do individual student-teacher conferences after this lesson to assess the depth of their knowledge and experience with word problems.

Unit 1, Lesson #2:

Comparing Tales to Word Problems

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Describe the contextual differences of various forms of literature (Grade 4, Writing and Speaking for Expression K–4 Benchmark III-B, Language Arts Performance Standards).

Identify and describe situations with constant or varying rates of change and compare them (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given the "Oreo Cookies" number tale created from the previous activity (Unit 1, Lesson #1) and an excerpt from a teacher-selected, well-known children's literature, the learners will distinguish the differences and similarities between these two tales as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following thing(s):
  - Comparing tales
  - Working together (continuation from Lesson #1)
- Student performance rubrics for teacher assessing the following thing(s):
  - Comparing tales
  - Working together (continuation from Lesson #1)
- Teacher field observational notes on the basic skills acquired and used through this lesson, which include the following thing(s):
  - How students compared the tales to find the similarities and differences between these two tales
  - How students interacted with each other while working together (continuation from Lesson #1)

Materials needed

OLD: "Working Together" poster and the "Oreo Cookies" number tale from the previous activity (Unit 1, Lesson #1), chalkboard, papers, and pencils/pens

NEW: "Tales versus Word Problems" Venn Diagram, "Word Problems K-W-L" chart, sample word problems, tale excerpts from well-known children's literature, "What makes a tale good?" poster, mathematics word wall (for keywords, etc.), and lesson #2 student performance rubrics for students and teacher (Appendix C)

Motivation

1. Show students the "Working Together" poster, and ask students as a whole group what they remember about working together from the last activity (Unit 1, Lesson #1). Remind them that they will always be working together consistently throughout rest of this curriculum and that their learning success will depend on how well they work together.

2. Present the "Word Problems K-W-L" chart (up to the teacher implementing this curriculum for creative poster design), and ask students what they know and want to learn about the word problems. List students' comments on the chart. Tell them that we will revisit the chart at the end of the curriculum to go over what they learned and see whether they have learned anything they want to learn at this moment. For example:

Word Problems K-W-L chart		
K **What I know…**	**W** **What I Want to Learn…**	**L** **What I Learned…**
* Word Problems has numbers.	* How to read word problems to know which arithmetic operation to use…	

3. Present the "Oreo Cookies" number tale created from the previous activity (Unit 1, Lesson #1) by signing it aloud together with the students. After signing, ask students some comprehension questions, e.g. "Can you summarize what happened in the "Oreo Cookies" tale?" After you ask them some comprehension questions, write a mathematical question at the end of this "Oreo Cookies" tale and ask them to solve this question with their classmates in partners.

Procedure

1. *Motivation (< 5 minutes)*

2. *Comparing Tales to Word Problems Activity (< 15 minutes)*

   a. Present the "Tales versus Word Problems" Venn Diagram (up to the teacher implementing this curriculum for creative poster design), and tell them that we will use it to compare tales and word problems. For example:

   b. Orient students to English word problems by asking them to think about and share with others what they know about word problems. Show them the "Oreo Cookies" word problem (a number tale with a mathematical question at the end) and some sample mathematical word problems.

   c. Tell students to look at several select excerpts from well-known children's literature (preferably what your students already read), and ask them if they are tales (answer:

yes) and if they are word problems (answer: no), and then ask them why. Have students next look several select word problems, and ask them if they are tales (answer: usually yes) and if they are word problems (answer: also yes), and then ask them why.

d. Tell them to next look at the "Oreo Cookies" tale with the question included at the bottom, and ask them whether it is a tale (the answer should be yes) and if it is a word problem (the answer should also be yes), and then ask them why. Ask them if it is still a word problem if we remove the question at the bottom (the answer should be no).

e. Some of the facts students should know about word problems:

    i.   Reading and comprehending word problems is similar to reading and comprehending any type of English text.
    ii. They both have the same text elements.
    iii. The organization of word problems differ from other English texts, e.g. the stated purpose for reading is at the end of each word problem compared to the beginning of a reading selection.
    iv. Understanding a paragraph is like solving a problem in mathematics.
    v.   Some word uses exist in both everyday English and in math, but often have different meanings in each context.

f. Let students know that for the next few weeks, they will be creating number tales.

3. *What Makes Good Tales Activity (< 20 minutes)*

    a. Discuss with students about what makes a good tale. Lead questions include the following:

        i. What are the elements of a good tale (e.g., who, where, when, what)?
        ii. What should we include in good tales?

        Record students' ideas and suggestions on the poster with ASL section (up to the teacher implementing this curriculum for creative poster design) entitled "What makes a tale good?" For example:

What makes a tale good?
- Is complete with character, setting, plot (problem) and setting   (i.e.: Who? Where? When? What?).   - Is well concise and clear.   - Has a lot of details   FOR ASL TALES: Correct use of eye gazes, facial expressions, action verbs, etc.

    b. Since students already know that we will be focusing on the word problems, ask them to keep in mind the elements of a good tale as you ask them this question: What makes a good word problem?

    c. Some of the facts students should know about good word problems:

        i. Good word problems must be relevant, particularly to their lives inside and outside of the school.

      ii. Good word problems are compact and robust enough to preserve its identity in the disorganized world around it.

   d. Ask students if what makes a good tale also makes a good word problem (the answer should be yes), and then ask them why. List students' reasons why on the chalkboard and then compare it to the listed facts about what makes a tale good.

4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask them questions including the following: Do you feel that you did a good job working together? Did you listen and take turns with your partner well? What did you notice when you work together with your partner? Ask them if they have any questions. Model how to fill out a student performance rubric for students (see Appendix C), and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Introduce students to the posted blank word wall list. Tell them that because of the fact the mathematical activities we are doing are heavily English-based, each time we encounter an English word related to mathematics and/or mathematical word problems, we will add that word and its definition to the word wall for future reference.

Unit 1, Lesson #3:

Planning and Creating ASL Tales

Note: Some of the material for this lesson is derived and modified from Lesson Activity 1.3 of Melissa Herzig's "Creating the Narrative Stories" Curriculum

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

> Use planning strategies that generate topics and organize ideas (e.g., brainstorming, mapping, webbing, and reading discussion) (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-C, Language Arts Performance Standards).

> Demonstrate and describe varying rates of change in relation to real-world situations (e.g., plant growth, students' heights) (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

> Given "What makes a tale good?" and "Planning strategies" posters, the learners will plan and create their tales as measured by student performance rubrics for students and teacher.

Assessment

Formative

- Teacher questions
    - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative

- Student performance rubrics for students assessing the following thing(s):
    - Planning and creating the tales
    - Working together (continuation from Lesson #1)
- Student performance rubrics for teacher assessing the following thing(s):
    - Planning and creating the tales
    - Working together (continuation from Lesson #1)
- Teacher field observational notes on the basic skills acquired and used through this lesson, which include the following thing(s):
    - How students planned and created their tales
    - How students interacted with each other while working together (continuation from Lesson #1)

Materials needed

> **OLD:** "Working Together" poster and the "Oreo Cookies" number tale (both from Unit 1, Lesson #1); "Tales versus Word Problems" Venn Diagram, sample word problems, an excerpt from well-known children's literature, and "What makes a tale good?" poster (from Unit 1, Lesson #2), chalkboard, papers, pencils/pens, and mathematics word wall

> **NEW:** "Planning strategies" posters, camcorder, and lesson #3 student performance rubrics for students and for teacher (see Appendix C)

Motivation

Review what makes a tale good by using "What makes a tale good?" poster from the previous activity (Unit 1, Lesson #2).

Tell them that they may use the posted "Oreo Cookies" word problem, sample word problems and excerpt(s) from well-known children's literature (all Unit 1, Lesson #2) for inspiration for their writing and to guide their writing in case they need some ideas.

Procedure

1. *Motivation (< 5 minutes)*

2. *Planning Tales Mini-Lesson (< 10 minutes)*

    a. Ask students what we should do first in planning and telling tales. For example:
        i. How do we plan?
        ii. What are different ways of planning a tale?

    b. List on the "Planning strategies" poster (up to the teacher implementing this curriculum for creative poster design) and discuss their ideas and strategies. If needed, add more teacher ideas to the poster. Possible strategies include:
        i. Making a tale matrix
        ii. Drawing
        iii. Mapping
        iv. Talking with each other for advices and ideas

    c. Explain and model each of the listed strategies.

    d. Explain to students that they can create good tales if they know how to plan and use which strategy to use.

3. *Using Prior Knowledge and Experience in Tales Mini-lesson*

    a. Ask students how they learn new things. Field students' comments and suggestions for learning new things. After fielding their comments, ask them this question: If this "new" thing they will be learning is similar to another thing that have learned or experienced in past in one way or another, how would it change their learning of this "new" thing. Field students' comments and suggestions again.

    b. Write on the board "Prior Knowledge and Experience" and ask students what they think it mean.

    c. List students' comments on the board. Tell students that it is their knowledge they gained from their previous learning experience. Give them few examples of how prior knowledge helped them learn new things, e.g. they can learn how to use new fancy calculator with many features using their experience when they learned how to use a different, simple calculator, or, during ASL storytelling, if I sign "riding the horse," they know what is horse and what it looks like because they have seen one before, whether it is in person or not.

    d. Ask them if they can see how mathematics is involved in their everyday lives. Field students' comments.

e. List "Use of Prior Knowledge and Experience" on the "Planning strategies" poster, and ask them why it can be a useful strategy in planning and creating their number tales. Field student ideas and comments.

f. Explain to them that they can use their background knowledge and experience, e.g. using our experience of sharing the Oreo cookies (see Unit 1, Lesson 1) to create the "Oreo cookies" number tale. Since mathematics is truly involved in nearly every aspect of their everyday lives in the real world, their prior knowledge and experience can help them connect with number tales.

4. *Planning and Creating Tales activity (< 25 minutes)*

a. Pick one of the listed planning strategies to model how to create a new number tale similar to the "Oreo Cookies" number tale (Unit 1, Lesson #1). For example, tell a real world story about the time you bought two pizzas for you and your friends. Make sure that this tale incorporate numbers, (e.g., note how many slices each person ate in the story, and then ask them how many slices are left).

b. First, share a topic idea, and then use a selected strategy to plan the number tale. Make sure to explain how you used your prior knowledge and experience to create this new number tale (e.g., you ordered and ate some slices of pizza the night before; so you will be using this experience to create a new number tale today).
    i.   In modeling the teacher creation of a new number tale, make sure to videotape it for the next lesson's feedback activity.
    ii. Try to intentionally leave out some important details (e.g., where, when, what, etc.) and to include too much details with little focus purposely, so that students can learn how to give constructive feedbacks on this teacher-created tale in the next lesson.

c. Ask if anyone has any questions or still do not understand.

d. Pair up and excuse students to start planning and creating their tales. Since students will be working on their word problems soon, ask them to plan and create their tales that incorporate numbers, and to keep it short and simple similar to the length of word problems.

e. After planning and creating tales, videotape students' newly created number tales individually (one for each student) for future use. Also, observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

5. *Closure (< 5 minutes)*

6. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student performance rubric for students (see Appendix C), and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Unit 1, Lesson #4:

Giving Feedback on ASL Tales

Note: Some of the material for this lesson is derived and modified from Lesson Activity 1.4 of Melissa Herzig's "Creating the Narrative Stories" Curriculum

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Goal (Based on New Mexico State Department of Education & National Council standards)

Actively contribute to a discussion (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-A, Language Arts Performance Standards).

Demonstrate and describe varying rates of change in relation to real-world situations (e.g., plant growth, students' heights) (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given the "Working Together" and "Giving Feedback and Suggestions" posters, the learners will use appropriate approaches in giving and receiving feedbacks as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
    - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following thing(s):
    - Giving feedback
    - Working together (continuation from Lesson #1)
- Student performance rubrics for teacher assessing the following thing(s):
    - Giving feedback
    - Working together (continuation from Lesson #1)
- Teacher field observational notes on the basic skills acquired and used through this lesson, which include the following thing(s):
    - How students gave feedbacks and conducted discussions with constructive criticisms
    - How students interacted with each other while working together (continuation from Lesson #1)

Materials needed

OLD: "Working Together" poster (Unit 1, Lesson #1); "What makes a tale good?" poster (Unit 1, Lesson #2), camcorder, the "Pizza" teacher-created number tale and students created number tales (all from Unit 1, Lesson #3), chalkboard, papers, pencils/pens, and mathematics word wall (for keywords, vocabulary, etc.)

NEW: "Giving Feedbacks and Suggestions" poster, television with video input (or computer with Firewire or USB access) for connection to camcorder with recorded student/teacher number tales, and lesson #4 student performance rubrics for students and for teacher (see Appendix C)

Motivation

Ask students to share their feelings and opinions about both working together with others and by themselves. Lead questions include the following: What do you prefer: working by yourself or together with others? Do you like to get help?

Ask students to look back at the time they needed help when they had to do their work themselves. Go slightly off-track by using this as a perfect opportunity to tell them that it is a good example of their using prior knowledge and experience when they looked back at the moments they needed help and/or worked together. Talk about it as being a useful strategy to creating as well as reading to understand number tales. Go back on track by sharing a teacher tale with them about the time you needed help with something, and, when you got the help, how you received feedbacks and suggestions rather than unhelpful criticism. Tell them that in order to successfully work together with others, we need to be able to give and take feedbacks and suggestions well.

Procedure

1. *Motivation (< 5 minutes)*

2. *Giving Feedbacks and Suggestions Activity (< 45 minutes)*

   a. Review "What makes a good tale?" poster (Unit 1, Lesson #2) with the students.

   b. Show students videotaped "Pizza" teacher-created number tale from the last lesson's modeling (Unit 1, Lesson #3), and ask them to help give feedback as they check the "What makes a good tale?" poster (Unit 1, Lesson #2) to see if the tale has met all the criteria for a good tale.

   c. List on the chalkboard comments, questions and suggestions as students give feedback on the teacher-created tale.

   d. After doing so, ask students what they did that helped them to give feedbacks ask they worked with you (the teacher). List their procedures the students said on the chalkboard and add it to "Working Together" poster (Unit 1, Lesson #1). Some of the points in giving feedback can include:

      i. Primarily listening
      ii. Giving specific compliments
      iii. Asking questions and giving suggestions
      iv. Take feedbacks and suggestions into consideration, revise and tell the tale again.

   e. Share with the class the feelings when they gave feedbacks and suggestions. The comments can include the following:

      i. I like it when you complimented my tale.
      ii. I also appreciate that you said, "I suggest that..." instead of saying "you should."
      iii. By saying, "I think… I suggest… It might be better if…," feedbacks and suggestions will be easier to take in.

   f. Add student comments to the "Giving Feedback and Suggestions" poster (up to the teacher implementing this curriculum for creative poster design) like below:

Giving Feedback and Suggestions		
Looks like	Feels like	Signs like

g. Tell students that anyone including you will have easy time taking in these feedbacks and suggestions if given in nicest possible way. Ask and discuss how they would feel if they were in my shoes receiving feedbacks and suggestions. Also, ask them how they would feel if someone criticizes their work and is telling them what to do.

h. Ask if anyone still has any questions or still do not understand.

i. Pair up and excuse students to have them view other's videotaped student-created tales created in the previous lesson either on television or computer, and start giving feedbacks and suggestions on their partners' stories. Remind them to record their partners' comments, questions and suggestions for future reference as they are being given feedback on their tales.

j. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

k. At the end of the activity, round up the class, and begin closure.

3. *Closure (< 5 minutes)*

4. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask them questions including the following: How did you feel when you receive feedback? Were feedbacks helpful? Did you feel like someone was criticizing your work and telling you what to do? If so, how could we avoid that?

Tell them that their help in giving feedbacks on my tale earlier in this lesson is appreciated, and that the feedback they gave will be considered as you show how you revise my tale in the next lesson.

Ask if they have any questions. Model how to fill out a student performance rubric for students (see Appendix C) and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Unit 1, Lesson #5:

Revising ASL Tales

Note: Material for this lesson is derived and modified from Lesson Activity 1.5 of Melissa Herzig's "Creating the Narrative Stories" Curriculum
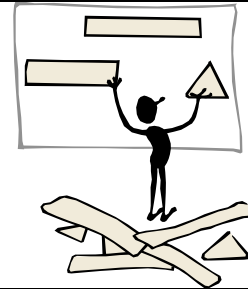
Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Focus revision on: Sequence of events and ideas; Transitional words; and/or Sentence patterns (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-C, Language Arts Performance Standards).

