

TRANSLUCENCY AND LEARNABILITY OF BLISSYMBOLS

Translucency and Learnability of Blissymbols in Setswana-speaking Children: An Exploration

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Abstract

Although the importance of iconicity in the learning of symbols has been widely acknowledged, there have been few systematic investigations into the influence of culture on the ratings of symbol iconicity. The purposes of this study were two-fold: to determine (a) the translucency ratings of specific Blissymbols as rated by 6- to 7-year-old Setswana-speaking children (one of South Africa's official 11 languages); and (b) whether the ratings changed after second and third exposures in order to determine the learnability of these symbols. This study is partially based on the study by Quist et al. (1998), which utilized Dutch and American participants. Thirty-four Setswana children were exposed to 93 selected Blissymbols. A 3-point semantic differential scale consisting of three faces accompanied each Blissymbol, without the written gloss. This procedure was repeated over a period of 3 days. The results indicated that the majority of Blissymbols were rated as having high translucency ratings. The research further demonstrated significant differences in translucency ratings between the first and subsequent exposures, suggesting learning of the symbols. The comparison between the results of the current study and the results reported in the Quist et al. study, reveal that the translucency ratings of the majority of the selected Blissymbols ranged from moderate to high for all three studies, but that the distribution of symbols across the ratings appears to be different.

Translucency and Learnability of Blissymbols in Setswana-speaking Children:

An Exploration

Blissymbols were created in the mid-1960s by Charles K. Bliss, in the hope that the use of his symbol system, as a universal communication system, would promote world peace by eliminating misunderstandings between people who speak different languages (McNaughton, 1985; 1990). Bliss acknowledged the importance of communication as key to entering the cultural milieu and attaining community membership for all individuals after realizing that both the words “communicate” and “community” share the same Latin root, “to make common” (McDonald, 1980). He theorized that, if certain symbols (both verbal and visual) could share conventional meanings among persons who have grouped themselves together as a community, then a universal, culture-free communication system, would be possible.

However, a significant number of publications have pointed to the complexity of issues related to iconicity and learnability of graphic symbols in different cultures, emphasizing the dynamic relationship between culture and iconicity ratings of symbols. The visual relationship between a symbol and its referent; that is, iconicity (Blischak, Lloyd, & Fuller, 1997; Fuller & Lloyd, 1991) is thus largely influenced by environmental exposure. The iconicity hypothesis, which states that more iconic symbols tend to be learned more readily than symbols that are less iconic (Brown, 1977; Fristoe & Lloyd, 1979; Lloyd & Fuller, 1990), also highlights the role of iconicity in the learning of symbols.

Iconicity of a symbol is typically described in terms of: *transparency*, which refers to the guessability of a symbol in the absence of its referent; and *translucency*, which refers to the degree with which individuals perceive a relationship between a symbol and its referent when the

referent is known (Blischak et al., 1997). If a symbol is highly iconic on first exposure, its teaching and use will be simplified, as symbol recall should be easier (Sevcik, Ronski, & Wilkinson, 1991). This would also imply that most people from that particular culture would be able to understand the symbol with minimal effort. Hence, the argument could be made that highly iconic symbols are more appropriate or likely to be included in initial communication intervention efforts. As noted by Wachs (2000), however, iconicity “is necessary, but not sufficient” in understanding learnability and use (p. 3).

Apart from symbol iconicity, the potential learnability of graphic symbols (i.e., how the individual relates to subsequent exposures to the symbols), should be of equal importance. The learnability of graphic symbols is not only dependent on teaching methods and strategies, but also is influenced by many factors, such as the features or inherent characteristics of the symbol set or system (Fuller, Lloyd, & Stratton, 1997); the individual’s own abilities (Light & Lindsay, 1991); motivation (Vanderheiden & Lloyd, 1986); schooling (Duncan, Gourlay, & Hudson, 1973; Martlew & Connolly, 1996); the selected vocabulary (Arvidson & Lloyd, 1997); the individual’s previous experience and world knowledge (Stephenson & Linfoot, 1996; Zangari & Kangas, 1997); and representational range and cultural aspects (Huer, 2000, 2003; Soto, Huer, & Taylor, 1997).

Huer (2000) reported that participants from four different cultural groups in America (European-American, African-American, Chinese, and Mexican) all perceived Blissymbols to be the least translucent graphic symbol system. Due to the difficulty in isolating cultural groups in an acculturated linguistic and cultural context like the USA. However, Nigam (2003) argued that the Huer study (2000) cannot make any claims in relation to interactions between ethnicity and

the graphic symbols. He argued that further investigation is required, as neither the participant's level of acculturation nor the selection of the lexical items should be ignored because lexical items in the nouns category might be more culturally sensitive than verbs. This academic debate not only highlighted a most important issue in the complexity of conducting cross-cultural studies by means of defining different cultural groups but also identified potential biases in the use of test material within this context.

