CHAPTER 2
LITERATURE REVIEW

2.1. INTRODUCTION

2.1.1. Scope of the chapter

The aims of this chapter are to discuss the characteristics of Blissymbols and CyberGlyphs and to compare the systems to each other. Different characteristics influencing the learnability of GSS will be discussed and recall and recognition of symbols as an indicator of learnability will be highlighted.

2.2. COMPARISON BETWEEN BLISSYMBOLS AND CYBERBLYPHS

There is a variety of GSS with different characteristics that influence the way in which they are learned, retained and used. Systems like PCS, PICSYMS, Rebus and Sigsyms have been researched and compared to one another to identify the influence of different features on the ease of learning in typical and disabled populations. This study focuses on two graphic symbol systems namely Blissymbolics and CyberGlyphs.

2.2.1. Blissymbolics

Charles K. Bliss created Bliss to function as an international means of communication for people of different languages (Wood, Storr & Reich, 1992) in order to surpass cultural barriers (Schlosser, 1997). The symbols have a geometric configuration and according to Wood *et al.*, 1992) is described as a semantically based, pictographic, ideographic symbol system, which is generative in nature. Therefore, the development of new vocabulary is possible by combining the 120 key symbols in various ways to form new concepts.

Several studies have focused on Bliss, its benefits and characteristics (Archer, 1977;

Luftig & Bersani, 1985a; Yovetich & Young, 1988; Fuller, 1988; Mizuko & Reichle, 1989; Alant, 1994; Schlosser, 1995; Carmeli & Shen, 1998; Hetzroni & Lloyd, 2000). For the purpose of this study a brief analysis of the characteristics influencing learnability will be discussed. The rules facilitating the expansion of the systems, types of symbols as well as advantages and disadvantages will be discussed.

2.2.1.1. Rules for expansion

Different rules exist to govern the generation of new symbols, which include rules for changes in shape, size, location, use of indicators, orientation or direction of symbols, differences in distance and pointers (See Table I).

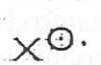
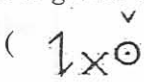
Table I: Rules for expansion of Blissymbols

RULE	EXAMPLE	
I: CHANGES IN SHAPE	cloth 	number
II: CHANGES IN SIZE	mouth 	sun 
III: LOCATION	earth 	sky
IV: INDICATORS (e.g. size or angle)	action indicator 	pointer 
V: ORIENTATION OR DIRECTION	mind 	container 
VI: DISTANCE	far 	near 
VII: POINTERS (A particular part of significant area can be identified)	stomach 	foot

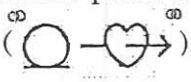
Archer (1977) mentions certain rules that facilitate the creation of various grammatical structures such as verb tense, plural, possessive, questions, and negative forms. Present tense is indicated by the action indicator situated above the verb () "walks". To indicate past tense, the action indicator is replaced with the appropriate past or future indicator () "walked"; () "will walk".

Symbol strategies exist to ensure more efficient use of the limited space available on a communication board:

1). *The opposite symbol* ( )

This symbol indicates the opposite of a given symbol when placed directly in front of a symbol () "dirty" becomes () "clean".

2). *The combination symbol* ()

If a symbol is not displayed on the communication board, the combination symbol enables the creation of new symbols. A number of symbols are contained between two combination symbols with the most important elements of the symbol placed first in symbol sequence. It is usually used for ideas or concepts that are not used on a regular basis and do not warrant a permanent place on the communication board. An example is the symbol for Valentine's Day ().

It is important that the symbols are represented according to scale, since small variations in size or position cause differences in meaning. When the symbols are combined for one concept, it is important to keep the symbols the same size that they would be when displayed individually () "page" () "day" () "month" can be combined as ( ) "calendar" just by spacing the symbols closer together. The symbols must also be drawn in relation to an imaginary earth- and skyline.

2.2.1.2. Types of Blissymbols

Blissymbols can be classified into four different types, namely pictographs, ideographs, arbitrary symbols and international symbols.

Table II: Different types of Blissymbols

SYMBOL TYPE	EXAMPLE	
I: PICTOGRAPH A visual relationship exists between the symbol and the referent	wheel 	house 
II: IDEOGRAPH The form may represent the concept indirectly. After an explanation of the symbol is given, it is easy to deduce the meaning of the symbol.	cloth 	face 
III: ARBITRARY SYMBOL No resemblance exists between the symbol and the referent	the 	it
IV: INTERNATIONAL SYMBOLS These symbols have virtually universal meanings	two 2	up 

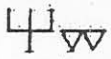
Some symbols can be classified as either pictographic or ideographic. They are called duel classification symbols (Musselwhite & St. Louis, 1988). Examples of these symbols are:

Man person


2.2.1.3. Symbol composition

Blissymbols can be configured as either simple or compound symbols (Musslewhite & St. Louis, 1988). A simple symbol involves a symbol appearing alone to represent a concept, whereas a compound symbol consists of more than one key symbol combined to form a concept. According to Schlosser (1995) compound symbols can either be sequenced or superimposed, as depicted in Table III.