Demonstrate and describe varying rates of change in relation to real-world situations (e.g., plant growth, students' heights) (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given "Reasons for Revision" poster and student feedbacks and suggestions, the learners will respond to feedbacks and suggestions they received in the last lesson and use various revision techniques to revise their tales as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following thing(s):
  - Doing revisions
  - Working together (continuation from Lesson #1)
- Student performance rubrics for teacher assessing the following thing(s):
  - Doing revisions
  - Working together (continuation from Lesson #1)
- Teacher field observational notes on the basic skills acquired and used through this lesson, which include the following thing(s):
  - How students revised their tales
  - How students interacted with each other while working together (continuation from Lesson #1)

Materials needed

OLD: "Working Together" poster (Lesson #1), "What makes a tale good?" poster (Lesson #2), the "Pizza" teacher-created number tale and students created number tales (all from Unit 1, Lesson #3), "Giving Feedbacks and Suggestions" poster and students' recorded feedbacks and suggestions (all from Unit 1, Lesson #4), camcorder, television, chalkboard, papers, pencils/pens, and math word wall

> **Materials needed (continued)**
>
> **NEW:** "Reasons for Revision" poster, and lesson #5 student performance rubrics for students and for teacher (see Appendix C)

Motivation

Ask students what is the next step after they received feedbacks and suggestions on their tales. Next step is to revise their tales. Discuss how the students feel after telling them that they have to revise their tales after initially creating them.

Discuss with the students about why all tales, signed or written, deserves to go through revision at least once. Some of the reasons include:

- Content and emphasis
    - Is any information missing? Are there meaningless parts? Are important ideas emphasized and lesser ones de-emphasized?

- Clarity
    - Is organization logical? Is content straightforward and understandable?

- Correctness
    - Is it grammatically correct? Are words and phrases well chosen? Is it well structured?

- Brevity
    - Is it well concise with no wordy phrases? Does it contain any unnecessary information? Does it contain any unimportant ideas?

- Style
    - Is its style appropriate for the content of the tale?

List students' reasons on the "Reasons for Revision" poster and discuss each of it one at a time. Ask why we cannot leave the tales we initially created alone. Tell them that everybody, including the famous storytellers, has to revise all their work at least once.

Procedure

1. *Motivation (< 5 minutes)*

2. *Revising Tales Activity (< 40 minutes)*

    a. Show students how their feedbacks from the previous lesson had informed the revision of the "Pizza" teacher-created number tale (Unit 1, Lesson #3). Tale does not need to be drawn, mapped or outlined again. Just show what the revision look like on the videotape.

    b. Show where the content has been added or removed based on their feedback.

    c. Show the videotaped revised tale, and, again, ask for feedback and suggestions. If necessary, refer them to the "What makes a tale good?" and "Giving Feedbacks and Suggestions" posters for some guidelines (Unit 1, Lesson #2 and #4).

(Note: If students do give more feedback for the tale, demonstrate the reediting and retelling of the tale in class.)

d. Ask if anyone has any questions or still do not understand.

e. Pair up and excuse students to start revising their videotaped tales based on the feedback and suggestions they received. Videotape their revised tales.

f. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

g. At the end of the activity, round up the class, and discuss how they improved their tales after revisions. Discuss what differences they saw in their tales.

3. *Closure (< 5 minutes)*

4. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask them questions such as: How do you feel about revising your work? Has your feeling toward revising your work changed from before this lesson? Remind them that everybody has to revise often, as there is nothing wrong with it. Everybody, including the storytellers and me, always ask other people for their feedback. Ask if they have any questions. Model how to fill out a student performance rubric for students (see Appendix C), and then have them fill their own out. Collect rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Tell students that we now will save their revised tales for the future use, and that it will be at least one week and half before we revisit these tales (in Unit 3).

Revisit "using prior knowledge and experience" discussion (discussed in previous two lessons), and talk about how it has or has not helped them in planning and creating their number tales as well as reading and connecting to given number tales.

UNIT TWO:

Telling Number Tales in ASL

Unit 2, Lesson #1:

Acting Out ASL Addition Number Tales
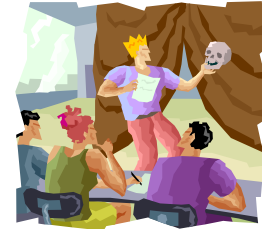
Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Use appropriate non-verbal communication while giving presentations (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-A, Language Arts Performance Standards).

Use a variety of strategies (e.g., rounding and re-rounding) to estimate the results of whole number computations and judge the reasonableness of the answers (Grade 4, Numbers and Operations 3 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given ASL-signed addition number tales, the learners will act out these tales as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
    - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following thing(s):
    - Acting out addition number tales in ASL
    - Solving ASL addition number tales
- Student performance rubrics for teacher assessing the following thing(s):
    - Acting out addition number tales in ASL
    - Solving ASL addition number tales
- Teacher field observational notes on students' learning process during this lesson, which include the following thing(s):
    - How students acted out ASL addition number tales
    - How students solved ASL number tales using Joining All Strategy

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Materials needed

All of the posters from the Unit 1, "Reading Word Problems strategy" poster, chalkboard, papers, pencils/pens, mathematics word wall, "Facts and Questions" worksheet #1 (Appendix B), and unit 2, lesson # 1 student performance rubrics for students and for teacher (see Appendix C)

Motivation

1. Review activities in the first unit by raising hand and asking students what they remember about working together, planning and creating tales, giving feedbacks and suggestions, and revising tales. Remind students that these skills are very vital to future activities that they soon will be doing.

2. After review, raise hand again and ask students what they remember about adding, and have them discuss with their classmates sitting beside them what they remember and then share with others in the classroom. If necessary, remind them to use their "working together" skills, which they learned from the previous unit.

3. Tell students that for the next few weeks, they will be working on the given word problems in addition to creating their own word problems.

Procedure

1. *Motivation (< 5 minutes)*

2. *Reading Word Problems Strategy Mini-lesson (< 10 minutes)*

    a. Orient students to word problems by asking students to think about and share with each other what they know about word problems.

    b. Present one simple English word problem, like below for example, and sign it in ASL. Ask students what this word problem is asking for and how they would solve it. List on the chalkboard the steps students took in solving this word problem. During the listing, first discuss and list which arithmetic operation we should use for this word problem. For example:

        > There are 10 turtles near the pond. 2 turtles left the pond. How many turtles are left?

    c. Ask students which parts of this word problem are facts. Also ask them which part(s) is a question. Discuss why some are facts and some are questions.

    d. Now, offer them strategic steps listed below in solving this word problem. List and explain each of these strategic steps on "Reading Word Problems strategy" poster (up to the teacher implementing this curriculum for creative poster design).

        i.   Step 1: <u>Read</u> the entire problem twice. Do not try to solve anything when you have only read half a word problem (or even a sentence).

        ii. Step 2: Try to <u>understand</u> the whole word problem.

             1. Can form a picture of the problem in your mind or draw a picture of the problem.

             2. See what information you have and what information you still need.

             3. Replace any hard names you can't read with easier ones.

        iii. Step 3: Work in a <u>clear, organized manner</u>.

             1. Identify and label/underline variables, and/or underline keywords. By working clearly, this will help you to think clearly and solve a given word problem clearly.

2. Ignore extra information you don't need to solve the problem

 iv. Step 4: <u>Look for</u> keywords that help decide whether to add, subtract, multiple or divide. Certain words always indicate certain mathematical operations.

 v. Step 5: <u>Identify</u> what the question is asking, and <u>solve</u> the problem after determining what mathematical operation needs to be carried out and which variables need to be computed.

 vi. Step 6: <u>Check</u> your answer and ask yourself this: "Is my answer possible?" If not, go back to Step 1 and redo the word problem.

e. Emphasize on two things: reading the word problem whole first and looking for keywords. Use this time as an opportunity to use mathematics word wall adding known keywords in typical word problems to it like below for example:

Word Wall		
- One (1), two (2), three (3), four (4), five (5), six (6), seven (7), … - addition (+), subtraction (−), multiplication (*, X), division (/, ÷) - …		
Addition	Subtraction	Equals
in all, all together, altogether, joined together, total, product, increased by, plus, more than, combined together, total of, sum, added to, fewer than	how many left, less than, sum difference, decreased by, minus, less than, difference between/of, less than, fewer than/of, how many more	is, are, was, were, will be, gives, yields, sold for

f. Some of the facts students should know about reading and solving word problems:

 i. There actually are two main steps to solving word problems:

  1. Translating the English wording to a numeric equation

  2. Solving the equation.

 ii. The hardest thing about doing English word problems is taking the English problem and translating it into arithmetic sentence. Arithmetic sentence is a mathematical numeric equation complete with numerical and other math-related symbols.

 iii. Usually, once you get the arithmetic sentence, you are able to solve the problem fairly simple.

 iv. The only way to really learn and master reading and solving word problems is to practice, practice and practice.

g. Explain to students that they will have little difficulty or easily solve a given word problem if they follow these steps.

h. Ask if anyone has any questions or still do not understand before moving on to the next activity.

3. *Acting out Number Tales in ASL activity (< 20 minutes)*

    a. Model how to do the activity

        i. Present and act out at least one ASL-signed number tale based on classroom materials readily available in the classroom. For example:

        "I took six pencils from *<Student A>*. I then took three more pencils from *<Student B>*. How many pencils do I have now?"

        Recall and employ "Reading Word Problems" strategy on chalkboard together with the students. Ask them for the answer.

        ii. Present another at least one ASL-signed number tale and call on students to act it out. For example:

        "*Student A* put four books on the table. *Student B* put two more books on that table. How many books are on the table altogether?"

        Recall and employ "Reading Word Problems" Strategy.

    b. Remind them how to work together and that all their tales must incorporate both numbers and a mathematical question. Tell them that they can use the present posters and sample word problems (and tales) on the chalkboard for some ideas to create and act out their tales.

    c. Ask if anyone has any questions or still do not understand.

    d. Pair up and excuse students to start creating and acting out their number tales with their partners.

    e. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

    f. At the end of the activity, round up the class, and have at least one student volunteer to come up with their own ASL-signed number tale, and share it with the class.

4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student performance rubric for students (see Appendix C) and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Distribute "Facts and Questions" worksheet #1 (see Appendix B) and tell students that it is their homework. Before excusing them, model how to do the worksheet and ask them if they have any questions. Also recall with students our recent discussion on identifying facts and questions in word problems (see Procedure step 2c. in this lesson).

Unit 2, Lesson #2:
Using Cubes for ASL Addition Number Tales
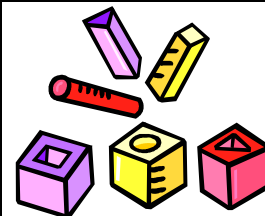
Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Use language to: Present information and ideas clearly and concisely; Interview; Solve problems; and Make decisions (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-A, Language Arts Performance Standards).

Use a variety of strategies (e.g., rounding and re-rounding) to estimate the results of whole number computations and judge the reasonableness of the answers (Grade 4, Numbers and Operations 3 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given cube manipulative and ASL-signed addition number tales, the learners will use cube manipulative to represent these ASL tales as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
  - Using cubes to represent ASL addition number tales
  - Solving ASL addition number tales
- Student performance rubrics for teacher assessing the following things:
  - Using cubes to represent ASL addition number tales
  - Solving ASL addition number tales
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
  - How students used cubes to represent addition number tales
  - How students solved addition number tales using certain strategies

Materials needed

OLD: All of the posters from the Unit 1, Lessons # 1 – 5, "Reading Word Problems strategy" poster (Unit 2, Lesson #1), chalkboard, papers, pencils/pens, and mathematics word wall

NEW: Cube manipulative (e.g., Snap, Multilink, or Unifix cubes), "Joining To strategy" poster, "Addition Word Problems" worksheet #2 (see Appendix B), and unit 2, lesson # 2 student performance rubrics for students and for teacher (see Appendix C)

Motivation

Ask students what did they remember and learn about acting out addition number tales in ASL from the previous lesson (Unit 2, Lesson #2), and have them share their thoughts together with the class.

Tell students that in this lesson, they will be using cubes to represent their acted out number tales.

Procedure

1. *Motivation (< 5 minutes)*

2. *Joining To Strategy Mini-lesson (< 10 minutes)*

   a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

   ---- **The problem** --

   Jennifer had two boxes. Megan gave her some more. Now Jennifer has five boxes. How many boxes did Megan give her?

   ---- **Joining To Strategy** --

   Use objects or fingers (for more advanced students, use number sense) to model the actions and/or relationships in this problem.

   You make a set of two objects. Then you add objects to the set at a time until there is total of five objects. You find the answer by counting the number of objects added.

   ----

   b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Which words in this word problem that usually means that addition is the correct operation to use? How do you know?"

   c. Use "Joining To strategy" poster board (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

   d. Come up with several addition-based problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For examples:

      Alex had 5 action figures. His parents gave him some more action figures for Christmas. Then he had 7 action figures. How many action figures did Alex's parents give him for his birthday?

      Alex has 7 action figures. How many more action figures does he need to get to have 11 action figures all together?

      Jennifer had 3 pairs of shoes. Her friend gave her some more pairs of shoes. Now Jennifer had 8 pairs. How many pairs of shoes did Jennifer's friend give her?

     e.   Discuss how this lesson's Joining To strategy is different from the Joining All strategy covered in the previous lesson plan (Unit 2, Lesson #1).

3.   *ASL Number Tales with Cubes activity (< 20 minutes)*

    a.   Model how to do the activity

         i.   Present at least one ASL-signed number tale using interlocking cubes to represent the people, objects, or animals in the tale(s) told. For example:

            "Cynthia ate four candy bars. She ate few more candy bars. Now Cynthia ate seven candy bars. How many candy bars did Cynthia eat?"

            Recall and employ "Joining To" Strategy on board together with the students. Ask them for the answer.

        ii. Come up with a variety of additional tales to practice formulating correct arithmetic sentences. Also good for students to see execution a variety of different word problem-solving strategies in action.

    b.   Remind them how to work together; if necessary, tell them to look at the "Working Together" poster (Unit 1, Lesson #1). Also tell them that they can use the present poster and same word problems (and tales) on the chalkboard for some ideas to come up with and use cubes to represent their tales.

    c.   Ask if anyone has any questions or still do not understand.

    d.   Pair up and excuse students to start using cube manipulative to represent their ASL tales that they will be creating with their partners.

    e.   Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

    f.   At the end of the activity, round up the class, and have at least one student volunteer to come up with their own ASL-signed number tale, and share it with the class.

4.   *Closure (< 5 minutes)*

5.   *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Distribute "Addition Word Problems" worksheet #2 (see Appendix B) and tell students that it is their homework. Before excusing them, model how to do the worksheet and ask them if they have any questions.

Unit 2, Lesson #3:

Formulating Arithmetic Sentences for ASL Addition Number Tales

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Use language to: Present information and ideas clearly and concisely; Interview; Solve problems; and Make decisions (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-A, Language Arts Performance Standards).

Express mathematical relationships using equations (Grade 4, Algebra 2 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given ASL-signed addition number tales, the learners will formulate arithmetic sentences for those tales they acted out as measured by both the quality of the arithmetic sentences students created and student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
  - Formulating arithmetic sentences to represent ASL addition number tales
  - Solving ASL addition number tales
- Student performance rubrics for teacher assessing the following things:
  - Using cubes to representing ASL addition number tales
  - Solving ASL addition number tales
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
  - How students formulated arithmetic sentences to represent ASL addition number tales
  - How students solved ASL addition number tales using certain strategies

Materials needed

OLD: All of the posters from the Unit 1, Lessons # 1 – 5, "Reading Word Problems strategy" and "Joining To strategy" posters (Unit 2, Lesson #1), Cube manipulative (e.g., Snap, Multilink, or Unifix cubes) and "Joining To strategy" poster (Unit 2, Lesson #2), chalkboard, papers, pencils, and math word wall

> **Materials needed (continued)**
>
> > **NEW:** "Joining All strategy" poster, " More Addition Word Problems" worksheet #3 (see Appendix B), and unit 2, lesson # 3 student performance rubrics for students and for teacher (see Appendix C)

Motivation

Tell students that so far they have been acting out addition number tales in ASL and using cube manipulative to represent these tales.