There is a paucity of research that investigates iconicity using cross-cultural comparisons (Bridges, 2004). The few studies that have been conducted (Huer, 2000; Nakamura, Newell, Alm, & Waller, 1998; Quist, Lloyd, Van Balkom, Welle-Donker Gimbrere, & Vander Beken, 1998) agree that individuals with different language and life experiences appear to perceive graphic symbols differently. Comparing responses across cultures is a complex and challenging process because equivalence on various levels of the process must be achieved. Considerations include orientation of the participants to the research task (interpretation and motivation of subjects could be different), and translation issues such as method and message equivalence (Alant, 2005a; Bridges, 2004).

Although the important role of culture in iconicity studies has been acknowledged, the majority of studies have utilized participants from European-American linguistic communities (Bloomberg, Karlan, & Lloyd, 1990; Clark, 1981; Mizuko, 1987; Musselwhite & Ruscello, 1984). Accordingly, in South Africa over the past decade, there has been a systematic attempt to obtain an African perspective on the iconicity and learnability of symbols. In one of the first studies, Moolman and Alant (1997) used Blissymbols and reported that children experience difficulty in interpreting the use of arrows. Thereafter, Haupt and Alant's investigation (2002) of

the iconicity of Picture Communication Symbols (PCS) in a rural Zulu community with 94 eight-year-olds, reported that the average iconicity of 36 selected PCS was generally low. Following these studies, the logical next line of inquiry was to investigate the impact of multiple exposures to graphic symbols on children's iconicity ratings, in order to determine the learnability of these symbols.

A study by Basson and Alant (2005) on the iconicity of PCS to Afrikaans-speaking children endeavoured to investigate the impact of multiple exposures to symbols on their learnability. This study used a control group design, whereby the experimental group was exposed to a training session on the recognition of PCS symbols. The findings of this study displayed a low average iconicity score, which improved significantly for both the control group and experimental group after a single exposure to PCS symbols.

As shown by earlier studies by Deregowski, Muldrow, & Muldrow (1972) and Arnheim (1969), people from non-Western contexts seem to have a disadvantage in initial exposure to pictures (line-drawings). However, Deregowski (1973) found that after minimum explanation most people could understand pictures and that most did not even need one trial to be successful. This finding suggests that, as an individual gains familiarity with the visual stimuli, the iconicity of the symbols might increase. Alant (2005b) also discusses the importance of the concept of visual equivalence in relation to picture comprehension. This concept, originally coined by Sigel (1978), suggests that pictures that appear to be different but share some of the same characteristics can have the same perceived meaning. In other words, visual symbols might, at first, seem different, but the more times an individual is exposed to them, the more similar the symbols may appear to be. Both the control and experimental groups in the study by Basson and

Alant (2005) showed significant improvement between pre- and post-exposure measures, but the experimental group's performance was also significantly better than that of the control group, because they had been exposed to more focused training in PCS.

The present study is partially based on a study by Quist et al. (1998), which had three main aims: to obtain and compare (a) ratings of translucency by non-reading 6- to 7-year-old children and by adult, (b) translucency ratings by individuals from different cultures (The Netherlands and the USA), and (c) translucency ratings by children with disabilities and by non-disabled peers. All 161 typically developing children (6- to 7-year-old non-readers) were actively enrolled in schools in The Netherlands and the USA. In addition, data was obtained on 21 deaf children and 16 children with severe disabilities in The Netherlands. Words from the participant's primary language (English or Dutch) were used for presenting the Blissymbols. A total of 273 Blissymbols were randomly selected from the Lloyd, Karlan, and Nail-Chiwetalu (1995) list and subjected to a social validation process in which teachers from The Netherlands and USA deleted words they felt could not be understood by the children they taught. In addition, Dutch linguists were given this pool of words to translate, with only words which 90% or more of the judges determined appropriate for these participants retained. The remainder of the words were randomly assigned to one of two lists (57 symbols each), including 14 practice items. Test booklets were made containing the Blissymbols, and three faces followed each Blissymbol: A frown (i.e., Blissymbol doesn't look at all like the word presented), neutral (i.e., Blissymbol might look a little like the word presented), and a smile (i.e., Blissymbol looks a lot like the word presented). Teachers presented all of the items for training and rating to their classrooms as a whole, and the children with disabilities received individual instruction with

appropriate adaptations (e.g., speech and manual signs). After going through the practice items, teachers asked children to draw a circle around the face that best represented their rating of the Blissymbol. Results showed that children, although more variable in their ratings, generally rated the translucency of Blissymbols, and in particular those with high translucency ratings, similarly to that of adults. The results also indicate that, for some children, translucency plays a significant role, but for others, individual perceptions might be more affected by personal experiences (which is linked to cultural background) or their level of imagination. Furthermore, data from the current study suggest that there is some similarity in performance of disabled and non-disabled children; however, given the small number of participants and limited types of disabilities, this observation should be interpreted with caution.

