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The relationship between grammar and the psychological processing of language

A B S T R A C T The study reported in this article identifies aspects of language usage that illustrate the relationship between grammatical structures and psycholinguistic processing. The psycholinguistic assumption underlying the research for this paper is that structures of speech utterances reflect the manner in which speakers perceive and psycholinguistically process information. The data analysed was elicited from selected first language users of Shona, Ndebele and Setswana. The corresponding English sentences were provided by the researcher. Similarities between the data verified the assumption that grammatical structuring is largely determined by speakers' psycholinguistic perceptions and how they process the meaning of what they perceive.

Keywords: linguistic universals, psycholinguistic processing, universal grammar, psycholinguistic word order, metaphorical extensions, processing constraints, end-focus theory

1. Introduction

The concept of linguistic universals assumes that certain linguistic features are common to all natural languages, as set out below. There may be certain variations among languages but some features, generally referred to as absolute universals, have been observed to be identical in most natural languages. The aim of this paper is to enunciate the evidence of the relationship between psychological processing and grammar or syntax and then, compare selected linguistic data from Shona, Ndebele and Setswana to find out if there are any similarities between the languages. On the basis of the data and the comparisons made, it will be indicated to what extent the four languages used in the investigation have linguistic commonalities which can be described as aspects of universal grammar. In addition to that, the paper intends to compare ways in which phrase and clause structures are ordered in the generation of sentences.

2. Psychological processing of language: theoretical concepts

2.1 Linguistic Universals

It was pointed ot above that the concept of linguistic universals assumes the existence of certain linguistic features that are common to all natural languages. Psycholinguists such as White (1989) observe that when the rules and rule systems of world languages have been analysed, we observe a subset or sets of rules that are common to all languages. These are technically referred to as linguistic universals. They are based on socio-psychological factors that are common to most language communities. The psycholinguistic assumption underlying this paper is that the way individuals who speak various languages perceive relationships between objects in specific temporal settings, determine the form of the language they use. This view is supported by Crystal (1991: 366) who says: "Universal Grammar is used to specify precisely the possible form of a human grammar – and especially the restrictions on the form such grammars can take". In another discussion, Crystal (1995: 457), states clearly that psycholinguistics is concerned with "the study of language in relation to mental processes". Such claims provide strong motivation for the need to carry out comparative research studies such as the one reported in this article.

2.2 Psycholinguistic processes

The view explained in the above quotation is further discussed by Fromkin (2004: 1) when she observes that cognitive scientists "have been concerned to find out the interface between brain/mind and language". Psycholinguistic processes suggested in the title of this paper can be defined as activated aspects of the brain which determine the grammatical/discourse features reflected in the language used by the users of a language.

Reference to activated aspects of the brain need to be discussed more clearly in the context of Chomsky's (1965) explication of competence and performance. Fromkin (op. cit.) refers to "linguistic representation" a concept that is synonymous with Chomsky's concept of "competence". These terms are used to refer to a speaker's knowledge of a given language. This is conceived as opposed to "linguistic processing", a term that is synonymous with "performance". The realisation of "linguistic processing" is active intellectual behaviour. It draws rules of usage from the speaker's "linguistic representation" and applies these in the communication of ideas. This theory is supported by Cook (1994), who claims that the human mind has a built-in mechanism for storing linguistic information. In addition to that, he also claims that it also has a mechanism for applying the stored linguistic information to communicate ideas in the language used by various speakers. Richards et al. (1992: 392) explain this view more clearly when they say:

"It (universal Grammar) claims that every speaker knows a set of principles which apply to all languages and also a set of PARAMETERS that can vary from one language to another, but only within certain limits."

2.3 Universal grammar and language acquisition

Some studies carried out by some applied linguists have led to the assumption that Universal Grammar has a role to play in language acquisition (Ellis: 1985). According to Richards et al. (op.cit: 393) "...acquiring a language means applying the principles of UG grammar to a particular language..." Some linguists like Rutherford (1984) have reservations about the value of UG in

language acquisition. There are, nevertheless, many linguists who find the theory valuable when describing language acquisition theories. Goodluck (1991) and Guttenplan (1995) believe UG enables children to acquire their first language quickly and naturally with relatively little instructional intervention from parents and siblings.