Ask them what they know about arithmetic sentences, and have them share what they know with the class.

Tell students that in this lesson, they will be formulating arithmetic sentences to represent their number tales and its cube manipulative representations.

Procedure

1. *Motivation (< 5 minutes)*

2. *Joining All Strategy Mini-lesson (< 10 minutes)*

    a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

> ---- **The problem** --
>
> > **Andrew had two apples. He bought five more apples. How many apples does Andrew have now?**
>
> ---- **Joining All Strategy** --
>
> > **Use objects or fingers (for more advanced students, use number sense) to model the actions and/or relationships in this problem. Using objects or fingers, you make a set of two objects and a set of five objects. Then you count the union of the two sets, starting with one.**
> >
> > **The answer to the problem is found through joining the two sets of objects and counting them all together, starting with one. You can first join the sets and then count all the items or count one set followed by the other set.**
>
> --

    b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Which words in this word problem that usually means that addition is the correct operation to use? How do you know?"

    c. Use "Joining All strategy" poster (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

d. Come up with several addition-based problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For examples:

> Andrew had 5 toy cars. His parents gave him 2 more toy cars for his birthday. How many toy cars did he have then?

> John spent $24 on video games. He bought a plant for $8. How much did he spend all together?

> The attendances at the last two football games at the local school for the deaf were 151 and 254. How many people came to these two games?

3. *Recording ASL Addition Number Tales Symbolically activity (< 20 minutes)*

   a. Model how to do the activity

      i. Present at least one ASL-signed number tale. Do call on students to act it out, use cube manipulative of it, or both. Write the addition arithmetic sentence for it so the students can see the use of symbols in representing the given number tale. For example:

         "Josh caught five baseballs. David caught three more baseballs. How many baseballs did they catch?" $5 + 3 = 8$

         Recall and employ Joining All Strategy.

      ii. Present another at least one ASL-signed number tale and call on students to act it out. For example:

         "Today, I read first five pages of this book. Tomorrow, I read next three pages of this book. How many pages did I read altogether?" $5 + 3 = 8$

         Recall and employ Joining All Strategy.

      iii. Make sure to come up with a variety of additional tales to practice formulating correct arithmetic sentences. Also good for students to see execution a variety of different word problem-solving strategies in action.

   b. Remind them how to work together; if necessary, tell them to look at the "Working Together" poster (Unit 1, Lesson #1). Also tell them that they can use the present poster and same word problems (and tales) on the chalkboard for some ideas to come up with and create arithmetic sentences to represent their tales.

   c. Ask if anyone has any questions or still do not understand.

   d. Pair up and excuse students to start formulating arithmetic sentences to represent their ASL tales that they will be creating with their partners.

   e. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

     f.   At the end of the activity, round up the class, and get at least one student to volunteer coming up with and formulating arithmetic sentence for their own ASL-signed number tale, and share it with the class.

4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Distribute "More Addition Word Problems" worksheet #3 (see Appendix B) and tell students that it is their homework. Before excusing them, model how to do the worksheet and ask them if they have any questions.

Unit 2, Lesson #4:

Acting Out and Using Cubes for ASL Subtraction Number Tales

Note: The material for this lesson is nearly similar to Unit 2, Lesson # 2.

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Use language to: Present information and ideas clearly and concisely; Interview; Solve problems; and Make decisions (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-A, Language Arts Performance Standards).

Use a variety of strategies (e.g., rounding and re-rounding) to estimate the results of whole number computations and judge the reasonableness of the answers (Grade 4, Numbers and Operations 3 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given cube manipulative and ASL-signed subtraction number tales, the learners will use cube manipulative to represent these tales they created as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
    - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
    - Acting out subtraction number tales in ASL
    - Using cubes to represent ASL subtraction number tales
    - Solving ASL subtraction number tales
- Student performance rubrics for teacher assessing the following things:
    - Acting out subtraction number tales in ASL
    - Using cubes to represent ASL subtraction number tales
    - Solving ASL subtraction number tales
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
    - How students used cubes to represent ASL subtraction number tales
    - How students used cubes to solve ASL subtraction number tales
    - How students solved ASL subtraction number tales using certain strategies

---

Materials needed

> **OLD:** All of the posters from the Unit 1, Lessons # 1 – 5, "Reading Word Problems strategy" and "Joining All strategy" posters (Unit 2, Lesson #1), Cube manipulative (e.g., Snap, Multilink, or Unifix cubes) and "Joining To strategy" poster (Unit 2, Lesson #2), "Compare strategy" poster (Unit 2, Lesson #3), chalkboard, papers, pencils/pens, and mathematics word wall

> **NEW:** "Separating From strategy" poster, "Subtraction Word Problems" worksheet #4 (see Appendix B), and unit 2, lesson # 4 student performance rubrics for students and for teacher (see Appendix C)

Motivation

Review with the students what they learned during this past few lesson activities focusing on additions. Ask them what they know about subtractions and how it differ from additions. Tell them that we will be focusing on subtractions this time.

Procedure

1. *Motivation (< 5 minutes)*

2. *Separating From Strategy Mini-lesson (< 10 minutes)*

    a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

    > **--- The problem --**
    >
    > > **There were seven boys playing tag. Two boys went home. How many boys were still playing?**
    >
    > **--- Separating From Strategy --**
    >
    > > **Using objects or finger, make a set of seven objects. Removes two objects from the set. The number of remaining objects is the answer.**
    >
    > **--**

    b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Which words in this word problem that usually means that subtraction is the correct operation to use? How do you know?"

    c. Use "Separating From strategy" poster (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

    d. Come up with several subtraction-based problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For example:

    Amelie spent $27.26 at the mall. She started out with $30. How much did she have left?

    The big, fat clown had 13 banana cream pies. He threw 5 pies at another small, skinny clown. How many banana cream pies does the big, fat clown have left?

    There were 8 seals playing. 3 seals swam away. How many seals were still playing?

      e.   Discuss how this strategy is different from other strategies covered in the previous lessons.

3.   *ASL Subtraction Number Tales with Cubes activity (< 20 minutes)*

      a.   Model how to do the activity

          i.   Present at least one ASL-signed number tale using interlocking cubes to represent the people, objects, or animals in the tale(s) told. For example:

              "There were six pencils. The boy broke four of them. How many pencils are still left?"

              Recall and employ Separating From Strategy on board together with the students. Ask them for the answer.

         ii.   Present another at least one ASL-signed number tale and call on students to act it out. For example:

              "There are twenty pages in the book. The librarian read first ten pages. How many unread pages are there left?"

              Recall and employ Separating From Strategy.

      b.   Remind them how to work together; if necessary, tell them to look at the "Working Together" poster (Unit 1, Lesson #1). Also tell them that they can use the present poster and same word problems (and tales) on the chalkboard for some ideas to come up with, and act out and/or use cubes to represent their tales.

      c.   Ask if anyone has any questions or still do not understand.

      d.   Pair up and excuse students to start using cube manipulative to represent their ASL tales that they will be creating with their partners.

      e.   Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

      f.   At the end of the activity, round up the class, and have at least one student volunteer to come up with their own ASL-signed number tale, and share it with the class.

4.   *Closure (< 5 minutes)*

5.   *Clean-up/Dismiss (Classroom Management; 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Unit 2, Lesson #5:

Formulating Arithmetic Sentences for ASL Subtraction Number Tales

Note: The material for this lesson is nearly similar to Unit 2, Lesson # 3 of this curriculum.

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Use language to: Present information and ideas clearly and concisely; Interview; Solve problems; and Make decisions (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-A, Language Arts Performance Standards).

Express mathematical relationships using equations (Grade 4, Algebra 2 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given ASL-signed subtraction number tales, the learners will formulate arithmetic sentences for those tales they acted out as measured by both the quality of the arithmetic sentences students created and student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
    - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
    - Using cubes to representing ASL subtraction number tales
    - Solving ASL subtraction number tales
- Student performance rubrics for teacher assessing the following things:
    - Using cubes to representing ASL subtraction number tales
    - Solving ASL subtraction number tales
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
    - How students formulated arithmetic sentences to represent ASL subtraction number tales
    - How students solved ASL subtraction number tales using certain strategies

---

Materials needed

OLD: All of the posters from the Unit 1, Lessons # 1 – 5, "Reading Word Problems strategy" and "Joining All strategy" posters (Unit 2, Lesson #1), Cube manipulative (e.g., Snap cubes) and "Joining To strategy" poster (Unit 2, Lesson #2), "Compare strategy" poster (Unit 2, Lesson #3), "Separating From strategy" poster (Unit 2, Lesson #4), chalkboard, papers, pencils, and math word wall

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Materials needed (continued)

NEW: "Separating To strategy" poster, "More Subtraction Word Problems" worksheet #5 (see Appendix B), and unit 2, lesson # 5 student performance rubrics for students and for teacher (see Appendix C)

Motivation

Ask them what they remember about formulating arithmetic sentences for their addition number tales they acted out and its cube manipulative representations they also created.

Tell students that in this lesson, they will be formulating arithmetic sentences to represent their subtraction number tales and its cube manipulative representations in similar fashion as what they did before.

Procedure

1. *Motivation (< 5 minutes)*

2. *Separating To Strategy Mini-lesson (< 10 minutes)*

   a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

   --- **The problem** --

   > **Billy bob had 25 dollars. He spent some money. Now he has 7 dollars left. How much money did Billy Bob spent?**

   --- **Separating To Strategy** ---

   > **Start with a set of 25 objects and keep removing objects one at a time until there are 7 left. The number of objects removed is the answer.**

   ----

   b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Can you find any words in this word problem that will tell you what the correct operation to use is? How do you know?"

   c. Use "Separating To strategy" poster (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

   d. Come up with several subtraction-based problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For example:

   > Kimberly had 8 hot dogs. She gave some hot dogs to her sister. Then she had 5 hot dogs left. How many hot dogs did Kimberly give her sister?

   > Audri had $5.00 in her pocket. She brought a special computer pen and got $1.96 back. How much did that special computer pen cost?

There were 8 people on the fishing boat trying to catch fishes. Some people gave up and got off. Now there are 3 people still fishing on the boat. How many people got off the fishing boat?

  e. Discuss how this strategy is different from other strategies covered in the previous lessons of this second unit.

3. *Recording ASL Subtraction Number Tales Symbolically activity (< 20 minutes)*

  a. Model how to do the activity
    i. Present at least one ASL-signed number tale. Do call on students to act it out, use cube manipulative of it, or both. Write the subtraction arithmetic sentence for it so the students can see the use of symbols in representing the given number tale. For example:

     "There are eight cups of water. I drank some of it. Now there is one cup of water left. How many cups of water did I drink?" $8 - 7 = 1$

     Recall and employ Separating To strategy.

    ii. Make sure to come up with a variety of additional tales to practice formulating correct subtraction arithmetic sentences. Also good for students to see execution a variety of different subtraction word problem-solving strategies in action.

  b. Remind them how to work together; if necessary, tell them to look at the "Working Together" poster (Unit 1, Lesson #1). Also tell them that they can use the present poster and same word problems (and tales) on the chalkboard for some ideas to come up with and create arithmetic sentences to represent their tales.

  c. Ask if anyone has any questions or still do not understand.

  d. Pair up and excuse students to start formulating arithmetic sentences to represent their ASL tales that they will be creating with their partners.

  e. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

  f. At the end of the activity, round up the class, and get at least one student to volunteer coming up with and formulating arithmetic sentence for their own ASL-signed number tale, and share it with the class.

4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (<1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

UNIT THREE:

Re-Telling ASL Number Tales in English

Unit 3, Lesson #1:
Comparing ASL and English Tales

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Describe the contextual differences of various forms of literature (Grade 4, Writing and Speaking for Expression K–4 Benchmark III-B, Language Arts Performance Standards).

Identify and describe situations with constant or varying rates of change and compare them (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given "What makes a tale good?" poster, and various ASL and English number tales, the learners will compare and distinguish differences between ASL and English number tales as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
  - Distinguishing differences between ASL and English number tales
  - Distinguishing similarities between ASL and English number tales
- Student performance rubrics for teacher assessing the following things:
  - Distinguishing differences between ASL and English number tales
  - Distinguishing similarities between ASL and English number tales
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
  - How students distinguish differences and similarities between ASL and English tales

Materials needed

"What makes a tale good?" poster (Unit 1, Lesson #2), all strategy posters from Unit 2, "Compare strategy #1" poster, chalkboard, overhead projector, papers, pencils/pens, mathematics word wall, video of good ASL-signed number tale, hardcopy of good written English number tale, "Compare Word Problems" worksheet #6 (Appendix B), and unit 3, lesson #1 student performance rubrics for student and teacher (Appendix C)

Motivation

Tell the students that up to now we focused on ASL-signed number tales and word problems. Ask students to share their feelings and opinions about what they have been doing and learning up to now.

Ask them questions about their learning experience with ASL number tales that include the following: "What did you learn about ASL number tales? How do you feel about using all the posters created up to now? Were they helpful or not?" Ask them if there really is a written form of ASL (the answer is no), and how we can record our ASL-signed number tales (the answer is in a different language form, namely English).

Procedure

1. *Motivation (< 5 minutes)*

2. *Compare Strategy #1 Mini-lesson (< 10 minutes)*

    a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

    ---- The problem --

    > **Tom has five brothers. Juan has two brothers. How many more brothers does Tom have than Juan?**

    ---- Compare Strategy ---

    > **Create a set of five objects and a set of two objects. Match the objects in each set one to one and counts the number of unmatched objects.**

    ---

    b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Can you find any words in this word problem that will tell you what the correct operation to use is? How do you know?"

    c. Use "Compare strategy #1" poster board (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

    d. Come up with several compare problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For example:

    > Mark has 3 books. Sally has 7 books. Sally has how many more books than Mark?

    > Cynthia has 13 coins. Amanda has 5 coins. How many more coins does Cynthia have than Amanda?

    > Robert has 3 stickers. Michelle has 8 stickers. How many more stickers does Michelle have than Robert?

    e. Discuss how this strategy is different from other strategies covered in the previous lessons of this second unit.

3. *Comparing ASL and English Tales activity (<20 minutes)*

    a. Review with the students what they know about creating a good English tale.

        i. List properties of a good English tale on the chalkboard.

        ii. Refer to the "What makes a tale good?" poster (Unit 1, Lesson #2) for guidelines.

        iii. Since we created these guidelines with ASL in mind, ask students if the guidelines are any different for English. (The answer, for the most part, should be no.)

        iv. Write on the chalkboard what supposed differences there may be between ASL and English tales. It could be anything, make sure address these comments.

    b. Show them a video of good ASL-signed number tale.

        i. Ask students if it is a good ASL-signed tale. Refer to the guidelines on the poster above.

        ii. Ask students for any comments or questions about this tale.

    c. Show them a hardcopy of good English-written number tale (whose content should be the same as the ASL-signed number tale above).

        i. Ask students if it is a good English-written tale. Refer to the guidelines on the poster above.

        ii. Ask students for any comments or questions about this tale.

        iii. Ask them to compare it to ASL-signed number tale they just recently saw on the videotape (hopefully, they should notice that they are about the same thing in two different languages).

    d. Now, ask students again about what supposed differences their may be between ASL and English tales. Write their comments on the board and address them.

4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Tell students that for the next few days, we will focus on writing English versions of student-produced ASL number tales (either from the end of Unit 1 or Unit 2, depending on students' choices made; for more information regarding students' choices, see extension idea section of Unit 2, Lesson #5). In other words, they now will to begin re-telling their ASL-signed number tales in English.

Distribute "Compare Word Problems" worksheet #6 (see Appendix B) and tell students that it is their homework. Before excusing them, model how to do the worksheet and ask them if they have any questions.

Unit 3, Lesson #2:

Modeling a Good English Tale

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Analyze how language and visuals bring characters to life, enhance plot development, and produce a response (Grade 4, Reading and Listening for Comprehension K–4 Benchmark I-C, Language Arts Performance Standards).

Identify and describe situations with constant or varying rates of change and compare them (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given good and bad English tales, the learners will know what makes good English tales and identify its properties as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
  - Identifying good English tales
  - Identifying bad English tales
  - Telling good English tales apart from bad ones
- Student performance rubrics for teacher assessing the following things:
  - Identifying good English tales
  - Identifying bad English tales
  - Telling good English tales apart from bad ones
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
  - How students can identify good English tales
  - How students can identify bad English tales
  - How students could tell good English tales apart from bad ones

Materials needed

OLD: All strategy posters from Unit 2, "Compare strategy #1" poster (Unit 3, Lesson #1), "What makes a tale good?" poster (Unit 1, Lesson #2), overhead projector, chalkboard, and papers, pencils/pens, and mathematics word wall

NEW: "Compare strategy #2" poster, Sample good English tales, sample bad English tales, "More Compare Word Problems" worksheet #7 (Appendix B), and unit 3, lesson #2 student performance rubrics for student and for teacher (Appendix C)

Motivation

Now that students have made comparisons between ASL and English tales, ask them about their English writing experiences. Ask them and list on the board what things can make a difference between good and bad English tales (list should include grammar, details, clarity, and style).

Procedure

1. *Motivation (< 5 minutes)*

2. *Compare Strategy #2 Mini-lesson (< 10 minutes)*

   a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

   ---- **The problem** --

   > **Mother has 9 siblings. Father has 5 fewer siblings than mother. How many siblings does mother have?**

   ---- **Compare Strategy** --

   > **Create a set of nine objects and removes five objects from it. Count the number of unmatched objects to find the answer.**

   ----

   b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Can you find any words in this word problem that will tell you what the correct operation to use is? How do you know?"

   c. Use "Compare strategy #2" poster board (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

   d. Come up with several compare problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For example:

   > Richard has 9 books. Arnold has 2 fewer books than Richard. Arnold has how many books?

   > Billy Bob has 13 boxes of fruits. Amanda has 4 fewer than Billy Bob. How many boxes does Amanda have?

   > Alex had 3 burritos. Cynthia ate 2 fewer than him. How many burrito(s) did Cynthia eat?

   e. Discuss how this strategy is different from other strategies covered in the previous lessons of these second and third units.

3. *Modeling a good English Tale (< 40 minutes)*

   a. Show "What makes a tale good?" poster (Unit 1, Lesson #2). Discuss with students about what makes a good English tale. Lead questions include the following:

Record students' ideas and suggestions on the poster with English section (up to the teacher implementing this curriculum for creative poster design) entitled "What makes a tale good?" For example:

What makes a tale good?
- Is complete with character, setting, plot (problem) and setting 　　　　(i.e.: Who? Where? When? What?). - Is well concise and clear. - Has a lot of details For ASL Tales:　- Correct use of eye gazes, facial expressions, action verbs For English Tales:　　　- Good sentences (noun, adjectives, verbs, adverbs) 　　　　　　　-　Correct use of punctuations (.!?) 　　　　　　　-　Good use of capital letters 　　　　　　　-　Grammar

Move on to modeling a good English tale. Add more to the poster later this lesson if necessary.

b. Show students a good English tale on the overhead.
   i. Ask them questions about the tale and its English.
      1. What is it about? (E.g. Who? Where? What? When?)
      2. What did you notice about its English writing?

c. Now show them a bad English tale on the overhead.
   i. Ask them questions about the tale and its English.
      1. What is it about? (E.g. Who? Where? What? When?)
      2. What did you notice about its English writing?

d. Compare both good and bad English versions of the tale.
   i. Ask students what differences they notice between the tales.
   ii. Ask them questions such as:
      1. Does it have a clear focus and topic with good details?
      2. Are the sentences clear?
      3. Do the sentences make sense?
      4. Are the sentences not too long but not too short?
      5. Are the sentences interesting?
      6. Is it organized with ideas and details in proper order with a clear beginning, middle and ending?
      7. Is its grammar and punctuation correct?

4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Unit 3, Lesson #3:

Planning and Writing English Tales

Note: Some of the material for this lesson is derived and modified from Lesson Activity 4.1 of Melissa Herzig's "Creating the Narrative Stories" Curriculum

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Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Use planning strategies that generate topics and organize ideas (e.g., brainstorming, mapping, webbing, and reading discussion) (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-C, Language Arts Performance Standards).

Identify and describe situations with constant or varying rates of change and compare them (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given "Planning strategies" poster and videotaped student-signed ASL tales from the previous unit, the learners will plan and create written English version tales as measured by student performance rubrics for students and teacher.

Assessment

Formative

- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative

- Student performance rubrics for students assessing the following things:
  - Planning how to write their English version of ASL-signed number tales
  - Creating their English version of ASL-signed number tales
- Student performance rubrics for teacher assessing the following things:
  - Planning how to write their English version of ASL-signed number tales
  - Creating their English version of ASL-signed number tales
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
  - How students plan how to write their English version of ASL-signed number tales
  - How students create their English version of ASL-signed number tales

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Materials needed

OLD: "What makes a tale good?" poster (Unit 1, Lesson #2), "Planning strategies" poster (Unit 1, Lesson #2), the revised "Pizza" teacher-created tale and students-created revised tales (Unit 1, Lesson #5), posted sample good and bad English tales (Unit 3, Lesson #2), overhead projector, board, papers, pencils, and math word wall

NEW: Recorded teacher-created ASL tale (Unit 1, Lesson #5), recorded student tales (Unit 1, Lesson #5 or Unit 2, Lesson #5), "Part-Part-Whole strategy #1" poster, "Part-Part-Whole Word Problems" worksheet #8 (Appendix B), and unit 3, lesson #3 student performance rubrics for student and for teacher (Appendix C)

Motivation

Tell them that they are almost ready to start writing out their English tales. Pull out the "Planning strategies" poster (Unit 1, Lesson #2). Ask them they still would use some of the listed strategies used for ASL tales to plan their English versions. Ask how their planning would differ, if any.

Procedure

1. *Motivation (< 5 minutes)*

2. *Part-Part-Whole Strategy #1 Mini-lesson (< 10 minutes)*

   a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

   ---- The problem ---

   > **6 boys and 4 girls were playing soccer. How many children were playing soccer?**

   ---- Part-Part-Whole Strategy --

   > **The student creates a set of six objects and a set of four objects. He merges both sets into one and counts the number of merged objects.**

   --

   ---

   b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Can you find any words in this word problem that will tell you what the correct operation to use is? How do you know?"

   c. Use "Part-Part-Whole strategy #1" poster board (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

   d. Come up with several compare problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For example:

   > I have 5 red pens and 8 black pens. How many pens do I have all together?

   > The dog buried 2 big bones and 1 small bone in the backyard. How many bones did the dog bury?

   > The boy has 5 striped shirts and 8 plain shirts. How many shirts does he have?

   e. Discuss how this strategy is different from other strategies covered in the previous lessons of these second and third units.

3. *Planning and Writing English Tales activity (< 40 minutes)*

   a. Watch the first part of the teacher-signed tale on videotape with the students. Pause and discuss with students how to write the English words for the ASL signs we just saw. List on the chalkboard their ideas, e.g. English words and phrases with closest meaning to what was signed in ASL.

b. Have students to agree on which words and phrases that appear to best describe the signs. Point out to the students that there are different ways to write that sentence in English with the same information.

Example ASL signs:
"ME OLD SEVEN. BIKE RICE WITH MY SISTER. HAPPEN WHERE? NEAR MY HOME, HILL."

Write on board the following:
Where? Near home, on hill
When?   When I was seven years old
Who?   Sister and me
What?   Bike race

Discuss how to write this information down in English sentences. Write on board their ideas and suggestions, and have them pick out the one they feel best reflect what was said in ASL.

Example ASL signs:
HAPPEN PAST ME OLD SEVEN.

Discuss when this happened. Since it happened in the past, pick the one with past tense phrases. Add "when" because you are telling when this happened.

c. Ask students what differences or similarities did they notice between ASL and English? (E.g., we use the word "was" often in English while there is no "was" sign in ASL).

d. Continue repeating steps (a.) to (c.), watching, pausing and writing down in English what we saw in ASL on the videotape.

e. Ask if anyone has any questions or still do not understand. Tell them that if they need any help, they can ask their partner or teacher for help.

f. Pair up and excuse students to start planning, writing out and revising their English tale versions of their recorded student-produced ASL number tales (either from the end of Unit 1 or Unit 2, depending on students' choices made).

g. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

h. At the end of the activity, round up the class, and discuss how they did.

4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

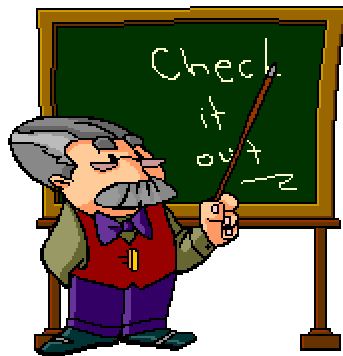Distribute "Part-Part-Whole Word Problems" worksheet #8 and tell students that it is their homework. Before excusing them, model how to do the worksheet and ask them if they have any questions.

Unit 3, Lesson #4:

Editing English Tales

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Focus revision on: Sequence of events and ideas; Transitional words; and/or Sentence patterns (Grade 4, Writing and Speaking for Expression K–4 Benchmark II-C, Language Arts Performance Standards).

Identify and describe situations with constant or varying rates of change and compare them (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given ASL-signed teacher number tale and "Editing English Tale" checklist, the learners will help teacher edit the tale as measured by student performance rubrics for students and teacher.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
  - Identifying errors in the teacher tale
  - Giving feedbacks and suggestions to help teacher edit and improve the tale
- Student performance rubrics for teacher assessing the following things:
  - Identifying errors in the teacher tale
  - Giving feedbacks and suggestions to help teacher edit and improve the tale
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
  - How students identified errors in the teacher tale
  - How students give feedbacks and suggestions to help teacher edit the tale

Materials needed

OLD: "What makes a tale good?" poster (Unit 1, Lesson #2), "Planning strategies" poster (Unit 1, Lesson #2), "Giving Feedbacks and Suggestions" poster (Unit 1, Lesson #4), "Reasons for Revision" poster (Unit 1, Lesson #5), posted sample good and bad English tales (Unit 3, Lesson #2), recorded teacher-created ASL tale (Unit 1, Lesson #5), recorded student number tales (Unit 1, Lesson #5 or Unit 2, Lesson #5), overhead projector, chalkboard, papers, pencils, and math word wall

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Materials needed (continued)

> **NEW:** Teacher and students written English number tales (Unit 3, Lesson 3), "Part-Part-Whole strategy 2" poster, "More Part-Part-Whole Word Problems" worksheet 9 (see Appendix B), and unit 3, lesson 4 student performance rubrics for student and for teacher (see Appendix C)

Motivation

Ask students what they remembered about editing ASL tales from the first unit. Show them "Reasons for Revision" poster (Unit 1, Lesson #5) and ask them if reasons for revising ASL tales are the same for revising English tales. Tell them that this time they will be editing English version of their ASL-signed tales. Note that their editing English tales in this lesson will be similar to their editing ASL tales; the only main difference is the medium used for the tale being told.

Procedure

1. *Motivation (< 5 minutes)*

2. *Part-Part-Whole Strategy #2 Mini-lesson (< 10 minutes)*

   a. Present one English number tale and sign it in ASL. Model executing this mini-lesson's problem-solving strategy to solve the given tale. For example:

   > **---- The problem --**
   >
   > **10 children were playing soccer. 6 of them were boys. How many girls were playing soccer?**
   >
   > **---- Part-Part-Whole Strategy ---**
   >
   > **Create a set of ten objects and remove six objects. Count the number of remaining objects to find the answer.**
   >
   > **---**

   b. Guide students throughout the steps in execution of the strategy. Give teacher-guided discovery/probing questions. For example: "Can you find any words in this word problem that will tell you what the correct operation to use is? How do you know?"

   c. Use "Part-Part-Whole strategy #2" poster board (up to the teacher implementing this curriculum for creative poster design) to list strategy steps.

   d. Come up with several compare problems and repeat steps (b.) to (c.) to show students a variety of similar situations where this strategy is applicable. For example:
      > I have 10 pens of two different colors. 2 of them are red. How many pens are not red?

      > The monkey has 7 sticks. 6 of them are broken. How many unbroken stick(s) does the monkey have?

      > The boy has 15 shirts and 5 of them are striped shirts. How many shirts does he have that is not striped?

   e. Discuss how this strategy is different from other strategies covered in the previous lessons of these second and third units.

3. *Editing English Tales activity (< 40 minutes)*
    a. Ask students for reasons why we should edit tales. Refer to the reasons covered and listed in Lesson 4 of Unit 1.

    b. Ask students how they can edit their English tales. List the ways students came up with on the board.

    c. Tell students how well they can edit their English tales will depend on what they have learned through English grammar lessons. So, ask them to keep their English grammar conventions in mind when they edit their work.

    d. Show them "Giving feedback and suggestions" poster (Unit 1, Lesson 4), and ask students if the process of giving and receiving feedback and suggestions for English tales is the same as for ASL tales in Unit 1, Lesson 4 (the answer is yes). Discuss why.

    e. Review the "Editing English Tale" checklist. Tell them that they can use this checklist if they want to when they edit their work later.

    f. Present an intentional grammatically incorrect English number tale on the overhead projector, and tell them that it is an English version of the ASL number tale you signed on the videotape.

    g. Tell students that you will need their help to improve this English version. Have them lookout for incorrect words, misspellings and anything else that violate English grammar conventions (e.g., incorrect use of punctuations, capital letters, etc).

    h. If mistakes still remain, have them refer to the "Editing English Tale" checklist to uncover and fix remaining mistakes. Continue until no errors remain.

    i. Now, ask them if this English version to see if it has clarity flows well, etc.

    j. Thank them for their help in giving feedbacks and improving my English tale.

    k. Ask if anyone has any questions or still do not understand. Tell them that if they need any help, they can ask their partner or teacher for help.

    l. Pair up and excuse students to continue working on their English tale versions of their recorded student-produced ASL number tales.

    m. Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task. Fill out student performance rubric for teacher (see Appendix C) during observation.

    n. At the end of the activity, round up the class, and discuss how they did.
4. *Closure (< 5 minutes)*

5. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Unit 3, Lesson #5:

ASL and English Number Tales Cumulative Project

Goal (Based on New Mexico State Department of Education & National Council of Teachers standards)

Describe the contextual differences of various forms of literature (Grade 4, Writing and Speaking for Expression K–4 Benchmark III-B, Language Arts Performance Standards).

Identify and describe situations with constant or varying rates of change and compare them (Grade 4, Algebra 4 K–4 Benchmark, Mathematics Performance Standards).

Objective

Given student-created ASL and English versions of number tales, the learners will produce individual mathematics class book with videotape as measured by the completion of their creation.

Assessment

Formative
- Teacher questions
  - See Motivation, Procedure and Closure sections for some of the teacher questions

Summative
- Student performance rubrics for students assessing the following things:
  - Producing mathematics class book with videotape
- Student performance rubrics for teacher assessing the following things:
  - Producing mathematics class book with videotape
- Teacher field observational notes on students' learning process during this lesson, which include the following things:
  - How students produce their mathematics class book with videotape

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Materials needed

OLD: "Word Problems K-W-L" chart (Unit 1, Lesson #2), "Tales versus Word Problems" Venn Diagram (Unit 1, Lesson #2) Word Problem survey (Appendix B), Recorded teacher and student signed number tales (Unit 1, Lesson #5 or Unit 2, Lesson #5), completed hardcopy of teacher and students written English number tales (Unit 3, Lesson #4), papers, pencils/pens, and math word wall

NEW: Word Problem posttest (Appendix B), Teacher-created mathematics class book with videotape (for modeling), "Word Problems Review" worksheet #10 (Appendix B), and Unit 3, lesson #5 student performance rubrics for student and for teacher (Appendix C)

Motivation

Show students teacher-created mathematics class book with videotape that contain both recorded teacher signed number tale from either Unit 1, Lesson #5 or Unit 2, Lesson #5 depending on which one were selected for re-telling, and hardcopy of teacher written number tale with multiple color illustrations (up to the teacher implementing this curriculum for creative mathematics class book design).