The present study endeavoured to use the same methodology as the Quist et al. (1998) study, after piloting methods and procedures in Quist et al. to ensure their relevance to the South African context. The aims of this study were to first determine the translucency ratings of specific Blissymbols on first exposure by Setswana-speakingⁱ children; and then to determine the learnability of these symbols after subsequent exposure. The results were compared to those of the Quist et al. (1998).

Method

Research Design

A descriptive design was used, based on a study done by Quist et al. (1998), whereby participants were exposed to a task requiring the rating of iconicity of Blissymbols over 3 successive days. Setswana-speaking first graders (6 - to 7-year-olds) were exposed to 93 selected Blissymbols. A 3-point semantic differential scale (McMillan & Schumacher, 2001), a variation

of the Likert scale that is oriented towards younger children, was used. Participants marked the option that best described their perception of the specific symbol's iconicity. The feasibility of the planned data collection procedures and the suitability of the test material and protocol were confirmed in a pilot study conducted with 10 children who met the inclusion criteria but who were not included in the main study. Minor modifications were made to the instructions, the layout of the test booklets, and the rating scale used in the Quist study, resulting in the procedures described below.

Participants

Thirty-four participants whose first language was Setswana and who were between the ages of 6; 0 and 7; 11 years (comparable to Quist et al., 1998), were selected. The mean age of the participants was 6; 11 ($SD = 5$ months). All participants were in Grade 1, attended the same school (where Setswana was the language of instruction), and had been enrolled in this school for at least 5 months prior to the commencement of the study. Poverty, low literacy levels, and high levels of unemployment were characteristic of the particular geographical area.

As reported by their teachers, none of the participants had noticeable learning or language disabilities, attention or behavioural problems, or hearing or vision loss that could have influenced their participation in the study. None of the participants had prior exposure to Blissymbols.

Stimuli

The stimuli were the 100 words used in the Quist et al. (1998) study. When rating iconicity, it is important that the participants from the target population are familiar with all of the words (labels) and concepts included in the test material (Blachowics, 1994; Penã, 2005).

Accordingly, the original list of words was adapted, minus those words that were unfamiliar to the participants of this study. The 100 words in the original list contained 10 repeats to account for internal consistency and seven practice items, for a total of 97 words. These 97 words were given to two foundation-phase (Grade 1 and 2) teachers associated with the participating school, who were familiar with 6-to 7-year-old children and spoke both English and Setswana. They were asked to independently judge the words and to eliminate concepts not familiar to children at this age level. These teachers worked independently and indicated four concepts that could possibly be unfamiliar to the target population: pepper, purple, peek, and shower. The same seven practice items that were used in the original Quist et al. study were deemed to be appropriate for the present study.

Materials

Three different test booklets, one for each day, were used. Each booklet contained all 93 symbols, but in randomized order to control for a possible order effect. The test booklets were printed on A4 pages in landscape format. Each page of the test booklet consisted of a 10.1 cm x 10.1 cm (4" x 4") table, with four Blissymbols (one for each concept) in the first column, accompanied by the semantic differential scale. Column 2 contained a happy, agreeing computer-drawn face to indicate that the Blissymbol *looks a lot like the word* (high translucency); Column 3 had a neutral face indicating that the Blissymbol *looks a little bit like the word* (moderate translucency); and Column 4 had an unhappy disagreeing face indicating that the Blissymbol *does not look like the word at all* (low translucency). This rating scale was an adaptation of the scale used in the Quist et al. (1998) study, which also used three faces, one with a smile (high translucency), one with a straight line (moderate translucency) and one with a

frown (low translucency). The frown was changed to an unhappy face following the pilot study. The gloss was not printed in the booklets, nor were the symbols numbered, in order to enhance visual clarity. The researcher, however, had a copy with numbered and translated Setswana concepts in order to ease the sequence process for presenting the test-material. Each page was numbered in the middle, at the bottom of the page.

The Blissymbols used in the test booklet were generated using WinBliss computer software (Anycom, 2005). The order in which the symbols appeared was randomized, and the random ordering was double-checked to ensure that no symbol appeared more than once on the same page. In total, each participant evaluated 279 symbols over the 3 days (93 x 3). Of the 93 symbols, 72 were nouns, 6 were adjectives, 12 were verbs and 3 were adverbs (see Tables 1 and 2).

Procedure

To minimize the influence of linguistic factors on the performance of participants, the entire test procedure was conducted in Setswana. The original list of English words, as well as the initial orientation, instructions, and help prompts, were translated into Setswana using what is considered to be the most reliable method of accomplishing ethnographic translation: to involve persons familiar with both the source and the target language (Bridges, 2004; Retief, 1988). Seven translators participated, including four who considered themselves to be professional translators and who did frequent translation work. The other three did occasional freelance translation work for social and church groups. All of the translators had university degrees, and their occupations were teaching, ministry, library work, and chemistry. The translation procedure

was as combination of blind back translation, review committee, and pre-test procedures (Bracken & Barona, 1991; Brislin, 1980).

Insert Tables 1 and 2 About Here

Permission was obtained from the relevant authorities to conduct the study: Consent forms and related materials were compiled and ethical approval was obtained from the University of Pretoria. Data were collected over 3 successive days. A detailed outline of the procedures, which involved 14 steps, ensured that the same sequence was followed each day (du Preez, 2006). Each day's proceedings were conducted over two sessions, with a break in between in order to prevent fatigue.

Participants met outside of the designated classroom and received a participant number that was pinned to their shirts (to ensure consistency over the 3-day period). They were then instructed to take the seat with the corresponding number. Test booklets, also identified with the same participant number, were distributed. The researcher then explained that there were no correct or incorrect answers, and that all participants would have their own ideas of what a particular symbol looked like. Seven symbols served as practise items at the beginning of each day. The researcher guided the participants through the seven practise items on the whiteboard, orally presenting the word for each symbol, one-by-one. The participants were then asked to choose which of the three faces most closely matched the symbol. The researcher showed the target symbol on an overhead projector to ensure that each participant knew which of the four symbols on each page was being targeted. The researcher also walked through the class to ensure that the participants were all viewing the same page. After the participants had successfully completed the seven practice items, they completed the test booklet, rating the symbols one-by-

one by marking the option on the rating scale that best described their choice. Participants were asked to look up after making a choice as a means of alerting the researcher that the procedure could continue. Each session concluded with the researcher expressing appreciation and giving each child a reward in the form of a sticker.

Testing sessions were audio-recorded. An independent research reviewer rated the reliability with which the procedures were executed, in order to ensure equivalence between the three sessions. The prompts used were also rated. Of all the comments used, 96% were scripted comments. The remaining 4% were comments related to the situation (e.g., *Here's another pencil for you*).

Data Analysis

Care was taken to ensure that participants received the booklet identified with the same participant number on each day, in order to balance objectivity and traceability. The researcher kept master copies of the three versions of the test booklet, which included the corresponding words next to each symbol.

The raw data was captured per participant, per booklet, and per symbol, using MS Excel software. For the analysis of translucency ratings, the number of children choosing each rating level was calculated for each symbol on each day. Low translucency was indicated by a value of 1 (*does not look like the word at all*), moderate translucency was indicated by a value of 2 (*looks a little bit like the word*), and high translucency was given a value of 3 (*looks a lot like the word*). Symbols judged as looking a lot like the word by 75% or more of the participants (25/34) were classified as highly translucent. For the learnability analysis, the changes in translucency ratings were examined by comparing frequencies over three successive exposures. In order to make a

direct comparison with the original Quist et al. (1998) study, mean ratings and standard deviations were calculated for each symbol.

Results

Results are described and discussed according to the aims.

Translucency Ratings

The first aim was to determine the degree to which participants perceived a relationship between the specific Blissymbol and its referent, when the referent was known. The translucency ratings over all 87 symbols (93 symbols excluding the 6 repeated symbols) are shown Table 1. The repeated symbols (Table 2) were excluded in Table 1, as children were exposed to these symbols six times in total, and not three times.

[Insert Table 1 About Here]

In judging the translucency-ratings of the individual graphic symbols, data shows that 40.22% (35 of the 87 symbols) were highly translucent on first exposure. When using the same 75% cut-off, none of the symbols fell into the category for low translucency, or even into the category for moderate translucency. This finding implies that even some compound symbols, such as *CAMP*ⁱⁱ was rated as having a high translucency rating.

When the cut-off point was lowered to 50% ($N=17$), three symbols were rated as having low translucency, namely *ANIMAL*, *PIG* and *POLICEMAN*. It is interesting that both of the symbols that had an animal-element were rated as having low translucency. The translucency rating for the only other symbol that contained this animal element (*SAUSAGE*), remained spread out on the translucency scale. If the 50% cut-off point was also applied to the highly translucent symbols, an additional 31 symbols (35.63%) could be added to the 35 symbols that already met

the 75% cut-off. This implies that in total, 66 of the 87 symbols (75. 86%) were rated by more than half of the participants as being translucent.