2.4 Psycholinguistic constraints in language processing

Slobin (1979: 64) provides a detailed discussion that focusses on the claim that "...language has the form it does because of the use to which it is put". This is an extension of the derivational theory of complexity (DTC) expounded by Fodor, Bever and Garrett in 1968. The DTC theory assumes "that every syntactic rule-phrase structure and transformational rule, particularly corresponds to a specific psychological operation." (Fromkin, op. cit.: 2)

Slobin also developed and discussed this claim with reference to linguistic phenomena he described as psycholinguistic constraints. These pertain to speakers' perceptual processes which force them to choose, order and group words in a manner that corresponds to the way they perceive the situations or processes they verbalise. This concept of psycholinguistic constraints will be discussed below using illustrative data from four languages: English, Shona, Ndebele and Setswana.

3. The data

3.1 Collection of the data

The major data collection strategy, used in the research involved discussion interviews with selected native speakers of Shona, Ndebele and Setswana. The main objective of the interviews was for the interviewees to provide translations of selected English words and sentences into their mother tongue languages (see Appendices B and C). Altogether, twelve (12) interviewees were selected as indicated in the table below.

Language	Number of interviewees
Shona	4
Ndebele	4
Setswana	4
Total	12

No native users of English were involved in the interviews. The researcher carefully prepared English sentences which he used to elicit the required information.

In addition to word/sentence translations, the researcher also used simple scenario descriptions and picture illustrations. For instance, a description of a person holding an object such as a broom or a hoe could be given and the interviewee would be asked to generate a sentence or sentences that verbally described the scenario.

One of the elicitation tests suggested above, picture interpretation, was a modification of what psychologists refer to as thematic apperception test (TAT). Cardwell (1996: 234) defines TAT as a "projective test" in which a testee explains his/her perceptions or the relationship between objects. Psycholinguists generally use TAT to diagnose emotional states or psychological needs using ambiguous pictures (Westen, 1996). Modifications of the TAT were used in this research

on the basis of what Westen (op. cit.: 460) says about its other function, namely, that in TAT, the testee uses his/her ways of experiencing relationships. "Certain scenarios required that interviewees use their experience to express relationships between objects."

3.2 Data analysis

Discussion of the findings was preceded by a careful analysis of the sentences provided by the respondents. The analytical method adopted for this research is based on descriptive categories provided by Slobin (1979). These include: ways of thinking, processing constraints and discourse constraints. Each of these categories will be defined and illustrated in the sections that follow.

4. Psycholinguistic Processing Strategies

4.1 Ways of Thinking

Garnham (1985: 136) in a discussion on "sentential semantics", observes that Katz and Fodor (1993), proposed a semantic theory which suggests "that mental representations of word meanings are put together to produce text representations ... the meanings of sentences are assembled by a set of projection rules that amalgate sets of features."

The projection rules referred to in the preceding quotation are, in fact, ways in which the generator of a sentence uses mental images to construct a sentence that complies with the order in which these images are perceived. This theory is further articulated in an online article (2004: 1) in which the researcher aimed "to uncover some basic underlying cognition-based functional principles of word order in Mandarin Chinese by investigating certain specific syntactic phenomena". Ways of thinking are constraining factors that involve the speaker's perceptual processes. They are described as constraining factors because they control the grammatical or discourse structure of a sentence or utterance under the sub-headings described below.

4.1.1 The sensory-motor comparison

Westen (1996: 509) credits Piaget (1972) for explaining sensory motor perception as a central concept in children's development of knowledge. Sensory motor perception is defined as an initial stage of cognitive development in which "thinking (is) primarily characterised by action" (Westen op. cit.: G18).

This pre-linguistic phase of development is characterised by sensory – motor activity. The actions the child perceives and performs and the sequence in which he perceives the units that make up the total behavioural situation get internalised in a manner that will constrain the form of language subsequently used to verbalise those experiences. For instance, the child may perceive his mother holding a broom. The order in which the agent/doer of the action (the mother), the action she performs (holding) and the thing that suffers the experienced action or the patient (broom) are perceived by the child, do in fact, correspond to the syntactic order of the sentence used to represent the thought – 'Mother is holding a broom'. According to the sensory-motor-comparison theory, the syntactic order of the sentence is as it is because it should conform to the perceptual pattern in the speaker's mind. Shona, Ndebele and Setswana have examples of sentence structures that are governed by this psycho-syntactic word order principle. These can be illustrated as follows:

	Subject	Verb	Object
English	Mother	is holding	a broom
Shona	Amai	vakabata	mutsvairo
Ndebele	Umama	uphete	Umthanyelo
Setswana	Mme	o tshotse	lefeelo

One common feature among the sentences cited above is that the subject precedes the object. Slobin (op.: cit) provides psychological reasons why languages tend to restrict the positional occurrence of the subject and the object in certain sentences. Some psycholinguists argue that in the sensory-motor phase of development, action is perceived as flowing from the agent (subject) to the patient (object). The second reason is that in most cases, subjects, in the agentive sense, tend to be animate or human. They are, therefore, accorded greater emotional significance and the words which represent them qualify for first position in sentences. The other reason is that actions begin with intentions formulated in the actor's mind. When one describes an event, he puts himself in the position of the actor. This has the constraining effect that the subject should be mentioned first in a statement.

