# Logograms: Memory Aids for Learning, and an Example with Hearing-Impaired Students

Ligia Medeiros[1], Marcos Brod Júnior[2], and Luiz Vidal Gomes[1]

[1] Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil
ligia@esdi.uerj.br
[2] Universidade Federal de Santa Maria, Rio Grande do Sul, Brasil
brodjr74@gmail.com

**Abstract.** This paper describes a methodology for teaching design based on the use of a set of memory aids named *logograms*. Users' experiences involving the usability of logograms as a teaching support are being registered throughout empirical research during the last ten years by the authors. More recently, the technique was applied with success to hearing-impaired students. The material described here includes phonographic and iconographic elements aiming at the organization of a logographic system that, in addition to sign language, supported a more inclusive education. Some of the logograms presented refer to stages and procedures of the design process, and were converted into LIBRAS – the Brazilian Sign Language with the intensive participation of the users (interpreter, students and teacher). The process consisted in: establishment of keywords; denotative and connotative analysis of keywords; search of applicable signs within LIBRAS; creation of new signs when there were no codified signs for design technical terms in dactylology; validation by the interpreter and student; systematization of use through photographs; verbal description of the agreed gestures. The logograms are perceived as innovative ways to teach product and graphic design in undergraduate and graduate courses, and their use can be combined to software programs and Internet resources in new curricular approaches.

**Keywords:** perception of visual information, teaching of hearing-impaired and speech-impaired people, logograms.

## 1 Introduction

In 2003, in Brazil, the document "Program for Inclusive Education: the right to diversity" was launched by the Ministry of Education aiming at "guarantee that pupils with special educational needs have access to regular education in schools" [2]. That Program encouraged schools to provide proper facilities for disabled people, and faculty members to become aware of special education. In order to fulfill the objectives of the program, education managers should be able to enroll students with special needs in their under graduation courses, and teachers should be flexible in adopting new activities for educating, instructing and imparting knowledge.

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In 2007, a student with hearing difficulties was admitted in one the Design Courses established in Porto Alegre city, Brazil. Promptly, an interpreter of LIBRAS (Brazilian Sign Language) was hired to assist the communication between design teachers and the deaf student. However, despite the efforts of the interpreter and the attentiveness of the student, difficulties in communication were causing a significant loss of the teachers' explanations. The main problems were not related to the cognitive capabilities or psychomotor skills of the student, but with the lack of codified signs for design technical terms in dactylology (the use of the fingers and hands to communicate and convey ideas, as in the manual alphabet used by hearing-impaired and speech-impaired people). An agreement was made among a teacher of graphic design, the student and the interpreter to expand the use of an existing methodology for teaching design based on logograms. The teacher responsible for the discipline has had previous experiences with the use of logogram charts as a teaching resource and as memory aid [3, 10, 11, 12]. Moreover, he has done extensive research on the aspects of perception of visual communication addressing the needs of employees with hearing impairment in manufacturing workplaces [4] (Figure 1).

**Fig. 1.** Logograms, pictograms and sign language created during a PhD research on Production Engineering [4], aiming at inclusive manufacturing workplaces.

As a preliminary solution, a handout with logograms of relevant terms of the design process was prepared, and after, a broader instructional system was developed to promote a better understanding of the main notions employed during the course.

Most if not all engaged in making the teaching/learning process successful will agree with the idea that it is part of a teacher's job to improve instruction methods to suit their students' manual skills and mental capabilities. When facing the challenge of teaching hearing-impaired people, for example, it becomes more than natural for teachers to use visual aids. Motivated by the need to communicate with all design students, whether listeners or non-listeners, the authors developed a method integrating verbal, gestural and logographic language. The words and logograms presented here are related to the stages of the creative process and how those arbitrary

signs were “translated” into the Brazilian Sign Language. To make such didactic effort useful and usable, the design teacher relied on the fundamental advice of the certified interpreter of LIBRAS, and also on the monitoring of the learning progress of the deaf student. Nowadays, the logograms charts and the related LIBRAS signs facilitate the learning of other design students with hearing difficulties.