Various factors could have had an impact on this finding. Firstly, in spite of explaining to participants that there were no right or wrong answers, they might have been eager to please, and therefore did not want to use the lower end of the scale, which indicated low translucency (the so-called Hawthorne effect). As previously discussed, the semantic differential scale that was used contained three faces: a happy agreeing face indicating that the Blissymbol *looks a lot like the word* (high translucency), a neutral face indicating that the Blissymbol looks a little bit like the word (moderate translucency), and an unhappy disagreeing face to indicate that the Blissymbol *does not look like the word at all* (low translucency) (Table 1). Possibly, the children in the study did not choose the unhappy face because of uncertainty in relation to the association between “unhappy” and the description *does not look like the word at all* (i.e., low translucency as was required by the use of the semantic differential scale). Although this possibility cannot be ruled out, it was not evident from the results of the pilot study.

Learnability

The second aim of the study was to repeat the procedure over 3 successive days in order to determine the effect of subsequent exposure on the translucency ratings, and thus establish the learnability of the symbols.

The results in Table 1 show that the translucency ratings increased over the 35 days. All of the 35 symbols, except the symbol for *BOY* (number 10), that met the 75% cut-off criterion on Day 1 (Symbols 2, 4, 5, 6, 14, 22, 23, 24, 27, 28, 29, 30, 34, 36, 38, 39, 40, 42, 43, 46, 53, 57, 59, 63, 65, 66, 71, 73, 77, 79, 84, 88, 89, and 93) remained translucent. The symbol for *BOY*,

however, only missed the cut-off point ($N = 25$) by 1, and therefore does not warrant a further discussion. In addition to these symbols, 12 more symbols (numbers 8, 11, 13, 37, 45, 47, 50, 55, 58, 68, 70, and 82) became more translucent over the 3 days using the 75% cut-off. When further examining the data, it is noted that the biggest changes actually occurred between Day 1 and Day 2, and Day 1 and Day 3, but not between Day 2 and Day 3.

The increase in translucency ratings over the 3 days might be attributable to the fact that Setswana, a predominantly oral language (Ong, 1982), is more conceptually-based. People from oral cultures, such as the Setswana, appear to be more oriented toward the whole than to specific detail (Heath, 1989); and therefore tend to focus on concepts (context-dependent) rather than on specific words or descriptors (more context-independent), as highlighted in the work of Hall (1976).

These results also support Basson and Alant's findings (2005) of significant differences between the first and second exposures, despite the fact that the participants in the control group had not received any training. The finding was attributed to the single exposure participants had to the symbols during the pre-test procedure. Ong (1982) also supports the notion that individuals learn a great deal through apprenticeship; that is, by listening, repeating, and otherwise participating in informal ways of learning, as opposed to formal training and learning more typical of educational contexts.

Reliability of Data

In the present study six randomly selected symbols were repeated daily for internal validity: *BEGIN*, *HOLD*, *LIVING ROOM*, *MONEY*, *MOP* and *TEETH* for a total of six exposures (see Table 2). The first and second exposures were on Day 1, the third and fourth exposures were on Day 2, and the fifth and sixth exposures were on Day 3. It is evident that, for all of the six repeated symbols, the translucency ratings increased with exposure. Three of the symbols (*BEGIN*, *MOP*, *TEETH*) had high translucency ratings during the first exposure on Day 1, and these ratings remained high. However, the other three symbols (*HOLD*, *LIVING ROOM*, *MONEY*), which did not have high initial translucency ratings during the first exposure of Day 1, became more translucent with the second exposure. The biggest differences are noted between the first and second exposures (both on Day 1), and thereafter the pattern becomes more consistent. This finding is in line with the rest of the data, which shows that generally, the symbols became more translucent after more exposures; and that, when translucency ratings did not differ, it was possibly due to initially high ratings.

[Insert Table 2 About Here]

Comparison of Studies

The results obtained on Day 1 of the present study were compared to those of Quist et al. (1988), which described two sets of participants (Dutch and American). Care must be taken when comparing results of the current study with results reported in Quist et al. because of the differing number of variables between these two. Obvious variable differences include language and culture of the participants; others, such as parental education level and exposure to books and pictures, could also be significant. As mentioned earlier, four of the original symbols in the

Quist et al. (*PEPPER*, *PURPLE*, *PEEK*, and *SHOWER*) were excluded from the current study following the familiarity rating, which might have influenced the outcome of the comparison between the studies.

Quist et al. (1988) looked only at translucency ratings on first exposure; hence, only results from Day 1 of the present study are shown in Table 3. As frequencies are not available for the original research (Quist et al.), mean translucency ratings were calculated for comparison purposes. Low translucency was indicated by a mean value of $1.00 \leq \bar{X} \leq 1.49$, moderate translucency was indicated by a mean value of $1.50 \leq \bar{X} \leq 2.49$, and high translucency was indicated by a mean value of $2.50 \leq \bar{X} \leq 3.00$. The majority of the selected Blissymbols ranged from moderate to high for all three groups of participants; however, the distribution appears to be different. For example, the number of symbols with high translucency ratings for the Setswana participants in the present study appears to be greater than those for the Dutch and American participants. And, although the number of symbols with low translucency ratings was small for the Dutch and American participants, no low translucency ratings were reported in the Setswana study. This data is most interesting, in view of the cultural differences between the groups in the two studies. It could be argued that for participants who came from a strong oral language tradition, conceptually-based symbol systems like Bliss could be more user-friendly, relative to participants who come from more literate language backgrounds (e.g., The Netherlands and USA). This hypothesis will, however, require further investigation.

[Insert Table 3 About Here]

Conclusion and Recommendations for Future Research

The current study built on the existing body of knowledge related to culture-specific iconicity and also investigated the learnability of Blissymbols with subsequent exposure (not training) to these symbols over a 3-day period. The main finding of this research was that 75% of the 93 Bliss symbols used in this study were rated as having high translucency values by at least 50% of the participants, despite the fact that compound symbols (e.g., *SAUSAGE*, *SNEEZE*, and *LIVING ROOM*) were included. Moreover, subsequent exposure had a positive effect on translucency ratings, with the biggest differences noted between Day 1 and Day 3 and Day 1 and Day 2, indicating that exposure has a positive effect on the learnability of the symbols.

Although the results of the present study could not be statistically compared with Quist et al. (1998) because there were too many differing variables, (language, culture, literacy exposure, parental level of education, and subsequent measurements), descriptive comparisons did show similarities. For all three groups of participants, the translucency ratings of the majority of the selected Blissymbols ranged from moderate to high, although the distribution appears to have differed. The translucency ratings in the present study were higher than for the Dutch and American participants in Quist et al. This might be due to the fact that there are higher literacy rates in The Netherlands and the United States, which mean that respondents were more analytical in their approach to interpretation of the symbols. Setswana children, on the other hand, might be more oriented towards holistic interpretation of the symbols (concepts) represented by Bliss due to their predominantly oral language background.

The first implication for further research is to conduct a systematic investigation into the impact of different backgrounds on children's interpretations of graphic symbols. To deepen understanding of how children from different cultures approach graphic symbols requires more

in-depth descriptive work about their initial interpretation of symbols at first exposure (i.e., what they see and their explanations of what they have seen). Similarly, more information on the interpretation of the faces used in the semantic differential scale is essential to ensure common understanding of the rating scale.

A second implication for further research relates to increased understanding of the dynamic nature of iconicity ratings at subsequent exposures. It is clear from the current and other studies that iconicity ratings can improve with subsequent exposures. However, it is not clear if and when a saturation point (or plateau) might present itself where iconicity ratings remain more stable. A better grasp of the types of symbols that might be better understood with subsequent exposures could significantly enhance intervention efforts in graphic symbol use. This could eventually lead into explorations of the phases of learning that may be involved when children are exposed to graphic symbols over a period of time.

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






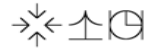

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
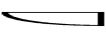


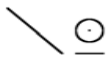



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Table 1











Blissymbol Stimuli, Corresponding English and Setswana Words, and Number of Children (N = 34) choosing each Translucency Rating for each Symbol on Day 1, 2, and 3. Shaded cells Indicate that 50% (light grey) or 75% (dark grey) of the Participants chose the same Level of Rating for a Symbol






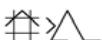



			Rating: Looks like the word								
Stimuli			Not at all 			A little bit 			A lot 		
NR	Blissymbol	English/Setswana	Day			Day			Day		
			1	2	3	1	2	3	1	2	3
1		Above/Godimo	3	3	7	10	3	4	21	28	23
2		Alike/Tshwanang	5	4	7	2	5	2	27	25	25
3		Animal/Phologolo	6	4	7	8	5	7	20	25	20
4		Bag/Kgetsi	5	5	4	3	5	5	26	24	25

5		Banana/Panama	0	1	0	2	0	0	32	33	34
6		Beautiful/Bontle	1	0	1	6	3	2	27	31	31
7		Begin/Simolola	Repeat symbol								
8		Bird/Nonyane	13	1	1	8	4	3	13	29	30
9		Black/Ntsho	8	6	3	8	5	8	18	23	23
10		Boy/Mosimane	5	7	4	2	1	6	27	26	24
11		Brain/Byoko	6	4	4	11	7	5	17	23	25
12		Bring/Tlisa	8	6	6	13	7	7	13	21	21
13		Camera/Khamera	7	5	2	4	2	2	23	27	30
14		Camp/Kampa	1	2	1	4	5	6	29	27	27
15		Candy/Dimonamonane	7	7	4	9	6	8	18	21	22

16		Careful/Ka tlokomelo	10	7	7	6	12	6	18	15	21
17		Carrot/Segwete	6	11	3	9	6	7	19	17	24
18		Cheese/Kase	8	7	8	10	6	8	16	21	18
19		Chop/Rema	12	8	5	9	7	12	13	19	17
20		Coat/Jase	16	8	10	8	7	9	10	19	15
21		Crayon/Kheraeyone	7	5	4	4	9	10	23	20	20
22		Curtains/Garatene	1	1	1	3	0	1	30	33	32
23		Doll/Popi	4	2	2	4	2	4	26	30	28
24		Down/Tlase	2	0	0	1	0	1	31	34	33

25	♩♩♩♩♩♩♩♩♩	Drum/Moropa	5	6	5	7	5	9	22	23	20
26	♩♩♩♩♩♩♩♩♩	Elbow/Sekgono	8	6	5	9	4	5	17	24	24
27	♩♩♩♩♩♩♩♩♩	Enter/Tsena	2	1	0	2	1	1	30	32	33
28	♩♩♩♩♩♩♩♩♩	Eye/Leihlo	0	1	1	2	1	0	32	32	33
29	♩♩♩♩♩♩♩♩♩	Fall/Go wa	3	2	3	4	3	3	27	29	28
30	♩♩♩♩♩♩♩♩♩	First/Wa nthla	1	3	1	5	0	2	28	31	31
31	♩♩♩♩♩♩♩♩♩	Flower/Dithunya	15	12	7	6	9	9	13	13	18
32	♩♩♩♩♩♩♩♩♩	Food/Dijo	13	4	6	5	6	5	16	24	23
33	♩♩♩♩♩♩♩♩♩	Foot/Lenao	9	10	5	12	8	10	13	16	19
34	♩♩♩♩♩♩♩♩♩	Fork/Foroko	1	1	1	1	0	0	32	33	33

45		Hour/ Ura	6	2	3	5	4	2	23	28	29
46		House/ Ntlo	0	0	1	3	1	0	31	33	33
47		Iron/ Tshipi	9	7	3	4	5	5	21	22	26
48		Lady /Mme	14	12	9	7	7	6	13	15	19
49		Living room/ Phaposi/ bojela	Repeat symbol								
50		Machine/ Motshini	7	4	4	7	7	5	20	23	25
51		Mask/ Mmampakisi	12	6	4	6	5	8	16	23	22
52		Money/ Madi	Repeat symbol								
53		Moon/ Ngwedi	1	0	0	3	1	1	30	33	33
54		Mop/ Mmope	Repeat symbol								

55		Mountain/ Thaba	8	5	4	7	6	4	19	23	26
56		Nose/ Nko	5	3	6	5	1	4	24	29	24
57		One/ Nngwe	0	1	0	1	1	1	33	32	33
58		Outside/ Kwa ntle	6	6	3	5	1	3	23	27	28
59		Package/ Sephuthelwana	3	1	1	4	2	2	27	31	31
60		Pants/ Borokgo	15	8	7	8	10	10	11	16	17
61		Paper towel/ Pampier toulo	12	9	6	8	9	11	14	16	17
62		Pig/ Kolobe	18	7	6	6	5	6	10	22	22
63		Pillow/ Mosamo	5	6	3	4	5	4	25	23	27

64	⊥^	Policeman/ Lepodisi	18	11	9	8	11	11	8	12	14
65	→□	Push/ Kgarametsa	1	4	0	3	2	4	30	28	30
66	□?	Question/ Potso	4	4	2	1	2	4	29	28	28
67	○□	Read/ Buisa	7	9	4	4	4	9	23	21	21
68	□	Room/ Phaphosi	8	6	2	9	1	4	17	27	28
69	○∞H	Sausage/ Borose	15	11	8	11	9	11	8	14	15
70	⬆⬆⬆	School/ Sekolo	7	5	4	5	2	2	22	27	28
71	∞	Scissors/ Sekere	1	0	2	3	1	2	30	33	30
72	○III	Scream/ Goa	6	8	5	11	6	10	17	20	19
73	7	Seven/ Supa	0	1	3	0	1	0	34	32	31

74	𐀓𐀛	Skirt/ Sekhete	10	8	8	5	4	5	19	22	21
75	𐀚𐀓!	Sneeze/ Ethimola	14	7	5	11	8	9	9	19	20
76	𐀓𐀛𐀛	Soldier/ Lesole	6	10	12	8	8	6	20	16	16
77	𐀓𐀛	Soup/ Sopo	2	0	0	3	3	2	29	31	32
78	𐀓𐀛	Spider/ Segokgo	4	7	9	11	8	9	19	19	16
79	𐀓𐀛	Stairs/ Matatabelo	1	1	2	2	2	2	31	31	30
80	𐀓𐀛𐀓	Sugar/ Sukiri	12	14	9	11	9	10	11	11	15
81	𐀓𐀛	Sweet/ Monate	6	10	9	6	3	6	22	21	19
82	𐀓𐀛	Swim/ Thuma	3	4	2	10	6	7	21	24	25
83	𐀓.𐀓𐀛	Swimming pool/ Bothumelo	9	5	4	12	4	8	12	25	22











84		Table/ Tafole	0	0	1	0	0	0	34	34	33
85		Teeth/ Meno	Repeat symbol								
86		Tennis/ Thenese	9	9	7	8	5	6	17	20	21
87		Toilet/ Boithusetso	11	10	9	9	3	6	14	21	19
88		Toothbrush/ segotlha meno	1	0	2	1	0	2	32	34	30
89		truck/Llorri	1	1	0	3	2	3	30	31	31
90		Turn/ Dikologa	5	4	5	8	8	6	21	22	23
91		Woman/ Mosadi	12	8	8	4	5	5	18	21	21
92		Woods/ Dikgang	5	8	10	9	7	8	20	19	16
93		Worm/ Seboko	1	2	1	2	2	2	31	30	31

TABLE 2 Blissymbol Stimuli for the 6 Repeated Symbols, Corresponding English and Setswana Words, and Number of Children Choosing Each Translucency Rating for Each Symbol on First and Second Presentation on Days 1, 2 and 3

				Rating: Looks like the word								
				Not at all ☹️			A little bit 😐			A lot 😊		
				Day			Day			Day		
#	Blissymbol	Stimuli English/Setswana		1	2	3	1	2	3	1	2	3
7		Begin/Simolola	1st	6	5	4	5	4	6	23	25	24
			2nd	4	3	1	6	3	4	24	28	29
44		Hold/Tshwara	1st	12	3	2	11	6	9	11	25	23
			2nd	7	2	4	5	7	7	22	25	23
49		Living room/Phaphosi ya bojelo	1st	14	4	2	10	6	5	10	24	27
			2nd	7	4	2	2	4	4	25	26	28
52		Money/madi	1st	15	6	8	8	5	4	11	23	22
			2nd	10	6	6	6	9	5	15	22	23
54		Mop/Mmopo	1st	5	8	6	10	3	6	19	23	22
			2nd	3	7	5	8	3	3	22	24	26
85		Teeth/Meno	1st	2	1	1	1	0	0	32	33	33
			2nd	1	1	2	0	0	0	33	33	32

Table 3

Number of Symbols Rated at Low ($1.00 \leq \bar{X} \leq 1.49$), Moderate ($1.50 \leq \bar{X} \leq 2.49$), and High ($2.50 \leq \bar{X} \leq 3.00$) Levels of Translucency in the Present Study (Setswana) and in Quist et al. (1998) (Dutch and USA studies).

Study	Translucency		
	Low	Moderate	High
Current study: Day 1 ($n = 93$)	0 symbols	46 symbols	53 symbols for glass, seven, table, one, toothbrush, banana, eye, stairs, fork, house, curtain, worm, teeth, down, moon, push, scissors, truck, camp, enter, first, girl, soup, beautiful, heart, question, fall, glasses, hear, package, alike, boy, doll, front, bag, begin (x 2), pillow, mop (x2) nose, living room (x2), above, drum, swim, outside, camera, hour, turn, read, sweet, crayon
Dutch study ^a ($n = 97$)	6 symbols for sausage, policeman, pants (x 2), woman, animal	67 symbols	24 symbols for one, moon, seven, heart, curtains, glasses, down, question, eye, cheese, house, first, table, mask, teeth, fork, truck, nose, banana, hear, camera, enter, push, glass
USA study ^a ($n = 97$)	8 symbols for sneeze, policeman, pants (x 2), black, coat, hold (x2)	64 symbols	25 symbols for down , one, glasses, seven, moon, house, fork, heart, first, package, eye, truck, cheese, table, mask, hear, banana, nose, question, teeth, girl (x2), camera, glass, soup

^a Dutch and USA data are from Quist, Lloyd, van Balkom, Welle-Donker Gimbrere, & Vander Beken (1998).

Note: The following were the common symbols across the studies: nine nouns (table, eye, fork, house, teeth, moon, truck, heart, glasses) that were all pictographs; one verb (hear), and ideograph; three numerals (one, seven, first) that were arbitrary symbols; and two descriptors (down, question) that were ideographs.