Procedure

1. *Motivation (< 5 minutes)*

2. *Turning Number Tales into Word Problems Mini-Lesson (< 15 minutes)*
   a. Present the completed "Tales versus Word Problems" Venn Diagram (Unit 1, Lesson #2) and ask students what they remember about our discussion, from way back in the first unit, comparing number tales and word problems in terms of their similarities and differences.

   b. Present the final draft copy of the written English version of the teacher-created number tale (Unit 3, Lesson #4), and discuss with the students how we could turn this tale into a word problem (the main idea for students to know is that the only way for the number tale to become a word problem is to add at least one question to it).

   c. Brainstorm and add at least one question to the number tale, thus turning it into a word problem.

   d. Ask if anyone has any questions or still do not understand.

   e. Excuse students to come up with the questions for their number tales.

3. *Cumulative Project activity (< 45 minutes)*
   a. Show students teacher-created mathematics class book with videotape that contain both recorded teacher signed number tale from either Unit 1, Lesson #5 or Unit 2, Lesson #5 depending on which one were selected for re-telling, and hardcopy of teacher written number tale with multiple color illustrations (up to the teacher implementing this curriculum for creative mathematics class book design).

   b. Write a to-do checklist on the board as shown below, and explain it to the students. Also, make explicit any other teacher expectations that you may have for the students of what they need to do to individually produce a mathematics class book.

Mathematics Class Book Checklist

1.) Ask teacher to go over your last written draft version of number tale for approval.

2.) Type your approved draft version of number tale.

3.) Ask teacher to go over your typed draft version for approval (your last draft version will become final version after getting approved).

4.) Draw pictures related to your number tale/word problem. Students also may search for (via the internet and other sources) and use photographic images related to it.

5.) Put them together and make a cover for it.

6.) Ask teacher to go over your mathematics class book for approval (if it is approved, then you are DONE!)

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    c.   Ask if anyone has any questions or still do not understand.

    d.   Excuse students to individually create their own mathematics class book with videotape.

    e.   Observe, and help and/or ask questions to further students' thinking if necessary. Make sure that students stay on task.

    f.   At the end of the activity, round up the class, and have all of the students to show their mathematics class book one at a time.

4. *Word Problem Survey (< 5 minutes)*
    a.   Administer Word Problem survey (see Appendix B)

    b.   Show students the survey they filled out at the beginning and compare it to the survey they filled out today. Point out any changes (hopefully, mostly positive), and discuss and applause it.

5. *Word Problem Posttest (< 15 minutes)*
    a.   Administer Word Problem posttest.

    b.   May go over the posttest with the students after administrating the posttest

6. *Closure (< 5 minutes)*

7. *Clean-up/Dismiss (< 1 minute)*

Closure

Have a whole classroom discussion about what students learned from today. Ask if they have any questions. Model how to fill out a student individual rubric for students (see Appendix C) and then have students fill their own out. Collect student-completed rubrics. If needed, finish student performance rubrics for teacher (see Appendix C) after class.

Revisit the "Word Problems K-W-L" chart and ask students to brainstorm what they learned from this curriculum. List their comments. For example:

Word Problems K-W-L chart		
K What I know…	W What I Want to Learn…	L What I Learned…
* Word Problems has numbers.	* How to read word problems to know which arithmetic operation to use…	* Certain keywords in word problems always indicate certain mathematical operations (e.g., all together usually mean addition operation)

Distribute "Word Problems Review" worksheet #10 and tell students that it is their homework. Before excusing them, model how to do the worksheet and ask them if they have any questions.

You have the option to do the individual student-teacher conferences as soon as you possibly can after this lesson to assess the depth of their knowledge and experience with word problems.

Appendix B

Curriculum Forms

Telling, Reading and Writing Number Tales

Telling, Reading and Writing Number Tales Curriculum

Student Name: _____   Date: _____

Word Problem Survey

DIRECTIONS: Read the four questions below. Circle the answer that BEST describes how you feel about math word problems. Remember, your name does not have to be written on this survey.

1. How do you feel about word problems?
A. I like them.
B. I don't have special opinion about them.
C. I hate them.

2. Do you think that word problems you do at school help you handle problems in the "real world"?
A. Yes.
B. Sometimes.
C. No.

3. Word problems are...
A. Easy.
B. A little hard.
C. Very hard.

4. I don't understand how to work word problems.
A. True.
B. Sometimes true.
C. False.

5. Using word problems and/or number tales help me to understand important math concepts.
A. True.
B. Sometimes true.
C. False.

6. Do you use your prior knowledge and experience to connect with word problems?
A. Yes.
B. Sometimes.
C. No.

7. I have strategies, tools and knowledge to read, understand and solve word problems well.
A. True.
B. Sometimes true.
C. False.

8. I know how ASL and English versions of word problems are related to each other.
A. True.
B. Sometimes true.
C. False.

9. I know how mathematical English language differs from regular English language.
A. True.
B. Sometimes true.
C. False.

Student Name: _____   **Date:** _____

Word Problem Test

Pretest

1. Kimberly had 15 shoes. Her parents gave her 6 more shoes for her birthday. How many shoes did she have then?

2. Kimberly had some shoes. Her parents gave her 2 more shoes for her birthday. Then she had 7 shoes. How many shoes did Robin have before her birthday?

3. Audi had 9 color pencils. She gave 4 color pencils to Krystle. How many color pencils does Audi have left?

4. Audi had 11 color pencils. She gave some color pencils to Krystle. Then she had 5 color pencils left. How many color pencils did Audi give Krystle?

5. Jamaal had some fruits. He gave 3 fruits to his friend. Then he had 5 fruits left. How many fruits did Jamaal have to start with?

6. 7 boys and 5 girls were playing baseball. How many children were playing baseball?

7. 10 children were playing football. 6 were boys and the rest were girls. How many girls were playing football?

Pretest

8. Alex took a long trip from San Diego, CA to Santa Fe, NM. The first day he traveled 650 miles. The second day he traveled 232 miles. How many miles did he travel in two days?

9. A school for the deaf has 105 students. If 55 students go on a field trip, how many students are still in school?

10. On Thursday 3 kinds of sandwiches were sold at the lunchroom. 23 egg sandwiches were sold, 40 chicken sandwiches were sold, and 56 cheese sandwiches were sold. How many sandwiches were sold on Thursday?

11. At the cafeteria there were 45 boys and girls. IF 22 were girls, how many were boys?

12. To build her new brick house, Kim needs 850 bricks. She has 645 bricks. How many more bricks does Kim need?

13. For the problem below, write a word problem to match.

$$
\begin{array}{r}
22 \\
+39 \\
\hline
61 \text{ chairs}
\end{array}
$$

14. For the problem below, write a word problem to match.

$$
\begin{array}{r}
48 \\
-12 \\
\hline
36 \text{ cupcakes}
\end{array}
$$

15. Underline the facts and draws a ring around the question.

**Terry has 12 toy cars. Antoine has 24 toy cars.
How many cars do they have in all?**

Student Name: _____   **Date: _____**

Word Problem Test

Posttest

1. Kimberly had 15 shoes. Her parents gave her 6 more shoes for her birthday. How many shoes did she have then?

2. Kimberly had some shoes. Her parents gave her 2 more shoes for her birthday. Then she had 7 shoes. How many shoes did Robin have before her birthday?

3. Audi had 9 color pencils. She gave 4 color pencils to Krystle. How many color pencils does Audi have left?

4. Audi had 11 color pencils. She gave some color pencils to Krystle. Then she had 5 color pencils left. How many color pencils did Audi give Krystle?

5. Jamaal had some fruits. He gave 3 fruits to his friend. Then he had 5 fruits left. How many fruits did Jamaal have to start with?

6. 7 boys and 5 girls were playing baseball. How many children were playing baseball?

7. 10 children were playing football. 6 were boys and the rest were girls. How many girls were playing football?

Posttest

8. Alex took a long trip from San Diego, CA to Santa Fe, NM. The first day he traveled 650 miles. The second day he traveled 232 miles. How many miles did he travel in two days?

9. A school for the deaf has 105 students. If 55 students go on a field trip, how many students are still in school?

10. On Thursday 3 kinds of sandwiches were sold at the lunchroom. 23 egg sandwiches were sold, 40 chicken sandwiches were sold, and 56 cheese sandwiches were sold. How many sandwiches were sold on Thursday?

11. At the cafeteria there were 45 boys and girls. IF 22 were girls, how many were boys?

12. To build her new brick house, Kim needs 850 bricks. She has 645 bricks. How many more bricks does Kim need?

13. For the problem below, write a word problem to match.

$$\begin{array}{r} 22 \\ +\quad 39 \\ \hline \textbf{61 chairs} \end{array}$$

14. For the problem below, write a word problem to match.

$$\begin{array}{r} 48 \\ -\quad 12 \\ \hline \textbf{36 cupcakes} \end{array}$$

15. Underline the facts and draws a ring around the question.

Terry has 12 toy cars. Antoine has 24 toy cars.
How many cars do they have in all?

Student Name: _____   **Date:** _____

Facts and Questions

Worksheet 1

A word problem gives some facts and asks a question.

A. The facts you need to solve the problem below are underlined. Draw a circle around the question the problem asks.

   Alex has 12 books. Cynthia has 24 books. How many books do they have in all?

B. In each problem below, underline the facts and circle the question.

   1. Jamaal had $15. He spent $9. How much money does he have left?

   2. How many animals does Krystle have all together? She has 14 hamsters, 11 cats, and 1 dog.

   3. Kimberly has 14 Barbie dolls. Her father gave her 3 more. How many dolls does she have now?

   4. Audri has 9 blue pens, 8 black pens, and 7 red pens. How many pens does she have all together?

   5. Kim gave Shanni six candy bars. Shanni ate two of them. How many candy bars does Shanni have now?

   6. Cynthia has six dollars. She needs 21 dollars to buy a new pair of shoes. How much more money does she need?

   7. Last week Alex watched six cartoon shows, three quiz shows, and twelve mysteries. How many T.V. shows did he watch in all?

   8. Is Andrew older than Alex? Andrew is 19 years old. Alex is 26 years old.

Student Name: _____   **Date:** _____

Addition Word Problems

Worksheet 2

A. You had 2 homework for tonight. I gave you some more homework to do. Now you have 5 homework. How much homework do you have now?

$$2 + \_\_\_ = 5$$

B. Solve each word problem below.

1. Jennifer had two boxes. Megan gave her some more. Now Jennifer has five boxes. How many boxes did Megan give her?

2. Andrew had 5 toy cars. His parents gave him some more toy cars for his birthday. Then he had 7 toy cars. How many toy cars did Andrew's parents give him for his birthday?

3. Andrew has 4 toy cars. How many more toy cars does he need to get to have 11 toy cars all together?

4. Cynthia had 3 necklaces. Alex gave her some more necklaces. Now Cynthia had 8 necklaces. How many necklaces did Alex give her?

5. There were 7 bikes outside of school. After some children park their bikes outside school. There are 11 bikes now. How many bikes did they park outside school?

Student Name: _____   **Date: _____**

More Addition Word Problems

Worksheet 3

A. You had 2 homework for tonight. I gave you 7 more homework to do. Now, how much homework do you have all together for tonight?

2 + 7 = ___

B. Solve each word problem below.

1. Arpy had two apples. Apples are the treat Arpy likes best. She bought five more apples. How many apples does she have now?

2. Josh had 5 peanuts. His sister gave him 2 more peanuts for snack. How many peanuts did he have then?

3. Matt had 5 hats. Cynthia gave him 8 more hats. How many hats does Matt have all together?

4. Jennifer has 3 tomatoes. She picked 5 more tomatoes. How many tomatoes does Jennifer have now?

5. Alex found five golf balls. He found three more golf balls. How many golf balls did he find all together?

Student Name: _____   **Date:** _____

Worksheet 3 continued

C. ***Blast from the Past*** Review. Solve each older word problem below.

6. Kimberly put seven books on the table. Audri put three more books on that table. How many books are on the table altogether?

Student Name: _____   **Date:** _____

Subtraction Word Problems

Worksheet 4

A. You had 9 homework. You finished 8 homework. Now, how much homework do you have left?

9 – 8 = ___

B. Solve each word problem below.

1. There were seven boys and girls playing rugby. Two boys went home. How many children were still playing?

2. Sarah had 8 matches. She used 3 matches to start a campfire. How many matches does Sarah have left?

3. Amy had 13 unread magazines. She read 5 yesterday. How many unread magazines does she have left to read?

4. There were 8 monkeys hanging from the tree. 3 monkeys got down and walked away. How many monkeys were still hanging from the tree?

5. After school, 11 students got on the bus to go home from school. 6 students got off the bus at the first stop. How many students are still on the bus?

Student Name: _____   **Date:** _____

Worksheet 4 continued

C. ***Blast from the Past*** Review. Solve each older word problem below.

6. Krystle put nine books on the table. Jamaal put two more books on that table. How many books are on the table altogether?

7. Alex ate four Snickers candy bars. He ate few more candy bars. Now Alex ate seven candy bars. How many candy bars did Alex eat?

Student Name: _____   **Date:** _____

More Subtraction Word Problems

Worksheet 5

A. You had 20 homework to do. You finished most of it last night. Now you have 1 homework left. How much homework did you finish?

$$20 - \underline{} = 1$$

B. Solve each word problem below.

1. Billy Bob had 25 dollars. He spent some money. Now he has 7 dollars left. How much money did Billy Bob spent all together?

2. Arianne had 6 kittens. She gave some kittens to Rory. Then she had 3 kittens left. How many kittens did Arianne give Rory?

3. Don had 12 cold drinks. He gave some to Julio. Now he has 5 drinks left. How many drinks did Don give to Julio?

4. There were 8 students on the school bus. Some students got off. Now there are 3 students on the bus. How many students got off the bus?

5. There were 30 books on the shelf. I took some books from the shelf to read. There are now 17 books left on the shelf. How many books did I take off the shelf to read?

Student Name: _____   **Date:** _____

Worksheet 5 continued

C. ***Blast from the Past*** Review. Solve each older word problem below.

6. There are two clowns performing onstage at the circus. Five more clowns have come to join others performing onstage. How many clowns are performing onstage in the circus?

7. Jamaal had 6 pairs of shoes. His friend, Kimberly, gave him some more pairs of shoes. Now Jamaal had 9 pairs. How many pairs did Kimberly give Jamaal?

8. Yesterday, Krystle read first 10 pages of her book. Today, she read 9 more pages of the same book. How many pages did she read altogether?

Student Name: _____   **Date:** _____

Compare Word Problems

Worksheet 6

A. Audri has 3 rocks. Kimberly has 7 rocks. Kimberly has how many

more rocks than Audri?

$7 - 3 = $ ___

B. Solve each word problem below.

1. English class has 10 students. Spanish class has 7 students. English class has how many more students than Spanish class?

2. Garfield the cat ate 13 birds. Heathcliff the cat had 5 birds. How many more birds did Garfield eat than Heathcliff?

3. Jamaal has 3 stickers. Krystle has 8 stickers. How many more stickers does Jamaal have than Krystle?

4. Frank wrote 20 pages. Alan wrote 5. How many more pages die Frank write than Alan?

5. Cynthia has $14. Alex has $5. How much more money does Cynthia have?

Student Name: _____   **Date:** _____

Worksheet 6 continued

C. *Blast from the Past* **Review. Solve each older word problem below.**

6. There are 4 birds sitting in a big redwood tree. 3 more birds has flown in and sat in the same tree. How many birds are there now in the tree?

7. Rabbit took 7 carrots from the farmer's vegetable garden. How many more carrots does she need to take to have 11 carrots all together?

8. The photographer had 8 rolls of unexposed film. The photographer used 5 rolls of film at the wedding reception. How many rolls of unexposed film did the photographer have left?

9. There are twenty pages in the book. The librarian read most of it. Now there are two unread pages left to read. How many pages did the librarian read?

Student Name: _____   **Date:** _____

More Compare Word Problems

Worksheet 7

WARNING: Each problem requires either addition OR subtraction.