Table III: Means of Blissymbol composition

COMPOSITION	EXAMPLES	
I: SIMPLE	teeth 	man 
II: COMPOUND SEQUENCED	toothbrush 	policeman 
III: COMPOUND SUPERIMPOSED	love 	Coke 

2.2.1.4. Advantages and disadvantages

+ Bliss is a generative system where a small number of symbols (120) can be used to create new words (Burroughs, Albritton, Eaton & Montague, 1990).
+ A definite network of support exists defining rules and new symbols. The Blissymbol Communication International (BCI) is the central resource service for Blissymbolics. It offers training and test material and is responsible for the accuracy and approval of new symbols. Certain literature exists to support tips for teaching, such as *Handbook of Blissymbolics* (Silverman, McNaughton & Kates, 1978) and the *Blissymbol Reference Guide*, section II, Finding Symbols by Meaning (Wood *et al.*, 1992). *Picture your Blissymbols* (McNaughton & Warrick, 1984) was developed to facilitate learning of Blissymbols by enhancing the Blissymbols to look like their referents (Fuller *et al.*, 1997).

+ The system is semantically based which means that it is meaning-based rather than phonetically based (Schlosser, 1994).
+ Bliss can help bridge the gap between symbols and literacy – the way in which Bliss was constructed is consistent with the methods needed for reading and writing (McNaughton, 1993). The written word always accompanies the symbol, which might lead to the development of a sight vocabulary. Even though Bliss maps language at a word level and not the phonemic level (as is the case with traditional orthography), the awareness that print consists of words, letters and sounds may be facilitated (Bishop, Rankin & Mirenda, 1994).
– A system like Bliss requires a high level of cognitive functioning to perform the analysis and synthesis needed to encode and decode the messages (Clark, 1981; Burroughs *et al.*, 1990).
– Bliss is less iconic than most other GSS, such as PCS, Picsyms and Rebus (Mirenda & Locke, 1989; Bloomberg, Karlan & Lloyd, 1990).

2.2.2. CyberGlyphs

This semantically based system was developed in the early 1960s (Zavalani, 1995). The purpose for the development was similar to that of Bliss – to serve as a universal communication system. The potential for use with individuals with communication disabilities was realised. The system consists mainly of pictographs with a smaller proportion of ideographs and arbitrary symbols (Fuller *et al.*, 1997). The syntax of English is used for the syntax of CyberGlyphs and the symbols are intended to be hand drawn. The way in which this system compares to Bliss is in the fact that it is semantically based, as well as generative. However, Bliss consists of basic elements that can be combined to form new concepts. CyberGlyphs (even though there are basic elements) also use pictographic representations. The CyberGlyph system is therefore inclined to be more pictographic than Bliss as the user can decide to incorporate more hand-drawn pictographic symbols when creating new symbols.

2.2.2.1. Rules for expansion

There are five basic rules governing the production and use of new symbols. The several rules as described by Zavalani (1995) are as follows:

Table IV: Rules for CyberGlyph production

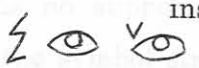
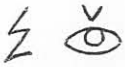
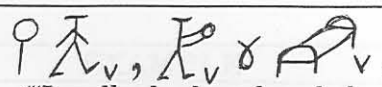
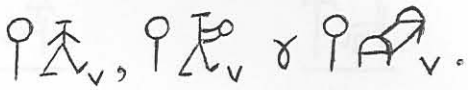
RULE	EXAMPLES
Rule I The symbol > is an action indicator. When it precedes a noun the compound symbol will become a verb. By reversing the direction of the arrow, the meaning of the verb is reversed.	Noun:  ("aeroplane")  ("to fly")  ("to return by plane")
Rule II This symbol  signifies location. When placed on top of a symbol representing a vehicle or vessel it denotes the location where the vehicle is usually boarded or parked. When placed on top of a symbol other than that of a vehicle or vessel, it indicates the public location where services or facilities are present.	Vehicle:  ("ship")  ("harbour")  ("church")
Rule III When a symbol serves simultaneously as a subject and as a verb, the action indicator goes to the right side of the sign that is being conjugated. Although not mentioned as a rule, the location of the action indicator in relation to the symbol depicts the tense of the sentence	 ("the eye sees") instead of  ("the eye sees")  ("the eye saw")  ("the eye will see")

Table IV: Continued

Rule IV With one single-symbol subject, more than one verb can be conjugated without repeating the subject for every verb.	 ("I walked, played and slept") instead of  ("I walked, I played, and I slept")
Rule V When the symbol for person is followed by an apostrophe, it reads "person's".	 ("person")  (person's")

It is interesting that, as opposed to Blissymbols, the rules are more focused on the grammatical structure and how to construct new sentences than on the creation of the individual symbols. Because the CyberGlyph system uses the semantic structure of the English language, these rules cannot be generalized to individuals who do not speak English. Adaptations would be needed to accommodate the specific language (Zavalani, 1995).

However, throughout his book, Zavalani (1995) refers to the ways in which he created the symbols and the logic he followed. When developing new symbols, one can follow these directions provided. Unfortunately, there is no support structure as yet to evaluate the new symbols (like the BCI). Some of the symbol strategies are discussed below in Table V.

Table V: Symbol formation of CyberGlyphs

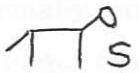
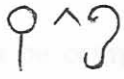
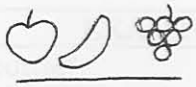
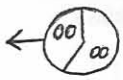
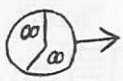
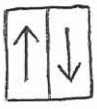
SYMBOL FORMATION	EXAMPLE
Subject If a referent contains more than one subject in the symbol, the subject being referred to has a more complete figure than the second figure that contributes to the meaning of the referent.	"student"  "teacher" 
Plural: Whenever a plural form of a noun is depicted, an "S" is added	 "dog" becomes  "dogs"
Possessive form: The symbol for a pronoun is used with the addition of a symbol representing a closed hand, indicating something is being possessed.	 "me" becomes  "my"
Interrogative form: A symbol resembling a question mark is used to depict the interrogative form. The symbol is adapted to form sentences in the present, past and future tenses, as well as the conditional form.	 "do?"  "did?"  "will?"  "would?"
Intransitive verbs: These verbs are changed by the positioning of the action indicator close to the pronoun. The position differs as the tense changes. This is also the case when the action indicator is positioned close to a verb	 "I am"  "I was"  "I hear"  "I heard"
Negative form: By reversing the direction of the action indicator, the meaning of the verb is reversed.	 "I am not"  "I was not"  "I do not hear"

Table V: Continued

Combination sign: When certain nouns are combined to form one concept, they are joined by underlining all the relevant symbols.	 "fruit"
Orientation/direction: The direction in which an arrow, for example, is pointing, can determine the meaning	"before"  "after" 

Similar to Bliss, CyberGlyph symbols can be divided into different symbol types, namely pictographs, ideographs, abstract symbols and internationally accepted symbols as depicted in Table VI. The number of pictographs is much larger than the other symbol types.

Table VI: Different symbol types

SYMBOL TYPE	EXAMPLE
I: Pictographs: These symbols easily depict the referent. The meaning can quickly be derived by looking at the symbol.	"mouth"  "eyeglasses" 
II: IDEOGRAPH The form may represent the concept indirectly. After an explanation of the symbol is given, it is easy to deduce the meaning of the symbol	"kitchen"  "elevator" 
III: ARBITRARY SYMBOL There is no resemblance between the symbol and the referent	"the"  "if" 
IV: INTERNATIONAL SYMBOLS These symbols are virtually internationally accepted and used.	"plus" + "eight" VIII

The symbol composition of CyberGlyphs can be compared to Bliss, because the Glyph symbols can be judged as being simple or compound symbols, as represented in Table VII.

Table VII: Symbol composition of CyberGlyphs

SYMBOL COMPOSITION	EXAMPLES
I: SIMPLE	"bottle"  "I" 
II: COMPOUND SEQUENCED	"escalator"  "read" 
III: COMPOUND SUPERIMPOSED	"classroom"  "tomorrow" 

2.2.2.2. Advantages and disadvantages

+ The majority of the symbols are pictographic (Fuller *et al.*, 1997) and therefore easy to learn
+ Symbols can be hand-drawn
+ The system can be expanded via several rules and logical directions provided
+ The system is semantically based which means that it is meaning-based and not phonetically based.
– English syntactic structure is used
– There is no support structure of the system (like the BCI), which can regulate and approve new symbols.

There are several aspects of Blissymbols and CyberGlyphs that are comparable in terms of the way in which the system can be expanded, but many aspects are different. When presented with different symbol systems, one needs to gain understanding of the differences between the systems to facilitate the selection of the most appropriate system for a particular client. It is therefore necessary to consider the different characteristics that might influence the learnability and recognition of these symbol systems.