The examples given above suggest that the SVO grammatical structure is in a number of communicative situations, determined by the speaker's psychological processing of mental experiences and other related perceptions of the physical environment.

4.1.2 Perception of figures against their backgrounds

This strategy is an extension of the sensory-motor strategy. Studies in this area suggest that figures tend to stand out against their backgrounds. As a result, they are given greater prominence. This, in turn, influences the grammatical structure of the sentence. The following illustrate this point:

The book is on the table.

Bhuku riri patafura. (Shona)

Ibhuku lesi tafuleni. (Ndebele)

Buka e mo tafoleng. (Setswana)

These sentences illustrate the normal word order in declarative utterances. These are presumed to correspond to the mental processes of the speaker. It would not be communicatively acceptable if the propositions of the sentences were expressed as follows:

The table is under the book.

Tafura iri pasi pebhuku. (Shona)

Itafuleni iphansi kwebhuku. (Ndebele)

Tafole e kata tlase ga buka (Setswana)

Such expressions would fail to show the link between the way in which the speaker perceives the book against its background and the language used to convey the idea.

4.1.3 Use of metaphorical extensions

There are occasions when a speaker desires to express an idea in as vivid a manner as possible but fails to get from his available lexical repertoire, words which satisfy his communicative need. To make up for this apparent lexical gap, he can use what Slobin (op. cit.: p.65) calls "metaphorical extensions of concrete experience". Such language features call for the broadening of the meaning of words to express ideas that are semantically different to the normal or central meanings of the words used. Bloomfield (1977 p.149) discussed such metaphorical expressions calling them "transferred meanings". The following examples taken from English, Shona and Ndebele illustrate this point.

The word bird, in English, is used, literally, to mean a creature with two wings and usually able to fly (Hornby, 1995). In the sentence: 'She is a cunning bird:' the word is used metaphorically to mean, 'she is a deceitful young lady'. In Ndebele the word 'isithwathwa' refers to a whitish object but is sometimes used to mean – 'She is beautiful'. A similar expression in Shona uses the word 'nyenye' metaphorically. The literal meaning of the word is a 'young tender lamb'. The sentence, 'Inyenye yemusikana', would mean 'She is a pretty tender young girl'. These few examples show how words can be effectively used to express vividly, ideas in the speaker's mind.

4.1.4 Expressing complex ideas

Every language has linguistic devices that are used to express complex ideas: complex in the sense of multiple or many instances of an item or occurrences the speaker wishes to communicate. In English, complex or many ideas can be expressed by words that contain such plural markers as /-s/, /-es/, /-ies/ added to certain nouns. Words that conform to such morphological changes can be described as illustrative of a psycholinguistic theory that suggests that when the mind perceives many things or events, the language forms used to represent or communicate them become correspondingly complexified. The following examples illustrate this linguistic phenomenon.

cow – cows

box – boxes

baby – babies

A comparative study of Shona, Ndebele and Setswana plural forms shows similarities in the positions or lexical environments in which the plural markers are found. They are placed before certain nouns to function as prefixes. In English, corresponding plural markers are suffixed to nouns as shown in the table below:

Table: Comparison of plural markers

English		Shona		Ndebele		Setswana	
Sing.	Plu.	Sing.	Plu.	Sing.	Plu.	Sing.	Plu.
horse	horses	biza	mabiza	ibiza	amabhiza	pitse	dipitse
cow	cows	tsiru	matsiru	inkomo	izinkomo	kgomo	dikgomo
hut	huts	kamba	tudzimba	mdhlu	izindhlu	ntlwana	matlwana
egg	eggs	zai	mazai	iqanda	amaqanda	lee	mae
day	days	zuva	mazuva	iqanda	amaqanda	letsatsi	malatsi
leaf	leaves	shizha	mashizha	ilanga	amalanga	letlhare	matlhare

Whereas the preceding examples show similarities between English and the other three languages in that they all use affixes either as prefixes or suffixes, the examples below show that English also uses infixes as plural markers. The three indigenous languages do however use prefixes as plural markers for words that refer to the same ideas as English as shown in the table below.