A. Alex has some markers. Kim has 12 markers. Kim has 7 fewer markers than Alex has. How many markers does Alex have?

12 + 7 = ___

B. Solve each word problem below.

1. Jamaal has 13 crayons. Audri has 6 fewer than Jamaal. How many crayons does Audri have?

2. Kimberly has some pencils. Krystle has 15 pencils. Krystle has 7 fewer pencils than Kimberly has. How many pencils does Kimberly have?

3. Matt ate 11 tacos. Cynthia ate 7 tacos fewer than Matt. How many tacos did Cynthia eat?

4. Ron has some Disney movies. Jeremy has 15 Disney movies. Ron has 7 fewer movies than Jeremy has. How many Disney movies does Ron have?

5. Steve has 14 comic books. Robert has 6 fewer than Steve. How many comic books does Robert have?

Student Name: _____   **Date:** _____

Worksheet 7 continued

C. *Blast from the Past* **Review. Solve each older word problem below.**

6. I put five books on the table. You put two more books on that table. How many books are there on the table all together?

7. The boy had four action figures. His parents gave him some more action figures for his birthday. Then he had seven action figures. How many action figures did the boy get from his parents for his birthday?

8. There were eight cups of water. The dog drank four of them. How many cups of water are still left?

9. There are six cups of water. The cat drank some of it. Now there is two cups of water left. How many cups of water did the cat drink?

10. Your teacher has six students, including you. Another teacher in a different classroom has five students. How many more student(s) does your teacher have?

Student Name: _____   **Date:** _____

Part-Part-Whole Word Problems

Worksheet 8

_____

A. 7 boys and 4 girls were playing rugby. How many children were playing rugby?

   7 + 4 = ___

B. Solve each word problem below.

1. 6 dolphins and 4 sharks were in the swimming pool. How many were swimming in the pool altogether?

2. Audri has 5 red crayons and 8 blue crayons. How many crayons does she have all together?

3. Jamaal has some action figures. He has 8 good guys and 3 bad guys. How many action figures does Jamaal have total?

4. Krystle has some dolls. She has 8 animal dolls and 3 Barbie dolls. How many dolls does she have altogether?

5. Kimberly has 6 long-sleeved shirts and 5 short-sleeved shirts. How many shirts does Kimberly have altogether?

Worksheet 8 continued

C. *Blast from the Past* **Review. Solve each older word problem below.**

6. The baseball player took caught nine baseballs. He then caught one more baseball. How many baseballs did the player catch now?

7. The batter hit 3 baseballs. He hit some more baseballs. Then he hit 9 baseballs all together. How many more baseballs did he hit?

8. You had $24 tucked away in your pocket. You took $9 out of your pocket to buy a new t-shirt at the store you were shopping at. How much money do you have left in your pocket?

9. There were twenty-one seals at the beach. Some seals swam away. How many seals were still at the beach if there are fifteen seals there?

10. Frank drew 9 pages of black and white art with his pencil. Joe drew 6 pages of color art with his color pencils. How many more pages of art did Frank drew than Joe?

11. I ate 5 big slices of watermelon. My friend ate 2 slices fewer than I ate. How many slices of watermelon did my friend eat?

Student Name: _____   **Date: _____**

More Part-Part-Whole Word Problems

Worksheet 9

A. There are 14 students who live in cottage building. 5 of the students are boys. How many girls live in the cottage building?

14 – 5 = ___

B. Solve each word problem below.

1. There are 105 students in a school for the deaf. 45 of the students are boys. How many students are girl?

2. There are 25 red and blue marbles altogether. 17 of the marbles are blue. How many marbles are red?

3. There are 10 bottles of different sodas. 8 of them are Pepsi. How many are not Pepsi?

4. There are 11 black and white cars. 6 of the cars are white. How many cars are black?

5. There are seven birds of different sizes. Five of the birds are big. How many birds are not big?

Student Name: _____   **Date:** _____

Worksheet 9 continued

C. *Blast from the Past* **Review. Solve each older word problem below.**

6. There were 4 cats playing at the park. Some more cats came to play at the park. Now there are 11 cats. How many more cats came to play with other cats?

7. Few minutes ago, there were 7 dogs chasing a cat. Now, 12 more dogs are chasing the same cat. How many dogs are chasing the poor cat altogether now?

8. The small, fat monkey had 13 bananas. He ate 5 of it. How many bananas does the monkey have left?

9. You had 12 problems on your math homework. You finished most of it. Now you have 4 problems left. How many problems did you finish on your homework?

10. You solved 10 word problems. Your friend solved 4 word problems. How many more word problems did you solve than your friend?

11. The red, slimy monster under the bed had 16 sharp teeth. The blue, furry monster in the closet had 9 fewer teeth than the red monster. How many teeth does the blue monster have?

12. Teresa has six plain pants and six striped pants. How many pants does Teresa have altogether?

Student Name: _____   **Date:** _____

Word Problems Review

Worksheet 10

Read and solve the problems one at a time carefully.

_____

1. Cynthia ate 4 Snickers candy bars. She ate few more Snickers candy bars. Now Cynthia ate 7 candy bars. How many Snickers candy bars did Cynthia eat?

2. Jamaal had 5 shirts. His parents gave him some more shirts for Christmas. Then he had 7 shirts. How many shirts did Jamaal's parents give him for his birthday?

3. Audri had 8 big rocks. Then her father gave him 3 new rocks. How many rocks did she have then?

4. Jamaal had 5 pants. His uncle gave him 7 more pants. How many pants does Jamaal have together?

5. Cynthia made 8 potato tacos for Alex to eat. Alex ate 3 potato tacos. How many more potato tacos left for Alex to eat?

6. Kimberly and Krystle baked 36 cookies. Then, they dropped 12 cookies on the floor. How many were left?

7. The boy had 6 water balloons. He threw most of it at his friend. There were 2 water balloons left. How many water balloons did he throw at his friend?

8. Cynthia had 12 cans of Coke. Then she gave some of her cans away. Then she had 7 cans left. How many cans of Coke did Cynthia give away?

9. Kimberly has 3 pens. Jamaal has 7 pens. Kimberly has how many more pens than Jamaal?

10. Krystle read 9 books. Audri read 6 books. Krystle read how many more books than did Audri read?

11. Teacher has some markers. Students has 12 markers altogether. Students have 7 fewer markers than the teacher has altogether. How many markers does the teacher have?

12. I read some magazines. You read five magazines. You already read two fewer magazines than I did. How many magazines did I read?

13. Kim has 5 cats and 4 dogs. How many pets does she have all together?

14. There are 2 boys and 4 girls in Alex's class. How many students does he have altogether?

15. There are twenty students in P.E. class. Ten of the students are deaf. How many students are hearing?

16. There are 50 fruits in the cafeteria. There are only two kinds: apples or oranges. 35 of the fruits are apples. How many fruits are orange?

Student Name: <u>   Answer Key   </u>   **Date:** <u>   </u>

Word Problem Test

Pretest/Posttest

1. Kimberly had 15 shoes. Her parents gave her 6 more shoes for her birthday. How many shoes did she have then?

   15 + 6 = 21 shoes

2. Kimberly had some shoes. Her parents gave her 2 more shoes for her birthday. Then she had 7 shoes. How many shoes did Robin have before her birthday?

   <u> ? </u> + 2 = 7   **7 – 2 = 5 shoes**

3. Audi had 9 color pencils. She gave 4 color pencils to Krystle. How many color pencils does Audi have left?

   9 – 4 = 5 color pencils

4. Audi had 11 color pencils. She gave some color pencils to Krystle. Then she had 5 color pencils left. How many color pencils did Audi give Krystle?

   11 – <u> ? </u> = 5   **11 – 5 = 6 color pencils**

5. Jamaal had some fruits. He gave 3 fruits to his friend. Then he had 5 fruits left. How many fruits did Jamaal have to start with?

   <u>   </u> – 3 = 5   **5 + 3 = 8 fruits**

6. 7 boys and 5 girls were playing baseball. How many children were playing baseball?

   7 girls + 5 boys = 12 children

7. 10 children were playing football. 6 were boys and the rest were girls. How many girls were playing football?
   10 children – 6 boys = 4 girls

Pretest/Posttest (Answer Key)

8. Alex took a long trip from San Diego, CA to Santa Fe, NM. The first day he traveled 650 miles. The second day he traveled 232 miles. How many miles did he travel in two days?

   650 + 232 = 882 miles

9. A school for the deaf has 105 students. If 55 students go on a field trip, how many students are still in school?

   105 – 55 = 50 students

10. On Thursday 3 kinds of sandwiches were sold at the lunchroom. 23 egg sandwiches were sold, 40 chicken sandwiches were sold, and 56 cheese sandwiches were sold. How many sandwiches were sold on Thursday?

    23 + 40 + 56 = 119 sandwiches

11. At the cafeteria there were 45 boys and girls. IF 22 were girls, how many were boys?

    45 – 22 = 23 boys

12. To build her new brick house, Kim needs 850 bricks. She has 645 bricks. How many more bricks does Kim need?

    850 – 645 = 205 bricks

13. For the problem below, write a word problem to match.

	22	*Note: Reasonable answer varies.*
+	39	*Example:*
	61 chairs	*Today, I sat in 22 chairs, and, tomorrow, I will sit in 39 more chairs.*
		How many chairs will I sit in altogether tomorrow?

14. For the problem below, write a word problem to match.

	48	*Note: Reasonable answer varies.*
–	12	*Example:*
	36 cupcakes	*Yesterday, there were 48 cupcakes, but, today, I ate 12 of it.*
		How many cupcakes are there left today?

15. Underline the facts and draws a ring around the question.
    <u>Terry has 12 toy cars.</u> <u>Antoine has 24 toy cars.</u>

How many cars do they have in all?

Student Name: _____**Answer Key**_____   **Date:** _____

Facts and Questions

Worksheet 1

A word problem gives some facts and asks a question.

> **NOTE:** *DOUBLE STRIKETHROUGHED LINES REPRESENT THOSE LINES THAT ARE SUPPOSED TO BE CIRCLED.*

A. The facts you need to solve the problem below are underlined.
   Draw a circle around the question the problem asks.

   Alex has 12 books. Cynthia has 24 books. ~~How many books do they have in all?~~

B. In each problem below, underline the facts and circle the question.

   1. Jamaal had $15. He spent $9. ~~How much money does he have left?~~

   2. ~~How many animals does Krystle have all together?~~ She has 14 hamsters, 11 cats, and 1 dog.

   3. Kimberly has 14 Barbie dolls. Her father gave her 3 more. ~~How many dolls does she have now?~~

   4. Audri has 9 blue pens, 8 black pens, and 7 red pens. ~~How many pens does she have all together?~~

   5. Kim gave Shanni six candy bars. Shanni ate two of them. ~~How many candy bars does Shanni have now?~~

   6. Cynthia has six dollars. She needs 21 dollars to buy a new pair of shoes. ~~How much more money does she need?~~

   7. Last week Alex watched six cartoon shows, three quiz shows, and twelve mysteries. ~~How many T.V. shows did he watch in all?~~

   8. ~~Is Andrew older than Alex?~~ Andrew is 19 years old. Alex is 26 years old.

Student Name: _____**Answer Key**_____   **Date:** _____

Addition Word Problems

Worksheet 2

A. You had 2 homework for tonight. I gave you some more homework to do. Now you have 5 homework. How much homework do you have now?

$$2 + \underline{} = 5$$

B, Solve each word problem below.

1. Jennifer had two boxes. Megan gave her some more. Now Jennifer has five boxes. How many boxes did Megan give her?

$2 + \underline{\ ?\ } = 5$ $5 - 2 = 3$ **boxes**

2. Andrew had 5 toy cars. His parents gave him some more toy cars for his birthday. Then he had 7 toy cars. How many toy cars did Andrew's parents give him for his birthday?

$5 + \underline{\ ?\ } = 7$ $7 - 5 = 2$ **cars**

3. Andrew has 4 toy cars. How many more toy cars does he need to get to have 11 toy cars all together?

$4 + \underline{\ ?\ } = 11$ $11 - 4 = 7$ **cars**

4. Cynthia had 3 necklaces. Alex gave her some more necklaces. Now Cynthia had 8 necklaces. How many necklaces did Alex give her?

$3 + \underline{\ ?\ } = 8$ $8 - 3 = 5$ **necklaces**

5. There were 7 bikes outside of school. After some children park their bikes outside school. There are 11 bikes now. How many bikes did they park outside school?

$7 + \underline{\ ?\ } = 11$ $11 - 7 =$ **bikes**

Student Name: _____**Answer Key**_____   **Date:** _____

More Addition Word Problems

Worksheet 3

A. You had 2 homework for tonight. I gave you 7 more homework to do. Now, how much homework do you have all together for tonight?

$$2 + 7 = \underline{\quad}$$

B. Solve each word problem below.

1. Arpy had two apples. Apples are the treat Arpy likes best. She bought five more apples. How many apples does she have now?

    2 + 5 = 7 apples

2. Josh had 5 peanuts. His sister gave him 2 more peanuts for snack. How many peanuts did he have then?

    5 + 2 = 7 peanuts

3. Matt had 5 hats. Cynthia gave him 8 more hats. How many hats does Matt have all together?

    5 + 8 = 13 hats

4. Jennifer has 3 tomatoes. She picked 5 more tomatoes. How many tomatoes does Jennifer have now?

    3 + 5 = 8 tomatoes

5. Alex found five golf balls. He found three more golf balls. How many golf balls did he find all together?

    5 + 3 = 8 golf balls

C. *Blast from the Past* Review. Solve each older word problem below.

6. Kimberly put seven books on the table. Audri put three more books on that table. How many books are on the table altogether?

    7 + 3 = 10 books

Student Name: _____Answer Key_____   **Date:** _____

Subtraction Word Problems
Worksheet 4

A. You had 9 homework. You finished 8 homework. Now, how much homework do you have left?

$$9 - 8 = \underline{\quad}$$

B. Solve each word problem below.

1. There were seven boys and girls playing rugby. Two boys went home. How many children were still playing?

7 – 2 = 5 children

2. Sarah had 8 matches. She used 3 matches to start a campfire. How many matches does Sarah have left?

8 – 3 = 5 matches

3. Amy had 13 unread magazines. She read 5 yesterday. How many unread magazines does she have left to read?

13 – 5 = 8 magazines

4. There were 8 monkeys hanging from the tree. 3 monkeys got down and walked away. How many monkeys were still hanging from the tree?

8 – 3 = 5 monkeys

5. After school, 11 students got on the bus to go home from school. 6 students got off the bus at the first stop. How many students are still on the bus?

11 – 6 = 5 students

C. *Blast from the Past* Review. Solve each older word problem below.

6. Krystle put nine books on the table. Jamaal put two more books on that table. How many books are on the table altogether?

9 + 2 = 11 books

7. Alex ate four Snickers candy bars. He ate few more candy bars. Now Alex ate seven candy bars. How many candy bars did Alex eat?

4 + _?_ = 7   7 – 4 = 3 Snickers candy bars

Student Name: _____Answer Key_____   **Date:** _____

More Subtraction Word Problems

Worksheet 5

A. You had 20 homework to do. You finished most of it last night. Now you have 1 homework left. How much homework did you finish?   **20 – ___ = 1**

B. Solve each word problem below.

1. Billy Bob had 25 dollars. He spent some money. Now he has 7 dollars left. How much money did Billy Bob spent all together?

    25 – _?_ = 7   **25 – 7 = 18 dollars**

2. Arianne had 6 kittens. She gave some kittens to Rory. Then she had 3 kittens left. How many kittens did Arianne give Rory?

    6 – _?_ = 3   **6 – 3 = 3 kittens**

3. Don had 12 cold drinks. He gave some to Julio. Now he has 5 drinks left. How many drinks did Don give to Julio?

    12 – _?_ = 5   **12 – 5 = 7 cold drinks**

4. There were 8 students on the school bus. Some students got off. Now there are 3 students on the bus. How many students got off the bus?

    8 – _?_ = 3   **8 – 3 = 5 students**

5. There were 30 books on the shelf. I took some books from the shelf to read. There are now 17 books left on the shelf. How many books did I take off the shelf to read?

    30 – _?_ = 17   **30 – 17 = 13 books**

C. Blast from the Past Review. Solve each older word problem below.

7. There are two clowns performing onstage at the circus. Five more clowns have come to join others performing onstage. How many clowns are performing onstage in the circus?

    2 + 5 = 7 clowns

8. Jamaal had 6 pairs of shoes. His friend, Kimberly, gave him some more pairs of shoes. Now Jamaal had 9 pairs. How many pairs did Kimberly give Jamaal?

    6 + _?_ = 9   **9 – 6 = 3 pairs of shoes**

9. Yesterday, Krystle read first 10 pages of her book. Today, she read 9 more pages of the same book. How many pages did she read altogether?

    10 + 9 = 19 pages

Student Name: _____**Answer Key**_____   **Date:** _____

Compare Word Problems

Worksheet 6

A. Audri has 3 rocks. Kimberly has 7 rocks. Kimberly has how many more rocks than Audri?

        7 – 3 = ___

B. Solve each word problem below.

   1. English class has 10 students. Spanish class has 7 students. English class has how many more students than Spanish class?

     10 – 7 = 3 students

   2. Garfield the cat ate 13 birds. Heathcliff the cat had 5 birds. How many more birds did Garfield eat than Heathcliff?

     13 – 5 = 8 birds

   3. Jamaal has 3 stickers. Krystle has 8 stickers. How many more stickers does Jamaal have than Krystle?

     8 – 3 = 5 stickers

   4. Frank wrote 20 pages. Alan wrote 5. How many more pages die Frank write than Alan?

     20 – 5 = 15 pages

  6. Cynthia has $14. Alex has $5. How much more money does Cynthia have?

     $14 – $5 = $9 dollars

C. *Blast from the Past* **Review. Solve each older word problem below.**

   6. There are 4 birds sitting in a big redwood tree. 3 more birds has flown in and sat in the same tree. How many birds are there now in the tree?

     4 + 3 = 7 birds

   7. Rabbit took 7 carrots from the farmer's vegetable garden. How many more carrots does she need to take to have 11 carrots all together?

     7 + _?_ = 11   **11 – 7 = 4 carrots**

   8. The photographer had 8 rolls of unexposed film. The photographer used 5 rolls of film at the wedding reception. How many rolls of unexposed film did the photographer have left?

     8 – 5 = 3 rolls of unexposed film

   9. There are twenty pages in the book. The librarian read most of it. Now there are two unread pages left to read. How many pages did the librarian read?

     20 – _?_ = 2   **20 – 2 = 18 pages**

Student Name: <u>   Answer Key   </u>   **Date:** _____

More Compare Word Problems

Worksheet 7

WARNING: Each problem requires either addition OR subtraction.

A. Alex has some markers. Kim has 12 markers. Kim has 7 fewer markers than Alex has. How many markers does Alex have?   **12 + 7 = ___**

B. Solve each word problem below.

1. Jamaal has 13 crayons. Audri has 6 fewer than Jamaal. How many crayons does Audri have?   **13 – 6 = 7 crayons**

2. Kimberly has some pencils. Krystle has 15 pencils. Krystle has 7 fewer pencils than Kimberly has. How many pencils does Kimberly have?
     15 + 7 = 22 pencils

3. Matt ate 11 tacos. Cynthia ate 7 tacos fewer than Matt. How many tacos did Cynthia eat?   **11 – 7 = 4 tacos**

4. Ron has some Disney movies. Jeremy has 15 Disney movies. Ron has 7 fewer movies than Jeremy has. How many Disney movies does Ron have?   **15 – 7 = 8 Disney movies**

5. Steve has 14 comic books. Robert has 6 fewer than Steve. How many comic books does Robert have?   **14 – 6 = 8 comic books**

C. *Blast from the Past* **Review. Solve each older word problem below.**

6. I put five books on the table. You put two more books on that table. How many books are there on the table all together?   **5 + 2 = 7 books**

7. The boy had four action figures. His parents gave him some more action figures for his birthday. Then he had seven action figures. How many action figures did the boy get from his parents for his birthday?   **4 + _?_ = 7**   **7 – 4 = 3 action figures**

8. There were eight cups of water. The dog drank four of them. How many cups of water are still left?   **8 – 4 = 4 cups of water left**

9. There are six cups of water. The cat drank some of it. Now there is two cups of water left. How many cups of water did the cat drink?   **6 – _?_ = 2**
     6 – 2 = 4 cups of water

10. Your teacher has six students, including you. Another teacher in a different classroom has five students. How many more student(s) does your teacher have?
     6 – 5 = 1 student

Student Name: _____*Answer Key*_____   *Date:* _____

Part-Part-Whole Word Problems

Worksheet 8

A. 7 boys and 4 girls were playing rugby. How many children were playing rugby?

   $7 + 4 =$ ___

B. Solve each word problem below.

   1. 6 dolphins and 4 sharks were in the swimming pool. How many were swimming in the pool altogether?   **$6 + 4 = 10$ (dolphins and sharks) in the swimming pool**

   2. Audri has 5 red crayons and 8 blue crayons. How many crayons does she have all together?   **$5 + 8 = 13$ (red and blue) crayons**

   3. Jamaal has some action figures. He has 8 good guys and 3 bad guys. How many action figures does Jamaal have total?   **$8 + 3 = 11$ (good and bad guy) action figures**

   4. Krystle has some dolls. She has 8 animal dolls and 3 Barbie dolls. How many dolls does she have altogether?   **$8 + 3 = 11$ (animal and Barbie) dolls**

   5. Kimberly has 6 long-sleeved shirts and 5 short-sleeved shirts. How many shirts does Kimberly have altogether?   **$6 + 5 = 11$ (long and short sleeved) shirts**

C. *Blast from the Past* **Review. Solve each older word problem below.**

   6. The baseball player took caught nine baseballs. He then caught one more baseball. How many baseballs did the player catch now?   **$9 + 1 = 10$ baseballs**

   7. The batter hit 3 baseballs. He hit some more baseballs. Then he hit 9 baseballs all together. How many more baseballs did he hit?   **$3 +$ _?_ $= 9$ $9 - 3 = 6$ baseballs**

   8. You had $24 tucked away in your pocket. You took $9 out of your pocket to buy a new t-shirt at the store you were shopping at. How much money do you have left in your pocket?   **\$24 – \$9 = \$15**

   9. There were twenty-one seals at the beach. Some seals swam away. How many seals were still at the beach if there are fifteen seals there?   **$21 -$ __ $= 15$ $21 - 15 = 6$ seals**

   10. Frank drew 9 pages of black and white art with his pencil. Joe drew 6 pages of color art with his color pencils. How many more pages of art did Frank drew than Joe?

   $9 - 6 = 3$ pages of art

   11. I ate 5 big slices of watermelon. My friend ate 2 slices fewer than I ate. How many slices of watermelon did my friend eat?   **$5 - 2 = 3$ slices of watermelon**

Student Name: _____**Answer Key**_____   **Date:** _____

More Part-Part-Whole Word Problems

Worksheet 9

A. There are 14 students who live in cottage building. 5 of the students are boys. How many girls live in the cottage building?   **14 – 5 = ___**

B. Solve each word problem below.

1. There are 105 students in a school for the deaf. 45 of the students are boys. How many students are girl?   **105 – 45 = 60 girls**

2. There are 25 red and blue marbles altogether. 17 of the marbles are blue. How many marbles are red?   **25 – 17 = 8 red marbles**

3. There are 10 bottles of different sodas. 8 of them are Pepsi. How many are not Pepsi?   **10 – 8 = 2 non-Pepsi sodas**

4. There are 11 black and white cars. 6 of the cars are white. How many cars are black?   **11 – 6 = 5 black cars**

5. There are seven birds of different sizes. Five of the birds are big. How many birds are not big?   **7 – 5 = 2 birds that are not big**

C. *Blast from the Past* **Review. Solve each older word problem below.**

6. There were 4 cats playing at the park. Some more cats came to play at the park. Now there are 11 cats. How many more cats came to play with other cats?
          4 + _?_ = 11   11 – 4 = 7 cats

7. Few minutes ago, there were 7 dogs chasing a cat. Now, 12 more dogs are chasing the same cat. How many dogs are chasing the poor cat altogether now?
          7 + 12 = 19 dogs

8. The small, fat monkey had 13 bananas. He ate 5 of it. How many bananas does the monkey have left?   **13 – 5 = 8 bananas**

9. You had 12 problems on your math homework. You finished most of it. Now you have 4 problems left. How many problems did you finish on your homework?
          12 – _?_ = 4   12 – 4 = 8 problems

10. You solved 10 word problems. Your friend solved 4 word problems. How many more word problems did you solve than your friend?   **10 – 4 = 6 word problems**

11. The red, slimy monster under the bed had 16 sharp teeth. The blue, furry monster in the closet had 9 fewer teeth than the red monster. How many teeth does the blue monster have?   **16 – 9 = 7 teeth**

12. Teresa has six plain pants and six striped pants. How many pants does Teresa have altogether?   **6 + 6 = 12 (plain and striped) pants**

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Student Name: ____**Answer Key**____   **Date:** _____

Word Problems Review
Worksheet 10
Read and solve the problems one at a time carefully.

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1. Cynthia ate 4 Snickers candy bars. She ate few more Snickers candy bars. Now Cynthia ate 7 candy bars. How many Snickers candy bars did Cynthia eat?
    4 + _?_ = 7   **7 – 4 = 3 Snickers candy bars**
2. Jamaal had 5 shirts. His parents gave him some more shirts for Christmas. Then he had 7 shirts. How many shirts did Jamaal's parents give him for his birthday?
    5 + _?_ = 7   **7 – 5 = shirts**
3. Audri had 8 big rocks. Then her father gave him 3 new rocks. How many rocks did she have then?   **8 + 3 = 11 rocks**

4. Jamaal had 5 pants. His uncle gave him 7 more pants. How many pants does Jamaal have together?   **5 + 7 = 12 pants**

5. Cynthia made 8 potato tacos for Alex to eat. Alex ate 3 potato tacos. How many more potato tacos left for Alex to eat?   **8 – 3 = 5 potato tacos**

6. Kimberly and Krystle baked 36 cookies. Then, they dropped 12 cookies on the floor. How many were left?   **36 – 12 = 24 cookies**

7. The boy had 6 water balloons. He threw most of it at his friend. There were 2 water balloons left. How many water balloons did he throw at his friend?
                        6 – _?_ = 2   6 – 2 = 4 water balloons
8. Cynthia had 12 cans of Coke. Then she gave some of her cans away. Then she had 7 cans left. How many cans of Coke did Cynthia give away?
                        12 - _?_ = 7   12 – 7 = 5 cans of Coke
9. Kimberly has 3 pens. Jamaal has 7 pens. Kimberly has how many fewer pens than Jamaal?
                        7 – 3 = 4 pens
10. Krystle read 9 books. Audri read 6 books. Krystle read how many more books than did Audri read?   **9 – 6 = 3 books**
11. Teacher has some markers. Students has 12 markers altogether. Students have 7 fewer markers than the teacher has altogether. How many markers does the teacher have?   **12 – 7 = 5 markers**
12. I read some magazines. You read five magazines. You already read two fewer magazines than I did. How many magazines did I read?   **5 – 2 = 3 magazines**
13. Kim has 5 cats and 4 dogs. How many pets does she have all together?
                        5 + 4 = 9 pets (cats and dogs)
14. There are 2 boys and 4 girls in Alex's class. How many students does he have altogether?   **2 + 4 = 6 students (boys and girls)**
15. There are twenty students in P.E. class. Ten of the students are deaf. How many students are hearing?   **20 – 10 = 10 hearing**
16. There are 50 fruits in the cafeteria. There are only two kinds: apples or oranges. 35 of the fruits are apples. How many fruits are orange?   **50 – 35 = 15 oranges**

Appendix C

Curriculum Rubrics

Telling, Reading and Writing Number Tales

Telling, Reading and Writing Number Tales Curriculum

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 1, Lesson 1 Working Together	

Note: Remember to indicate which unit and lesson you are using this rubric for on the top of this rubric since many lessons other than Unit 1, Lesson 1 use this same rubric.

Excellent (4 points)	Student almost always listens to, shares with, and supports the efforts of student's partner on all aspects of the project. Tries to keep working well together with and shows respect to partner at almost all the times.
Good (3 points)	Student usually listens to, shares with, and supports the efforts of others on most aspects of the project. Also usually shows respect to partner most of the time.
Okay (2 points)	Student often listens to, shares with, and supports the efforts of others on many aspects of the project. Also may have some trouble resolving disagreements or one partner does most of work. Sometimes is not a good team member not always showing some respect to partner at most of the times.
Need Work (1 point)	Student rarely listens to, shares with, and supports the efforts of others on at least most aspects of the project. Also often may argues or fights much of the time. Often not a good team player showing lack of respect to partner at most of the times.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 1, Lesson 2 Comparing Tales to Word Problems	

Note: Reuse "Working Together" student performance rubric for teacher for continued assessment of students working together.

Excellent (4 points)	Student accurately explains how each tale is related to the word problem, and accurately determines how each tale is similar or different from the word problem, and vice versa.
	Student always can accurately explain what makes a good tale independently.
Good (3 points)	Student accurately determines how each tale is similar or different from the word problem, and vice versa.
	Student usually can accurately explain what makes a good tale independently.
Okay (2 points)	Student sometimes accurately determines how some of the tale is similar or different from the word problem, and vice versa.
	Student sometimes can accurately explain what makes a good tale, and needs teacher help to fully explain what makes a good tale.
Need Work (1 point)	Student has difficulty in determining how each tale is related the word problem in terms of similarities and differences, and vice versa.
	Student has difficulties in explaining what makes a good tale, and needs a lot of teacher help to be able to explain what makes a good tale.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 1, Lesson 3	
Planning and Creating ASL Tales	

Note: Reuse "Working Together" student performance rubric for teacher for continued assessment of students working together. Prior knowledge and experience rubric will be reused in Unit 1, Lessons 4 & 5.

Excellent (4 points)	Student has developed a clear plan for creating a given number tale, and can independently explain the planned creation of the number tale without teacher help in explaining.
	Student always make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and can explain how they can see mathematics is involved in their everyday lives independently.
Good (3 points)	Student has developed a clear plan for creating a given number tale, and can independently explain the planned creation of the number tale with little teacher help in explaining.
	Student usually make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and usually can explain how they can see mathematics is involved in their everyday lives independently.
Okay (2 points)	Student has developed a clear plan for creating a number tale, and can independently explain most of this plan for creating a given number tale and rest of the explanation with teacher help.
	Student now and then make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read. Sometimes can explain how they can see mathematics is involved in their everyday lives independently and needs teacher help to fully explain mathematics' involvement.
Need Work (1 point)	Student has either no clear plan for creating a given number tale or is unable to explain his or her plan for creation of a given number tale, or both.
	Student, for the most part, do not make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and has difficulties in explaining how they can see mathematics is involved in their everyday lives, and needs a lot of teacher help to be able to explain mathematics' involvement.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 1, Lesson 4 Giving Feedback on ASL Tales	

Note: Reuse "Working Together" student performance rubric for teacher for continued assessment of students working together. Assessment of use of prior knowledge and experience rubric continued from Unit 1, Lesson 3.

Excellent (4 points)	Student routinely provides constructive and dignified feedback and useful suggestions to partner.
	Student regularly accepts feedback from partner willingly.
	Student always make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and can explain how they can see mathematics is involved in their everyday lives independently.
Good (3 points)	Student usually provides constructive and straightforward feedback and useful suggestions to partner that does not offend.
	Student occasionally reluctantly accept feedback from partner.
	Student usually make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and usually can explain how they can see mathematics is involved in their everyday lives independently.
Okay (2 points)	Student sometimes provides straightforward feedback and useful suggestions to partner, and feedbacks sometimes also are critical that can hurt feelings.
	Student for the most part refuse to accept feedback willing to argue own point of view over feedback given by partner.
	Student now and then make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read. Sometimes can explain how they can see mathematics is involved in their everyday lives independently and needs teacher help to fully explain mathematics' involvement.
Need Work (1 point)	Student either rarely provides feedback and suggestions or is openly rude to partner and gives hurtful feedback, or both.
	Student regularly refuses to listen to feedback.
	Student, for the most part, do not make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and has difficulties in explaining how they can see mathematics is involved in their everyday lives, and needs a lot of teacher help to be able to explain mathematics' involvement.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

<table>
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Unit 1, Lesson 5

Revising ASL Tales

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</table>

Note: Reuse "Working Together" student performance rubric for teacher for continued assessment of students working together. Assessment of use of prior knowledge and experience rubric continued from Unit 1, Lesson 3.

Excellent (4 points)	Student does superb job with the revision process making modifications that to a great extent improve the tale. Incorporates feedback and suggestions from partner for improvement during the revision process.
	Student always make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and can explain how they can see mathematics is involved in their everyday lives independently.
Good (3 points)	Student has no difficulty with the revision process making some modifications that soundly improve the tale. For the most part successfully incorporates feedback and suggestions from partner for improvement during the revision process.
	Student usually make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and usually can explain how they can see mathematics is involved in their everyday lives independently.
Okay (2 points)	Student has some difficulty with the revision process where some modifications were made that somewhat improve the tale. Incorporates little to some feedback and suggestions for improvement during the revision process.
	Student now and then make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read. Sometimes can explain how they can see mathematics is involved in their everyday lives independently and needs teacher help to fully explain mathematics' involvement.
Need Work (1 point)	Student seems to have tremendous difficulty with the revision process where modifications made are minor that improve the tale to a small extent. Struggles with incorporating feedback and suggestions for improvement during the revision process.
	Student, for the most part, do not make full use of prior knowledge and experience to create number tales as well as to connect to number tales they read, and has difficulties in explaining how they can see mathematics is involved in their everyday lives, and needs a lot of teacher help to be able to explain mathematics' involvement.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 2, Lesson 1 Acting Out ASL Addition Number Tales	

Note:

Excellent **(4 points)**	Student skillfully act clearly showing, rather than telling, the audience what happens thus providing context for them to imagine the circumstances of the situation in a given number tale.
	Student always can explain the strategic steps in reading and solving word problems independently.
Good **(3 points)**	Student, with varying degrees of success, is able to clearly act showing, rather than telling, the audience what happens thus providing context for them to imagine the circumstances of the situation in a given number tale.
	Student usually can explain the strategic steps in reading and solving word problems independently.
Okay **(2 points)**	Student at times struggles to act showing, rather than telling, the audience what happens to provide context for them to imagine the circumstances of the situation in a given number tale.
	Student sometimes can explain the strategic steps in reading and solving word problems, and needs teacher help to fully explain the steps.
Need Work **(1 point)**	Student, for some reasons, refuse to or is unable to act, showing rather than telling, the audience what happens to provide context for them to imagine the circumstances of the situation in a given number tale.
	Student has difficulties in explaining the strategic steps in reading and solving word problems, and needs a lot of teacher help to fully explain the steps.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 2, Lesson 2 **Using Cubes for ASL Addition Number Tales**	

Note:

Excellent (4 points)	Student always can show using manipulatives the meaning of arithmetic process (addition) in any given word problems in addition to solving them.
	Student consistently uses the Joining To strategy to read and find solutions to given word problems free of errors.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good (3 points)	Student for the most part can show using manipulatives the meaning of arithmetic process (addition) in any given word problems most of the time in addition to solving them.
	Student usually uses the Joining To strategy to read and find solutions to given word problems with little errors.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay (2 points)	Student, sometimes when reminded, occasionally can show using manipulatives the meaning of arithmetic process (addition) in any given word problems in addition to solving them.
	Student uses the Joining To strategy to read and find solutions to given word problems with some errors.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work (1 point)	Student rarely can show using manipulatives the meaning of arithmetic process (addition) in any given word problems in addition to solving them. May often "plays" with the manipulatives instead of using them as instructed.
	Student often makes errors in using the Joining To strategy to read and find solutions to given word problems.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 2, Lesson 3 **Formulating Arithmetic Sentences for ASL Addition Number Tales**	

Note:	

Excellent (4 points)	Student always use correct mathematics terminology and notation to write out appropriate addition arithmetic sentences to represent given word problems, which are easy for teacher to understand what was done. Always solve arithmetic sentences.
	Student consistently uses the Joining All strategy to read and find solutions to given word problems free of errors.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good (3 points)	Student usually use correct mathematics terminology and notation to write out appropriate addition arithmetic sentences to represent given word problems, which are fairly easy for teacher to understand what was done. Usually solve arithmetic sentences.
	Student usually uses the Joining All strategy to read and find solutions to given word problems with little errors.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay (2 points)	Student for the most part use correct mathematics terminology and notation to write out appropriate addition arithmetic sentences to represent given word problems, which sometimes are not easy for teacher to understand what was done. Sometimes solve arithmetic sentences.
	Student uses the Joining All strategy to read and find solutions to given word problems with some errors.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work (1 point)	Student either uses little of or inappropriately uses, or both, mathematics terminology and notation to write out addition arithmetic sentences to represent given word problems.
	Student often makes errors in using the Joining All strategy to read and find solutions to given word problems.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 2, Lesson 4 **Acting Out and Using Cubes for ASL Subtraction Number Tales**	

Note:

Excellent **(4 points)**	Student always can show using manipulatives the meaning of arithmetic process (subtraction) in any given word problems in addition to solving them.
	Student consistently uses the Separating From strategy to read and find solutions to given word problems free of errors.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good **(3 points)**	Student for the most part can show using manipulatives the meaning of arithmetic process (subtraction) in any given word problems most of the time in addition to solving them.
	Student usually uses the Separating From strategy to read and find solutions to given word problems with little errors.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay **(2 points)**	Student, sometimes when reminded, occasionally can show using manipulatives the meaning of arithmetic process (subtraction) in any given word problems in addition to solving them.
	Student uses the Separating From strategy to read and find solutions to given word problems with some errors.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work **(1 point)**	Student rarely can show using manipulatives the meaning of arithmetic process (subtraction) in any given word problems in addition to solving them. May often "plays" with the manipulatives instead of using them as instructed.
	Student often makes errors in using the Separating From strategy to read and find solutions to given word problems.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 2, Lesson 5	
Formulating Arithmetic Sentences for ASL Subtraction Number Tales	

Note:

Excellent (4 points)	Student always use correct mathematics terminology and notation to write out appropriate subtraction arithmetic sentences to represent given word problems, which are easy for teacher to understand what was done. Always solve arithmetic sentences.
	Student consistently uses the Separating To strategy to read and find solutions to given word problems free of errors.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good (3 points)	Student usually use correct mathematics terminology and notation to write out appropriate subtraction arithmetic sentences to represent given word problems, which are fairly easy for teacher to understand what was done. Usually solve arithmetic sentences.
	Student usually uses the Separating To strategy to read and find solutions to given word problems with little errors.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay (2 points)	Student for the most part use correct mathematics terminology and notation to write out appropriate subtraction arithmetic sentences to represent given word problems, which sometimes are not easy for teacher to understand what was done. Sometimes solve arithmetic sentences.
	Student uses the Separating To strategy to read and find solutions to given word problems with some errors.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work (1 point)	Student either uses little of or inappropriately uses, or both, mathematics terminology and notation to write out subtraction arithmetic sentences to represent given word problems.
	Student often makes errors in using the Separating To strategy to read and find solutions to given word problems.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

	Unit 3, Lesson 2
	Modeling a Good English Tale

Note:

Excellent (4 points)	Student always can accurately explain what makes a good English tale independently.
	Student consistently uses the Compare strategy # 2 to read and find solutions to given word problems free of errors.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good (3 points)	Student usually can accurately explain what makes a good English tale independently.
	Student usually uses the Compare strategy # 2 to read and find solutions to given word problems with little errors.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay (2 points)	Student sometimes can accurately explain what makes a good English tale, and needs teacher help to fully explain what makes a good English tale.
	Student uses the Compare strategy # 2 to read and find solutions to given word problems with some errors.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work (1 point)	Student has difficulties in explaining what makes a good English tale, and needs a lot of teacher help to be able to explain what makes a good English tale.
	Student often makes errors in using the Compare strategy # 2 to read and find solutions to given word problems.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 3, Lesson 3 — Planning and Writing English Tales	

Note:

Excellent (4 points)	Student has developed a clear plan for creating an English version of a given ASL number tale, and can independently explain the planned creation of the English number tale without teacher help in explaining.
	Student consistently uses the Part-Part-Whole strategy #1 to read and find solutions to given word problems free of errors.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good (3 points)	Student has developed a clear plan for creating an English version of a given ASL number tale, and can independently explain the planned creation of the English number tale with little teacher help in explaining.
	Student usually uses the Part-Part-Whole strategy #1 to read and find solutions to given word problems with little errors.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay (2 points)	Student has developed a clear plan for creating an English version of a given ASL number tale, and can independently explain most of the plan for creating a given English number tale and rest of the explanation with teacher help.
	Student uses the Part-Part-Whole strategy #1 to read and find solutions to given word problems with some errors.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work (1 point)	Student has either no clear plan for creating an English version of a given ASL number tale or is unable to explain his or her plan for creation of a given English number tale, or both.
	Student often makes errors in using the Part-Part-Whole strategy #1 to read and find solutions to given word problems.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 3, Lesson 4	
Editing English Tales	

Note:

Excellent (4 points)	Student does a superb job with editing making modifications that to a great extent improve the English tale. Fully incorporates feedback and suggestions from partner for improvement during the editing process.
	Student consistently uses the Part-Part-Whole strategy #2 to read and find solutions to given word problems free of errors.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good (3 points)	Student has no difficulty with editing making some modifications that soundly improve the English tale. For the most part successfully incorporates feedback and suggestions from partner for improvement during the revision process.
	Student usually uses the Part-Part-Whole strategy #2 to read and find solutions to given word problems with little errors.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay (2 points)	Student has some difficulty with the revision process where some modifications were made that somewhat improve the tale. Incorporates little to some feedback and suggestions for improvement during the revision process.
	Student uses the Part-Part-Whole strategy #2 to read and find solutions to given word problems with some errors.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work (1 point)	Student seems to have tremendous difficulty with the revision process where modifications made are minor that improve the tale to a small extent. Struggles with incorporating feedback and suggestions for improvement during the revision process.
	Student often makes errors in using the Part-Part-Whole strategy #2 to read and find solutions to given word problems.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Performance Rubric for Teacher

Student Name: _____ **Date:** _____

Unit 3, Lesson 5 **ASL and English Number Tales Cumulative Project**	

Note:
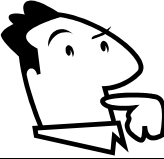
Excellent (4 points)	Student produces a class book that includes all required elements as well as additional information.
	Student consistently selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Good (3 points)	Student produces a class book with all the required elements.
	Student usually selects and applies appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems with little errors.
Okay (2 points)	Student produces a class book where all but one of the required elements is included.
	Student more often than not make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.
Need Work (1 point)	Student produces a class book with several required elements missing.
	Student always make errors in selecting and applying appropriate strategies, skills, methods, and/or concepts in reading and finding solutions to certain word problems.

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

Unit 1, Lesson 1 Working Together	

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I always listen to, share with, and support the efforts of my partner.				
I try to work together well with my partner.				

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

Unit 1, Lesson 2 Comparing Tales to Word Problems	

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I know how each tale is similar or different from the word problem.				
I can explain how each tale is related to the word problem.				
I can explain what makes a good tale.				

Comments: _____
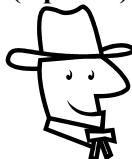
Student Name: _____ **Date:** _____

Student Performance Rubric for Students

	Unit 1, Lesson 3 Planning and Creating ASL Tales	

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I have a clear plan for creating my number tale.				
I can explain how I plan and create my number tale.				
I can use my prior knowledge to make my number tale and to connect to any number tale I read. I can see how mathematics is involved in my everyday life.				

Comments: _____
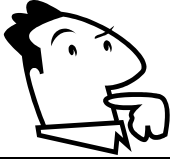
Student Name: _____ **Date:** _____

Student Performance Rubric for Students

Unit 1, Lesson 4			
Giving Feedback on ASL Tales			

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I give helpful feedback and useful suggestions to my partner.				
My feedback and suggestions are dignified and given in a nice way.				
I can use my prior knowledge to make my number tale and to connect to any number tale I read. I can see how mathematics is involved in my everyday life.				

Comments: _____
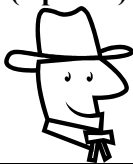
Student Name: _____ **Date:** _____

Student Performance Rubric for Students

Unit 1, Lesson 5

Revising ASL Tales

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I make modifications to my number tale to improve it.				
I use feedback and suggestions from my partner to revise my tale.				
I can use my prior knowledge to make my number tale and to connect to any number tale I read. I can see how mathematics is involved in my everyday life.				

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Unit 2, Lesson 1 **Acting Out ASL Addition Number Tales**				

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can act showing the audience what happens in my number tale, and I did not tell them what happens in my number tale.				
I can use acting to visualize and solve any word problems.				
I can explain the strategic steps in solving word problems.				

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

Unit 2, Lesson 2 Using Cubes for ASL Addition Number Tales	

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can use cubes to show the process of addition in any word problems.				
I can use cubes to represent and solve any addition word problems.				
I can use the *Joining To* Strategy to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

Unit 2, Lesson 3 — Formulating Arithmetic Sentences for ASL Addition Number Tales				

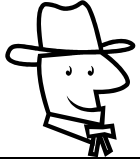|	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can write correct number sentences to represent any addition word problems.				
I can solve number sentences representing any addition word problems.				
I can use the *Joining All* Strategy to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ Date: _____

Student Performance Rubric for Students

Unit 2, Lesson 4 **Acting Out and Using Cubes for ASL Subtraction Number Tales**		

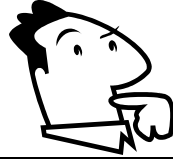|	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can use cubes to show the process of subtraction in any word problems.				
I can use cubes to represent and solve any subtraction word problems.				
I can use the *Separating From* Strategy to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ Date: _____

Student Performance Rubric for Students

Unit 2, Lesson 5

Formulating Arithmetic Sentences for ASL Subtraction Number Tales

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can write correct number sentences to represent any subtraction word problems.				
I can solve number sentences representing any subtraction word problems.				
I can use the *Separating To* Strategy to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ Date: _____

Student Performance Rubric for Students

Unit 3, Lesson 1
Comparing ASL and English Tales

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can explain how ASL tales are related to English tales.				
I can show how ASL tales and English tales are similar and different.				
I can use the *Compare* Strategy # 1 to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

| Unit 3, Lesson 2
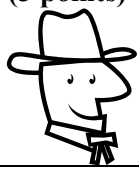
Modeling a Good English Tale | |

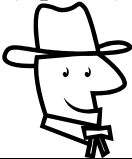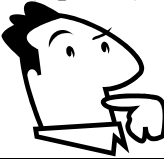|	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I can explain what makes a good English tale.				
I can use the *Compare* Strategy # 2 to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

Unit 3, Lesson 3 **Planning and Writing English Tales**			

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I have a clear plan for creating an English version of my ASL number tale.				
I can explain how I will create an English version of my ASL number tale.				
I can use the *Part-Part-Whole* Strategy # 1 to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ **Date:** _____

Student Performance Rubric for Students

	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
Unit 3, Lesson 4 **Editing English Tales**				

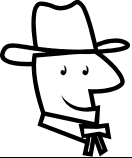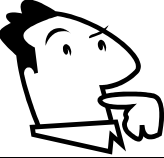|	EXCELLENT (4 points)	GOOD (3 points)	OKAY (2 points)	NEED WORK (1 point)
I make modifications to my English tale to improve it.				
I use feedback and suggestions from my partner to revise my English tale.				
I can use the *Part-Part-Whole* Strategy # 2 to read and find solutions to given word problems.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____

Student Name: _____ **Date: _____**

Student Performance Rubric for Students

		Unit 3, Lesson 5 **ASL and English Number Tales** **Cumulative Project**	

	EXCELLENT (4 points)	**GOOD (3 points)**	**OKAY (2 points)**	**NEED WORK (1 point)**
I made a class book that has everything it needs in it.				
I can select and apply appropriate strategies in finding solutions to certain word problems.				

Comments: _____