2.3. CHARACTERISTICS INFLUENCING THE LEARNABILITY OF GRAPHIC SYMBOL SYSTEMS

Various studies have focused on the variables that might influence the learnability and retention of AAC symbols such as iconicity and complexity (Luftig & Bersani, 1985a; Fuller & Lloyd, 1987; Fuller, 1997). These two symbol variants will be examined, as well as other variables influencing the learnability and recognition of graphic symbol systems. Other variables will include semantic transparency/ translucency, teaching method, perceptual distinctness, size of the symbols, level of abstraction, degree of ambiguity, number of messages encoded, differences in word categories as well as cultural factors.

2.3.1. Iconicity

The two variables, iconicity and complexity, are the most widely researched characteristics of graphic symbol systems. Iconicity is a general term referring to the way in which a symbol represents its referent, therefore how easily the relationship between the symbol and the referent can be guessed (Fuller, 1997; Fuller & Lloyd, 1997). Iconicity includes transparency and translucency (Fuller & Lloyd, 1997) where transparency is a more specific term than iconicity. If the meaning of a symbol is easily guessed in the absence of the referent, the symbol is highly transparent (Fuller, 1997). An example of a transparent Blissymbol is "house" ().

The iconicity hypothesis, postulated by Fristoe and Lloyd (1979), states that the iconicity of some AAC symbols may assist the learning and recall or recognition of symbol-referent associations. Research has demonstrated that learning of GSS is facilitated by iconicity (Clark, 1981; Luftig & Bersani, 1985; Ecklund & Reichle, 1987), since the strong visual relationships of the symbols to their referents make them easier to acquire (or learn) and retain (Mizuko, 1987; Fuller & Stratton, 1991; Fuller & Lloyd, 1997).

Translucency refers to the way in which people can grasp the meaning of a symbol once the referent is known (Luftig & Bersani, 1985a). If the referent is known, and it is still hard to derive the meaning of the symbol, the symbol is described as opaque (Fuller &

Lloyd, 1997). An example of an opaque Blissymbol is "the" (↗). The symbol does not give any indication of the meaning and because the visual relationship between symbol and referent is weak, it will be more difficult to learn and remember the symbol. Bliss, being low in transparency, would then be more difficult to acquire than more iconic sets or systems, e.g. PCS, Rebus and Picsyms.

Several authors have compared the iconicity of Bliss to that of other AAC systems. A number of the authors and their findings are listed in Table VIII.

Table VIII: The iconicity or learnability of Blissymbols compared to other AAC sets/systems

AUTHOR	BLISS COMPARED TO:	POPULATION	FINDINGS
Clark, (1981)	Traditional orthography (TO), Rebus, Carrier symbols	Non-disabled pre-schoolers	Bliss is easier to learn than Carrier symbols and TO. Bliss is more difficult to learn than Rebus
Hurlbut, Iwata & Green, (1982)	Rebus	Severely disabled adolescents	Rebus easier to acquire than Bliss
Goossens, (1983)	Rebus	Moderately retarded adolescents and adults	Rebus easier to learn than Bliss
Musselwhite & Ruscello, (1984)	Rebus symbols & Picture Symbols (PICSYMS)	Non-disabled individuals	Other GSS more transparent than Bliss
Ecklund & Reichle, (1987)	Rebus	Non-disabled individuals	Easier to acquire and retain than Bliss
Mizuko, (1987)	Picture Communication Symbols (PCS) & PICSYMS	Non-disabled pre-schoolers	Easier to learn than Bliss; Bliss less transparent than PCS & PICSYMS
Luftig & Bersani (1988)	American Sign Language	Undergraduate students	Blissymbols were learned faster than the manual signs
Mirenda & Locke, (1989)	Objects, photographs, PCS, PICSYMS, Rebus, Self-Talk. TO	Non-speaking persons with intellectual disabilities	Bliss & TO less transparent than PCS & PICSYMS and more difficult to recognise

Table VIII: Continued

Burroughs *et al.*, (1990)	Rebus	Language delayed preschool children	Initially more iconic Rebus symbols identified than ideographic Blissymbols.
Bloomberg *et al.*, (1990)	PCS, PIC symbols, PICSYMS & Rebus	Non-disabled undergraduate college students	Bliss the least translucent of all

Compared to most GSS, Bliss seems to be less transparent, more difficult to acquire (or learn) and to retain. The only exceptions were Carrier symbols and traditional orthography.

2.3.2. Semantic transparency/translucency

Carmeli and Shen (1998) claim that it is too limiting to focus on the visual relationship of a symbol and its referent alone. In addition to iconicity, the semantic relationship between symbols and their referents should be investigated. This is specifically relevant to Blissymbols, as different semantic components are combined to form new concepts. Because CyberGlyphs are also semantically based (Fuller *et al.*, 1997) the same principle applies to this GSS.