## 2 Teaching Design with Memory Aids

In 2002 we started the experience of rendering design contents using metaphors from mathematical expressions to stimulate students to use abstract, modular and rhythmic reasoning. In order to find original images to represent design knowledge, some logograms were sketched to help technical product analysis. From the teacher’s position, logograms became practical as “traffic signs”, conventionalized graphic icons employed to guide procedures, to define techniques and to call students attention about the steps of the design process. It is relatively easier to remember or guess the meaning of logograms than to remember or guess the sound of alphabetic written words. In addition, a single logogram may be used by a variety of languages to represent words with similar meanings.

There are three referential words in our search to improve the use of logograms as memory aid in design teaching. The words are: (i) a noun, utility, that states the quality of being of use and service useful; (ii) an adjective, usable, meaning the extent to which a product can be used by specified users to achieve some goals with effectiveness, efficiency, and satisfaction in a specified context of use; and (iii) an adverb, utterly, connoting a way to maximize the experience of learning.

We have been observing from empirical research that logograms charts are valuable as teaching resource in that they respond promisingly to some basic usability issues: 1. Which difficulties students face in their first use of logograms to perform basic design tasks? 2. How is the rhythm and pace of performance of design tasks by students after having learned to use logograms? 3. How is their acquisition of such skill/knowledge? 4. Do logograms induce students to make mistakes? 5. Do students have an enjoyable learning process with the method with logograms? 6. Are the images of logograms self-explanatory, or are they arbitrary signs to be learnt with teachers support?

Logograms represent ideas by means of icono- and phonographic elements of visual language, and are being employed to describe tasks and procedures employed in the design process. In the first experiences as teaching tools, logograms were distributed to students during classes and seminars, for a simple recognition exercise. The participants of the experience told that the logograms facilitated the recall of the situation represented, even when they cannot say it from memory. It appears that the image activated the understanding of a whole chain of ideas, and when the logograms came to mind the creative and projectual processes was easily codified.

Pictorial images are central elements in the composition of visual languages to improve the recognition of situations, to ease the human capacity to retain information, to memorize facts and phenomena. Iconographic representations appear among the universal principles of design [13]. On that subject, the Symbol

Sourcebook, written by Henry Dreyfuss (1904-1972), and published in 1972 is still a reference. In the preface of Dreyfuss' classical work, the architect and philosopher Buckminster Fuller (1895-1983) stated an idea that motivated the development of the logograms: "the ideographic language, basically visual, developed for the primitive people, now tends to bring the basic tools of communication to the universal understanding and use" [8]. Two other texts, written by Charle K. Bliss (One Writing for One World) and by Marie Neurath (Education Through the Eye), complete the Symbol Sourcebook introduction. Henry Dreyfuss affirmed that no book related to symbols would be complete without mentioning the Semantography, by C. K. Bliss, a complete system which crosses the barriers of language. "The lines and curves of his symbols can be translated into any language and therefore his words and ideas are enclosed in my book". [8].

Dreyfuss also highlighted the work developed by Otto and Maria Neurath, at the Isotype Institute Ltda. Otto Neurath (1882-1945), a social scientist and Austrian professor, included the "isotype" (an acronym for International System of Typographic Picture Education) as part of his theory of education, and defended the idea that images are better than words, at least in the initial stages of knowledge acquisition. To translate complex images into forms that are both significant and accurate for the great public, Neurath suggested not only a series of fine pictograms, but also the techniques for their drawings and application. These principles, then, are the basis for the proposal of logograms as a tool to universal communication (based on Fuller); a system of lines and curves conventionalized as signs to effective communication (based on Bliss in "Semantography"); learning in the initial design training with something similar to the isotypes of Neurath.

Dreyfuss suggested that to deal with more complex instructions and meanings, it is necessary to combine basic and conventional signs together with other newly developed. The contribution of Rudolf Modley must be mentioned too. