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Effects of Different Communication Methods on the Comprehension of Stories by Deaf Students in Zimbabwe: Implications for Classroom Communication and Academic Achievement

by

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ABSTRACT

Effects of Different Communication Methods on the Comprehension of Stories by Deaf Students in Zimbabwe: Implications for Classroom Communication and Academic Achievement

by

Robert Chimedza

This study examined Zimbabwe deaf students' comprehension of stories told in the manual mode (Zimbabwe Sign Language), the manual plus oral mode (simultaneous communication), and the oral mode (oral English) and compared how the three communication methods were used in the classroom. Also, the study compared the effects of English and Zimbabwe Sign Language in the deaf students' comprehension of the stories. It was predicted that: (a) comprehension would be different in the three modal conditions. Deaf students would score highest in the manual mode, followed by the manual plus oral mode and score the least in the oral mode; (b) Zimbabwe Sign Language would be a more efficient method of communicating with deaf students than English; (c) teachers of deaf students would not use communication methods that their students understand best.

Seventy-two deaf students from special schools and integration units throughout Zimbabwe participated in the story comprehension experiment. Thirty-six teachers completed the questionnaire items and three classes were observed during teaching and learning sessions. In the experimental task, subjects were shown a different story under each of the three modal conditions. After each viewing the subject's retelling was videotaped.

Data analysis showed that mode of communication, hearing threshold level and language were significantly related to story retelling scores. Students understood best stories told in the manual mode, followed by manual plus oral mode and then the oral mode. There were higher scores for Zimbabwe Sign Language than for English. Qualitative data analysis revealed that teachers had problems with communication competency in the manual mode while their students had problems of competence in oral communication. Implications for this are discussed and recommendations for future research are made.

DEDICATION

Dedicated to my father the late Mapfumo Chimedza, my mother Mbuya Ndarubva Rebecca Chimedza, my wife Tabeth, sons Comfort and Rodney and daughter Chido. My parents sent me to school when times were hard for them in colonial Rhodesia. I cherish and appreciate their sacrifice. My wife and children have always been my source of inspiration. You all are a blessing to me. "Mwari ngavarumbidzwe."

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CHAPTER I

INTRODUCTION

Background

The most enduring and controversial problem in the education of deaf students is the question of what communication methods teachers should use when teaching deaf students. There are two major aspects of this issue; kind of language and form of communication (Paul & Quigley, 1990 & 1984; Quigley & Kretschmer, 1982; Stewart, 1985). In Zimbabwe the problem involves two languages (English and Zimbabwe Sign Language) and three communication methods (oral communication [oral English], manual communication [Zimbabwe Sign Language], and simultaneous communication [manual and oral combinations]).

The oral methods emphasize the use of audition and speechreading (Ling, 1990; Paul & Quigley, 1990). Deaf students who use this approach need to learn to use their residual hearing as much as possible and combine this with speechreading. The major communication mode in the oral method is speech. The emphasis on speech comes from the thinking that society consists mainly of hearing people for whom a spoken language is the primary means of communication. Consequently, if deaf people are to become participating members in a hearing society then speech must be their mode of communication. It has been noted that educational programs that place a great deal of value on the acquisition of speech support the concept of good oral communication skills because they feel it will increase educational and vocational opportunities and, consequently, the socioeconomic status of the deaf individuals in society (Paul &

Quigley, 1990; Quigley & Kretschmer, 1982; Ross, Brackett, & Maxon, 1982; Ling, 1984; Mulholland, 1981).

Simultaneous communication is the simultaneous presentation of both speech and sign communication by the speaker. It also uses other communication modes such as fingerspelling and writing. It assumes that the receiver is able to select / or combine information from the various sources to his or her advantage. It is based on the philosophy of total communication (Jordan, Gustason, & Rosen, 1979). In theory, total communication reflects a process embraced by teachers, parents, and children, which uses any available means of communication to express a thought (Paul & Quigley, 1990; Moores, 1987; Denton, 1970). In practice it is the combination of auditory-articulatory mechanisms and visual-motor mechanisms, resulting in the simultaneous production of speech and manual signs (McAnally, 1994; Quigley 1990; Moores, 1987). Because of its simultaneous nature of presenting both speech and signing, this approach is more commonly used with signed English. This allows the user to more readily match their signs with their spoken words.

Zimbabwe Sign Language is presented in the manual mode. It is a language in which the shapes, positions, and movements of the hands are combined with complex uses of nonmanual signals, such as facial expressions and movements of the head and body, to create a variety of linguistic possibilities as diverse as the combinations of sounds used in oral languages (Bayton, 1996). It presents a visual motor feedback system similar to the auditory-articulatory loop of spoken language users (Wilbur, 1987; Cicourel & Boese, 1972).

The problems of which communication method to use when teaching deaf students can be traced to the controversy between the " French Method and the German Method," of educating deaf children. The first documented attempt to teach deaf students took place in Spain under the tutelage of Ponce de Leon (1520-1584). De Leon used oral communication in his tutorials. He was followed in Spain by Pablo Bonet (1579-1620) who used a method that combined fingerspelling and speech. Abbe' Charles de L'Epee established the first school for deaf students in Paris in 1755. The means of communication in his school was "methodical signs" based on the French language (Bornstein, 1990; Paul & Quigley, 1990). He considered the language of signs to be the natural language of deaf people (Evans, 1982; Schein & Stewart 1995). He analyzed and modified the signs used by the deaf people in Paris to develop a signed analog to written French that he called "methodological signs." The "French" system of methodical signs followed the syntax and vocabulary of French. Abbe' de L' Epee undertook to prepare a dictionary for signs that was eventually completed by his successor Abbe' Roch Sicad (1818). Sicad was the head of the Paris School for the Deaf. In Germany, Samuel Heinicke taught the deaf students in his school using oral communication and forbade the use of signed communication in any manner. For him spoken language was the hinge upon which everything turned. He believed in pure oralism, a method that became widely known as the "German Method".

The two approaches led to an international controversy that dominated the education of deaf students for a long time. The International Congress on the Education of the Deaf held in Milan in 1880 endorsed the use of the oral approach, as the only means of communication teachers should use when teaching deaf students. This act

cemented the oral approach in the United States of America for the next eighty years and even longer in other countries. In recent times, research work in sign language and political pressure from the Deaf community and the World Federation of the Deaf have helped increase the use of sign language as the preferred means of communication for use in the education of deaf students.

In East and Southern Africa there are attempts for regional cooperation to establish the best communication methods that teachers can use when teaching deaf students. Regional workshops were held in Tanzania (1988), Ethiopia (1990), Kenya (1992), Uganda (1994), and Zimbabwe (1998). Unfortunately the agenda for these regional workshops has not been informed by research findings. Meetings were focused on pushing the use of sign language as the primary means of communication in the classroom. This is taking place against a background where the oral approach has dominated the region since the education of deaf students began in the 1940s. Because of lack of research, the discussion about communication method becomes more political and emotional than educational or scientific.

At the classroom level teachers adopt communication methods based on their training orientations, personal beliefs, and the policy of their school (Luetke-Stahlman, 1988). It is not clear how far this meets the communication needs of the deaf students they teach. A study that investigates deaf students' comprehension skills of content material presented to them in the different communication methods that teachers commonly use in the classrooms would help inform both policy and practice. This study compared deaf students' comprehension of stories presented in the manual-only communication mode (ZSL), simultaneous communication (signed English), and the oral

method (oral English). Also, it examined how teachers and their deaf students used the three communication methods mentioned above in classroom interactions during teaching and learning situations. In the last chapter the study discusses the implications of the study's results for classroom communications with deaf students in the teaching- learning situation in Zimbabwe.

Context of the Study

The Country

Zimbabwe is a landlocked country in Southern Africa. It shares its boarders with Zambia to the north, South Africa to the south, Mozambique to the east and Botswana to the west. It gained its political independence in 1980 after a legacy of ninety years of colonial rule by Great Britain. The last population census was done in 1992 and it reported the population to be 10.412 million people with a population growth of 3.3% (Government of Zimbabwe Central Statistics Office, 1994).

The People

About 96% of Zimbabwe are indigenous Africans. Of these about 70% are the vaShona people. They speak the chiShona language. Shona language has several dialects (e.g., chiKaranga, chiZezuru, chiNdau, chiUngwe). Twenty percent of the population is the Ndebele people. They speak the isiNdebele language. Another 6% are the minority indigenous groups and the migrant African groups from neighboring countries. White settlers mainly from Europe and particularly Great Britain form the last 4%. About 80% of Zimbabwe's people live in the rural areas. The majority are peasant farmers.

Zimbabwe's economy is based on agriculture and mining. The country's wealth is in the hands of a few commercial farmers, miners, and industrialists who are mostly white.

Attitude Toward Disability

The vaShona people's attitudes toward disability are changing due to the influence of education and Christianity. Traditionally the vaShona and Ndebele people held negative attitudes toward disability. The birth of a child with a disability was viewed negatively. Also, the family with a child who had a disability was stigmatized. Even today these negative attitudes toward disability are still prevalent and strong. Often disability is associated with witchcraft (Department of Social Services, 1982), promiscuity by the mother during pregnancy (Addison, 1986), and punishment by ancestral spirits and directly by God to the family or the parents of the child with a disability. Some people with disabilities are seen as possessed by evil spirits. Deaf people's speech defects perpetuate this perspective.

Attitudes and beliefs on disability among the vaShona and the Ndebele people are closely associated with their traditional religious beliefs. Among the vaShona people traditional religion is centered on their ancestral spirits (vadzimu). The ancestral spirits are responsible for the individual's fortunes and misfortunes. They protect the individual from misfortunes and punish the individual for wronging them. Illness or death in the family may be caused by one's enemies (through witchcraft) but only if their ancestral spirits no longer protect them. Maternal spirits are more vicious if angered than paternal ones. Making amends or healing is usually in the hands of the spirit medium (svikiro) or

the traditional healer (n'anga). Religious ceremonies usually involve beer drinking and dances. These are used to appease the angered spirits.

Education Provision

In 1979 (a year before independence) there were 819,000 students in primary schools in Zimbabwe. In 1985 (five years after independence) the number had risen to 2,229,000 students. The statistics for students with disabilities in the education system during the same period are not available, as the government was not directly involved with their education. Their schools were run by private nongovernmental organizations, churches, and individual philanthropists. The education of children with disability was an issue of charity. As a result, the access to education of children with disabilities was very limited and problematic. The National Disability Survey of 1981 shows that 52 percent of all people with disabilities in Zimbabwe had never been to school, 16.5 percent had attended school for up to two years, 28 percent had completed elementary education and one percent had progressed beyond high school (Department of Social Services, 1981). This was the situation in a country with a literacy rate of 89% (male) and (78%) female, probably one of the best in Africa.

Since Independence the number of students with disabilities who receive an education has increased due to the provisions of the Education Act of 1987. Section 4 (paragraph 2) of the Education Act states that,

> "No child in Zimbabwe shall be refused admission to any school on the grounds of race, tribe, color, religion, creed, place of origin, or the social status of his or her parents."

This act does not specifically mention children with disabilities. However, the Ministry of Education Special Education Policy Statement of 1989 gives the following strategies in its attempts to increase provision of education for students with disabilities:

(a) early detection, intervention and prevention of handicaps,

(b) integration of children with handicaps into ordinary schools, wherever possible,

(c) development of local relevant training facilities at college and university levels

(d) development of resource centers in order to localize integration,

(e) establishment of government personnel to service, monitor, and coordinate programs, and

(f) assistance of nongovernmental organizations (Ministry of Education and Culture Special Education Policy Statement, 1989).

The 1972 Zimbabwe Psychological Practices Act (Revised in 1988) advocated for the development of individualized programs for persons with disabilities and the placement of special needs children in the least restrictive educational environment.

However, the increase in numbers of students with disabilities who attend school has not been matched with quality instructions. The current educational achievement of deaf students is testimony of this situation. Less than 10 percent of the deaf candidates pass the Grade Seven final examination and an even smaller proportion proceed to any form of higher education. The rest of deaf school population drop out and end in the streets with little hope for employment. A few find work in menial jobs in the factories and are angry about the inadequacies in the educational system. Up to now no deaf people in Zimbabwe have attended colleges and universities. They fail the "O" and "A" Level University of Cambridge examinations that set the entrance requirements.

Education for the deaf in Zimbabwe began in 1947 under missionaries from Germany and Holland. Both countries strongly believed in teaching deaf students using the oral approach and they passed the same philosophy to the schools for the deaf they founded in Zimbabwe. When we consider the recency of formal education of deaf students in Zimbabwe and that programs in developed countries have yielded more efficacious results (e.g., United States of America, Britain and Australia where some deaf adults are professors, teachers, doctors, engineers, etc.), the need to identify and address the problem comprehensively is apparent.

The question is, why do deaf students in Zimbabwe persistently do poorly in their academic work? The literature suggested that deaf students' difficulty to school learning are language and communication barriers (Paul & Quigley, 1990; McAnnaly, Rose & Quigley, 1994, Moores, 1995). Teachers of deaf students in Zimbabwe are still debating at national conferences and in school meetings what communication methods to use in the classroom when teaching deaf children. This subject is controversial and difficult for teachers. Deaf community groups such as the Association of the Deaf (Zimbabwe) want Zimbabwe Sign Language to be the only method of communication allowed when teaching deaf students (Chimedza, 1998). Yet it was only in 1990 that some deaf students and their teachers began to use sign language or signed English in their classes (Chimedza, 1994). As yet, there is no policy for schools on the communication methods to use when teaching deaf students. The Ministry of Primary and Secondary Education is presently searching for information on which to base the policy guidelines. Recently it published a Zimbabwe Sign Language Dictionary (Chimedza, Sithole, & Rinashe, 1998). But policy should begin with research findings related to what type of communication

works and what does not. The present study is an attempt to inform policy makers in this direction.

Research Problem

The study undertaken here attempted to evaluate the story comprehension skills of deaf students under three communication methods that teachers use in special schools and integration units for deaf students in Zimbabwe. The three communication methods used are Zimbabwe Sign Language, simultaneous communication and the oral approach. These were presented using three different modal conditions; manual (Zimbabwe Sign Language), manual and oral combinations (simultaneous communication), and oral (spoken English). Two languages were used separately in the study. Zimbabwe Sign Language was used for the manual mode while English was used for simultaneous communication and the oral mode. Shona and Ndebele were not used in the study because English is the main medium of instruction in most schools in Zimbabwe. Shona and Ndebele are taught as subjects. In the schools for deaf children, English is the medium of instruction from Grade 1 while Shona and Ndebele are introduced as subjects in Grade 4. Deaf students in the schools for the deaf use the Zimbabwe Sign Language for most of their out of classroom interactions. Their schools are boarding schools where deaf students live amongst one another. In such situations, deaf students are known to teach each other sign language (Schein & Delk, 1974).

Comprehension of the stories was tested by retelling. The subjects watched videotaped presentations of three different stories told to them using the three

communication methods. They retold each story immediately after presentation in their own preferred mode of communication. Also, the study examined how the three communication methods were used in classroom situations.

First the study employed a 3 (stories) x 3 (communication methods) x 2 (languages) repeated measure design to evaluate the story comprehension skills of the research subjects. Each subject was presented with three stories each in a different method of communication from the others. Three communication methods were used by each research participant. Two of the stories were presented in English (for the stories presented in oral communication and those in simultaneous communication) and one story was presented in Zimbabwe Sign Language to each research subject. Secondly, the teachers completed a questionnaire and the researcher made classroom observations of teachers teaching deaf students using these three communication methods. He compared the communication patterns in the three different settings. The essence of the study was to relate the story comprehension skills as described by the experiment and the observations of how the different communication methods were used in classroom situations to the academic achievement of deaf students in Zimbabwe.

There are several features of this study that distinguished it from previous studies. Some studies were done through survey questionnaires (Woodward & Allen, 1988 & 1987) and laboratory settings (Hatfield, Coccamise and Siple, 1978; Stewart, 1985) without classroom observations of how the communication methods were used in teaching and learning situations. While quantitative methods such as those used in the surveys quoted above and controlled laboratory settings both helped to quantify the comprehension skills of deaf students using different communication methods, this study

found it important to extend the position made by previous studies by including classroom observations. This extension will help link the story comprehension skills of deaf students with their classroom communication patterns and their academic achievement. Secondly, the study made multivariate analysis of the research data. This helped to explain whether or not the effects of the story comprehension skills of deaf students using the three different communication methods depended on other factors besides the individual deaf child. Effects of communication methods on the comprehension of stories was considered in relation to the students' hearing level threshold, socioeconomic status, gender, hearing status of parents and siblings, and educational setting (special school or regular education program).

Finally, communication comprehension was measured through story retelling. This is a method suggested by Goodman and Burke (1972) and used by Stewart (1985). It is described in detail later in Chapter III of this study. Previous studies used nonsensical words (Carson & Goetzzinger, 1975; Beckmeyer, 1976), single words (Crittenden, Ritterman, & Wilcox, 1986), and single sentences (Caccamise & Blasdell, 1977) to test comprehension. Both classroom situations and daily communication discourses that deaf students are involved in are based on full language use particularly through conversations. Stories as used in this study were the closest approach the researcher could use to approximate authentic language use as evidenced in conversations. Comprehension of stories was then inferred to comprehension of classroom discussions and to academic achievement. This provided the study with greater ecological validity that allowed for generalizations to be made regarding language and communication comprehension.

The review of literature in the next chapter explores various aspects of sign language, simultaneous communication and oral communication methods as used with deaf students. It looks at information processing and the educational achievement of deaf students. Initially the characteristics of the three communication methods are discussed. This is followed by reports on research that looks at how each of these works and how they have been used with deaf students in the school learning situation. Next the linguistic, psychological, educational, and sociological aspects of oral communication, sign language, and simultaneous communication to deaf students are discussed. Finally, the review of the literature looks at bilingual education. Bilingualism is discussed with reference to the use of sign language and English by deaf students. The educational implications of such an approach are reviewed.

Definition of Terms

Aural mode: This is a communication mode that relies on the reception of speech signals using the auditory channel. For deaf and hard of hearing people this implies relying mainly on their residual hearing and amplification systems such as hearing aids.

Comprehension of stories: the amount of information that the test subject can reproduce after viewing the stories presented on a video. The students from whom the sample is selected have only one disability (deafness). They have at least one communication method that they use proficiently. This will control for retelling of stories not to be confounded with communication ability. Retelling of stories was done in a mode of communication preferred by the test subject. This study involves both the

reception and comprehension of stories. Since the recall of stories depends on these skills (Brasford, 1979), a retelling task suggested by Goodman and Burke (1972) was used as a measure of comprehension. The retelling was done immediately after watching and listening to the video. There was minimal delay between comprehension and retell, and any effects will applied equally across all communication methods, minimizing problems related to memory. The main factor that will contribute to accurate reproduction is comprehension.

Deaf community: a cultural group comprising persons who share similar attitudes and beliefs toward deafness. The "core Deaf Community" is comprised of people who have a hearing loss, use sign language as their dominant means of communication, share same values and experiences, and have a common way of interacting with each other (Schein, 1978; Schein & Stewart, 1995; Schein & Delk, 1974; Terzian & Saari, 1982; Bayton, 1998). The wider deaf community comprises individuals (both hearing and deaf) who have positive, accepting attitudes toward deafness which can be seen in their linguistic, social, and political behaviors (Padden, 1980; Maxwell, 1985; Rodda & Grove, 1987). The Deaf community is a necessary and important component of life for many individuals who are deaf. Through the Deaf community, the deaf person can find other individuals with similar problems, common interests, a common language (sign language), and a common culture.

Deaf person: from a cultural perspective, a deaf person is one who has a functionally significant hearing loss and identifies with the language, beliefs and culture

of the Deaf community (Lane, 1988; Bayton, 1998). From an educational perspective a deaf person is one with a hearing loss to the extent that it precludes the understanding of speech through the ear alone without or with hearing aids (Moores 1987). From an audiological perspective hearing impairment ranges from mild to profound hearing loss, with a deaf person having a hearing loss of 90db or greater. Even with the use of hearing aids or other forms of amplification, their primary means of developing language and communication is through the visual channel (Berg, 1987; Quigley & Paul, 1989).

Hard-of-hearing: for a hard-of-hearing person, audition is deficient but remains somewhat functional. Generally with the help of a hearing aid they are able to use their residual hearing to process linguistic information successfully through audition (Brill, MacNeil, & Newman, 1986).

Hearing impaired: this is a generic term that refers to persons with hearing loss of any level ranging from mild to profound. It includes both the hard of hearing and the deaf people.

Manual mode: means of communication of or relating to the use of signs. This may include fingerspelling, signing, facial expressions, gestures and any form of body language.

Oral mode: modal condition of communication relating to speech. In the present context, the oral mode is used to refer exclusively to the use of speechreading technics.

Sign language: a manual means of communication that is also the primary language of deaf people. There are different national sign languages (e.g., Zimbabwe Sign Language, American Sign Language & Kenyan Sign Language).

Sign system: a method of signing that attempts to create visual equivalents of oral language.

Signed English: the English language presented through signing and fingerspelling.

Simultaneous communication: a means of communication that uses both signing and speech simultaneously.

Oral English: the English language presented through speech.

Total communication: in theory reflects a process embraced by teachers, parents, and children that uses any available means of communication to express a thought (Moores, 1987; Pahz & Pahz, 1978; Paul & Quigley, 1990; Denton, 1970). The goal is to ensure effective communication with deaf students. In practice, it calls for teachers and parents to present manual signs and spoken words at the same time as they communicate with deaf children (McAnnaly, 1994; Paul & Quigley, 1990; Moores, 1987). Within total communication programs, simultaneous use of speech and signs is strongly encouraged

(Paul & Jackson, 1993; Gannon, 1981; Wilbur, 1987; Carr, 1981; Creekmore, 1982; Bornstein, 1990).

Zimbabwe Sign Language: the primary language used in the Deaf community in Zimbabwe.

Deaf: Deaf, with capital "D" refers to people who belong to the Deaf community (c above for definition of Deaf community).

Deaf: deaf, with small "d" refers to the condition of having a hearing loss such that the individual can not benefit from speech through audition without the use of hearing aids.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The review of literature explores various aspects of the manual, oral, and simultaneous communication methods used in the education of deaf students. First, the characteristics of each of the three communication methods are discussed. This is followed by reports on research that looks at how the communication methods work and how they have been used in the classroom. Lastly the review of literature looks at bilingual education and the academic achievement of deaf students. Bilingualism is discussed with reference to the use of sign language and English by deaf students. The research was done in Zimbabwe but the literature used is mainly from the United States of America, Canada, and Australia. Literature sources on the subject from Zimbabwe and Africa are limited and scarce.

Communication Methods Debate

Since the sixteenth century there have been debates concerning the relative effectiveness of different methods of communication with deaf students (Luterman, 1986; McAnally, Rose & Quigley, 1994). The oral-manual debate has existed since the beginning of formal education of deaf students (Moores, 1987). Debates on the merits of total communication and oralism have ensued in the last three decades (Paul & Quigley, 1990; Schein & Stewart, 1995). The idea to use national sign languages such as the

Zimbabwe Sign Language in the education system started receiving attention more recently (Regan, 1990). The impetus of these debates has been concern for the children's personal, linguistic, and educational development. Some researchers have claimed that the major contributing factor to the deaf students' poor linguistic and educational achievement is the difficulty of identifying the forms of communication that best facilitate language acquisition and learning in the classroom (Crittenden, Ritterman & Wilcox, 1986; Moores, 1987).

It seems the ability to receive information and to communicate it to others is one of the most critical and controversial issues in the education of deaf students (Conrad, 1979; Moores, 1987; Paul & Quigley, 1990; Quigley & Paul, 1990). These debates on language and communication in the education of deaf students encompass a number of different elements (McAnally, Rose & Quigley, 1994; Quigley & Paul, 1990). The focus in this study is on the nature of the communication methods and languages that are used in the education of deaf students and their impact on deaf students' comprehension of stories and in academic achievement.

The review of literature that follows discusses the three communication methods that teachers in Zimbabwe use when teaching deaf students. The three communication methods are Zimbabwe Sign Language (manual mode), simultaneous communication (manual mode plus speech), and the oral approach.

Manual Forms of Communication

Sign Language

The most common form of manual communication for deaf students is sign language. In Zimbabwe they use Zimbabwe Sign Language (ZSL). In the United States of America and most parts of Canada they use American Sign Language (ASL). Sign language is a manual form of communication that does not rely upon audition and the speech mechanism. It is a visual form of language that has been developed and used by deaf people for interpersonal communication (Stokoe, 1981). It involves movements of the hands, fingers, body, and facial features to transmit language (McAnally, 1994). Symbols formed by the hands are called signs and are analogous to the words or phrases of a spoken language. Facial expressions and body movements serve as inflections and modifiers. All features of sign language are subject to the constraints imposed upon them by visual reception and the articulatory dynamics of manual movements. This unique set of constraints has resulted in a grammatical structure that is unique and distinct from spoken languages (Stokoe, 1981). Sign language is the language typically used by deaf adults when communicating with each other (Humphries & Padden, 1988; Brodenky & Cohen, 1988).

Since the study by Stokoe (1960), most linguists have accepted American Sign Language as a bona fide language with its own syntax (Lucas, 1990; Lane & Grosjean, 1980; Wilbur, 1987). The word order of ASL is different from English. ASL like other sign languages (e.g., Zimbabwe Sign Language, British Sign Language, Kenyan Sign Language) is structured to accommodate the visual capabilities of the eye and the motor capabilities of the body (Paul & Jackson, 1993). The shapes, movements, and positions of

the hands constitute the manual movements of a sign. Nonmanual movements involve parts of the body such as eyes, eyebrows, cheecks, lips, tongue, and shoulders (Paul & Jackson, 1993). The syntaxes of sign languages are not universal (Baynton, 1998). The grammar of American Sign Language is not the same as that of the Zimbabwe Sign Language.

Sign languages do not have a writing counterpart. Things told in American Sign Language for instance are written in English. Deaf cultural literature is presented in the form of conversations, storytelling, and videotapes (Baker & Cokely, 1980; Neisser, 1983; Padden, 1980; Padden & Humphries, 1988).

Fingerspelling

Besides signs, many sign languages (e.g., Zimbabwe Sign Language, American Sign Language, British Sign Language) have manual letters of the alphabet. These differ from one sign language to the other. Some sign languages use a one-hand alphabet (e.g., American Sign Language, Zimbabwe Sign Language) while others use a two-hand alphabet (e.g., British Sign Language, Australian Sign Language). Fingerspelling uses manual letters of the alphabet to spell out words and sentences. It is not usually used exclusively on its own. The Rochester method incorporated fingerspelling and speech simultaneously (Quigley, 1969; Scoute, 1967). It was commonly used in the 1950s and 1960s. At the moment no schools are known to use the Rochester method any more (Baker & Cokely, 1980; Jordan & Karchmer, 1986; Wilbur, 1987). For the most part fingerspelling is used with signed communication, especially for common names, numbers, and some words that are not available in sign (Wilbur, 1980; McAnally, 1994).

English Sign Systems

In addition to sign language and fingerspelling, sign systems are another form of manual communication. They are manual codes for a spoken language. They borrow signs from sign languages and use them to represent a spoken language such as English. For instance Signing Exact English has 61 percent American Sign Language signs, 18 percent modified American Sign Language signs and 21 percent new signs (Bornstein, 1973). Several other signed systems have been developed. The major rule-governed ones are Signed English (Bornstein, Saulnier & Hamilton, 1983), and Signing Exact English (Gustason, Pfetzing, & Zawolkow, 1980). They require knowledge of English by the user (Cokely, 1983; Paul & Quigley, 1990; Quigley & Paul, 1990, Wilbur 1987, Quigley & Kratschmer, 1982).

Another important distinction between sign language and sign systems is that sign language is culturally based (Padden, 1980) and is used among fluent signers (Stewart, 1981; Markowitcz, 1972). It is the language of communication within the Deaf community. Many deaf people have not mastered high levels of either communicative or academic competency in English (Paul & Quigley, 1990; Wilbur, 1987). They use sign language as they interact with members of their own community or work through interpreters whenever necessary and if the service is available.

English sign systems on the other hand were designed for education purposes. There are three basic reasons why they were developed:

(a) dissatisfaction with educational achievement level of deaf students,

(b) increased knowledge of oral language development in normal hearing children,

(c) dissatisfaction with the ambiguous input of speechreading alone.

Research studies from the beginning of the century showed that American deaf students had difficulty learning English and academic subject matter (Moores, 1995). Deaf children tended to write short and simple sentences, those of seventeen year old deaf students being comparable to those of hearing children in grade three (Heider, 1940), deaf students' use of clauses differed from that of hearing students, being simpler and more rule bound (Reay, 1946); deaf children were weaker in the mastery of the morphology and syntax of English when compared to hearing children (Cooper , 1965), and most of the errors that deaf children made were errors of omission (Myklebust, 1965). Their reading and writing were lower than that of hearing children. They had hovered around the third and fourth grade for more than fifty years (Moores, 1995). These problems led to the development of English sign systems such as Seeing Essential English. Today, sign systems are the most widely used communication method in the education of deaf students (Moores, 1987; Paul & Quigley, 1990). A possible explanation for this situation is the fact that sign languages such as American Sign Language have no written form of their own. The materials deaf students use for reading and writing in schools are in English. Also, many teachers of deaf students are not proficient in sign language (Kluwin, 1981; Woodward & Allen, 1988; Stewart, Akamatsu & Becker, 1995).

Several elements are common across all signed systems. Two of the main common characteristics of all sign systems are that each has a one -to-one correspondence

between signs and the words or morphemes of spoken English, and each incorporates to a certain extent, the use of sign language signs (Crystal & Craig, 1978). Another important aspect of sign systems is the restricted environment within which they are used. They are most effective in the school system. They are meant for the interaction between teachers and students. Although popular in total communication programs, it appears that not many teachers have succeeded in giving a one-to-one equivalence between spoken English and signed words (Kluwin, 1981; Woodward & Allen, 1988;). A lot depends on the signer's signing experience.

One form of sign systems that is widely used especially in total communication programs is Signed English. Harry Bostein and his associates (Bornstein, Saulnier, & Hamilton, 1983) developed Signed English at Gallaudett University in Washington D.C. The major focus of Signed English is to provide a typical English language environment resembling that given to hearing children (Paul & Quigley, 1990). Signed English consists of signs representing English words and sign markers for the most inflectional aspects found in the language of young children. Most of the signs in Signed English are American Sign Language signs. There are no signs for some English words and for some proper nouns such as names of people. Fingerspelling is used in such situations as part of Signed English. Like with other sign systems, Signed English was designed for children for education purposes.

Contact Sign (Pidgin Sign English)

The term contact sign has been used to refer to the type of sign language that deaf people use when they speak to non-signing hearing people. Much of the literature uses

the term Pidgin Sign English (e.g., Quigley & Paul, 1984; Luetke-Stahlman, 1990; Wilbur, 1987). As indicated by Schein and Stewart (1995) some linguists refer to it as contact sign.

Contact sign is not a sign system such as signed English. It is not a sign language such as ASL either. It is best described as a compromise where deaf people use signs from a sign language such as ASL to string English-like word order. This is usually presented more slowly and in a simpler fashion. The idea is for the non signing person to understand the signing. It is a social language. Not much research has been done to see how contact sign has been used in classrooms particularly in situations where the hearing teacher is not a fluent signer.

Research on Sign Language

Perspectives on Sign Language Research

Research in disability studies has been influenced by the medical and the social paradigms. The medical paradigm views disability as a disease or an impairment that needs treatment and correction. According to Woodward and Markowicz (1980) in the past, deaf people in encounters with professionals, such as teachers, doctors, speech therapists, counselors, psychologists, and religious workers were treated as pathological individuals. Likewise, past research on deaf individuals was largely demographic, medical, psychological, and anecdotal in nature. It viewed deaf people from the medical paradigm. Sign language was seen as a deviant form of communication and not as a language in its own right (Van Uden, 1977). The medical paradigm dominated special education for many years.

The second and more recent paradigm in disability studies is the social paradigm usually referred to as the social model (Corker, 1998). The social model views disability as socially constructed. It separates disability from impairment and attributes the creation of disability to the dominant sociocultural environment. The model, for example, describes deafness not as an impairment, but the lack of access to "visually produced information" as a disability which might be countered by removing communication and information barriers in society (Corker, 1998). As a result of work by linguists, sociologists, anthropologists, and researchers, using ethnographic techniques to describe attitudes, values, and behaviors of deaf people (Jacobs, 1980; Higgins, 1980; Woodward & Markowicz, 1980; Johnson & Erting, 1982; Erting, 1982; Padden, 1980; Bienvenu & Colonomos, 1986; Erting, 1992), a marked shift from a medical model toward a social model of deafness has occurred. Researchers following the social model of deafness view deafness as an ethnic phenomenon (Padden & Humphries, 1988; Ladd & John, 1991; Lane, 1995; Lane, Hoffmeister, & Bahan, 1996). To them deafness is not primarily a physical disability but an ethnic and cultural identity. Sign language is seen not as a deviant means of communication but as a language for effective communication.

Stokoe (1960) was the first to do research that investigated and described sign language as a language in its own right with its own grammar, semantics, pragmatics, and phonology. He was the first researcher to recognize the linguistic characteristics of sign language and its existence as a cultural entity. Stokoe examined the phonology, morphology, semiology, syntax, iconicity, and the phonetic and phonemic notation of American Sign Language (Stokoe, 1960, 1970, 1972, 1980, 1981). His description of sign language provides the following guidelines for researchers:

> Sign language is quite like English or any other spoken language. Its elements contrast with each other (visibly instead of audibly). Individual signs have meanings as spoken words or morphemes do. Constructions, combining signs, like constructions combining words, express meaning more completely and complexly than single words can. These constructions or syntactic structures are systematic, rule-governed structures. But there is a unique set of rules for making sign language constructions just as there is for making standard English constructions, or the construction of any language (1981 p xv).

Stokoe viewed sign language as a cultural entity. He believed it was:

> ..... the cultural system which employs certain of the visible actions of the face and the hands, combines them in recurrent sequences, and arranges these sequences, into systematic distribution in relation to each other and in reference to other cultural systems (Stokoe, 1960 p 30).

Sign Language Acquisition

Research on deaf children of deaf parents and that on deaf children of hearing parents has something to tell us about how deaf children acquire sign language. The type of family that the deaf child is raised in affects the child's self- esteem and language acquisition (Handerson & Hendershott, 1991). The deaf child's sign language acquisition will differ depending on whether the parents are deaf or hearing. It will also depend on whether the parents accept sign language as their child's language of communication or not. Deaf parents are more likely to use sign language in their own communication and in their interactions with their deaf child. Deaf parents, and mothers in particular are able to nurture positively the social and emotional development of their deaf child (Levine, 1981; Meadow, 1980; Meadow-Orlan, MacTurk, Prezioso, Erting, & Day, 1987; Erting, Prezioso, & Hynes, 1990; Jamieson, 1994; Jamieson & Pedersen, 1993; Spenser, Bodner-Johnson, & Gutfreund, 1992). The child grows in a normal linguistic environment where sign language is the language of communication in the family. The

children are provided with a home environment that enables them, for the most part, to develop into healthy social beings with adequate cognitive and linguistic skills. As noted by Levine (1981) in Paul and Jackson (1993):

> Deaf parents of deaf children escape the disruptive potential that the discovery of deafness has for hearing parents. The soundless world into which their child is born is their world. They have been reared in its subculture, use its unique manual communication, have experienced its problems, and generally feel equipped to guide the child over many of the obstacles. Furthermore, they are familiar with habilitative measures and educational procedures through personal experience, and seldom challenge professional educational responsibilities. Most feel comfortable with their deaf children (p.62).

On the other hand, deaf children of hearing parents are more likely to grow in home environments where sign language is not known. Hearing parents are more likely to see sign language as deviant to the communication methods they use in their family. Already deafness often causes a sense of mourning in hearing parents (Kampfe, 1989; Koester & Meadow, 1990; Vernon & Andrews, 1990). The stress of having a deaf child can compound feelings of inadequacy in hearing parents (Levine, 1981; Somers, 1987; Vernon & Andrews, 1990). This may lead to parents wanting their child to be a normal hearing child. In such situations the deaf child is denied a chance to learn sign language at home. The parents may not even take the initiative to learn sign language. This will have an adverse effect on how the deaf child will acquire sign language and the language spoken in the home.

Studies in the literature show that deaf children's acquisition of sign language progresses along developmental stages that are similar to those of hearing children learning a spoken language (Hoffmeister & Wilbur, 1980). Many of these studies primarily have examined children's acquisition of the vocabulary and grammar of

American Sign Language (Siedlecki & Bonvillian, 1993). From these studies it has become clear that language development in deaf children acquiring sign language parallels in many ways the language development of hearing children learning spoken languages (Newport & --Meier, 1985; Meier, 1991).

Several studies have looked at the sign language acquisition process. Siedlecki and Bonvillian (1993) made a study of the acquisition process of the three principal formation components of any sign namely location, movement, and handshape. "Location" in this case refers to the area in space and on the body where the sign is made, "movement" refers to the movements made by the hand and other body parts to make the sign during the signing process and, "handshape" refers to the handshapes that are involved in making a specific sign. These three components of a sign are acquired differently. Nine deaf children participated in this study. Seven of these children were under nine months and the remaining two were eleven and fourteen months of age. All the parents in the study were proficient in American Sign Language and in seven families both parents were deaf. Sign language was the principal means of communication for all the research subjects. The study began with the children's initial signs. The results of the study showed that the children were highly accurate in their production of the location aspect of signs. The movement of the children's sign tended to be produced less accurately than locations. Handshapes were produced with the least accuracy. With increasing age the children produced a greater variety of signs and with greater accuracy. Earlier studies by Wilbur and Jones (1974) and Kantor (1980) had produced similar findings. These researchers suggested that the most likely order of acquisition of the

three aspects of a sign was first correct location, then movement, and finally handshape. Each of these improved with time and use.

McIntire (1974) studied the question of deaf children's sign language vocabulary. The study looked at the size of deaf children's sign vocabulary. A one-year-old deaf child had a sign vocabulary of about 20 words. Hearing children are about to produce their first word at about that age. In another study, Prinz & Prinz (1981) looked at the sign acquisition of hearing children of deaf parents. They had similar findings. The hearing children of deaf parents acquired sign language earlier than they acquired English. It maybe that the earlier acquisition of sign is more a result of physical maturity than cognitive. It appears control of hands is accomplished earlier than control of oral articulatory system.

In another study, Kantor (1982) examined the role of the pointing behavior in the sign language acquisition process of deaf children and compared it with that of hearing children acquiring a spoken language. The study found that initially pointing was used in a similar way by deaf children acquiring sign and by hearing children acquiring speech. In the early stages both groups were learning the structure of indication and signification (indication - the process of giving symbols or taking action such as pointing to indicate an object; signification - process of naming the signified object). They were naming things but did not have the sign or speech vocabulary of symbolizing the things they were naming. Eventually the hearing children acquired speech and the spoken words replaced pointing. In deaf children the pointing increased and then developed into a sign.

Livingstone (1983) studied six deaf children of hearing parents who were entering a total communication program that used Signed English as the means of communication.

The subjects were congenitally deaf and had no additional disability. Their parents did not know how to sign. The question of investigation was what language was acquired by deaf children exposed to Signed English. The following results were found:

a. American Sign Language processes appeared earlier than similar processes in Signed English.

b. Greater acquisition of syntax was made in the use of American Sign Language than in Signed English.

c. Basic principles of language development were evident in both American Sign Language and Signed English. These were similar to those guiding the acquisition of language by hearing children.

In this study the subjects became competent in a language in which they had no role model meaning that signed English may have more parallels with ASL than was previously thought (Stewart, 1985). The parents were not deaf and yet the children learned sign language. This shows the importance of peer interactions in the acquisition of sign language. It is well documented that deaf children of deaf parents teach deaf children of hearing parents sign language at school (Schein & Delk, 1974). Falberg (1971) claimed that sign language is the only type of language that has successfully been passed from children to children. This does not rule out the importance of the adult deaf as role models for sign language to deaf children.

There are not many studies in the literature that show the acquisition of syntax in sign language. However, the fact that sign language has its own syntax is well established. Stages in syntactic development appear not to be different for English (Brown, 1973; deVilliers & deVilliers, 1979) and American Sign Language (Shirmer, 1985; Wilbur, 1987). Word order is an important aspect of syntax. Fischer (1975)

studied the word order in American Sign Language. She saw an evolution in American Sign Language from subject-object-verb (SOV) to subject-verb-object (SVO) word order. She attributed this (SVO) order in American Sign Language to the influence of English on American Sign Language. However, Fischer's study was based on prepared sentences rather than live discourse of deaf students.

Friedman (1976) used samples of American Sign Language from natural conversations in her study. She found that the word order in American Sign Language was relatively free but with a basic underlying sentence pattern of (SOV). It was Wilbur (1979) who tried to resolve these two different and rather controversial findings. She noted that in both of these studies "the point in space" as utilized in American Sign Language word ordering was critical in determining the word order. She described the point in space as a sign which functions as an index for a noun phrase or a pronoun and as an indication of a verb's inflection. She attempted to resolve the controversy of American Sign Language word order by stipulating that inflected verbs themselves are a condition for free word ordering. Also, it appears the mere fact that signs are not necessarily equivalent to words (Schein & Stewart, 1995) makes the whole analysis of word order suspect. It is important to realize that the hands do not say it all. There are some nonmanual features that alter meaning and are part of the sentence structure of sign language such as body posture and facial expression (Schein & Stewart, 1995). In many cases these are wrongly excluded when analysis of word order is made in sign language.

McIntire (1982) shares the same perspective discussed above. In her study of locative constructions in elicited and narrative discourse of deaf signers, she noted that the capacity to encode simultaneously a lot of information into a single sign reduces the

significance of word ordering. This means that the distinction between subject, object and verb becomes less important because a single sign may contain all these and at the same time the signer's facial expression, eyes, and body posture may be adding more syntactic information.

Research by Baker and Padden (1978), Baker- Shenk (1983), Liddell (1980), and Coulter (1979) have shown that nonmanual behaviors are critical in making certain grammatical structures in ASL. For example, American Sign Language uses the face as a linguistic marker (Bettger, Emmorey, McCullough, & Bellugi, 1997). Different facial expressions serve to mark different lexical and syntactic structures such as wh-questions (e.g., what, where, when), relative clauses, conditionals, adverbials, and topics (Barker-Shenk, 1983; Liddell, 1980; Reilly, McIntire, & Bellugi, 1990). These facial expressions differ from emotional expressions in their scope and timing and in the facial muscles used (Reilly, McIntire, & Bellugi, 1990). Grammatical facial expressions have a clear onset and offset and are coordinated with specific parts of a signed sentence. These expressions are critical for interpreting the syntactic structure of sign language structures (Bettger, Emmorey, McCullough, & Bellugi, 1997).

More studies of how deaf children acquire sign language are needed to establish clearly the processes involved in sign language acquisition. These may be important for schools that want to teach deaf children from non sign language homes sign language. This knowledge can also provide insights into how deaf children can be helped to learn a second language such as English.

Sociolinguistics of Sign Language

Language is socially constructed and mediated. Sign Language is constructed in the Deaf community. As a language, American Sign Language exhibits variations that are influenced, for example, by geographical factors (Woodward, Erting, & Oliver, 1976), racial factors (Woodward, 1976) and gender (DeSantis, 1977). There are different sign languages from country to country. New Zealand, China, Zambia, Great Britain, Australia, and Sweden for example all have their own sign languages different from each other. Despite these sign language differences from country to country, deaf people more freely communicate with their counterparts who use a different sign language than hearing people do with different spoken languages.

Many Deaf people are bicultural. They belong to the main culture that they are born in. In Zimbabwe this may mean they belong to the Shona or Ndebele culture. The main culture has influence on the nature of the signs used by deaf people. Some gestures and hand shapes used in one sign language may be unacceptable in the other. For instance the handshape of the letter of the alphabet "t" in American Sign Language is obscene in Zimbabwe Sign Language. Likewise the handshape of the letter of the alphabet "i" in the Zimbabwe Sign Language is obscene in the United States. The fact that some handshapes are inappropriate to use in certain cultures affects the type of signs that naturally develop since sign language is socially constructed.

The variety of signs that Deaf people use is also affected by societal institutions they belong to such as school, church, sport club, and work place. The signing that deaf people use among themselves at a Deaf Sports Club is probably different from the one they would use in a more formal place like the work place. Also, within the same sign

language there could be varieties on how certain words are signed. These varieties might be due to regional, gender, racial, and ethnic factors. Chimedza (1995) surveyed sign language differences among deaf adults in Zimbabwe. He limited the sign language differences to differences in the signs used for specific given words and compared these by regions. He found that there are a lot of varieties in the way that certain words are signed from one province to the other in Zimbabwe. It could be argued that the regional sign varieties are dialects of the Zimbabwe Sign Language. Rutherford (1988) noted that American Sign Language has its own regional dialects and slang.

Stokoe (1970) attempted to explain the varieties found in ASL in terms of diglossia. In this situation diglossia refers to a condition which utilizes different varieties of a language according to the needs of the situation. A literacy variety for instance is used in more formal situations while a colloquial variety is more suited for less formal situations (Woodward, 1980). Within the Deaf community, Stokoe identified English (signed) as the literacy variety and ASL as the colloquial. That position has since been challenged. It gives the impression that signed English is the more superior variety of sign communication compared to sign language (Hawkins, 1983). By taking different perspectives of the environment in which the languages are used, Hawkins was able to show that American Sign Language in certain circumstances becomes the superior variety of sign communication. These variations in sign language are phonological (Woodward, Erting & Oliver, 1976; DeSantis, 1977), lexical (Battison, 1978), and grammatical (Woodward & DeSantis, 1977).

Psycholinguistics of Sign Language

Psycholinguistics is the study of the way people generate and comprehend language (Morgan, King, & Robinson, 1979). The study of sign language has much to offer in this area. This is important due to the discovery that sign languages such as American Sign Language are authentic languages. However, the area of sign language studies still draws significantly from oral language theories to generate hypotheses and give meaning to observed linguistic traits of sign language. A transition from oral language theories to a sign language theory will not always be a straightforward one. As Grosjean (1980) stated, a model of linguistic performance must include, "those aspects of encoding and decoding that are specific to the modality of communication, oral or visual" (p.34) as well as those aspects common to all languages irrespective of modality.

Working memory is an important aspect of the whole process of encoding and decoding language. Traditional models of working memory contain two major components, one used for verbal material, and the other used for visuo-spartial material (Baddeley, 1986; Gathercole & Baddeley, 1993; Logie, 1995). The verbal domain for working memory can be characterized either by its relationship to language such as the printed stimuli (Baddeley, 1986) and lip-reading stimuli (Campbell, 1980) or by its grounding in auditory and vocal-articulatory properties of speech. Many differences between verbal and visuo-spatial working memory have been attributed to the differences between speech and vision.

Languages that are not auditory and vocal, namely sign languages, challenge the traditional model of working memory (Wilson & Emmorey, 1997). Sign languages such as American Sign Language are perceived visually and use spatial relationships to convey

grammatical information. On these grounds sign languages seem to fall into the visuo-spatial domain of working memory. On the other hand, sign languages share many characteristics of speech that may be critical for the structure of verbal working memory. On these grounds, sign languages seem to fall into the linguistic domain of working memory.

Wilson and Emmory (1997) discussed why working memory for sign and speech may differ and why it may be similar. Because sign language and spoken language are grounded in different sensory modalities that have different processing abilities and constraints, there is reason to believe that working memory for speech and for sign may differ systematically. Several studies have confirmed this line of thinking. For instance, Loftus, Duncan and Gehrig (1992) found that iconic memory vanishes within 200-300 milli-seconds while Turvey and Crowder (1972) found that echoic memory persists for two seconds or more. Other studies have shown that sign languages have limited sequential contrasts and permit more simultaneous expression than spoken languages (Emmorey, 1995). ASL can express grammatical information on the face simultaneously with information on the hands (Reilly, McIntire, & Bellugi, 1991). At the phonological level, the number of linearly arranged segments appear to be substantially fewer than permitted in spoken languages (Emmorey, 1995; Sandler, 1989).

Despite the differences mentioned above sign languages have a lot in common with spoken languages. Signs are not holistic gestures. They are made up of "syllabic" handshapes, hand movements, body locations, and facial expressions that are combined in rule governed ways similar to that of the phonological level in spoken languages (Battison, 1978; Coulter, 1993; Stokoe, 1960). Also, signs have a syllabic structure

(Wilbur, 1993; Corina & Sandler, 1993; Perlmutter, 1992) similar to that of words in spoken languages. Liddell and Johnson (1989) argue that the hold and move segments in their model correspond to consonant and vowel segments and that these sequences constitute syllables in both sign and spoken languages.

Growing evidence shows that deaf signers of ASL use an ASL-based code for temporary storage, which resembles in some ways the type of speech-based memory used by hearing subjects (Hanson, 1982; Klima & Bellugi, 1979; Krakow & Hanson, 1985; Poizner, Bellugi, & Tweney, 1981). More recently Wilson and Emmorey (1998) studied the structure of this sign-based memory code to find the extent it resembles the phonological loop for speech. Their findings indicate a striking degree of resemblance between the two types of memory codes. Although the evidence also shows some differences between the speech loop and the sign loop, this line of research suggests that both the sign-based and the speech-based rehearsal mechanisms are shaped by linguistic properties common to all human languages (Wilson, Bettger, Niculae & Klima, 1998). Both vision and audition have their own processing constraints. What is important for this study is whether these constraints have any consequences to linguistic working memory or short-term memory. Wilson, et. al. (1998) addressed this issue. In their first experiment they explored how modality of language influences the structure of working memory. They found that deaf subjects were equal on both forward and backward report of linguistic stimuli while hearing candidates were worse on backward than on forward report. This suggests that working memory for speech and that for sign language differ in how they represent serial order information. In their second experiment they explored whether expertise in a language within a particular modality influences nonlinguistic

working memory within that modality. They found that deaf subjects were better than hearing subjects on spatial memory, indicating that expertise in a visuo-spatial language can influence nonlinguistic visuo-spatial memory. The two experiments indicate important differences in how information is represented in these two forms of the phonological loop, and that those differences are a result of differences between the auditory and visual modalities. Taken together, the results of the studies by Wilson & Emmorey (1998) and by Wilson, Bettger, Niculae and Klima (1998) indicate the extent to which the structure of working memory is flexible in response to experience, allowing a rehearsal loop structure to develop in whichever modality receives the appropriate input, but indicate also that there are some limitations in this flexibility. The picture emerging from these studies is that working memory exploits the sensory and language resources available to it in order to devise rehearsal mechanisms.

Simultaneous Communication

Simultaneous communication is an integral component of the total communication philosophy. The basic philosophy of the total communication approach is to promote the use of any method of communication available to develop language competence in the child (Denton, 1970). The most common communication practice under this philosophy combines listening, speechreading, and signing (and /or fingerspelling). It is assumed that the receiver is able to select or combine information from the various sources to his or her particular advantage (Ross & Calvert, 1984). In this way the total communication philosophy attempts to emphasize exposure to language through the visual channel. It implies a bisensory (visual and auditory) and a trimodal

(manual, oral and aural) form of communication. In the classroom situation it is realized as simultaneous communication, which is the simultaneous production of spoken and signed English or the simultaneous production of speech and sign.

What has been of concern to researchers is whether it is possible to effectively communicate using both signing and speech simultaneously. Some research studies have shown that teachers and parents are not able to maintain high levels of correspondence between their spoken and their manual outputs (Mckee & Lang, 1982; Swisher, 1983). For example studies examining the correspondence between speech and signed English have reported that the signed representations were between 10% (Marmor & Pettito, 1979) and 92% (Savage, Savage, & Potter, 1987) of the morphemes spoken. The normal production rate of spoken English is reported to be twice that of signed English (Caccamise, Hatfield, Brewer, 1978; Hyde, 1988) and three times that of fingerspelling form (Caccamise, Hatfield, & Brewer, 1978; Hyde, 1988). In order for the teacher to simultaneously produce speech and signed English it may mean that the speech has to be adjusted. This may mean dragging the speech part, which will no doubt affect the prosodic qualities of the teacher's speech making it difficult to follow. The slow utterances may affect intonation, pausing, and stress. Overall, this can reduce the naturalness of the teacher's speech (Hyde & Power, 1991).

Hyde and Power (1991) studied the use of simultaneous communication by four teachers in total communication programs in Australia. The researchers were interested in studying the following;

a. the proportion of signed versus spoken morphemes,

b. the grammatical nature of deletions,

c. the proportional use of fingerspelling

c. the possible influences of signed English on some of the prosodic features of speech.

The results of this study indicated no significant difference between the rate of signed and spoken morphemes. The degree of correspondence between the two was very high with an average of 91.1%. Mean signed variations from the spoken component consisted of morpheme deletions (6.4%), substitutions (1%), and additions (1%). The proportion of words finger spelled by the teacher varied at 1.8%. These results show high correspondence rate between signed and spoken English in simultaneous communication. This is different from previous studies that reported a lower rate of correspondence (Luetke-Stahlman, 1988; Wood, Wood, & Kingsmill, 1989; Kluwin, 1981). Stewart and Akamatsu (1987) have shown that greater congruence between speech and sign can be attained in simultaneous communication through training. This is a possible explanation of the difference between the Australian and the American studies above.

At classroom level, it seems teachers using simultaneous communication tend not to use more difficult linguistic structures of the language they are using. Newton (1985) in a study of nonliteral language found that teachers using simultaneous communication used significantly less idiomatic language than teachers in oral programs or teachers of hearing children. Further interviews with the teachers revealed their reluctance to use visual representations of English idioms, preferring either to omit them, or substitute them with non-idiomatic paraphrases.

So far this discussion has focused on studies that show the role of expressive language in simultaneous communication. These studies show teachers and parents

expressing themselves using simultaneous communication. Implied in this discussion so far is that deaf students on the other end are receiving the information. What is not clear in these studies is the expressive ability of deaf children using simultaneous communication. Geers, Moog and Schick (1984) in their study of children from both oral and total communication programs found that most children did not simultaneously talk and sign themselves and that their signing production was far more superior to their spoken production. In simultaneous communication it would appear deaf students rely more heavily on the signing component of the teachers' communication. This may be due to the fact that sign language is easier for deaf children to learn than spoken English. Also, the question of exposure is very important. If deaf students are more exposed to sign than oral communication they are more likely to rely on the signed component of simultaneous communication and if they are more exposed to oral approaches then the opposite should be true.

Several studies that show deaf students' ability to understand content presented to them in simultaneous communication have been done. Klopping (1972) assessed the language comprehension of 30 deaf subjects between the ages of 13 and 20 years. Four modes of communication were used in administering the vocabulary; speech, speechreading, fingerspelling with speech and simultaneous communication as used in total communication. It was found that simultaneous communication as used in total communication scores were significantly higher than fingerspelling and that both simultaneous communication and fingerspelling were higher than either speech or fingerspelling. However, this study omitted the use of sign language only as part of the

communication methods. It may be that the signs being understood are those used in signed English only and not the ones in sign language.

Moores, Weiss, and Goodwin (1973) developed a receptive communication test to assess the following modes: sound alone, the printed word, sound plus speech reading, sound plus speech reading plus signs. Seventy-four deaf subjects were selected from seven different programs. They were then administered vocabulary items that had been suggested by the teachers in the programs. The results show that as modes were added the scores improved from sound alone (34%), to printed words (38%), to sound plus speechreading (56%), to sound plus speechreading plus fingerspelling (61%), to sound plus speech reading, plus signs (72%). Moores et. al., concluded that the simultaneous use of audition, speech reading, and signs provided the most efficient way of communicating with deaf students. Again, this conclusion is weakened by the absence of a sign only presentation.

White and Stevenson (1975) explored deaf students' comprehension of oral communication, manual communication, total communication and reading. They used a random sample of deaf students aged between 11 and 19 years with an I.Q. of between 60 and 140. They found that reading or the print mode, was the easiest to comprehend and oral communication was the toughest. There was no significant difference between manual and total communication. Of interest here is that sign plus speech resulted in better comprehension than speech alone but not signs alone. It would appear that the strength of the visual mode and the weakness of the auditory mode in deaf students contributed to this finding. Unlike previous studies that used nonsense syllables to test deaf students' communication comprehension (Carson & Goetzinger, 1975), Pudlas

(1984) is one of the first studies that tried to test deaf students' comprehension of English using sentences. Pudlas presented single sentences to 106 deaf subjects with an average age of 14.6 years and a mean hearing threshold level of 97.7 dB. Each subject received sentences in one of the following modes: oral (speechreading), aural (audition), manual (signs), oral-aural (speechreading plus audition), and simultaneous communication (speechreading plus audition plus signs). The test sentences were presented to the test subjects via video presentations. The subjects gave written responses to the presentations. The maximum possible score they could attain was 57. The simultaneous communication condition (m= 33.2) and the manual condition (m= 31.5) received the highest scores. They were both significantly higher ($p < .01$) than the other conditions. At the lower end of the scale it was found that the oral-aural mode (m=7.3) was significantly higher ($p < .05$) than the oral (m=3.8) or the aural (m=3.2) modes. Signed English was the manual mode used in the study. These results could have been affected by the fact that the responses were written. The students' syntactic ability in English too could be another factor that influenced the scores. What was interesting in this study was the high scores of the manual only mode. This needs further investigations. It was also noted that the addition of the weaker mode (audition) to the stronger mode did not significantly change the scores. The multi-modal condition in this case proved to be stronger only when compared with the oral and aural mode.

Stewart (1985) examined deaf students' comprehension of stories under two languages (signed English and American Sign Language) and three modal conditions (manual-only, manual plus oral, and manual plus oral plus aural). He presented three different stories to 36 deaf students from a total communication program. He found that

overall mode was not significant. The addition of an oral mode, and then an oral plus aural mode to the manual-only mode did not change the comprehension scores significantly. This study proved the manual-only mode to be stronger than the other modes and that addition of the weaker mode to the stronger mode did not make any impact.

Oral Communication

Oral methods have a long documented history that can be dated back to the 16th century when Pablo Ponce de Leon founded his school for deaf students in Spain. According to a report given by Sir Kenelm Digy (1644) (Mulholland, 1981) Pablo Ponce de Leon's students were well educated men who had a good command of language and speech and were masters of speechreading. As Ling (1984) stated:

> "The philosophy of oral education is that hearing-impaired children should be given the opportunity to speak and to understand speech, learn through the spoken language in school, and later function as independent adults in a world in which people's primary mode of communication is speech."

The term oral education is usually associated with such techniques as speechreading and is generally considered a visual approach. This is more appropriate for situations where the access and use of electro-acoustic equipment such as hearing aids is limited. In current situations where the use and access to hearing aids is not that difficult the term oral education tends to be more inclusive to include oral-aural approaches. Hardman, et. al. (1996) advise that in addition to electroacoustic equipment, the teacher may employ speechreading, reading, writing, and motokinesthetic

speech training (feeling an individual's face and reproducing breath and voice patterns). According to Paul and Jackson (1993) the oral methods emphasize the development of students' skills in the areas of speech, speechreading and residual hearing. The thrust of oralism is the use of spoken English. What is important for the purposes of this study is the fact that in a broader definition the oral mode includes audition. This should not however be mistaken with aural methods which rely on audition only.

Speechreading and speech articulation are the primary modes of communication in an oral program. Speechreading (sometimes referred to as lipreading) is the process of understanding another person's speech by watching lip movement and facial and body gestures (Hardman, et. al., 1996). Speechreading is difficult to do especially for prelingually deaf children who do not have experience with the spoken language. Many deaf students in Zimbabwe are in this situation.

In spite of the problems associated with speechreading and the use of audition with deaf students, the oral approaches have been successful with some deaf students (McAnally, 1994). Research reports have indicated that orally trained students performed significantly better than the average deaf student in other special education programs on measures of academic achievement, language, and literacy (e.g., Geers & Moog, 1989; Ogeden, 1979). Geers and Moog (1989) summarized the performance of some successful orally trained deaf students. They examined the spoken, written, and cognitive performance of students with profound hearing loss in regular education and special oral education programs in the United States and Canada. They concluded that;

(a) it is possible for profoundly deaf children, by the time they are sixteen years of age to achieve reading skills commensurate with those of normal-hearing students.

(b) children who have a combination of favorable factors - including at least developing much higher reading, writing, and spoken language skills than is reported for deaf students in general (e.g., 7th to 8th grade reading skills rather than 3rd grade reading levels).

(c) The primary factors associated with the development of literacy in this orally educated sample are good use of residual hearing, early amplification and educational management, and above all oral English language ability, including vocabulary, syntax, and discourse skills (Geers & Moog, 1989, p 84).

Oral programs can facilitate good literacy because their focus is on the development of oral English. Good readers including deaf and second language learners need to have a working knowledge of the language in which they are trying to read (Bernhardt, 1991; King & Quigley, 1985; Paul, 1993). It is becoming increasingly evident that knowledge of the internal structure of words leads to an understanding of the alphabetic principle, the writing system underlying printed English (Shankweiler & Liberman, 1989; Paul 1993; Hanson, 1989).

Bilingual - Bicultural Education

Bilingual-bicultural education is the most recent attempt in the education of deaf students to try to improve their academic achievement. It is a direct product of educators' dissatisfaction with the existing communication and teaching methods of deaf students. It is also based on the promise that sign language seems to give, in terms of deaf students understanding things better that are presented to them in sign language as their native language. Lane and Molyneaux 1996) defined bilingual education as an educational program designed to allow students to learn academic subjects and concepts in their first

or home language while they learn a second language. Approximately 10% of deaf students have Deaf parents and are exposed to sign language from birth, and the remaining 90% have hearing parents. If we follow the common definition of native language or mother tongue, then deaf children with hearing parents can not claim sign language to be their native language. However, it has been asserted that sign language is the native or natural language of deaf individuals because it presents an adequate visual motor feedback system similar to the auditory-articulatory loop of spoken language users (Paul & Jackson, 1993). It will take many years if not decades to determine what bilingual-bicultural education means to teachers of deaf students and how it can best be implemented in the field (Stewart, 1993)

There are several models that educators have proposed for bilingual-bicultural education for deaf students. Paul and Quigley (1990) depicted an ideal bilingual-bicultural education program as one in which all instruction is conducted in sign language from preschool to third grade. In grade three, English, in sign and with speech as an option is introduced as a language of instruction until sign language and English are all used about equally throughout the school day (Schirmer, 1994). Johnson, Liddel and Erting (1989) proposed a different model. They portrayed an ideal bilingual-bicultural education as one in which deaf children are taught by a team of two teachers from preschool through high school. One teacher is deaf and the other is hearing, and both use sign language for face to face communication. Beginning in grade one, English is taught through reading and writing. Subject matter is taught through sign language and the reading of material is done in English.

A common perspective of bilingual-bicultural education with deaf students, views sign language (e.g., ASL) as the only form of language appropriate for instructional purposes, and that the teaching of English should be confined to reading and writing (Israel, Ewoldt, & Hoffmeister, 1992). Proponents of this viewpoint usually resist the presentation of English information in the sign modality (Stewart, 1993). They argue that when manually coded English is used with speech, the results are unwieldy and difficult to understand (Johnson, Liddell, & Erting, 1989). They justify their criticism with research showing the inconsistencies and inaccuracies in the signing behavior of teachers (Kluwin, 1981; Woodwood & Allen, 1988). However, it is difficult to implement this model because of the reading level of deaf students and the mere fact that for deaf students to read and write English, they should have already mastered the English language. The assumption of this perspective is that deaf students already know English. This is not the situation in the majority of cases.

In bilingual-bicultural programs deaf children learn two languages and two cultures. In general, learning two languages is not detrimental to the child's language learning process. For a deaf child learning sign language should not be detrimental to their learning of English and vice versa. Languages mutually reinforce each other rather than compete for limited resources. Knowledge and skills from one language transfer to other languages acquired. Social expectations and the environment may retard or facilitate the development of bilingualism. Maintaining the native language while acquiring English does not deter the deaf child from acquiring English.

Although bilingual- bicultural education is relatively new this is not necessarily the first time it has been explored in deaf education. Already in the 1760s Abbe De L'

Epee used bilingual methods to teach deaf students at his school in Paris. He adopted the sign language of the deaf people and then taught French as a second language using methodological signs which was a means of coding French in signs. In this respect he is one of the earliest educators to acknowledge the bilingual-bicultural nature of deaf people's lives. This recognition of sign language as a language in its own right and that deaf people have a culture of their own forms the theoretical basis of the bilingual-bicultural education of deaf people. Internationally we can expect the national sign languages (e.g., American Sign Language, Zimbabwe Sign Language, Australian Sign Language, British Sign Language, & Chinese Sign Language) to be used in the education of deaf students together with the national spoken languages (e.g., English, Chinese, Shona).

It is important to distinguish between sign language and sign systems as used in bilingual education and also bilingualism from bimodalism. Sign language as used in the bilingual education of the deaf is a language on its own. It is not English presented in sign form. On the other hand sign sytems represent a spoken language such as English. There is no difference between spoken English and signed English. They have the same linguistic structure except that they are presented in different modalities. Therefore bilingual education of the deaf means using two languages together in the education process (Stewart, 1985). The use of two modes of communication such as speech and sign is called bimodalism. Bilingualism does not mean the simultaneous use of different modes as in simultaneous communication. Different modes may be used with different languages. The main focus in bilingualism is not mode but language of communication.

It seems reasonable to expect deaf children to learn sign language as their first language and English as a second language when their parents are also deaf. In such a situation sign language is the language used at home. The situation is different when the parents are hearing. The conditions for developing sign language are usually not there. Some hearing parents may not like to have their children encultured into the deaf culture and may not want their children to learn sign language. Moreover, for many years parents have been advised against the use of sign language. Advice given to parents was that if they wanted their deaf child to talk, contact with other deaf people should be avoided (Gannon, 1981). This was against a background where signing was a stigmatized form of communication deemed inferior to speech (Van Uden, 1977). Such attitudes are still prevalent in oral programs. What this means for bilingual education is that although it may be a desirable goal, the ultimate decision will depend on societal attitude and not necessarily on the communication needs of the child.

Academic Achievement

Many studies that look at the academic achievement of deaf students in the United States have been carried out at the Center for Assessment and Demographic Studies (Allen & Karchmer, 1981; Allen & Osborn, 1984; Karchmer, Milone, & Wolk, 1979). Results based on norm-referenced and criterion-referenced tests show that most 18 to 19-year-old deaf students are reading and writing no better than the average 8 to 9- year-old hearing child (Allen, 1986; King & Quigley, 1985; Quigley & Paul, 1989). Also, these poor academic results have not changed ever since the beginning of formal testing (Quigley & Paul, 1986). However, we need to note that the academic achievement of

deaf students is determined by assessing the students' knowledge of the subject matter via reading and writing. There is an interrelationship among achievement, language, and literacy (Paul & Jackson, 1993). Competence in the use and understanding of English, has a marked effect on the results of achievement tests and success in school (Adams, 1990; Anderson, Hiebert, & Wilkinson, 1985; King & Quigley, 1985).

Achievement tests require that the students possess an adequate level of competence in the language of the tests and of the various subjects tested, such as social studies, science, and mathematics. It has been argued that most achievement tests assess the English language competence of deaf students rather than their knowledge of the content areas (Moores, 1987; Paul & Quigley, 1990; Quigley & Paul, 1986). This situation is compounded by the fact that sign language has no written form. Knowledge of English becomes necessary in achievement tests. Apparently in many cases the reported academic achievement of deaf students is lower than the material they actually know in the content area.

It makes sense therefore to link academic achievement with level of hearing loss. Hard of hearing students are likely to do better on academic achievement tests than deaf students (Paul & Quigley, 1990; Allen, 1986). This is because hard of hearing students have better access to the English language and reading and writing because of the lower level of their hearing loss. They are more likely to acquire the spoken language in daily conversations with hearing people. This is possible mainly if the hard of hearing person uses good hearing aids. On the other hand deaf students have more difficulty in understanding the English language that the test is presented to them in. Their problems of comprehension and expression may have little to do with their knowledge of the

concepts and content in the subject area being tested. However, knowledge of content area may also have been limited by the poor language and mode of communication during the learning process. The statistics in a study of patterns of academic achievement for deaf and hard of hearing students (1974 and 1983) by Allen in Schildroth & Karchmer (1986) indicate that hard of hearing students did significantly better in reading comprehension than deaf students. In mathematics the difference was not as great. The eight and twelve year old hard of hearing students scored better than their deaf counterparts. However, for the sixteen year olds the opposite was true. Deaf students did better than hard of hearing students.

We can not therefore jump to the conclusion that hard of hearing students will have no problems with their academic achievement. It is well documented that even slight hearing loss can have adverse effects on academic achievement and on literacy skills (e.g., Blair, Peterson,& Viehweg, 1985; Jensema, 1975), and that there is an inverse relationship between level of hearing loss and achievement: the more severe the impairment the lower the academic achievement. The assumption here is that the more severe the hearing loss, the more difficult it becomes for the deaf child to learn the English language. This in turn affects reading, writing, and academic achievement. Hard of hearing students go through similar developmental stages as hearing students in terms of speech, language, and literacy (Paul & Quigley, 1990). What is different is the speed at which they go through these stages. They tend to take longer. This has implications on the type of curricula to design for hard of hearing students. While it makes sense for them to follow the regular school curricula with support, we should not ignore the fact that they still need individual attention. In the main, hard of hearing students' academic

development is qualitatively similar to that of their hearing counterparts but quantitatively slower. Research shows that on the average hard of hearing students lag behind hearing students by between one and three years (Paul & Quigley, 1987; 1989; 1990).

The position of deaf students is worse than for hard of hearing students. Their academic achievement is far below that of their hearing counterparts as well as that of hard of hearing students. By the end of high school their overall educational achievement is seven years or more below that of same age hearing children. Research shows an annual academic growth rate of 0.3 grade per year, with a leveling off or plateau at grade three or four (Moores, 1987; Davey, LaSasso, & Macready, 1983). Only 10 percent of both hard of hearing and deaf students are reading at 7.5 grade level or better (Allen, 1986; Trybus & Karchmer, 1977).

Related Research

The aim of the present study is to examine the comprehension of stories by deaf subjects under three methods of communication and two languages. In a search of the literature no theory was found to serve as framework for the present study. However, in the area of intersensory integration and selective attention there are several studies that provide different perspectives on the process involved in simultaneous communication. These studies will now be briefly reviewed.

Intersensory Integration

In simultaneous communication, information from three sources is presented to the senses. Voice is transmitted in the aural mode, signs in the manual mode, and

speechreading in the oral mode. For simultaneous communication to be successful, information must be combined from each of the input modes, hence the importance of intersensory integration. The strength of the total communication approach is dependent on the ability to integrate the messages as well as on the strength of the individual signals. Obviously, for a deaf child the strength of the auditory input will be weaker than that of the visual input. Individual signing and speechreading skills will determine the strength of manual and oral signals. Although, there are no models available that directly describe the information processes involved in simultaneous communication, there are several cross-model investigations that do provide an insight into the possible relationship between the sensory modalities.

Intersensory or cross-modal integration refers to the transfer of information received in one modality to another modality as well as the integration of similar information from two modalities. For example, a visually perceived triangular object may be subsequently recognized through touch when the eyes are closed. For this to occur, the visual information must in some way be matched to information perceived in the tactile modality.

In the present study several questions can be raised that relate to the field of intersensory integration. The most obvious question is whether or not any benefits can be expected when information is perceived in two or more modalities relative to that which is only received in the best single modality. One necessary condition for increased perception as suggested by Goodnow (1971) is redundancy of information between modalities. That is, when information is similar, input to one mode enhances the comprehension of the input to another mode. However, where the information from the

modalities differs, an overloading of information may occur, leading to a disadvantage in understanding the incoming stimuli.

Walden, Prosek, and Worthington (1975) used transfer analysis of redundant information to describe the performance of 90 deaf adults on consonant recognition tasks. Results showed that transmission of duration, place of articulation, friction, and nasality information increased substantially with the provision of visual cues. These findings agree with studies by Moores, et. al. (1973), and Pudlas (1984). Their studies showed that when you add oral mode to aural communication the amount of information assimilated is increased. This means that the amount of speech that the deaf person can perceive increases when the oral mode is added to the aural mode. This is possible because the simultaneous use of visual and auditory cues means they support each other allowing for increased perception.

CHAPTER III

METHODOLOGY

Overview

The purpose of this study was to investigate Zimbabwe deaf students' comprehension of stories told in Zimbabwe Sign Language, simultaneous communication, and oral English and compare how the three communication methods were used in the classroom. The study used three communication modes and two languages. The communication modes used were manual, manual plus oral, and oral while the two languages were Zimbabwe Sign Language and English (both signed and spoken). The Zimbabwe languages, Shona and Ndebele were not used in the study because English is the medium of instruction in schools for deaf students from first grade onwards and in regular schools from grade 4 onwards. In essence, what was examined was how each modality and language was advantageous to the comprehension of stories and ultimately to academic achievement. Comprehension of stories was tested through retelling. This raised the question of memory. The present study did not separate memory and comprehension because there was minimal delay in retelling once the story had been told. The research subjects retold the story immediately after watching the video. Memory had an effect but the effect was equally balanced over communication methods and languages.

As indicated in the literature review, one can expect comprehension to be greater for stories in multimodal conditions as opposed to those told in unimodal conditions. The increase in modal conditions was likely to enhance comprehension. However, that

depended on the strength of the dominant mode that the candidate uses for communication. Also, because most deaf people are stronger in the use of their sight than hearing, the manual mode was likely to be understood best, followed by the oral, and then aural modes. In the present study, simultaneous communication used multimodal conditions, Zimbabwe Sign Language used the manual mode, and oral English used the oral mode.

The study used two languages, English and Zimbabwe Sign Language. English used the manual and oral modes of communication. The Zimbabwe Sign Language used only the manual mode. The study used two languages in response to the bilingual environment in which many deaf students interact. Also, the fact that sign language has no written component made the inclusion of English important for reading and writing. No research has seriously examined the differences between the two languages. Research in other bilinguals suggested that students would do better in their dominant language (Scherer & Wertheimer, 1964; Kolers, 1966; Stewart, 1985). Sign language is the dominant language for most deaf students.

Finally, the study included a questionnaire for teachers and classroom observations to assess how the three communication methods were used during teaching and learning situations. The questionnaire examined teacher perceptions of their use of the three communication methods. Classroom observations analyzed the nature of interactions in three different classes each representing one of the three communication methods under investigation. The nature of interactions in these different classroom conditions and the types of discourse that the study observed helped explain some of the differences in the comprehension of stories.

Methodology

Design

Data collection was done in three stages. In the first stage, the study followed an experimental approach for data collection on deaf students' communication methods. Robson (1993) defines experimentation in research as involving:

> The assignment of subjects to different conditions; manipulation of one or more variables (called "independent variables") by the experimenter; the measurement of the effects of the manipulation on one or more other variables (called "dependent variables"); and the control of all the other variables.

This study's experimental design used a 2 (language) x 3 (mode) x 3 (story) repeated measure approach to evaluate the story comprehension skills of the deaf subjects. The within subject factors were mode of communication and language. The between subjects factors were school setting, socioeconomic status, hearing threshold level, hearing status of parents and siblings, and gender. Stories were told in English and Zimbabwe Sign Language to allow investigation of the differences in comprehension between the two languages.

To enhance generalizability (and to generate degrees of freedom), each subject was tested under each of the modal conditions. This required three stories, one for each mode per child. Secondly, the possibility existed that the subjects would improve from one presentation to the next while going through the sequence. To control for that, it was necessary to have across all subjects, each modal condition shown an equal number of times at the start, middle and final position. To accomplish both ends, a Greco-Latin square design was used to counterbalance simultaneously the repeated (within subject) factors of the stories, modes, and order of presentation (see figure 1 below).

Table 1: Greco-Latin Square Sequence for Assignment of Subjects:

School type	Student type	Student number	Stories: order of presentation		
			1	2	2
Special school classes	Male	1 2 3	Ai Bii Ciii	Biii Ci Aii	Cii Aiii Bi
	Female	4 5 6	Ai Bii Ciii	Biii Ci Aii	Cii Aiii Bi
Integration classes in regular schools	Male	1 2 3	Ai Bii Ciii	Biii Ci Aii	Cii Aiii Bi
	Female	4 5 6	Ai Bii Ciii	Biii Ci Aii	Cii Aiii Bi

(a) Story type indicated by the letters A, B, and C.
(b) Order of presentation indicated by the numbers 1, 2, and 3.
(c) Communication methods: i, ii, and iii.
N = 3 for each combination and 6 for each cluster

Students were in clusters of six (three boys and three girls) of three combinations each. Each student was tested on three different stories (A, B, & C) and three different

communication methods (i, ii, and iii). Stories Ai, Bi, and Ci were presented in Zimbabwe Sign Language, stories Aii, Bii, and Cii were presented in simultaneous communication, while stories Aiii, Biii, and Ciii were presented using the oral approach. There was need to balance the test subjects by the between subjects factors. Thus, for this design the number of subjects used were in multiples of twelve with a minimum of 36. Each subject had three test scores. However, because of the multilevel analysis nature of this study more students were needed. Thirty-six classes and 72 students were used in the study. Two hundred and sixteen test scores were generated for analysis (72 for each communication method).

The independent variables, and their levels were;

a. language: Zimbabwe Sign Language and English (oral and signed)

b. mode: manual, oral, and manual plus oral combinations

b. school setting: segregated special schools and integrated classes in regular schools.

d. student type: hearing threshold level, gender, hearing status of parents and siblings, and socioeconomic status.

The dependent measures for the experiment were the story recall test scores obtained from the three communication methods and the two languages. These were obtained using a scoring system proposed by Goodman and Burke (1972) and used by Stewart (1985). The scoring system is discussed later in this chapter.

In addition to the above experimental variables, bio-demographical information was collected to determine the extent to which such factors affected performance. All such information was obtained from the school records and class teachers. These variables are;

a. degree of hearing loss

b. age of onset of hearing loss

c etiology of hearing loss

d. history of communication method

e. hearing status of parents

Stage two of the research used a questionnaire instrument to collect data from teachers. Thirty -six teachers completed the questionnaire. These were the teachers whose students participated in the story comprehension experiment. One half of the teachers were from special schools for students who are deaf and the other half were from integration units. Nineteen teachers (50%) were trained to teach students who are deaf. Three teachers did not reveal their training status. Fourteen teachers had no specialist training to teach deaf students but had training as ordinary primary school teachers. The teaching experiences of the teachers were as follows: two years and below – 4; more than two years to five years – 10; more than five years to ten years – 17; more than ten years – 5.

The questionnaire items examined the teachers' perceptions of the use of the three communication methods in the classroom (see appendix E). The questionnaire instrument had 19 questions. Four questions asked for personal details of the teacher (questions 1 to 4). Fifteen questions were grouped into themes for analysis purposes (questions 5 to 19). The five themes were:

(1) use of communication method by the teacher in the classroom (questions 5, 6, & 7).

(2) teachers' beliefs on which specific communication methods should be used when teaching students who are deaf (questions 8, 9, & 10)

(3) teachers' conviction that students learn best using a particular method (questions 11, 12, & 13)

(4) teachers' proficiency in using the three communication methods (questions 14, 15, & 16)

(5) students' dominant communication method according to the observations of the class teacher (17, 18, & 19).

Stage three of the research was classroom observations of three classes (one for each communication method) to observe classroom communication practices. The three classes were selected from the thirty-six classes that participated in stage one of the study. The three teachers whose classes were observed were selected by their school heads. They were recommended as exemplary and model teachers of their schools. The researcher observed classroom interactions between the teachers and their deaf students and also among the deaf students on their own during class sessions. Each class was videotaped twice for 30 minutes per session during language arts and social studies classes. The observations looked at three specific issues. These issues were also used as themes for data analysis purposes. The issues were:

a. teachers' communication practices

b. students' proficiency in communication method.

c. correspondence of communication practices between the teachers and their students

Videotapes were used to capture some aspects of the instructional practices and classroom interactions in the three classes. The three teachers were interviewed to establish their beliefs and conceptions of the communication methods they used in the classroom and to clarify some observations made.

Research Questions

The critical research questions for this study were:

1. Is there a difference in the amount of information reproduced by deaf students when stories are presented to them in the manual, oral and oral plus manual modes?

1.2. To what extent will comprehension depend on the type of school setting that the students are in (segregated special schools, integration units in regular schools)?

1.3. To what extent will comprehension depend on student type (level of hearing loss, socioeconomic status, hearing status of parents and siblings, and gender)?

2. How do teachers and their deaf students use the Zimbabwe Sign language, simultaneous communication, and the oral communication method in classroom interactions during teaching / learning sessions?

2.1 Are teachers using communication methods compatible with the ones their students understand best?

2.2 Are deaf students using their dominant/ preferred communication methods in the classroom?

2.3 Is their any particular communication method among the three that results in higher levels of deaf students' participation during class work?

Hypothesis

The critical questions stated above led to the following null hypotheses:

1. Comprehension of stories will not be different for mode in the manual plus oral mode (simultaneous communication), the manual mode (Zimbabwe Sign Language) and the oral mode (oral English).

Past research suggested that increase in communication modes enhanced comprehension. This implied that comprehension would be best for stories told in the simultaneous communication mode. However, this only happened when the increase in number of modes was made on a mode of communication that was not the deaf student's dominant

mode of communication. Many deaf people's dominant mode of communication is the manual mode. Therefore, it is possible in this study that the students would understand best stories told in the manual mode.

2. The difference in comprehension of stories using the three communication methods will not depend on hearing threshold level.

Typically, an individual's hearing acuity is likely to be a good predictor of their comprehension of speech communication. Research on the development of spoken language in individuals with severe and profound hearing losses shows that hearing threshold level is the strongest and most constant predictor (e.g., Jensema, Karchmer & Trybus, 1978; Kyle, 1977; Wolk & Schildroth, 1986). It is reasonable to assume that hearing threshold level will affect comprehension of stories. The less the deaf subject's hearing loss the more comprehension they are likely to have of the presentations in oral and simultaneous communications. Conversely, the more severe the hearing loss the more likely the subject would prefer to converse in the manual communication mode.

3. There will be no difference in the comprehension of stories in each of the three communication methods due to school setting (school type: special school or integration unit).

4. The difference in comprehension of stories using the three communication methods will not depend on gender.

5. The difference in comprehension of stories using the three communication methods will not depend on socioeconomic status.

6. Comprehension of stories will not depend on the hearing status of the deaf Subject's parents and siblings.

7. Comprehension will not be different in stories told in Zimbabwe Sign Language and those told in English (signed and spoken).

Zimbabwe Sign Language is the language of Deaf community. It is a visual gestural language that is easy for deaf students to follow. It is likely to be the dominant means of communication for most deaf people. However, schools use English in sign or oral and have not incorporated Zimbabwe Sign Language as an instructional option. English has been used mainly for reading and writing. Zimbabwe Sign Language has no reading and writing format.

For the classroom questionnaire and the classroom observations the study made the following predictions:

1. Teachers are not using communication methods that their students understand best in the classroom.

2. Deaf students are not using their dominant or preferred communication methods in the classroom.

2. There will be some differences in classroom participation among deaf children using Zimbabwe Sign Language, simultaneous communication and oral communication.

Subjects and Sampling

The design of this study involved multilevel sampling. For stage one, sampling was done at two levels. First, 36 classes were randomly selected from grades 5, 6, and 7 classes of deaf students across the country (18 each from special schools and integration classes in regular schools). Students in these grades were old enough to be able to follow instructions easily and to understand and retell the stories. Eighteen of these classes were from integrated classes in regular schools while the other eighteen were from special schools. Secondly, two students were randomly selected from each of the 36 classes

balanced for gender (36 boys & 36 girls). A total of 72 research subjects and 36 classes participated in stage one of the study.

Stage two of the study was a questionnaire instrument that was completed by the 36 teachers whose students participated in the story retelling experiment in stage one. Stage three involved classroom observations of teachers interacting with their deaf students during teaching and learning situations. Three classes were observed (one each per communication method). These classes were selected from the 36 classes used in stage one of the study. The three class teachers whose classes were observed were selected by their school heads. They were recommended as exemplary in their teaching and interactions with the deaf students they taught and as models for the communication policies of their schools.

Development of Instruments

Three things were done before the study. They were:

a. developing three test stories equated for syntax and interest level

b. video recording each test story in the three communication methods

c. developing a reliable procedure for the scoring of the videotaped retelling of stories.

Stories

Preceding stage one was the development of three test stories. The researcher created new stories to use as the test instrument. New stories were needed to ensure that no child knew the stories before the test. One story was about ghosts, another was about detectives, while the last story was an animal story. These three themes seem to interest

children across many cultures and they are relevant to the culture and experiences of the deaf students in the study. The animal story meshes very well with African traditional folk-tales. There are many ghost stories in both the Shona and the Ndebele cultures. Students in grades 5 to 6 in Zimbabwe are familiar with detective and police fiction stories from books and television and more so if they attend a boarding school. Most students in this study attended boarding schools and they all appeared to be familiar with the three themes used. In most boarding schools in Zimbabwe students watch television in the evening. The stories were equated for syntax, reading level and interest level using the Flesh-Kincaid test of readability computer program. The subjects watched these stories presented to them in the different communication methods. They were tested on their comprehension of these stories. The test stories were pilot tested during the pilot study and they were found to be suitable. The details of the pilot testing of the stories is discussed below.

Table 2: Test Stories Readability Statistics Table

Counts:	**Detectives story**	**Animal story**	**Ghost story**
Paragraphs	7	7	6
Sentences	38	37	36
Averages:			
Sentences per paragraph	5.6	4.6	7.2
Words per sentence	8.4	8.6	7.4
Character per word	4.1	4.1	3.8
Readability:			
Passive sentences	5%	5%	2%
Flesch Reading Ease	92.1	85.4	97.3
Flesch-Kincaid Grade Level	2.4	3.4	1.5

The general reading level of most sixteen years old deaf students levels off at Grade 4 reading level. The school grades for the students in this study are grades five to seven. A reading level of 3.4 was of concern to the researcher. He therefore field tested the stories to see if the students understood them. He did this in the pilot study. The six

students in the pilot study were each presented with the three test stories and videotaped retelling them. The researcher and the judges who were used in the main study scored the retelling of the stories. The average scores for the retelling of stories for the pilot study was detective story 78%, animal story 75%, and ghost story 80%. These scores made it reasonable to proceed and use the stories. It appeared the three stories were within the comprehension level of the test subjects. Also, reading a story should be more difficult than being told one and to date there is no way of assigning a score that describes the degree of difficulty in a signed story. The lengths of the stories were almost equal. The detective story had 38 sentences while the ghost story and the animal story had each 36 sentences. The videotape presentations of each story took about ten minutes.

Videotaping the Stories

To ensure that the candidates were told the stories in exactly the same way, the stories were presented to them through a video recording of someone telling the story. Each story was told using the three different communication methods for a total of nine video recordings. For the Zimbabwe Sign Language stories one deaf person was videotaped presenting them. The storyteller was proficient in Zimbabwe Sign Language and she understands English well. One other deaf person of equal ability viewed her videotapes to confirm that the Zimbabwe Sign Language versions of the stories were equivalent to the written stories. One parent of a deaf child who is also a teacher of deaf students at a school for the deaf presented the simultaneous communication and the oral versions of the stories. She was proficient in both simultaneous communication and the oral approach. Again another teacher of deaf students of similar ability viewed her videos

and confirmed that both the simultaneous communication and oral versions were equivalent to the written version.

Some previous studies used one presenter for the different communication methods (e.g., Stewart, 1985; Caccamise & Blasdell, 1977; White & Stevenson, 1975). This study used two different presenters, one for Zimbabwe Sign Language and another for oral English and simultaneous communication. The justification for using two different presenters is that the Zimbabwe Sign Language presenter is a native user of Zimbabwe Sign Language. She is therefore proficient in it. Both Zimbabwe Sign Language and the manual-only mode were presented efficiently by using her. The presenter for the oral English and simultaneous communication is proficient in oral English and simultaneous communication. Both were presented efficiently by using her. Also, the researcher could not easily find one person equally proficient in all the three communication methods. Other similar previous studies have used two or more presenters for the same reason (e.g., Eagney, 1987; Propp, 1972; Grove & Rodda, 1984). Eagney (1987) used two presenters (one native American Sign Language user and one native English language user) to present sentences in American Sign Language, simplified English, and standard English to her test subjects. The study was examining the effects of ASL, standard English, and simplified English on the comprehension of sentences by deaf students.

Scoring Instrument

The research used the scoring system for comprehension suggested by Goodman and Burke (1972), Miscue Analysis Procedure for Retelling Stories (see appendix A).

Each test session per child had a scoring sheet of its own. The candidates were tested in four areas of the story which were character analysis (names of the characters in the story and one thing they each did), theme (give two main messages in the story), plot (mention three scenarios in the story as they retell), and events (mention at least five events in the story). A total score of 100 was possible for each story. These were distributed as follows; character analysis (30), theme (20), plot (20), and events (30). The score sheet had possible answers and the points allocated for each specific answer. The scorer recorded the total of the scores for each sheet. Also, the raters wrote comments or additional information they observed. As suggested by Goodman and Burke (1972) in their manual it was necessary to provide prompts to test candidates to elicit appropriate responses. However, the prompts followed the following three guidelines:

a. The prompt did not use new information not already mentioned by the test subject. The idea was to prompt test subjects into giving more information of what they already mentioned and not provide them with new clues.

b. Any name changes that the subject made were retained in the scoring.

c. The prompts were general in nature so that they could not provide insights that did not originate from the test subject. They were based on the information already given by the students as they retold the stories

Test Material

Instrument

Nine videotapes were used as test instruments for stage one of the study. Three were in Zimbabwe Sign Language (one per story) and the stories were presented in the signing mode. Three other tapes were in simultaneous communication (one per story), they were presented in a mode that combined both signing and speech simultaneously.

The last three videotapes were in oral English and the stories were presented through the speech mode. The volume control of the monitor was set so that the output is at about the average loudness level for speech (i.e., 60 - 65 decibels). The responses of the candidates were videotaped. The subjects were videotaped in sitting positions. The camera was centered on the signing zone of the candidate. This is the area between the waist and about three inches above the head of the signer.

Scoring

Two adults (one hearing and one hard of hearing) competent in Zimbabwe Sign Language, simultaneous communication and oral communication scored the taped responses. One of the two scorers is a sign language interpreter for the television news of the Zimbabwe Broadcasting Corporation. She also interprets for deaf adults in many gatherings. The other is a teacher of deaf students at a school for the deaf. Each story session per child had its own scoring sheet as discussed earlier in this chapter. The raters used the scoring form in appendix A of this study. The researcher trained the judges on how to score (see discussion on pilot study below). The judges individually viewed the tapes and scored each individual's responses. Interrator reliability coefficients were found using Pearson's correlation (detective story = .91; ghost story = .94; animal story = .90).

Qualitative Methods Data Collection Procedures

For stage two, data was collected through a questionnaire that was completed by the 36 teachers whose students participated in the story recall experiment. For stage three, the method used to capture data consisted of video recording of representative classes of

deaf students being taught by their teachers: one class was an oral program, one was a Zimbabwe Sign Language program, while the other was a simultaneous communication program. Three teachers were involved in stage three of the study. They were all certified teachers of deaf students with a minimum of two years experience teaching deaf students. All had originally trained as primary school teachers and had experience in teaching hearing children. Based on their experience and competence the three teachers had been rated as exemplary or model teachers by their schoolheads. The assumption by this researcher, was that the three teachers would be competent in their communication with the deaf students they taught.

Classroom observations occurred after the filming of the students retelling the test stories. A preliminary agreement between the researcher and the teachers was made through the schoolheads and confirmed later by the researcher in person. All three teachers agreed to participate in the research and to be video filmed while teaching.

The researcher was interested in observing lessons that involved interactions between the teacher and her students and also among students themselves. The researcher therefore chose to observe either language arts or social studies lessons. After the lessons the observer asked questions to the teachers on things that were not clear to him. This was meant to maximize shared understanding of what was going on. The students in the classes were as follows.

Class A: Simultaneous communication program. There were nine students in the class (four boys and five girls). The class used simultaneous communication for most of its communication. The communication policy of the school is total communication. The

students' ages ranged from thirteen to sixteen years (13 years = 3; 14 years = 4; 15 years = 1; 16 years = 1). One student had mild hearing loss, one had moderate, three had severe and four had profound hearing losses. Seven students came from low socioeconomic backgrounds and two came from middle income families. Two students had deaf siblings, one had a deaf father, and one had a deaf grandmother (maternal side). All the students used contact sign and gestures when communicating with their hearing family members.

Class B: Oral program. There were nine students in the class (three boys and six girls). The class used oral communication for most of its classroom communication. Oralism was the communication policy of the school. The students' ages ranged from fourteen to sixteen years (6 years = 1; 15 years = 3; 14 years = 5;). One student had a mild hearing loss, two had moderate, three had severe and three had profound hearing losses. Six students came from low socioeconomic status families while three were from middle income families. None of the students had deaf parents. One student had a deaf sister. All the students used contact signing and gestures when communicating with members of their families at home.

Class C: Zimbabwe Sign Language Program. There were eight students in the class (four boys and four girls). The class used Zimbabwe Sign Language for most of its classroom communication. Signing was also the communication policy of the school. The students' ages ranged from thirteen to sixteen years (16 years = 1; 15 years = 3; 14 years = 1; 13 years = 3). One student had a mild hearing loss, three had severe and four had profound hearing losses. Six students came from low socioeconomic status families while

two were from middle income families. None of the students had deaf parents. One student had a twin deaf brother, one had a deaf sister, one had two deaf sisters and one had a sister and a brother who were deaf. More than half the class had a member of their nuclear family who was deaf. All the students used contact signing and gestures when communicating with members of their families at home.

Data Analysis

Quantitative data analysis. For stage one, the study used the SPSS statistical package 8.0 (1998) to analyze the data using the General Linear Model Repeated Measure Statistical procedures (GLM Repeated Measures). The GLM Repeated Measure tests provided both the univariate and the multivariate analyses for the repeated measures in the data. Comparisons were made of the mean test scores of the within subject variables (mode and language) and between subjects variables (hearing threshold level, socioeconomic status, gender, and school setting).

Qualitative Data Analysis. The researcher analyzed the videotapes taken from the three classes being taught by the three selected teachers using qualitative data analysis procedures. Data from the questionnaire and the classroom observations was coded into categories based on themes discussed earlier in this chapter. The themes for the classroom observations focused on: (1) teachers' communication practices, (2) students' proficiency in communication method, and (3) agreement of communication practices between the teachers and their students. In addition, another person competent in qualitative research methods, Zimbabwe Sign Language and simultaneous

communication viewed the videotapes to verify the researcher's observations. He agreed with the observations. The results were described using descriptive statistics and qualitative descriptions of the observations made. Lastly the various analyzed data were put together to find out how they confirmed or rejected the hypotheses and answer the main research questions.

Pilot Study

A pilot study was done in Harare using six deaf students (three boys and three girls). These candidates did not participate in the main study. The test stories were field tested during the pilot study and they were found to be suitable for the test group. The candidates were presented with the three test stories each. Their retelling of the stories was videotaped. The researcher and the judges that rated the main study scored the retelling of the stories in the pilot study. The average scores for the retelling of stories for the pilot study were detective 78%, animal 75%, and ghost 80%.

The detective story had long Shona names and the research subjects had problems remembering them because most of them do not speak Shona very well. These were changed to short English names (Tom, Jane, Sarah, Paul). Fingerspelling the initial letter of the alphabet (e.g., "T" for Tom) was accepted as a correct answer for names in all stories. Also, the detective story took longer to present than the other stories. One part of the story was deleted to make it shorter without changing the original meaning of the story. The two raters were trained by the researcher on how to score. They each read the test stories several times and retold the stories themselves to make sure they understood them. The researcher then went through the items in the test instrument one by one

explaining the scoring process to the raters. They practiced the whole process with the researcher role playing the retelling of the stories and the raters judging. They then rated the videotapes. At each stage they discussed their ratings with the researcher. Initially there were three raters but one had to be removed because he was difficult to train and frequently judging students' competence in signing and speech rather than their understanding of the test stories as detailed in the scoring instrument. With the two raters the Pearson's correlation coefficients for the three stories were .91 for the detective story, .94 for the ghost story, and .90 for the animal story. Candidates for the pilot study were limited due to the low incidence nature of deaf people in the population.

CHAPTER IV

DATA ANALYSIS AND DISCUSSION OF RESULTS

The purpose of the study was to examine Zimbabwe deaf students' comprehension of stories told in the manual mode, manual plus oral mode, and oral mode and compare how the three communication methods were used in the classroom. The results of the study are presented in two parts. First the results give a statistical analysis of the students' comprehension of the three stories presented in three different communication methods and two languages. Second, the results give a qualitative analysis of classroom observations on how the three communication methods were used in three different classrooms. At each stage a discussion of the results is made.

Based on a review of literature, seven null hypotheses were formulated for the first part of the study (quantitative analysis) and three predictors were formulated for the second part of the study (qualitative analysis). The seven hypotheses stated expected main effects of mode of communication and independent variables of hearing threshold level, gender, socioeconomic status, school type, hearing status of parents and siblings, and language. The predictions were related to how the three communication methods were used in classroom situations. The results of the study are presented below.

Quantitative Analysis

Null Hypothesis I

Comprehension of stories will not be different for mode in the manual plus oral mode, the manual mode, and the oral mode. The within subject General Linear Model

Repeated Measure results show an F effect of 9.882 and a significant value of .000. Mode is significant. The null hypothesis is rejected. There are some significant differences in the comprehension of stories due to different modal conditions (see tables 3, & 4 below).

Table 3: Descriptive Statistics: Mode

Mode	N	Min	Max	Mean	Std. Dev	Skewnes s	Std Er.
Simcom	72	5.00	95.oo	52.0694	15.8410	-.649	.283
Manual	72	8.00	92.00	57.2083	15.2924	-.420	.283
Oral	72	10.00	85.00	49.5417	16.6530	-.351	.283

Table 4: Within-Subjects Effects: Mode

Source		Sum of Squares	Df	Mean Square	F	Sig.	Eta
Mode	Sphericity assumed	2197.815	2	1098.907	9.892	.000	.122
	Greenhouse -Geisser	2197.815	1.789	1228.732	9.892	.000	.122
	Huynh-Feldt	2197.815	1.832	1199.773	9.892	.000	.122
	Lower-bound	2197.815	1.000	2197.815	9.892	.002	.122

Modal Conditions and the Comprehension of Stories

As table 4 above shows recall scores under manual plus oral mode (simultaneous communication), manual mode (Zimbabwe Sign Language) and the oral mode (oral English) were significantly different from each other. The students had the highest mean scores in the manual mode, followed by those in the manual plus oral mode and the least scores were in the oral mode (see table 3 above). However, because two different signers were used, the significance of this finding must be interpreted with caution. It may well be that if the same signer had been used for all signed presentations then the results might have been different. However, the reason for using two different presenters is that the Zimbabwe Sign Language presenter is a native user of Zimbabwe Sign Language. She is therefore proficient in it. The presenter for the oral English and simultaneous communication is proficient in oral English and simultaneous communication. Both were presented efficiently by using her. Also, the researcher could not easily find one person equally proficient in all the three communication methods.

Some previous studies found multimodal conditions to be superior to unimodal conditions (e.g., Pudlas 1984; Brooks, Hudson & Reisburg, 1981; Klopping, 1972; Moores, Weiss, and Goodwin, 1973). According to these studies the addition of other modal conditions should result in higher recall scores of the stories. In the current study, it was found that manual-only conditions of sign language (Zimbabwe Sign Language) were superior to multimodal conditions of oral plus manual mode (simultaneous communication). The results of this study agree with the findings by Stewart (1985) who found no improvement when the oral and aural modal conditions were added to the manual- only mode. Implied in Stewart's findings was that comprehension and memory

in the manual-only mode was sufficient to the point where additional modes did not help increase the scores. All information that could be retained from the story was already picked up in the manual-only mode. Also, as Hyde and Power (1992) showed, if signing is present, the signed aspects contributed the highest to the deaf student's understanding of the message and the oral aspects contributed little to the overall comprehension.

Theoretically one would expect the manual-only communication mode and the simultaneous communication mode not to differ significantly since both benefit from signing. However, comprehension of the signed component of simultaneous communication (signed English) is dependent on the deaf student's proficiency in understanding English. Many deaf students in Zimbabwe come from homes where English is not spoken.. Family members communicate to each other in either Shona or Ndebele in the home. As a result the command of English of most of these deaf students is suspect. As Eagney (1987) pointed out, if deaf students are to do well in school there is need for continuation between school and home of both mode and language of communication. This could be a contributing factor to the differences observed in this study.

Null Hypothesis II

The difference in the comprehension of stories using the three communication methods will not depend on the hearing threshold level of the deaf candidates.
The GLM Multivariate Tests of the interaction of mode and hearing threshold level show an F effect of 3.370 (Wilk's) and a significant value of .004. (See tables 5 and 6 below).

Hearing threshold level is significant. The null hypothesis is rejected. However, the Bonferrroni Post Hoc Tests show that differences in simultaneous communication and manual communication (ZSL) are not significant for all the four levels of hearing threshold level. What is significant is the oral communication mode for mild and profound hearing losses with a significance level of .001.

Table 5: Descriptive Statistics: Hearing Threshold Level.

Mode	Htl.	Mean	Std. Deviation	N
Simultaneous communication	Mild	59.18182	9.0313	11
	Moderate	52.3125	6.3426	16
	Severe	48.5455	29.8073	11
	Profound	50.7941	14.3163	34
	Total	52.0694	15.8410	72
Manual communication	Mild	56.9091	8.5142	11
	Moderate	56.0000	8.1894	16
	Severe	57.2727	24.0877	11
	Profound	57.8529	16.5440	34
	Total	57.2083	15.2924	72
Oral communication	Mild	64.2727	14.9739	11
	Moderate	53.1250	7.1636	16
	Severe	50.0909	21.0069	11
	Profound	42.9118	15.7391	34
	Total	49.5417	16.6530	72

Table 6: Multivariate Tests: Hearing Threshold Level.

Effect		Value	F	Hypothesis	Error df	Sig
MODE	Pillai's Trace	.102	3.805	2.000	67.000	.027
	Wilks' Lambda	.898	3.805	2.000	67.000	.027
	Hotelling's Trace	.114	3.805	2.000	67.000	.027
	Roy's Largest Root	.114	3.805	2.000	67.000	.027
MODE* Hearing threshold level	Pillai's Trace	.251	3.254	6.000	136.000	.005
	Wilks' Lambda	.755	3.370	6.000	134.000	.004
	Hotelling's Trace	.316	3.481	6.000	132.000	.003
	Roy's Largest Root	.289	6.542	3.000	68.000	.001

a Exact statistic
b The statistic is an upper bound on F that yields a lower bound on the significance level.
c Design: Intercept+HTL Within Subjects Design: MODE

Hearing Threshold Level and the Comprehension of Stories

Hearing threshold levels were categorized as follows: mild (41 to 55 dB), moderate (56 to 70dB), severe (71 to 90dB), and profound (91+dB) (Paul & Quigley, 1990; Paul & Jackson, 1993). Recall scores on the overall effect of the interaction of mode and hearing threshold level were significantly different from each other. However, the Bonferroni post hoc tests showed that simultaneous communication and the manual-only communication mode (ZSL) were not significantly different from each other on all the four levels of hearing threshold level (mild, moderate, severe, and profound). What was significant was oral communication at the mild and profound levels of hearing threshold level.

In both sign language and simultaneous communication the signed component over- shadowed speech because as Stewart (1985) found out adding a weaker modal

condition to a stronger one does not increase comprehension. Signing is the stronger mode of communication for deaf students compared to speech (Hyde & Power, 1992). However, students with mild hearing loss benefit from audition while those with profound hearing loss do not benefit from the use of residual hearing for speech communication (Paul & Jackson, 1993). This is why in the study recall scores for oral communication are significantly different from each other for students with mild hearing loss compared with those for students with profound hearing loss. This result confirms findings of previous studies. Research on the development of spoken language in individuals with severe and profound deafness shows that hearing threshold level is the strongest and most consistent predictor, accounting for up to 55% of the variance (e.g., Jensema, Karchmer, & Trybus, 1978; Kyle, 1977; Wolk & Schildroth, 1986).

Null Hypothesis III

There will be no difference in the comprehension of stories in the three communication methods due to school type (school-type: integration or special school).

The GLM multivariate tests give an interaction result between mode and school-type of an F effect of 2.169 and a significant value of .122. School-type is not significant, therefore the null hypothesis is accepted (see table 8 below)

Table 7: Descriptive Statistics: School Type.

Mode	School Type	Mean	Std. Deviation	N
Simultaneous communication	Special school	50.9167	17.9752	36
	Integration	53.2222	13.5354	36
	Total	52.0694	15.8410	72
Manual communication	Special school	58.6389	15.3291	36
	Integration	55.7778	15.3364	36
	Total	57.2083	15.2924	72
Oral communication	Special school	47.1389	19.5143	36
	Integration	51.9444	13.0339	36
	Total	49.5417	16.6530	72

Table 8: Multivariate Tests: Mode and School Type.

Effect		Value	F	Hypothesis	Error df	Sig
MODE	Pillai's Trace	.200	8.642	2.000	69.000	.000
	Wilks' Lambda	.800	8.642	2.000	69.000	.000
	Hotelling's Trace	.251	8.642	2.000	69.000	.000
	Roy's Largest Root	.251	8.642	2.000	69.000	.000
MODE* school type	Pillai's Trace	.059	2.169	2.000	69.000	.122
	Wilks' Lambda	.941	2.169	2.000	69.000	.122
	Hotelling's Trace	.063	2.169	2.000	69.000	.122
	Roy's Largest Root	.063	2.169	2.000	69.000	.122

a Exact statistic

b Design: Intercept+SCH_TYP Within Subjects Design: MODE

School Type and the Comprehension of Stories

School type was not significant. Several studies have documented that deaf students in integration programs have better spoken language than those in segregated special schools (Huntington & Watton, 1986; Jensema, Karchmer & Trybus, 1977; Roberts & Richards, 1994). Mussleman (1996) pointed out that selected placement could

be a confounding factor in these studies. It is not clear whether students were placed in integrated settings because they were high scorers or they got high scores because they were integrated. However, deaf students in Zimbabwe go to programs of their choice or where they get a place. Factors such as level of hearing loss, ability and socioeconomic status are not considered for placement. Theoretically it makes more sense though to place students with mild and moderate hearing loss in integration units and those with severe and profound hearing losses in special schools especially in situations where the schools do not have sign language interpreters. This is not the placement practice in Zimbabwe.

Null Hypothesis IV

The difference in comprehension of stories using the three communication methods will not depend on gender. Table 10 below shows that the interaction between mode and gender is not significant. They have an F effect of .830 and a significant level of .440. The study fails to reject the null hypothesis.

Table 9: Descriptive Statistics: Mode and Gender

Mode	Gender	Mean Scores	Std Deviation	N
SIMC	Male	52.1944	12.8970	36
	Female	50.7500	14.9176	36
	Total	51 4722	13.8645	72
MANUAL	Male	64.9722	14.3178	36
	Female	59.2500	15.8193	36
	Total	62.1111	15.2552	72
ORAL	Male	44.4444	16.5899	36
	Female	43.7778	22.5681	36
	Total	44.1111	19.6688	72

Table 10: Multivariate Tests: Mode and Gender

Effect		**Val.**	**F**	**Hypo**	**Error df**	**Sig.**
MODE	Pillai's Trace	.426	25.618	2.000	69.000	.000
	Wilks' Lambda	.574	25.618	2.000	69.000	.000
	Hotelling's Trace	.743	25.618	2.000	69.000	.000
	Roy's Largest Root	.743	25.618	2.000	69.000	.000
MODE* GENDER	**Pillai's Trace**	.023	.830	2.000	69.000	.440
	Wilks' Lambda	.977	.830	2.000	69.000	.440
	Hotelling's Trace	.024	.830	2.000	69.000	.440
	Roy's Largest Root	.024	.830	2.000	69.000	.440

Gender and the Comprehension of Stories

Previous studies that compared deaf students' comprehension of content materials using different communication methods did not check on the effect of the interaction of gender and communication mode (e.g., Pudlus, 1984; Stewart, 1985; Klopping, 1972,

Eagney, 1987). Mussleman (1996) looked at the unexplained variances in these studies. On gender she found no significant differences between boys and girls on total communication and oral communication scores for both high scoring and low scoring students. Her findings agree with the results of this study where gender was not significant across the three modal conditions.

Null Hypothesis V

The difference in comprehension of stories using the three communication methods will not depend on socio-economic status.

The interaction between mode and socio-economic status is not significant. The test results show an F value of .225 with a significance level of .799 (see table 12 below).

Table 11: Descriptive Statistics: Socio-Economic Status.

Mode	Ses	Mean	Std. Deviation	N
Simultaneous communication	Low	51.7018	14.9833	57
	Medium	53.4667	19.2868	15
	Total	52.0694	15.8410	72
Manual communication (ZSL)	Low	57.1579	15.8337	57
	Medium	57.4000	13.5320	15
	Total	57.2083	15.2924	72
Oral communication	Low	48.7895	17.8253	57
	Medium	52.4000	11.1535	15
	Total	49.5417	16.6530	72

Table 12: Multivariate Tests: Mode and Socio-Economic Status.

Effect		Value	F	Hypoth. df	Error df	Sig.
Mode	Pillai's Trace	.110	4.258	2.000	69.000	.018
	Wilks' Lambda	.890	4.258	2.000	69.000	.018
	Hotelling's Trace	.123	4.258	2.000	69.000	.018
	Roy's Largest Root	.123	4.258	2.000	69.000	.018
Mode* Ses	Pillai's Trace	.006	.225	2.000	69.000	.799
	Wilks' Lambda	.994	.225	2.000	69.000	.799
	Hotelling's Trace	.007	.225	2.000	69.000	.799
	Roy's Largest Root	.007	.225	2.000	69.000	.799

a Exact statistic
b Design: Intercept+SES Within Subjects Design: MODE

Socio-economic Status and the Comprehension of Stories

Table 11 above shows that 57 students in the study had low socio-economic status, 15 had middle income backgrounds while none were from high socio- economic status families. This situation appears to be a true reflection of the socio-economic status situation of the students in the special schools and integration units in Zimbabwe. Before Zimbabwe gained its political independence in 1980, the schools were racially divided into schools for white students and those for black students. After independence these schools were integrated into one system. This meant both black and white students went to the same schools and shared the same boarding facilities. Students from poor rural areas and those from rich urban suburbs literally lived together in the same schools and

boarding places. The result was that most rich white people removed their children from special education institutions in Zimbabwe and sent them to other countries for their education (e.g., South Africa, Great Britain, Australia, United States of America). In the schools and integration units for the deaf where this study was carried out the researcher did not come across any white students. Some rich black families appear to sending their children out of the country, too. The results in table 12 should be understood within this context. Also, in the boarding place students from rich families do not get the advantages they would normally get from home that usually work to their advantage for academic achievement (e.g., support from better educated mothers, reading books, quiet private reading rooms, televisions, educational games). Whatever facilities are provided for are for everybody.

As in the case of the variable gender discussed above, socio-economic status was not considered in earlier studies that compared deaf students' comprehension of content materials under different modal conditions (e.g., Pudlas, 1984; Stewart, 1985; Eagney, 1987, Klopping, 1972). Again, it was Mussleman (1996) who looked into the unexplained variances in these earlier studies. In her study she found socio-economic status not to be significant in the deaf students' comprehension of content materials presented in total communication and the oral mode. This was true for both the high scoring and the low scoring students in her sample. The current study confirms Mussleman's findings. Students from different socio-economic backgrounds did not have scores that were significantly different from each other across all the three modal conditions.

Null Hypothesis VI

Comprehension of stories will not depend on the hearing status of the deaf subject's parents and/or siblings.

As table 13 below shows, the results of the GLM multivariate test of the interaction between mode and the hearing status of the deaf subject's parents and siblings (famdeaf) has an F effect of .081 and a significant level of .922. The hearing status of the deaf child's parents or siblings is not significant. The null hypothesis is accepted.

Table 13: Descriptive Statistics: Hearing Status of Parents and Siblgs.

Mode	Gender	Mean Scores	Std Deviation	N
Manual (ZSL)	Yes	52.0833	11.7354	12
	No	58.2333	15.7903	60
	Total	57.2083	15.2924	72
Oral	Yes	46.1667	8.8300	12
	No	50.2167	17.7879	60
	Total	49.5417	16.6530	72
Simultaneous communication	Yes	47.2500	9.2454	12
	No	51.6833	15.4300	60
	Total	50.944	14.6238	72

Table 14: Multivariate Tests: Hearing Status of Parents and Siblings

Effect		Value	F	Hypoth. df	Error df.	Sig.
Mode	Pillai's Trace	.093	3.552	2.000	69.000	.034
	Wilks' Lambda	.907	3.552	2.000	69.000	.034
	Hotelling's Trace	.103	3.552	2.000	69.000	.034
	Roy's Largest Root	.103	3.552	2.000	69.000	.034
Mode* Famdeaf	Pillai's Trace	.002	.081	2.000	69.000	.922
	Wilks' Lambda	.998	.081	2.000	69.000	.922
	Hotelling's Trace	.002	.081	2.000	69.000	.922
	Roy's Largest Root	.002	.081	2.000	69.000	.922

a Exact statistic

b Design: Intercept+FAMDEAF Within Subjects Design: MODE

Hearing Status of Parents and Siblings and Comprehension of Stories

The results of this study show that the hearing status of the deaf child's parents and siblings were not significant in the comprehension of the stories under the three modal conditions (manual, manual plus oral, and oral). Much of earlier research revealed that deaf children of deaf parents were significantly superior to deaf children of hearing parents on cognitive and academic measures (Balow & Brill, 1975; Quigley, & Paul, 1990; Paul & Quigley, 1990). Two major parental factors that contributed to this were the establishment of an intelligible, fluent and common communication system early in the child's life and acceptance of deafness. Based on these findings one would have expected

hearing status of parents and siblings in the current study to be significant. However, others have challenged this position claiming that it can not be assumed that adequate levels of parental acceptance and early communication practices exist only in deaf parents or deaf parents who sign (Messerly & Aram, 1980; Paul & Jackson, 1993). The results of this study confirm this thinking. In the current study the hearing status of the deaf students' parents and siblings did not cause any significant difference in the deaf students' story comprehension scores across all the three modal conditions.

Null Hypothesis VII

> Comprehension of stories will not be different for stories told in Zimbabwe Sign Language and those told in English (signed and spoken).

The GLM Repeated Measure test results for Zimbabwe Sign Language and signed English show an F effect of 537.958 and a significant value of .000 and that of Zimbabwe Sign Language and oral English show an F effect of 579.245 and a significant value of .000. In both cases language is significant. The null hypothesis is rejected. There are significant differences in the comprehension of stories due to the two languages (see tables 15, 16, 17, & 18 below).

Table 15: Descriptive Statistics: Zimbabwe Sign Language and Signed English.

Language	Mean	Std. Deviation	N
ZSL.	57.2083	15.2924	72
Signed English	52.0694	15.8410	72

Table 16: Multivariate Tests: Zimbabwe Sign Language and Signed English.

Effect		Value	F	Hypoth. df	Error df	Sig.
Intercept	Pillai's Trace	.939	537.958	2.000	70.00	.000
	Wilks' Lambda	.061	537.958	2.000	70.00	.000
	Hotelling's Trace	15.370	537.958	2.000	70.00	.000
	Roy's Largest Root	15.370	537.958	2.000	70.00	.000

a Exact statistic

b Design: Intercept

Table 17: Descriptive Statistics: Zimbabwe Sign Language and Oral English.

Language	Mean	Std. Deviation	N
ZSL	57.2083	15.2924	72
Oral English	49.5417	16.6530	72

Table 18: Multivariate Tests: Zimbabwe Sign Language and Oral English.

Effect		Value	F	Hypoth. df	Error df	Sig
Intercept	Pillai's Trace	.943	579.245	2.000	70.00	.000
	Wilks' Lambda	.057	579.245	2.000	70.00	.000
	Hotelling's Trace	16.550	579.245	2.000	70.00	.000
	Roy's Largest Root	16.550	579.245	2.000	70.00	.000

a Exact statistic

b Design: Intercept

Language and the Comprehension of Stories

A greater amount of content was reproduced when stories were in Zimbabwe Sign Language than in English. In this study English was presented in two parts namely, signed English and oral English. Comparisons were made between Zimbabwe Sign Language and signed English and then between oral English and Zimbabwe Sign Language. In both situations there was a significant difference between the two languages and also the F effects were very high compared to results on modal conditions.

The command of English of most deaf students in Zimbabwe is suspect. The researcher noted that the written English of the deaf students he observed during lessons to be poor. Their reading level of English is very low. It appears even their comprehension of signed and oral English is low too. The dominant language of communication among deaf students in Zimbabwe is Zimbabwe Sign Language. At home, most of their families do not speak English. They use Shona or Ndebele for most of their communications. Use of English for most deaf students is limited to the classroom for communication with the teacher. Given this scenario, the results found in this study seem reasonable.

The F effect were much higher because only two variables (English and ZSL) were compared. Under modal conditions three main effects were compared first then an interaction effect. These lowered the effect size.

Dominant Mode of Story Retelling

During the story retelling experiment students were free to retell the stories in any mode of communication that they were comfortable with. It was highly unlikely that

there would be students who are not proficient in at least one mode of communication considering that the students in the study were in grades 5 to 7 and that they had no other known disabilities. They were also free to retell the stories in a language of their choice. The results show that all the 72 students retold the stories in the manual mode using sign language.

Qualitative Analysis

Questionnaire

A questionnaire was used to establish the teachers of deaf students' conceptions of how the three different communication methods were used in the classroom. The questionnaire instrument had 19 questions. The five themes discussed in the methods section were used for analysis. These are: (1) use of communication method by the teachers in the classroom, (2) teachers' beliefs on a specific communication method to be used for communication with deaf students in the classroom, (3) teachers' conviction that students learn best when using a particular communication method, (4) teachers' proficiency in using the communication methods in the classroom with students who are deaf, and (5) students' dominant communication method. Thirty-six teachers answered the questionnaire. The results of the questionnaire analysis are shown in table 19 below.

Table 19: TEACHERS OF DEAF STUDENTS' PERSPECTIVES ON USE OF DIFFERENT COMMUNICATION METHODS IN THE CLASSROOM

Statement	Disagree	Agree	Strongly Agree
I use oral communication only when teaching deaf students in my class.	35 (97%)	0 (0%)	1 (3%)
I use simultaneous communication only when teaching deaf students in my class.	20 (56%)	10 (28%)	6 (17%)
I use manual-only communication (ZSL) only when teaching deaf students in my class.	22 (61%)	8 (22%)	6 (17%)
I believe teachers should use oral communication only when teaching deaf students.	30 (83%)	4 (11%)	2 (6%)
I believe teachers should use simultaneous communication only when teaching deaf students.	8 (22%)	20 (56%)	8 (22%)
I believe teachers should use manual communication (ZSL) only when teaching deaf students.	4 (11%)	20 (56%)	12 (33%)
My deaf students learn best when they use oral communication.	36 (100%)	0 (0%)	0 (0%)
My deaf students learn best when they use simultaneous communication.	14 (39%)	12 (33%)	10 (28%)
My deaf students learn best when they use manual (ZSL) communication.	8 (22%)	22 (61%)	6 (17%)
I am proficient in using oral communication when teaching deaf students.	18 (50%)	18 (50%)	0 (0%)
I am proficient in using simultaneous communication when teaching deaf students.	12 (33%)	16 (44%)	8 (22%)
I am proficient in using manual communication (ZSL) when teaching deaf students.	34 (94%)	2 (6%)	0 (0%)

My deaf students' dominant mode of communication is the oral mode.	10 (28%)	16 (44%)	10 (28%)
My deaf students' dominant mode of communication is simultaneous communication.	8 (22%)	12 (33%)	16 (44%)
My deaf students' dominant mode of communication is the manual mode (ZSL).	8 (22%)	12 (33%)	16 (44%)

N.B. Percentages were rounded to the nearest whole number. As a result, they do not Always add up to 100 percent.

Theme I: Use of Communication Method by Teacher in the Classroom

Oral Communication

Thirty-five out of the thirty-six teachers in the study (97%) disagreed with the statement that they used the oral approach only during lessons when communicating with the students who are deaf that they taught. This was so despite the fact that some of the teachers were from oral programs. Only one teacher (3%) agreed with the statement.

Simultaneous Communication

Twenty out of the thirty-six teachers in the study (56%) disagreed with the statement that they used simultaneous communication only to communicate with the deaf students they taught. Ten teachers in the study (28%) agreed that they used simultaneous communication only when teaching deaf students in their classes. Six teachers (17%) strongly agreed with the statement.

Manual Communication (ZSL)

Twenty-two out of the thirty-six teachers in the study (61%) disagreed with the statement that they used signing only when teaching deaf students. Eight of the teachers (22%) agreed, and six (17%) strongly agreed.

Discussion: Mode and Use by Teacher

Results of the questionnaire items that looked at the use of different methods of communication by teachers in the classroom during teaching and learning situations showed that the teachers did not use a single communication method only when communicating with the students they taught. A large majority did not use oral communication only in the classroom, (97%). Only small percentages were definite (strongly agree) that they used one method of communication (simultaneous communication - 17%; Zimbabwe sign language -17%; Oral communication - 3%). Stewart (1993) described the signing behavior of most teachers of deaf students in the classroom as simultaneous communication. Research has shown that most teachers may be using a type of signing that is neither a strict coding of English nor a sign language (e.g., American Sign Language). Instead they tend to use speech and forms of signing commonly referred to as pidgin signing or more recently contact signing (Lucas, 1989; Stewart, 1993, Schein & Stewart, 1995). Contact signing was originally called Pidgin Signed English and was described as a mixture of English and ASL (Woodward, 1973). It is the type of communication that is commonly used by deaf people when they sign to hearing people. The results in this study agree with the studies discussed above and suggest that many teachers in Zimbabwe are using contact signing in their classrooms.

Many teachers of deaf students in Zimbabwe are not trained in Zimbabwe Sign Language and some are not certified to teach deaf students. They are trained as ordinary schoolteachers. The results given above make a lot of sense given that background.

Theme 2: Teachers' Beliefs on Use of Communication Methods by Students

Oral Communication

Thirty out of the thirty-six teachers in the study (83%) disagreed with the statement that they believed the deaf students that they taught should use oral communication only during lessons in the classroom. Four teachers (11%) agreed with the statement. Two (6%) strongly agreed with it.

Simultaneous Communication

Eight of the thirty-six teachers in the study (22%) disagreed with the statement that they believed the deaf students that they taught should use simultaneous communication only during lessons. Twenty of the teachers (56%) agreed with the statement and eight teachers (22%) strongly agreed with it.

Manual Communication (ZSL)

Four out of the thirty six teachers in the study (11%), disagreed with the statement that they believed the deaf students they taught should use only manual communication methods during lessons (e.g., ZSL). Twenty (56%) agreed with the statement. Twelve (33%) strongly agreed.

Discussion: Mode and Teachers' Beliefs

On average teachers did not believe that students should use the oral approach when communicating with them during teaching and learning situations. They however, believed that students should use both simultaneous communication and Zimbabwe Sign Language. It appears most of these teachers believed that there were times when students should use simultaneous communication and other times when they should use Zimbabwe Sign Language.

A central concern of virtually all teachers is the promotion of optimal learning among their students. Many factors are relevant to optimal learning and consequent academic achievement. For deaf students, an especially important consideration is their ability to communicate with their teachers and peers. Teacher-student and student-student communications are the primary means of learning in the classroom. In situations where communication in the classroom is poor, little learning takes place (Long, Stinson, Braeges, 1991).

Many severe and profoundly deaf students have problems communicating orally. Their speech is usually unintelligible and speechreading is very taxing for them (Conrad, 1979; Reichstein & Weisel, 1986; Wold, Evans & Montague, 1994). The students that were observed in this study had poor speech. The teachers' beliefs are probably based on such observations. One's beliefs are usually a product of knowledge and experience with the subject.

Theme 3: Teachers' Conviction on Communication Method from Which Students Learn Best

Oral Communication

All the 36 teachers in the study disagreed with the thinking that students who are deaf learn best using the oral approach.

Simultaneous Communication

Fourteen teachers in the study (39%) disagreed with the thinking that their deaf students learnt best using simultaneous communication. Twelve teachers (33%) agreed and ten teachers (28%) strongly agreed with the statement.

Manual Communication (ZSL)

Eight of the thirty-six teachers in the study (22%) disagreed to the thinking that their deaf students learnt best using manual-only communication methods. Twenty-two teachers (61%) agreed and six teachers (17%) strongly agreed with the statement.

Discussion: Mode and Communication Methods

Teachers were divided on their perception as to which communication mode between simultaneous communication and Zimbabwe Sign Language from which their students would learn best. They were however very clear that their students would not learn best using oral communication. The key appears to be that the students have some signing in their education whether its in simultaneous communication or Zimbabwe Sign Language.

The ability to receive information and to communicate it to others has long been observed as one of the most critical issues in the education of deaf students (Long, et. al., 1991). This is the focal point of the oral/manual controversy regarding optimal modes of communication for deaf children (Moores, 1987) and is the basis of this study. As discussed in the review of literature many studies have measured the adequacy of different communication methods with deaf students or have compared deaf students' abilities to comprehend information presented in different communication methods (Stewart, 1985; Coccamise & Blaisdell, 1977; Grove & Rodda, 1984; Quinsland & Long, 1989). Yet, teachers are still divided and undecided as to which mode of communication works best for their students.

Theme 4: Teachers' Proficiency in Using the Communication Methods in the Classroom with Deaf Students

Oral Communication

One half of the teachers in the study disagreed and the other one half agreed with the statement that they were proficient in using oral communication when teaching deaf students. No teachers in the study strongly agreed that they were proficient in using oral communication when teaching deaf students.

Simultaneous Communication

Twelve teachers in the study (33%) disagreed with the statement that they were proficient in using simultaneous communication when teaching deaf students. Sixteen teachers in the study (44%) agreed and eight (22%) strongly agreed that they were proficient in using simultaneous communication when teaching deaf students.

Manual Communication (ZSL)

Thirty-four teachers in the study (94%) disagreed with the statement that they were proficient in the manual-only approach when teaching deaf students. Two teachers (6%) agreed and no teacher strongly agreed with the statement.

Discussion: Mode and Teachers' Proficiency

It was interesting that one half the teachers believed they were not proficient in the oral approach. All the teachers used in this study are hearing. They have no speech problems and communicate fluently in either Shona or Ndebele and English. However, being fluent in a language or a mode of communication is one thing and being able to use it proficiently when communicating with deaf students is another. Also, this perception may have been a direct result of the hard time teachers had trying to communicate orally with their students. They ended up believing they were the poor oral communicators themselves.

Teachers in the study believed they were proficient users of simultaneous communication when teaching deaf students. On the other hand, they were convinced that they were not good at using Zimbabwe Sign Language when teaching. Several studies have been done that examined teachers' use of signs particularly in simultaneous communication (Kluwin, 1981; Marmor & Pettito, 1979; Strong & Charlson, 1987; Swisher, 1984; Woodward & Allen, 1987). The findings of these studies suggested that teachers had problems when they used sign communication with deaf students. They deleted signs, substituted signs, used less idiomatic expressions and were inconsistent in

their signing. These findings are consistant with the findings of this study. Most teachers indicated they were not proficient in signing.

Theme 5: Students' Dominant Communication Method

Oral Communication

Ten teachers in the study (28%) disagreed that oral communication was the dominant mode of communication that the deaf students that they taught used during lessons. Sixteen teachers (44%) agreed and ten teachers (28%) strongly agreed with the statement.

Simultaneous Communication

Eight teachers in the study (22%) disagreed, twelve (33%) agreed, and sixteen (44%) strongly agreed that simultaneous communication was the dominant mode of communication used during lessons by the deaf students that they taught.

Manual Communication

Eight of the teachers in the study (22%) disagreed that manual communication (Zimbabwe Sign Language) was the dominant mode of communication used during lessons by the deaf students that they taught. Twelve teachers (33%) agreed and sixteen (44%) disagreed with the statement.

Discussion: Students' Use of Communication Method

Teachers in this study indicated that some of the deaf students they taught used oral communication, others used simultaneous communication, while others used Zimbabwe Sign Language in class during lessons. What was not indicated is whether the use of these communication methods was voluntary or students were required to use specific communication methods by the teacher. In one classroom observation of an oral program by this researcher the teacher demanded that students speak orally. If that is the class communication policy, then students will speak orally. Geers, Moog and Schick (1984) in their study of children from both oral and total communication programs, found that most of the children did not simultaneously talk and sign themselves, and that their signed component were superior to their oral component. Stewart (1985) established that the dominant mode of communication for the deaf students in his study was ASL. Many deaf students use sign language as their primary method of communication.

Observation

The observation method was used to examine how the three communication methods (manual-only, oral, and simultaneous communication) were used in classroom situations. Three classes were observed. One class was an oral program, the other was a manual communication program and the last one was a simultaneous communication program. The manual communication program used Zimbabwe Sign Language while the simultaneous communication program used signed English. Data was captured by videotaping. The observations were guided by the three themes stated in the methods section of this study. These are:

(a) teachers' communication practices,

(b) students' proficiency in communication methodology, and

(c) agreement of communication practices between the teachers and their students.

Analyses of teacher communication practices in the past looked mainly at assessing the teacher's competence in using simultaneous communication and signing. Quantitative analyses looked at rate of speech/sign expressed in words/signs per minute, accuracy expressed in percentage correct, omissions of signs or finger-spelled letters, and substitutions (Power, 1995). Qualitative analyses have looked at clarity (ease of understandability of signing/oral communication/finger spelling), synchrony (between speech and sign), speech adjustments, and non-manual movements. The analysis of the observations in this study used the three themes stated above as the framework and guide. The results are discussed below.

Class A: Simultaneous Communication Class

The class was observed being taught social studies and English. The following are the main observations made.

Teachers' communication practices. The official policy of the school is that they use simultaneous communication in their teaching and learning situations. The teacher confirmed this. She acknowledged that her class "total communicated". During the lessons observed, the teacher led the discussions. The students participated actively in the discussions.

The teacher used signed English in her communications. However,at times she used a mixture of signed English and Zimbabwe Sign Language. It appears she switched to Zimbabwe Sign Language whenever there were issues that students were not clear with. Twice in such situations she did not use speech. She signed only.

At times the teacher gave different signs for the words she said through speech. This conveyed different messages to the students who relied on the signing. This could be seen when the teacher asked questions. The teacher would expect the answer from her speech component of the message yet the students would have picked the signed component. The following is an example of this observation.

Teacher: (Speech) There were three boys in the car.
(Accompanying signing). THREE MEN IN CAR.

Teacher: How many boys were in the car? (Writes the question on the chalkboard).

Student I ZERO

Teacher: How many?

Student 2 NO BOYS. THREE MEN.

> This discussion went on for some time. Their only point of misunderstanding was that the teacher signed men when she meant boys. She said boys in her speech and that was what was in her mind. However, such situations where the teacher gave wrong or different signs from what she said orally were not many. In the two lessons observed this happened three times.

The teacher used a lot of scaffolding. She supported the students' communication by providing missing words when the students hesitated or could not find the word. She did not push the students to speak orally but accepted whichever means of communication they used.

The teachers' signing was slower compared to that of her students. Also, she tried to match her signing with her speech. This made her drag her speech.

Students' proficiency in simultaneous communication. Only three students used speech and sign simultaneously when they answered questions to the teacher or said something to the whole class. The other six signed only. The teacher reminded them to use speech together with signing. In the two lessons observed she reminded them once per lesson. The speech component of the three students who used both speech and sign was not very intelligible. However, the researcher could understand them by combining the speech with the signing. Although the teacher was using signed English, the students were using Zimbabwe Sign Language. For instance one student signed; "MAN HOME GO". She also said the same through speech.

Four times in the social studies lesson most of the students did not understand what the teacher said. They asked her to repeat and in three of those cases she fingerspelt the word first and then explained in sign. In one case she wrote on the chalkboard.

During student to student side talks the students signed to each other. They did not accompany their signing with speech. However, during their discussions with the teacher some students included speech in their communications.

Agreement between students' and teacher's communication. Both the students and the teacher knew the communication policy of their school. They both knew that they should use speech and signing simultaneously. The teacher was good at speech communication and her signing was average. Her signing was slower and at times she signed differently from what she said orally. Misunderstandings arose when that

happened. All the students were good at signing and three of the nine students combined speech and signing when they spoke to the teacher. The speech of those that spoke was not very intelligible.

There were situations when the correct message was conveyed by both speech and signing even though they did not say it exactly the same. The following example demonstrates this point:

Teacher: Which is the correct word? (Speech).
CHOOSE CORRECT (Signing).

In this particular instance all the students chose the correct word.

Class B: Oral Class

Teacher communication practices. In this class the teacher talked a lot. She repeated her speech most of the time by rephrasing. Her voice was very clear. She spoke naturally using speech. The following are the main communication practices by the teacher that the researcher observed.

The teacher used initialization many times. She fingerspelled the initial letter of the alphabet for the key words. For instance for the word "tools" she said the word and at the same time had the letter "t" fingerspelled on her fingers accompanying the speech. She used this in running speech and also in isolated words. These are words that she thought were difficult for students to speechread.

The teacher used gestures a lot to complement oral communication. The gestures she used were those commonly used among hearing people. However, at times her

gestures were accompanied by some signs and fingerspellings. She used fingerspelling whenever she failed to communicate with her students.

To enhance comprehension the teacher showed students real objects and at times acted or demonstrated the meaning of her speech. She did this whenever she realized the students did not understand her speech or when she thought the oral explanation alone would be difficult to understand. The teacher used a hierarchical strategy that moved from pure oral to oral plus gestures, to word by word oral, to fingerspelling and signing. The following is an example of this strategy.

Teacher: What name do we give to all these? (Oral)

Students: --- (No answer)

Teacher l: What name, name do we give to all these? (Initialized the word "name" in the second place by fingerspelling the letter "n" and used gestures to indicate garden tools).

Students: --- (look at each other and still no answer)

Teacher: What //name// name// you know, name // for these?

The teacher repeated her speech many times. She rephrased and repeated the same ideas more often than is common when talking to hearing people. The teacher gave words orally and wrote on the chalkboard words that the students failed to express orally or words that the students dramatized, demonstrated, or signed but were not sure the exact way to say them. She made them say those words orally over and over again.

Students' proficiency in oral communication. The students in this class knew the communication policy of their school. They tried to speak orally but had a hard time not

to sign. The teacher reminded them not to sign and encouraged them to speak orally only.

One student in the class had speech that was intelligible. The rest vocalized and supported their vocalization with initialization, gestures, and at times signing. It would appear that the teacher understood the vocalization because she would help the students by repeating what they said. She modeled for them and at times she asked them to repeat what she would have said.

The students had some words that they knew very well and could speak them intelligibly. For instance the teacher would ask; "What is this?" and all the students said clearly, "water, --- mop, ---bucket --- hoe".

The students fingerspelled many words. Whenever there were communication problems and the teacher or other students failed to understand them then they fingerspelled the word or signed it.

The researcher also observed the side talks that went on between students and also student to student talks during lessons. The students when talking to each other never attempted to use speech. They signed to each other. However, whenever they were talking to the teacher they tried to use speech. This gave the researcher the impression that for the students speech was for purposes of communicating with the teacher.

In this class students went to the chalkboard to write what they were saying several times. In the two lessons observed the students went to write on the chalkboard to make themselves understood nine times. They went to write either on their own or were requested by the teacher to do so.

Agreement between students' and teachers' communication. Both the students and the teacher knew they were in an oral program. They knew their main mode of communication should be speech. They both tried to follow the policy of the school. The teacher did most of the talking. It was difficult to know if the students understood what she said. She asked few questions. However she repeated her ideas and statements many times. This gave the impression she knew they did not understand. Several repetitions and rephrasing increased the opportunities for the students to understand. Students went up to the chalkboard several times trying to make themselves understood.

The students had a hard time trying to speak orally. Interestingly their teacher understood them. It was apparent that an outsider like the researcher would not understand them.

Progress in terms of ideas and information being communicated seemed slow. The researcher got the impression a lot of time was used on various strategies that were repeated to communicate the same idea.

As discussed above the teacher could communicate orally easily and the students could sign easily. The teacher used very few signs. When interviewed later by the researcher she said she knew only "survival signs". Her program and school policy discouraged her from learning signing. On the other hand the students' use of sign language was mainly for discussions amongst themselves and not with the teacher. In sum there was much effort expended to make communication comprehensible, and included strategies such as fingerspelling, initialization, dramatizing, writing on chalkboard, repeating, rephrasing, and paraphrasing.

Class C: Zimbabwe Sign Language Class

The communication policy of the school is that students and teachers are allowed to sign and to use Zimbabwe Sign Language. This particular class was officially a signing class. Zimbabwe is in a transition period from pure oral to using other alternative communication methods. This is one of the first schools to use Zimbabwe Sign Language.

Teacher's communication practices. The teacher used two main communication strategies during the periods she was observed teaching. She spoke and signed at the same time and at other times she signed only without speech. The uses of one method or the other were almost even. Whenever she spoke and signed at the same time, the signed component of her communication was signed English. She used Zimbabwe Sign Language when she was signing only without speech.

The teacher used fingerspelling for words that she had no signs for and for names of people that the children did not have signs for. The researcher's name for instance was fingerspelled for the students. The teacher understood the students' signing. She could converse with them without much difficulty and it appeared they understood each other. She however asked the students to slow down their signing or repeat a message whenever she did not understand. Also, her signing was slow and could not match with her speech. As a result she slowed down her speech to match the speed of her signing or fingerspelling. Twice she had to correct her signs after the students asked her what she meant. She had signed wrongly in both cases. Once she paused and asked the students the sign for a word, she fingerspelled the word.

Students' proficiency in the manual-only mode (ZSL). All students in the class signed for most of their communication during the lessons observed. Only twice did one student shout out answers orally. The other students signed both to the teacher and to each other. During the period she was observed teaching, the teacher did not write on the chalkboard for the purposes of enhancing communication problems. She wrote on the chalkboard to explain a concept.

Agreement between students' and teacher's communication. The teacher was an average signer. She understood both Zimbabwe Sign Language and signed English. She did not repeat her statements much. However, she had problems matching her speech and her signing. Her signing and fingerspelling were slow and at times she signed wrong words. Once she asked the students the sign for a specific word. On the whole it appeared the teacher and the students understood each other without much difficulty.

Discussion: Classroom Observations

Teacher Communication Practices

Teacher communication practices in the classroom differed from one program to the other. The teacher in the simultaneous communication program used speech and signing simultaneously in her communication. She used signed English for most of the time. She had problems with matching her speech with her signing because her signing was slow. She made a few signing errors during the period she was observed. However, on the whole she communicated very well with her class. Her students understood her and she understood them.

The teacher in the sign language program used Zimbabwe Sign Language and simultaneous communication evenly. She too made a few mistakes in her signing. Her signing was slower than that of her students. However, overall the teacher and her students understood each other very well.

The fact that teachers have problems with their signing has already been discussed earlier in this chapter. This observation in a practical classroom setting confirms earlier findings from the questionnaire answered by the teachers where they indicated that they were not proficient in Zimbabwe Sign Language and confirms earlier research that found problems with teachers' signing (Kluwin, 1981; Marmor & Pettito, 1979; Strong & Charlson, 1987; Swisher, 1984; Woodward & Allen, 1987).

The teacher in the oral program seemed to have no problems in talking to her students. She talked a lot and used several strategies to try to communicate her ideas to the students. Speech was her primary mode of communication but she augmented that with gestures, initialization, showing pictures and real objects. Yet, half the teachers who completed the questionnaire discussed earlier in this chapter felt they were not proficient to teach using the oral approach. In a way this is an indicator that whereas teachers in oral programs may be talking a lot and giving lots of information they notice that their students are not learning or comprehending much from the lessons. It took a lot of work and effort (e.g., dramatizing, repeating, rephrasing, writing on the chalkboard, initialization) for this teacher to be understood.

Students' Proficiency

Students in the oral class were forced to speak orally during lessons. Even under those circumstances they still sometimes signed in class. Their side talks to each other were in sign. Their speech was not very intelligible and most of them only vocalized. The results suggest that it was not easy for them to understand their teacher's speech. The students in the simultaneous communication program signed for most of the time. Only a few combined speech and sign when talking to the teacher. The students in the signing program signed for most of the time. On the whole the students in all the three programs were proficient in the sign mode but not in the oral mode.

Agreement Between Students' and Teachers' Communication Practices

The results show that where both the teacher and the students used and were proficient in the same communication method there was more agreement and the two understood each other better. This was the case in the simultaneous communication and the Zimbabwe Sign Language classes. In instances where the teacher's and the students' communication practices and proficiency were different problems arose. In the oral class there were many repetitions suggesting there were comprehension problems. It is important for teachers and students in the same class to share a common communication mode that they both understand.

Summary of Findings

In this chapter, the results of the subjects' comprehension of stories under three modal conditions and two languages were analyzed and discussed. General linear model

repeated measure results showed mode, language, and hearing threshold level to be significant. Hearing threshold level was significant for oral communication when comparing students with profound hearing loss with students with mild hearing loss. It was not significant for manual and simultaneous communication. School type, socioeconomic status, hearing status of parents and siblings, and gender were not significant.

The results from the classroom observations and the questionnaire answered by the teachers showed that students understood information presented to them in simultaneous communication and Zimbabwe Sign Language better than they understood oral communication. Students were proficient in signing but had problems with oral communication. Teachers spoke fluently but had problems with signing. The following chapter presents a discussion of the implications of these findings.

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS AND RECOMMENDATIONS

Introduction

In the last few decades there have been drastic changes in the education of deaf students internationally. Many schools that had previously employed oral methods switched to a total communication approach (Eagney, 1987). The foundation of total communication rested on the utilization of a simultaneous combination of audition, speech reading, and signing to facilitate greater comprehension in communication (Vernon, 1972). As Hyde, Power and Cliffe (1991) demonstrated, the most frequent realization of total communication philosophy is simultaneous communication in speech and sign, where speech is simultaneously accompanied by a representation of that speech on the hands through signing (Jeanes, Reynolds & Coleman, 1989; MacDougall, 1988). Over the past thirty years there has developed increased recognition of sign language as a natural language widely useable for the purposes of interpersonal communication by members of the Deaf community (Padden, 1980; Power, 1988). Some school programs have started to use sign language as their primary or sole method of communication for educational purposes (Carly & Potter 1991; Jackson & Stark, 1994). Debates on the effectiveness of these methods, however, still continue. In Zimbabwe, for example, the use of Zimbabwe Sign Language in schools is a very recent development. There is division among schools and teachers as to which method of communication to use in the classroom.

In the review of literature, questions were raised concerning the methodological techniques used in some previous studies that compared the effectiveness of different communication methods on deaf students (Pudlas, 1984; Stewart, 1985, 1993). The literature also revealed a trend amongst educators of deaf students toward including sign language in their school programs (Jackson & Stark, 1994; Carly & Potter, 1991). Zimbabwe, like many other developing countries, lags behind in these developments. It has recently published its first Zimbabwe Sign Language Dictionary (Chimedza, Sithole & Rinashe, 1998). For these reasons it seemed timely to explore the effects of various modal and language conditions of deaf students' comprehension of stories.

Summary

This study examined deaf students' comprehension of stories under three modal conditions and two languages. The three modal conditions used were; manual, oral, and manual plus oral. The two languages used were English and Zimbabwe Sign Language. The study also examined how the three modal conditions and the two languages were used in the classrooms. The decision to use the three modal conditions in this study stemmed from current development in Zimbabwe where there is a paradigm shift in the education of deaf students from oralism to simultaneous communication and the use of sign language. The decision to use English and Zimbabwe Sign Language stemmed from the fact that Zimbabwe Sign Language is the language of communication in the Deaf community in Zimbabwe and most deaf students use Zimbabwe Sign Language as their primary language of communication. English was used because it is the official medium of instruction in all schools in Zimbabwe. Also, deaf students live in a bilingual world

where they have to communicate in their own language and in the language of the hearing community.

The experiment presented three stories on nine videotapes under different conditions. Each story was presented in three different modes of communication. The reproduction of the stories was videotaped. Two adults (one hearing, one hard of hearing) proficient in the three modal conditions scored the reproduction and averaged the scores across judges. The judges had a high interator reliability. To test for the seven null hypotheses the General Linear Model Repeated Measure statistics procedures of the SPSS 8.0 version were used. The main effects and interactions of mode of communication, language, gender, socioeconomic status, hearing threshold level, hearing status of parents and siblings, and school-type were tested. The general linear model repeated measure results showed mode, language, and hearing threshold level to be significantly related to the story comprehension scores. Hearing threshold level was significant for oral communication when comparing students with mild hearing loss with students with profound hearing loss. Hearing threshold level was not significant for the manual mode and simultaneous communication. Gender, school type, socio-economic status, and hearing status of parents and siblings were not significant.

The sample consisted of 72 candidates equally distributed for gender (36 male; 36 female) and school type (36 from integration units; 36 from special schools). The 72 candidates were randomly selected from all the five schools for the deaf in the country and all the integration units.

For the second part of the study, a questionnaire instrument was used to study the teachers' perceptions of the methods of communication, they used when teaching students

who are deaf. Thirty-six teachers answered the questionnaire. These were the teachers whose students had participated in the story comprehension experiment.

Data analysis showed that teacher communication practices, beliefs, and proficiencies did not always agree with students' communication practices and how the students learned best. Teachers' deficits were mainly in signed communication and their strengths were in oral communication. All the teachers in the study were hearing. On the other hand the students' strengths were in the signed mode and their weaknesses were in the oral mode.

Lastly the study observed three classes (one oral, one simultaneous communication, one Zimbabwe Sign Language) to examine how the three communication methods were used during teaching and learning situations. The three teachers who were observed teaching had their students in the main study (story comprehension experiment). They were selected on the recommendation of their school heads. Their school heads rated them as model or exemplary teachers.

Class observations revealed more teacher and student communication problems in the oral class than in the simultaneous communication and manual-only (Zimbabwe Sign Language) classes. However, teachers in both the simultaneous communication and the Zimbabwe Sign Language classes were slower and less efficient in their signing than their deaf students. They dragged their speech to match their signing.

Conclusions

In the present study it was found that, mode of communication affected comprehension of stories. Students demonstrated different levels of comprehension for

stories told the in manual, oral, and manual plus oral modes. Students' comprehension was highest for manual mode, followed by manual plus oral mode. Oral mode was understood the least. Many students in the study commented that stories in the oral mode were difficult. The conclusion to be drawn from this data is that the deaf students in the study understood stories presented to them in the manual modes better than they did stories in the oral mode. It appears they had problems in understanding stories in the oral-only mode.

The second conclusion comes from the effect of hearing threshold level on the comprehension of stories presented in the different communication modes. The present study found the comprehension of stories to be significantly different from each other for stories told in the oral mode when comparing students with mild hearing loss with students with profound hearing loss. Comprehension of stories was not significantly different for stories told in simultaneous communication and in ZSL across all the four levels of hearing threshold level (mild, moderate, severe, and profound). Deaf students use their residual hearing differently (depending on level of hearing loss) to pick up sound from oral communication. The second conclusion therefore is that, in the study, there was a positive link between hearing threshold level, oral communication, and the comprehension of stories.

The third conclusion comes from the role of language of presentation in the comprehension of stories. In the study, students understood stories told in Zimbabwe Sign Language better than they understood stories told in English (both signed and oral). Sign Language is the natural language of deaf people. It is a visual-spatial language and deaf people are visual people. They use their vision as their primary distant sense.

Audition is probably their weakest sense. As discussed earlier, most deaf students in Zimbabwe have problems in their use of English. Part of the problem arises from the fact that most of them come from families where English is not spoken in the home. Family members use either Shona or Ndebele. English is used at school only under the guidance of the teacher. It is the official medium of instruction at school. The third conclusion therefore is that most deaf students in the study understood Zimbabwe Sign Language better than they understood English.

Teachers in the study had problems with signing both in Simultaneous Communication and Zimbabwe Sign Language. This was demonstrated in the classroom observations and questionnaire instrument data. The teachers' self-evaluation in one of the questionnaire questions confirmed this. The conclusion that could be drawn from these data is that the teachers are not signing efficiently to their students in both manual-only (Zimbabwe Sign Language) and simultaneous communication programs. Teacher training programs in Zimbabwe that trained teachers for deaf students in the past emphasized the oral approach. These results are therefore important for teacher education programs and for school based staff development programs in view of the new developments in schools and integration units for students who are deaf where manual and manual plus oral mode programs are now present.

The fifth conclusion comes from the results of the data from the questionnaire instrument given to teachers. It appears teacher communication practices, beliefs, and proficiencies were not compatible with students' communication practices and the communication methods that the students understood best. The teachers in the study were more comfortable and proficient in oral communication. They indicated that they

were not proficient in Zimbabwe Sign Language. The students on the other hand were not proficient in oral communication but very good in signing. For good classroom communication and effective learning, teachers and their students should have a common communication method and language that they are both proficient in. This is more important in Zimbabwe at the moment because the special schools and integration units for deaf students do not have interpreters. The teacher and the students have to understand each other.

However, the results of this study are not conclusive. They need further investigations. For instance the current study concluded that deaf students in the study understood stories told in Zimbabwe Sign Language better than those told in English. Further investigations on the actual efficiencies of these languages are needed. Also, the use of the different communication methods in the classroom needs more detailed investigations. In this study the story recall experiment was the main study. The questionnaire and classroom observations were minor parts meant to complement the main study. More extensive classroom observations are needed.

Implications

On the basis of the conclusions discussed above, the following implications for communication methods and language of communication in the education programs of deaf students in Zimbabwe are proposed.

(2) The implementation strategies for the inclusion of the manual-only mode and the simultaneous communication approaches in the education of deaf students in Zimbabwe should be expedited and expanded. The recent

publication of the Zimbabwe Sign Language Dictionary is a catalyst to this process. The use of the manual-only mode will be realized by using Zimbabwe Sign Language. This then means deaf students will learn Zimbabwe Sign Language and English at school making them bilingual. In Zimbabwe most people who have school education are bilingual. This is because the native Zimbabweans have their own indigenous languages (e.g., Shona and Ndebele) and are required to learn English at school. English is the medium of instruction in schools. The Zimbabwe Government is currently writing a National Language Policy. Input has already been made for Zimbabwe Sign Language. This development strengthens the status of Zimbabwe Sign Language in the country. This is important because the Zimbabwe Education Act (1987 revised 1996) suggests that children be taught in their first language during their first three years in school. If a legal decision is made that Zimbabwe Sign Language is the first language for students who are deaf, then it becomes a right for them to be taught in Zimbabwe Sign Language from Grade 1 to 3 while learning English as a subject. At Grade 4 level English becomes the medium of instruction in all schools. This change can help improve the academic achievement of deaf students.

(3) Deaf students' reliance on signing for comprehension requires that teachers be good role models. The situation shown in this study where most teachers are not efficient signers does not help the situation. Stewart, Akamatsu, and Becker (1995) demonstrated that with the right training

and practice teachers improve their signing efficiency to a proficient level. The implications for Zimbabwe are that there is need to establish both preservice and inservice teacher education courses that teach Zimbabwe Sign Language, simultaneous communication and signing skills to teachers of students who are deaf. Hyde and Power (1991) and Mayer and Lowenbraun (1990) indicated that well motivated teachers produce high levels of agreement between the spoken and the signed components of their simultaneous communication (average over 90%).

(4) In the study hearing threshold level was a good predictor for comprehension of content when comparing students with mild and profound deafness in oral communication. Implied in this finding is that the less severe the hearing loss (mild and moderate) the more the student would understand oral communication. The more severe the hearing loss (severe and profound), the less the individual would benefit from oral communication and the more they were likely to rely on manual communication. This information could be useful for planning purposes and for placement of the students into appropriate education programs. According to this finding it might be better to have severe and profoundly deaf students in manual-only and simultaneous communication programs and have those with mild and moderate hearing losses in oral programs.

(5) The three implications discussed above say something about the academic achievement of deaf students. The results seem to infer that deaf students in Zimbabwe are failing to understand subject matter because they are

taught in a language and under modal conditions that they do not understand best. Also, the teachers and the students do not have compatible proficiency in any one common language and mode of communication. Implied in this and in order to improve the academic achievement of deaf students, there is a need to change communication practices in schools and units for the deaf. More Zimbabwe Sign Language and simultaneous communication programs should be introduced. Teachers need to be trained to sign proficiently in either program.

Issues of bilingual education are alluded to in this study. Deaf students need to learn and use Zimbabwe Sign Language for their day to day communication. On the other hand they need to learn English for reading and writing and it is the medium of instruction in school. This area calls for further research.

Limitations

(a) The findings of the story recall experiment are generalizable to students who are deaf with mild, moderate, severe, or profound hearing loss, aged 13 to 16 years and in Grades 5 to 7 of the Zimbabwean education system or its equivalent.

(b) The stories were equated on measures pertaining to English but not Zimbabwean Sign Language. Techniques for measuring equivalencies for stories presented in Zimbabwe Sign Language are required.

(c) No tests were made of speechreading ability, aural skills and memory.

(d) Two different presenters presented test stories. One presenter presented the manual-only story and the other presenter presented the oral and the simultaneous communication stories. Both presenters were selected for their proficiency in the mode of presentation.

Recommendations for Future Research

(1) Replication of this study on a large scale should be undertaken. Wherever possible, information should be gathered on students' academic achievement levels to determine pertinent relationships. This may be of assistance in programming for those students and for remedial programs.

(2) Research is needed to inform and assist in designing implementation strategies for the bilingual programs suggested above. Students who are deaf should learn both English and sign language (e.g., Zimbabwe Sign Language). More information is needed on how best this could be done.

(3) There is a need to develop measuring techniques for assessing signing skills for both Zimbabwe Sign Language and signed English. The instruments should be for both expressive and receptive skills.

(4) This research has the story comprehension experiment as its main study and the questionnaire and class observations as minor parts. Studies that examine classroom use of these communication methods in more detail are needed. These could help explain authentic classroom practices.

(5) This study did not measure how fluent deaf students are in the three modal conditions (oral, manual, & simultaneous communication). No previous

studies known to this researcher have undertaken this task. Certainly no such study has been done in Zimbabwe. A study that investigates deaf students' fluency in the different modal conditions may help explain why and how they use the modes of communication they choose to use.

(6) Story retelling scores were allocated based on plot, character analysis, theme, and events. The theme and character analysis categories required inferential thinking skills while the plot and events categories required descriptive thinking skills. This study did not show how the deaf students fared in the two different thinking skills. Maybe different communication methods are good for certain thinking and memory skills and not at others. This could be a subject for future research.

(7) The results from the qualitative section of this study show a conflict between teachers' beliefs and their communication practices in the classroom with deaf students. Teachers are employees in schools. Each school for the deaf in Zimbabwe has its own communication policies. Teachers may be following school policies against their own personal and professional beliefs. Studies that investigate the effect of school communication policies on classroom communication practices are necessary and may help inform the decision and policymaking processes in the education of deaf students.

(8) Issues of which communication methods to use in the education of deaf students in Zimbabwe and internationally are fraught with political pressure from interested parties (e.g., World Federation of the Deaf,

national associations of the deaf, parental groups, and professionals). Policies on which communication methods to use when teaching deaf students may be made out of political pressure rather than out of academic and scientific knowledge. However, it is important for policy makers to have available to them scientific knowledge as they make such decisions. Also, for future research, it is important to investigate how much influence scientific research knowledge has in the decision and policy making processes in the education of deaf students vis-a-vis the political context discussed above.

APPENDICES

APPENDIX A

STORY RECALL EXPERIMENT SCORING INSTRUMENT

APPENDIX A

STORY RECALL EXPERIMENT SCORING INSTRUMENT

Subject----------

Date scored----------

Scorer----------

Story---------- communication mode ---------- Language----------

Story A: The Detectives Rescue Sarah

A. Character Analysis (30)

Recall	Development
Tom (3)	Detective, went into the house to rescue Sarah (3)
Jane (3)	Detective, tricked the kidnappers (3).
Peter (3)	Detective, arrested the kidnappers (3).
Paul (3)	Detective, arrested the kidnappers (3).
Sarah (3)	Kidnapped girl (3).

B. Theme (20)

Detectives help people in trouble (10).

Kidnappers get arrested and go to jail (10).

C. Plotting (20)

Two detectives investigate a kidnapping case. (4)

Tom sneaks into the kidnappers' house (4)

Jane tricks the kidnapper (4)

Tom rescues Sarah (4)

The kidnappers get arrested (4)

D. Events (30)

Tom and Jane park their car outside the kidnappers' house. (3)

Toms sneaks into the house (3)

Jane waits in the car (3)

The three kidnappers walk out of the room where Sarah is locked. They do not see Tom hiding behind the pillar in the house (3)

Peter and Paul come to back up Jane and Tom. They wait in the car (3)

Jane knocks at the door. She asks for help (3)

Tom rescues Sarah. They jump over the wall (3).

The kidnappers see Tom and Sarah. They run after them. (3)

Peter and Paul pull their guns and order the robbers to surrender. They arrest the kidnappers. (3)

Sarah's parents thank the four detectives. (3)

A. Character analysis----------

B. Theme ----------

C. Plot ----------

D. Events----------

Total points----------

Subject----------

Date scored----------

Scorer----------

Story communication mode ---------- Language----------

Story B: Who is Going to be King

A. Character Analysis (30)

Recall	Development
Lion (3)	Wanted to be king by force. Feared by other animals (3)
Elephant (3)	Wanted to be king. Destroyed trees to show strength (3)
Giraffe (3)	Wanted to be king. Showed advantage of height (3)
Frog and Hare (3)	Wanted to vote for king. (3)
Tortoise (3)	Popular because of his wisdom. (3)

B. Theme (20)

Rulers should be chosen by the people because of their wisdom (10).

Power does not necessarily mean good leadership (10).

C. Plotting (20)

All animals gather to select their king (5).

Lion and elephant want to be king by force. They disrupt the election (5).

Votes become frightened (5).

Peaceful candidates are threatened (5).

D. Events (30)

Animals decide to have a king (3).

Animals meet to choose a king (3)

Lion, giraffe, and elephant all want to be kings (3).

Lion roars to show his power (3).

Elephant pulls down trees to show his strength (3).

Giraffe stands up to show the advantages of his height (3).

Frog suggests that tortoise be elected king because of his wisdom (3).

Elephant and lion become very angry (3).

Lion wants to kill tortoise (3).

All animals run away afraid of lion (3).

A. Character analysis----------

B. Theme ----------

C. Plot ----------

D. Events----------

Total points----------

Story C: Sleeping on Graves

A. Character Analysis (30)

Recall		Development	
Peter	(3)	The boys driving to their rural home	(3)
Farai	(3)		
Joe	(3)	Car broke down	(3)
John	(3)	The boys went to look for help -	(3)
		Got help from a ghost	(3)
		Slept of graves	(3)
		Drove away fast and frightened	(3)

B. Theme (20)

Ghosts can help people in trouble..... (10)

Ghosts can be tricky..... (10)

C. Plotting (20)

Four boys travel by night (4)

Car breaks down (4)

Boys look for help (4)

Tricked by ghost (4)

Boys run away (4)

D. Events: (30)

The boys drive in John's car (3)

The car breaks down..... (3)

The boys go to look for help (3)

The boys come to a big house(3)

A tall man comes to meet them (3)

They are welcome to stay for the night (3)

They have nice dinner (3)

They go to sleep..... (3)

They wake up next morning sleeping on graves (3)

They run away..... (3)

APPENDIX B

TEST STORIES

APPENDIX B

TEST STORIES

Story A:

The Detectives Rescue Sarah

The two detectives Tom and Jane parked their car outside the big house. They waited for a long time. No one went in or came out of the house. Tom became impatient. He decided to go into the house to check it out. Jane remained in the car.

Tom found the door of the house locked. He walked quietly to an open window near the door. He climbed up the wall and got into the house through the window. He could hear people talking in one room. He listened carefully. He heard a woman screaming and knew it was Sarah. The robbers had kidnapped her. He did not want to put Sarah in danger. He hid behind a pillar thinking of what to do next.

Three men walked out of the room. They locked the door. They went past Tom but they did not see him. Tom radioed Jane to say he was going to get Sarah. Jane warned Tom to be careful. She radioed two more detectives as back up. When the two arrived, Jane asked them to remain in the car. She went and rang the doorbell at the big house. All the three kidnappers came to the door. She asked for some directions. The men looked at her. She was beautiful and charming.

As Jane was leaving one of the kidnappers saw Tom and Sarah jump off the wall. They knew Jane had tricked them. They chased her. The two detectives waiting in the car went after them. They drew their guns and ordered the three men to surrender. Jane joined the other detectives with her gun drawn too. The kidnappers were arrested. Tom

took Sarah back to her parents. The kidnappers were taken to prison. They suffered in jail for the rest of their lives. Sarah's parents thanked Tom, Jane and Peter and Paul, the other detectives. They threw a party for them.

Story B:

WHO IS GOING TO BE KING?

Once upon a time all animals lived happily together. They decided to choose one of them to be king. One day they met to decide who would be their king. The problem was many animals wanted to be the king.

"I will be the king," roared Lion. "Listen to my voice. I am the greatest animal on this land." Lion roared and roared and the other animals shivered in fear.

"I will be the king," declared Elephant. "Look at my size. I am big and powerful." Elephant pulled down big trees, broke several branches, and destroyed all the surrounding plants to demonstrate his power. His strength surprised many other animals. He was so powerful no other animal would stand in his way.

Giraffe looked at the animals and smiled. He stood up. He was as tall as the trees. "See how tall I am. I can see things far away. If you make me the king, I will be able to see all the danger before it gets to us. Make me king!" shouted Giraffe.

"Cro--ck, cro--ck, cro--ck," went frog. "We need a wise king, someone with wisdom like grandfather tortoise. Giraffe you are tall, you can be a good watch person for the king. Lion and elephant both of you are powerful, you can be good soldiers of the king. The king will need fighters like you to defend his kingdom. Neither of you can be king. We need a wise king."

"What!" roared Lion. "Me, soldier! No way, I will be the king or else---." Frog noticing the danger, dived into the pond of water that was nearby to save his life.

Lion was angry and he ran all over the place looking for frog. "I will kill frog," he thundered. Elephant too was very mad with frog. He wanted to squeeze life out of him. Frog got so frightened that he dared not come out of the pond. Even today he is still scared and jumps into the pond as soon as he hears someone coming. Elephant and Lion roared in anger. Tortoise became so scared and he quickly and quietly crawled into a nearby bush to hide. He hid his head in his shell in case elephant and lion came after it. Even today tortoise still hides his head in his shell to protect it from Lion and Elephant.. The other animals got so scared. They ran away. Till today lion has not made peace with other animals. He still wants to be the king of all animals.

Story C:

SLEEPING ON GRAVES

Peter, Farai and Joe were driving to their rural home in John's car. It was in the middle of the night. It was very dark and it began to rain. Their car broke down in the middle of a thick forest. The three boys began to walk to look for help. They soon came to a large metal gate. A huge house was behind the gate. Three dogs came barking to meet them. Behind the dogs was tall man. He was dressed in white clothes. He was very tall and had a very long beard. The boys began to shiver with fear.

The man was very kind. He took the boys inside the big house. They sat by the fire in the house. He gave them food to eat. They ate rice, chicken and vegetables. They

had oranges and bananas too. The man told them stories and they were very happy. He gave each of them a bed to sleep in. The boys thanked the man. They went to sleep happy and comfortable. Farai went to sleep first.

Peter was the first to wake up early in the morning. A chilly breeze woke him up. He looked at Farai and Joe in surprise. They were all sleeping on graves. There was no house. The man had gone. He was a ghost. The three boys ran to their car. They started the car. Nothing was wrong with the car. They drove off as fast as possible. They learnt a lesson. They will never travel in the country side by night again.

APPENDIX C:

CONSENT FORM (TEACHERS)

PARTICIPETION IN THE RESEARCH STUDY

TO BE CONDUCTED BY ROBERT CHIMEDZA

APPENDIX C:

CONSENT FORM (TEACHERS)

PARTICIPETION IN THE RESEARCH STUDY

TO BE CONDUCTED BY ROBERT CHIMEDZA

I agree to participate in this research study on effects of communication methodology on the comprehension of stories by deaf students. I understand that this research is in partial fulfillment of Robert Chimedza's doctoral degree from the College of Education at Michigan State University. The purposes, procedures and potential risks and benefits have been explained to me, and I have agreed to do the following:

1. Permit Robert Chimedza to observe and videotape me in while I am teaching.
2. Permit Robert Chimedza to interview me. Some interviews may be tape-recorded to facilitate note taking.
3. Complete a questionnaire on my perceptions on the different communication methods used by deaf students.

I also understand that:

1. My participation is this study is voluntary.
2. Except for the little time for the interviews and completing the questionnaire, my participation in this study involves little time commitment on my part.

3. Potential benefit for me from participating in this study is indirect. Findings from this study may lead to improve teaching approaches for deaf students in Zimbabwe.

And finally, I understand that:

1. Data collected will be used in Robert Chimedza's dissertation and may also be used in articles, presentations or instruction outside my school setting.
2. All data collected will be kept confidential and reported without individual identification.
3. I can choose not to answer any question or to discontinue my participation in the study anytime without adverse effect on my school or me.

If I have any additional questions about this study anytime, I can contact Robert Chimedza at the University of Zimbabwe, Department of Teacher Education or whatever address to which they may refer me.

Signature_____ Date:

APPENDIX D

CONSENT FORM (STUDENT)

PARTICIPETION IN THE RESEARCH STUDY

TO BE CONDUCTED BY ROBERT CHIMEDZA

APPENDIX D

CONSENT FORM (STUDENT)

PARTICIPETION IN THE RESEARCH STUDY

TO BE CONDUCTED BY ROBERT CHIMEDZA

I agree to participate in this research study on effects of communication methodology on the comprehension of stories by deaf students. I understand that this research is in partial fulfillment of Robert Chimedza's doctoral degree from the College of Education at Michigan State University. The purposes, procedures and potential risks and benefits have been explained to me, and I have agreed to do the following:

1. View the three test stories presented to me in Zimbabwe Sign Language, simultaneous communication, and standard oral English.
2. Retell the stories
3. Allow Robert Chimedza to video film me retelling the stories.
4. Permit Robert Chimedza to observe and video film me in classroom situations.
5. Permit Robert Chimedza to interview me. Some of the interviews may be tape-recorded to facilitate note taking.

I also understand that:

1. My participation is this study is voluntary.
2. Except for the little time for viewing the test stories and interviews, my participation in this study involves little time commitment on my part.
3. Potential benefit for me from participating in this study is indirect. Findings from this study may lead to improve teaching approaches for deaf students in Zimbabwe.

And finally, I understand that:

1. Data collected will be used in Robert Chimedza's dissertation and may also be used in articles, presentations or instruction outside my school setting.
2. All data collected will be kept confidential and reported without individual identification.
3. I can choose not to answer any question or to discontinue my participation in the study at any time without adverse effect on my school or me.

If I have any additional questions about this study anytime, I can contact Robert Chimedza at the University of Zimbabwe, Department of Teacher Education or whatever address to which they will refer me.

Signature_____ Date

Research participant

Signature_____ Date

Parent / Guardian.

APPENDIX E

QUESTIONNAIRE

APPENDIX E

QUESTIONNAIRE

This questionnaire is part of the study that the researcher is doing in partial fulfillment of his doctoral degree from the College of Education at Michigan State University. Information from this questionnaire will be kept confidential. Give your honest answers. There is no correct or wrong answer. By completing this questionnaire you are giving your consent to participate in the research voluntarily.

Answer the following questions by ticking the answer that best describes your situation.

1. What type of program do you teach in?
   (a) special school
   (b) integration unit
2. How many years of teaching experience do you have? (a) 0 to 2; (b) 2+ to 5; (c) 5+ to 10; (d) more than ten.
3. What type of formal training did you receive? (a) oralism; (b) total communication; (c) sign language; (d) cued speech.
4. What is the communication philosophy of your school/ program? (a) oralism (b) total communication (c) sign language.
5. I use the oral method only in my class. (a) disagree (b) agree (c) strongly agree.

6. I use simultaneous communication only in my class. (a) disagree (b) agree (c) strongly agree.

7. I use Zimbabwe Sign Language only in my class. (a) disagree (b) agree (c) strongly agree.

8. I believe deaf students should use oralism in class. (a) disagree (b) agree (c) strongly agree.

9. I believe deaf students should use sign language in class. (a) disagree (b) agree (c) strongly agree.

10. I believe students should use simultaneous communication in class. (a) disagree (b) agree (c) strongly agree.

11. My students learn best when I use the oral method. (a) disagree (b) agree (c) strongly agree.

12. My students learn best when I use simultaneous communication. (a) disagree (b) agree (c) strongly agree.

13. My students learn best when I use Zimbabwe Sign Language. (a) disagree (b) agree (c) strongly agree.

14. I am proficient in the oral approach. (a) disagree (b) agree (c) strongly agree.

15. I am proficient in simultaneous communication. (a) disagree (b) agree (c) strongly agree.

16. I am proficient in Zimbabwe Sign Language. (a) disagree (b) agree (c) strongly agree.

17. Most of my students use oral communication outside class. (a) disagree (b) agree (c) strongly agree.

18. Most of my students use total communication outside class. (a) disagree (b) agree (c) strongly agree.

19. Most of my students use Zimbabwe Sign Language outside class. (a) disagree (b) agree (c) strongly agree.

APPENDIX F

QUESTIONNAIRE ON STUDENTS

APPENDIX F

QUESTIONNAIRE ON STUDENTS

1. Student No.
2. School name _____
3. Type of school program (a) oral (b) total communication (c) sign language
4. Student's date of birth
5. Age of onset of deafness
6. Level of hearing loss _____
7. Cause of deafness
8. Parents' hearing status (a) both parents hearing (b) both parents deaf (c) mother deaf (d) father deaf.
9. How many deaf sisters and brothers does the student have? _____
10. Method of communication with deaf child in the family: (a) oral (b) total communication (c) sign language (d) contact sign
11. Socioeconomic status of the family. (describe: parents' income, property, education, what they do for living, etc.)

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