Fuller *et al.* (1997) identify two types of transparency/translucency. The first is visual transparency/translucency, which is based on iconicity of symbol components. The second is semantic transparency/translucency. The latter term is defined in terms of how the composite meaning of symbol components and the meaning of the symbol referent are in a relationship of agreement. For example, semantic transparency/ translucency refers to the agreement between the two symbol components "eye" and "ear" and their referent "news" in Blissymbols. To what extent then can the meaning of the referent be deduced by examining the combination of the different symbol components.

Carmeli and Shen (1998) state that the joint term "transparency/translucency" is used when focusing on the identical function as representing degrees of agreement. With

guessability vs. ratings of agreement, the terms "transparency" or "translucency" are used respectively. Symbol transparency is defined as semantic guessability, and semantic translucency is defined as an individual's rating of the degree of semantic agreement between the meaning of symbol components and the referent.

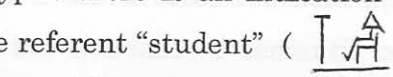
Previous studies have not focused on semantic transparency/translucency as such. Clinical implementations and understanding Blissymbol representational aspects have been affected by overlooking semantic transparency/translucency. It is therefore possible that basic constructs within Blissymbols are being overlooked, which could affect learnability. Carmeli and Shen (1995) state that it is important to investigate both visual and semantic transparency/translucency and their distinct contributions towards learnability.

The learnability of a symbol is therefore dependent on the visual relationship between the symbol and the referent, but also on the knowledge of the different components that make up the symbol. Also, the learnability will be influenced by the degree of agreement between the meaning of the components and the referent.

There are factors affecting semantic transparency/translucency of which **prototypicality of the referent** is most notable. This plays a role when the composite meaning of symbol components can include several referents. A prototypical referent will be the one that is the typical or best example of its category. If the referent guessed is the "target referent", then the symbol can be classified as high in transparency/ translucency. In the example of "aeroplane" in Bliss, the symbol components "bird" ( ) and "wheel" ( ) could depict referents like "aeroplane", "helicopter" or even a "microlite aircraft". It can be assumed that "aeroplane" would be the most prototypical object of flying transport, therefore it an be hypothesised that there would be a tendency to guess "aeroplane" with the conceptual combination of "bird" and "wheel".

A second factor affecting semantic transparency/translucency is the **uniqueness of the referent**. This occurs when a symbol includes a distinctive feature of a referent. The example used by Carmeli and Shen is that the hump of a camel is its distinctive feature, and therefore it is assumed that people will easily guess that "animal" + "hump" =

camel. If all symbols were unique and no ambiguity existed, a symbol system would be high in semantic transparency/translucency. However, prototypicality is necessary to economise the number of symbol components.

The third factor is **thematic interpretation**. Thematic relationships such as agent, recipient, location, etc. can play a role in the processing of symbols. For example the referent "mother" contains the symbols "woman" and "protection". It is difficult to determine if the "woman" is the agent or the recipient of the "protection". This can result in ambiguous thematic interpretation, especially in a system like Bliss where many of the symbols contain isolated component combinations, which lack explicit thematic relationships. In Glyphs there is an indication where the recipient/agent is involved. In the example of the referent "student" (), the symbol indicating the learner has a more complete figure. The referent "teacher" has an incomplete figure with a short line indicating the head. This indicates that the emphasis of the symbol is on the complete figure, namely the one receiving the instruction. If the symbol was "teacher" () the significant part of the symbol (namely the teacher) would have more detail. It can therefore be assumed that thematic ambiguity reduces semantic transparency/ translucency where symbols lack explicit thematic interpretation.

It is important to keep in mind that the learning of a system is a gradual process. Some people may find it difficult to learn symbols because of the lack of uniqueness or lack of specific features to accurately identify a referent. There are many other symbol sets and systems that can be used as a stepping stone, or in conjunction with a more challenging system like Bliss. Spoken language itself entails using primarily arbitrary symbols, which require an extensive learning period.

2.3.3. Complexity

Another variable that influences learnability is complexity. Complexity of a symbol is dependent on the amount of information contained in a symbol (Fuller *et al.*, 1997). In their study of perceivable complexity of graphic symbols, Fuller and Lloyd (1987) found that the degree of complexity could be predicted by the number of physical strokes necessary to depict a given symbol, or by the number of semantic elements included in a

specific symbol. It was also found that semantic elements (component complexity) and the number of lines of the symbol (visual complexity) are the best predictors of symbol complexity.

Component complexity entails the number of concepts, symbols or components that contribute to the representation of a given symbol (Luftig & Bersani, 1985a). The number of elements or components that are combined to create new meanings has an influence on learnability. The higher the number of elements or components (information-carrying parts) of the symbol, the more information there is to process, learn and understand, therefore the more complex the symbol. According to Luftig and Bersani (1985a), transparency has an inverted relationship with component complexity. It can be assumed that with the increase of semantic components in a symbol, the perceivable complexity of the symbol is increased and simultaneously the transparency is decreased. This puts a greater demand on cognitive processing of the symbol. It is stated by Clark (1981) that a higher level of intellectual functioning is required for the analysis and synthesis of compound Blissymbols than for individual iconic symbols. The complex symbol would be more difficult to guess because of its higher semantic complexity, which might be confusing for the user because of the large amount of visual stimuli. However, Luftig and Bersani (1985a) state that complexity may initially confuse the learner, but as the symbols become more familiar, and the learner links the symbols with a set of responses, the effects of complexity lessen. It can be argued that more semantic information might make it easier for someone to deduce the meaning of a symbol because there are more visual clues from which the meaning of the symbol can be derived, e.g. the Blissymbol "elephant": (). This could mean that visual complexity is not necessarily inverted to transparency.

The number of strokes (visual complexity) can be used as a way to define complexity, although not all GSS are constructed by semantic elements. It can be argued that the higher the visual complexity, the more complicated the symbol and the more difficult to learn and retain. Low-complexity symbols might not have enough visual clues for the meaning to be derived from the symbol alone. An example is where a single line represents the arbitrary Blissymbol "a" (). It is low in visual complexity but the

concept is abstract. Additional information of a more complex symbol could facilitate the learning or recall process when iconicity cannot be relied on (Lloyd & Karlan, 1994).

The interrelation of complexity and iconicity is further illustrated in a study by Alant (1994) on the use of Blissymbols as a first step into literacy with four children with Down's syndrome. The results indicated that the children identified a number of symbols incorrectly as the transparency of the symbols and the meaning of the concept influenced their responses. Some symbols were incorrectly selected because they presented with more visual information, e.g. "jump"() was substituted with "grasshopper" () because the latter has a much more descriptive sign to indicate jumping. There were semantic similarities between the concepts. Alant (1994) states that complexity, iconicity, time exposure and the teaching strategy should all be considered when determining the responses of subjects to the learning of symbol systems.

2.3.4. Teaching method

Another factor that may influence the learning of GSS is the method of teaching (Shepherd & Haaf, 1995). One can distinguish between the analytical approach (or diagnostic teaching approach) and the global approach. The analytical teaching method requires that every individual element in a complex symbol be explained. The global approach entails a symbol being taught by paired association. The symbol is taught as a whole, without referring to the individual elements. An extension of the analytical method is to incorporate symbol explanations within a story-telling context (Schlosser & Lloyd, 1993). Shepherd and Haaf (1995) found that subjects who were trained in the different symbol elements reached their training goal quicker than the ones trained via paired association. These authors also noted that age differences had an influence on the learning of symbols via the training of different symbol elements. The 12-year-old children found it easier to learn the symbols than the 6-year-olds. When trained by paired association, the two age groups performed similarly. In the study of Schlosser (1995) it was found that combining the symbol explanations with a story-telling context produced better retention of symbols than with the paired association method.

successful than the other. Someone who has difficulty with visual perception and distinguishing between small parts may have more success with a method where the individual parts are not explained individually, but the symbol as a whole is taught. A person with the ability to logically analyse a symbol might have more success with the analytical method.

When teaching Blissymbols (or a similar symbol system) one should consider implementing the suggested teaching guidelines (Blissymbolics Communication Institute, 1985). It includes teaching Bliss within a semantic structure (meaning-based context) as well as the explanation of individual elements before introducing these elements within a compound symbol.

2.3.5. Other characteristics influencing learnability

Several more characteristics influencing learnability of symbol systems have been described by Fuller *et al.* (1997), namely perceptual distinctness, size, level of abstraction, degree of ambiguity, and the number of messages that can be encoded by an individual.

- **Perceptual distinctness** of symbols entails the obvious differences between symbols in the same group. Many AAC systems have similar-looking symbols, depicting related concepts, or depicting polar opposites. Take the Blissymbols "flower" () and "plant" ( ); "hot () and "cold" ( ) for instance. These minimal pairs are very similar with only slight differences. The absence of high visual distinctness may cause confusion for some people when learning a new GSS. In the case of Bliss, it might be easier for an individual to learn the more distinct symbols for opposites, e.g. "hot" ( ) and "cold" ( ) rather than using the symbol indicating the opposite meaning ( ). This concept might be related to the prototypicality and uniqueness of referent mentioned by Carmeli and Shen (1998) under point 2.3.2.

- **Size** is an important factor, because the symbols should be visible to the user as well as the person with whom he is communicating. If the size is too small, the AAC user

might not be able to access or visually select the symbols. The size also influences the number of symbols that can be placed on a communication board. The number of symbols put on the board might not be appropriate for the particular person's processing ability. Too few symbols could cause frustration for the user by limiting his communication options.

- The **level of abstraction** refers to the amount of detail present in the given symbol. The more detail presented, the lower the level of abstraction. A colour photograph of an object would be easier to learn than a line drawing of the same object, which in turn would be easier to learn than an abstract symbol. The symbol set/system should be selected according to the individual's ability to cope with a certain level of abstraction. One can start on a low level of abstraction and move gradually to a higher level.

- The **degree of ambiguity** refers to the situation when one symbol represents more than one meaning. If more than one concept is represented by one symbol it may cause confusion, especially for the person with cognitive impairment. This can be linked to what Carmeli and Shen (1998) called prototypicality of the referent. Degree of ambiguity can be illustrated in the case of Bliss where (◯) represents "sun" and (O) represents "mouth", (and only the size of the symbol differs). However, the difference in size of the symbols can also be seen as a matter of low perceptual distinctness of these symbols.

- The **number of messages** that can be **encoded** by an individual within a specific AAC system refers to the provision that the system makes for forming new concepts with the symbols in the set/system. The presence of rules for expansion or logical symbol-forming strategies makes provision for this (as is found in Bliss and Glyphs). If a limited number of symbols are present in a set, a limited number of new concepts can be formed.

2.3.6. Word categories

An interesting question is whether specific word categories within a GSS are easier to learn than other word categories (e.g. are nouns easier to learn than prepositions) and to what extent will iconicity play a role. According to Mizuko (1987) there is limited evidence to indicate that translucency ratings will differ across different word categories in different representational symbol systems. In a study by Bloomberg (in Mizuko, 1987), nouns were found to be the most translucent word category when investigated across five different GSS. For normal word acquisition in children, the pattern also indicates that nouns (and secondly verbs) are easier to acquire than modifiers. Nouns tend to be more concrete and are thus mostly represented by more pictographic symbols and should be easier to acquire than other word categories. It may be safe to assume that the higher the level of transparency of the word category, the easier it will be to learn and recognised.

It has been difficult to generalise the findings regarding word categories, as the studies did not specify the proportions of nouns, verbs, etc. in the cross-system investigations (Mizuko, 1987). The author found (when using nouns, verbs and descriptors in his study) that scores for Picsyms and PCS were similar for nouns, but Bliss scored lower regardless of the category. PCS was more transparent than Picsyms for verbs and descriptors.

2.3.7. Cultural factors

Culture can be defined as the sum total of beliefs, values, traditions, behaviours and communication patterns that members of a community share. These aspects are learned as a function of their social membership (Saville-Troike, 1989). Culture permeates every aspect of a person's being and it will influence the whole process of AAC intervention and not only the learnability and retention of the system. The initial contact with the client and the family, the assessment and all areas of intervention must be conducted with the knowledge that services will need to be individualised (Soto *et al.*, 1997).

The service provider must therefore be careful with the select ion of the initial lexicon, as indicated by Nigam (1999) on his discussion on the development and cultural validation of lexicon for Asian-Indian individuals. A failure at the initial stages of intervention will decrease the effectiveness of the clinical services (Soto *et al.*, 1997).

Culture influences the patterns of communication, the conveying of messages and the comprehension of information (Hetzroni & Harris, 1996) and might therefore influence the learnability of an AAC system. The language structure, syntax and tone differ within cultures and should therefore be the focus of the professional working with the client to ensure that the person's functional skills are enhanced within the specific environment (Light, 1988). GSS should make provision for the different ways of behaving and thinking in a particular culture for it to be an effective, culturally appropriate communication tool.

Stephenson and Linfoot (1996) state that the resemblance of pictures to objects is dependent on the experience the subject has with pictures as a form of representation. In a culture inexperienced with pictures, this matching skill may not be introduced until school-going age. In teaching an AAC system to a child from a different cultural background one should keep in mind that recognising pictures or symbols and using them for different purposes are independent accomplishments and learned skills, and should not be thought of as universal association between the picture or symbol and the referent.

Even when these skills are mastered, some symbols within a system might not be culturally appropriate and therefore not recognised. Alternative symbols should then be created to replace the inappropriate symbols. This requires that the professional involved in teaching the new symbol system be sensitive to the cultural background and experience of the AAC user. It is particularly important that the clinician knows his/her own culture, as well as having a knowledge about factors that might influence interaction between him/herself and the persons receiving intervention and their families (Hetzroni & Harris, 1996; Soto *et al.*, 1997). This awareness will enable the clinician to understand his/her own cultural assumptions that could negatively affect service provision.

The appropriacy of symbols can be addressed by investigating the visual relationship between the symbol and the referent. A symbol that represents a certain referent in Western society does not necessarily represent the referent accurately in a developing country. An example would be "food" in CyberGlyphs (). In a rural African culture, a hamburger and ice cream are not representative of the food that they are familiar with. The same can be said for "doctor" in CyberGlyphs (). Again, in a rural setting the traditional healers do not have stethoscopes and so the association would not be apparent. These cultural differences influence the uniqueness of the referent referred to by Carmeli and Shen (1998). It can be argued that the higher the level of abstraction of a symbol, the more the cultural impact might be minimized, since the more abstract the concept portrayed, the less the visual resemblance will influence the recognition of the symbol. This is also illustrated in the study by Nigam(1999) where it was found that particularly symbols in the noun category of PCS were not culturally and socially appropriate. Nouns are generally more pictographic than pronouns or prepositions, which are more abstract.

In dealing with generative graphic symbol systems (like Bliss or Glyphs), new symbols could be developed to be culturally appropriate, should the need arise (Wood, *et al.*, 1992).

2.4. RECALL AND RECOGNITION OF SYMBOLS AS INDICATORS OF LEARNABILITY

Recall and retention are two ways of determining the effective learning of information, and in this instance, of GSS.

2.4.1. The importance of comparing the learnability and recognition of different GSS

The knowledge of the ease of learning and recognition of a GSS is valuable in the selection of a GSS to avoid trying to teach a system that is too complicated (Clark, 1981). According to this author, valuable time is often wasted in trying to teach a system that

is too taxing on memory or processing abilities, when a less complicated, more iconic system would have accomplished the desired results. Several authors have cited the ease of learning as an important factor when choosing a GSS (Mizuko, 1987; Burroughs *et al.*, 1990). Burroughs *et al.* (1990) state that the comparisons of different symbol systems (especially the ease of acquisition, as it is called by the authors) can provide important information on system assignment criteria and in intervention programming.

2.4.2. Learning and recognition

According to Schlosser (1995) there are three aspects to take into account when evaluating the efficacy of Blissymbol learning. These include the learning (or acquisition); retention; and generalisation of the symbols. Blissymbol learning can be described as a demonstrated cause-and-effect relationship between the teaching method used and the result obtained. This implies that a percentage is calculated of correct responses obtained by pairing a symbol and referent. Retention is defined as the percentage of correct responses retained after the teaching sessions. The success of the information-encoding process will thus be determined as well as the degree to which it stays in memory (Light & Lindsay, 1991). These authors state that there are two basic procedures by which memory can be tested: recall and recognition. Recall entails an individual learning information and reconstructing it later. Recognition means that the person does not have to recall or remember what he has learned, but that he merely recognises it when presented with the information at a later date. It can be tested by using a "yes/no" response where the subject is presented with the items one at a time and has to say whether or not the item was present in the original sample. With the "forced-choice" procedure, the subject is presented with the target item but also with "distracters". The subject then has to select the correct item from the set, therefore making a forced choice. With the "yes/no" procedure no distracters were presented.

Recall involves two stages, namely, reconstructing the originally encoded information from the information given (recalling it from memory), and then deciding whether the reconstructed item is the correct one. The procedure can fail at any one of these stages. With recognition, the first stage of recalling the information is eliminated as the items are presented to the subject.

According to authors Light and Lindsay (1991), recognition memory is usually better than recall. This means that a person using an AAC system where the symbols are presented on a communication board does not have to make use of recall memory skills. The AAC user only needs to recognise the desired symbol from a group of symbols to communicate. This study will focus on symbol recognition.

Schlosser (1995) defines generalisation as the demonstrated cause-and-effect relationship between the teaching method and the way in which new untrained symbols can be acquired, or the use of acquired symbols for other expressive tasks.

This particular study will only look into the learning and retention of symbols to investigate the way in which these systems are recognised and remembered, and not the way in which the learners use them. Focus is therefore on the accuracy with which the subjects visually recognise the symbols as a first step in comparing the different systems.

2.5. SUMMARY

It is clear from the discussion of Blissymbols and CyberGlyphs that there are many factors to consider when selecting a particular system for a potential AAC user. A detailed discussion of Bliss and Glyphs was presented in this chapter. Some factors to consider are the characteristics influencing the learnability and recognition of these symbol systems. These characteristics were discussed as well as the concepts recognition and recall as indicators of the learnability of GSS.