English		Shona		Ndebele		Setswana	
Sing.	Plu.	Sing.	Plu.	Sing.	Plu.	Sing.	Plu.
herdsman	herdsmen	mufudzi	vafudzi	umelusi	abelusi	modisa	badisa
man	men	murume	varume	indoda	amadoda	monna	banna
woman	women	mukadzi	vakadzi	unafazi	abafazi	mosadi	basedi
child	children	mwana	vana	umntwana	abantwana	ngwana	bana
person	persons	munhu	vanhu	umunthu	abanthu	motho	batho

We notice from the examples given above that the four languages cited provide comparable instances of pluralisations. Although words that refer to identical objects or ideas may use different pluralisation techniques, most of these are common pluralisation strategies in these languages. The application of the strategies may vary from language to language but they constitute universal pluralisation rules in the languages. More important still, the examples given confirm the psycholinguistic concept that when users of a language conceive of objects as many, that is, if their way of thinking involves more than one object or many events, the language they use indicates morphological changes that correspond to the number of objects referred to.

5. Processing constraints

These are conceived as mental phenomena that compel a speaker to order or process sentential units in a way that reflects the way ideas are grouped in the mind. Westen (1996: 280) defines such grammatical structures saying they constitute "a system of rules for generating understandable and acceptable language utterances".

Sentence structures can be broken into constituent units (words) which exhibit a close relationship towards one or more of its neighbours in a sentence. Words that form such semantic or syntactic structures are, according to O'Grady et al. (1996) referred to as structural units or constituents.

As with other linguistic features discussed above, there are psychological reasons why such clusters occur. The ideas formulated in the speaker's mind exist in an ordered pattern which should be represented by an ordered word structure which reflects that of the mental construct. This is what Clark and Clark (1977: 545) meant when they quoted Vennemann's observations in which he said, "what belongs together mentally is placed together syntactically". When a language structure conforms to this psychological constraint, it constitutes an acceptable communicative utterance or sentence. The following sentences illustrate the occurrence of such constituent collocations in English, Shona and Ndebele.
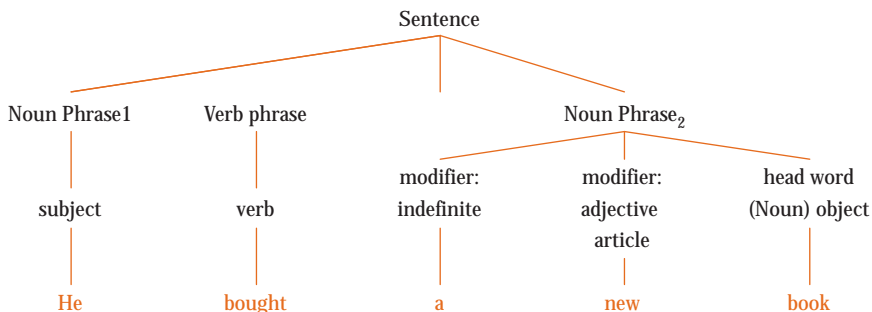
He bought a new book.

Akatenga bhuku idzva (Shona)

Utenge ibhuku elitsha (Ndebele)

The underlined phrases illustrate how, syntactically, certain words collocate or occupy adjacent positions in a sentence. Using tree diagrams, this fact can be illustrated as follows:

Sentence: He bought a new book

```
                              Sentence
              ┌──────────────────┼─────────────────────────────┐
       Noun Phrase1        Verb phrase                    Noun Phrase₂
              │                 │            ┌──────────────┼──────────────┐
           subject            verb       modifier:      modifier:      head word
                                         indefinite     adjective     (Noun) object
                                                         article
              │                 │            │              │              │
             He              bought          a             new           book
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An identical tree diagram can be drawn for the Shona, Ndebele and Setswana versions of the sentence.

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                              Sentence
              ┌──────────────────┼──────────────────┐
       Noun Phrase₁        Verb Phrase         Noun Phrase₂
              │                 │            ┌───────┴───────┐
           subject             verb        object        adjective
              │                 │            │              │
  (Shona)     A             katenga        bhuku          idzva
  (Ndebele)   U              tenge        ibhuku         elitsha
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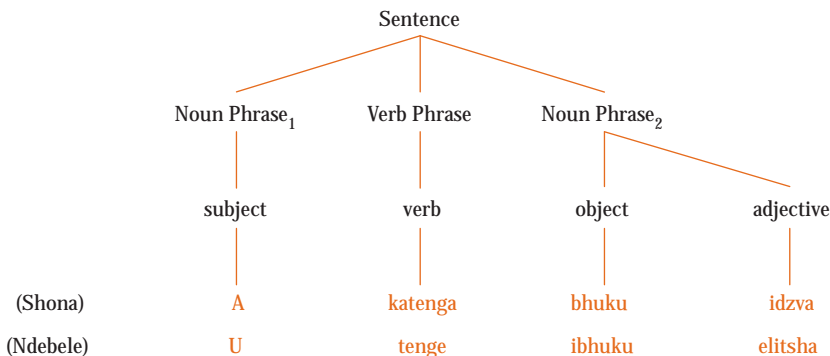
The second noun phrases in the sentences consist of words that collocate or group together because they have special grammatical relationships. The propositions of the words that form the Noun Phrases (NP) are linked in the speaker's mind. As a result, they are syntactically collocated. Clusters of ultimate constituents can be observed in a Noun Phrase Subject (NP subj.) a Verb Phrase (VP) and a Noun Phrase object (NP obj.) as in the following sentence.

Sentence: The new student can solve the two difficult problems.

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                                        Sentence
              ┌───────────────────────────┼───────────────────────────┐
          NP Subj.                        VP                        NP obj.
     ┌────────┼────────┐           ┌───────┴───────┐      ┌──────┬──────┬──────┐
 Modifier:  modifier:  head word  modifier:   head word  modifier: modifier: modifier: head word
 Definite   adjec-     noun       auxiliary   verb       definite  quanti-   adjective noun
 Article    tive                  verb                   article   fier
     │        │          │           │           │         │         │         │         │
    The      new      student       can        solve      the       two    difficult  problems
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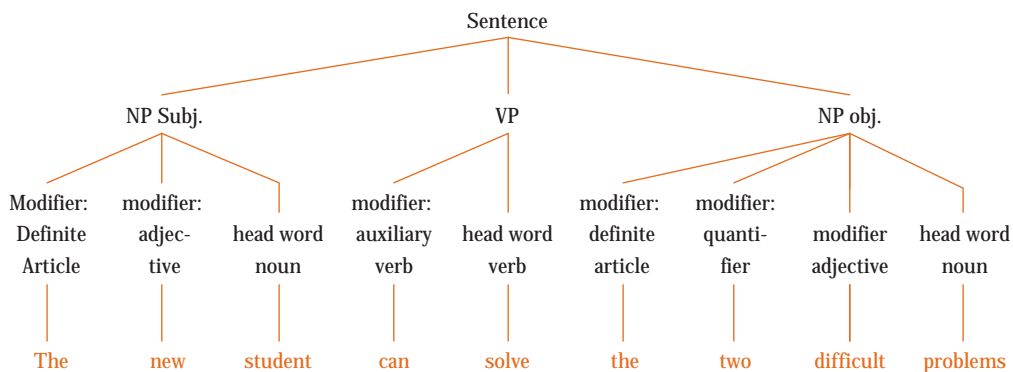
Each node below the sentence level indicates clusters of ultimate constituents that group together because of their special relationship. In this case, the head word, 'student' the verb, 'solve' and the object, 'problems' are flanked by their modifiers which are all pre-modifying.

6. Discourse Constraints

The requirements of conversation also determine the form of the language that speakers use. Such linguistic determinants can be grouped together under the heading discourse constraints. In a conversation, the addressor should guide the listener in order to make it easy for him to comprehend the message conveyed. There are various ways of achieving this, but one of the commonest ones include what linguists refer to as the end-focus linguistic device. (Givon, 1975 p. 76) describes this device as a principle of word-order in which "... the leftmost constituent is the more topical one and the rightmost constituent is the focus for new information". This is especially true of declarative sentences which, according to Clark and Clark, (op cit. p. 546) can be found in every language – "Every language has declarative sentences that express subject (S) verb (V) and Object (O), and although languages (like Latin) allow S, V, and O to occur freely in any order they all have a preferred, or normal order for these elements".

The end-focus theory suggests that the structure of a declarative sentence consists of two parts that conform to conversational requirements. The first is that what the listener knows already or has been told in the course of conversation comes first in a sentence. It is often expressed briefly or substituted by pronouns. It is topical in that it constitutes the topic of discussion or the idea that is central to what is being talked about. The second requirement is that new information is placed at the end of a sentence. This principle agrees with the belief that new information is easy to comprehend if it is based on or developed from what is familiar. Linguistically, this can be illustrated as follows:

John:	Do you see that man putting on a red hat?	1
Mary:	Yes. Who is he?	2
John:	He is the president of the United People's Republic of Urania.	3
Mary:	Really? ...	4

Utterance 3 contains both given and new information. 'He' is given information. At this stage of the conversation Mary knows what 'he' refers to, that is, the man putting on a red hat. But that the man is the president of Urania is new information to her.

This example shows that speakers generally comply with the end-focus discourse theory when they place given information at the beginning of a sentence and new information at the end. Psycholinguistically speaking, it can be said that the addressor, 'John', in the discourse exchange given above, prepares the listener, 'Mary', to create mental images and ideas that help her process the information conveyed in utterance 3. Reference to 'He', which is given information prepares Mary to receive the new information, that is, the pronoun, 'he', the topic of discussion refers to "president of the United People's Republic of Urania".

7. Conclusion

Specific conclusions

Firstly the researcher wanted to investigate if there is evidence of relationships between

psychological processing and grammatical/syntactic structures in the languages selected for this paper. An analysis of word and sentence translations show these relationships. Use of affixes in pluralisation, word orders in sentences generated from picture observations and constituent analyses of sentences from different languages show similarities which lead us to conclude that the common factors we observe in the structures have psycholinguistic bases.

Secondly, the study aimed to investigate if there are aspects of Universal Grammar between the languages compared. On the basis of the observations cited above, it can also be claimed that the languages selected for this research have numerous similarities and differences. These observations lead us to conclude that the similarities we observe are instances of what studies in Universal Grammar describe as linguistic universals. So, there is evidence of the acceptability of the notion of Universal Grammar.

General Conclusion

The importance of the study of the relationship between grammar and the psychological processing of language is that it helps teachers appreciate the link between language and thought. It can be claimed that if language structures are determined by the thought patterns of the speaker, his language reflects the way he perceives the world, that is, his psychological reality. It can also be claimed that some of the stylistic problems encountered by second language users of English are partly due to the fact that second language structures are determined by the speaker's repertoire of mental images and perceptions of relationships between these. An appreciation of this psycholinguistic phenomenon is expected of teachers of English as a second language since it helps them develop learner-based content and teaching strategies.

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APPENDICES

Sources of Pictures in Appendices.

Pictures in the appendices were selected from the books indicated below:

Arnold, U. A. Smith, C. B. Flood, J. Lapp, D. 1989. I Think I Can. N.Y. Macmillan Publishing Company.

Okiyo, F. and Ojwang, A. 1997. Heinneman Primary Science. HPS Heinneman, Kenya, Nairobi.

Richards, H. 1981. Junior English. Ginn and Company Ltd

APPENDIX A

Picture Interpretation (Write a sentence that describes what you see in each of the pictures below)
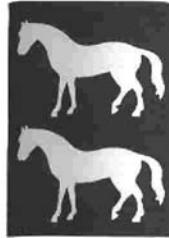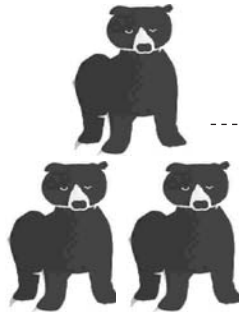

1.

2.

3.

4.

5.

1. --
2. --
3. --
4. --
5. --

APPENDIX B

Naming Objects in Mother Tongue (Give words used in your mother tongue to refer to objects or sets of objects given)

ONE   MORE THAN ONE

APPENDIX C

Word Translation

Translate the following words into your first language i.e. mothertongue.

1. cow _____	16. cows _____
2. horse _____	17. horses _____
3. hut _____	18. huts _____
4. egg _____	19. eggs _____
5. day _____	20. days _____
6. leaf _____	21. leaves _____
7. baby _____	22. babies _____
8. man _____	23. men _____
9. herdsman _____	24. herdsmen _____
10. woman _____	25. women _____
11. child _____	26. children _____
12. person _____	27. persons _____
13. broom _____	28. brooms _____
14. tin _____	29. tins _____
15. stone _____	30. stone _____

APPENDIX D

Sentence Translation

Translate the following sentences into your first language i.e. motherongue in the spaces provided.

1. Mother is holding a broom
2. The book is on the table
3. The new student can solve the two difficult problems.
4. He bought a new book.
5. She is a beautiful girl.

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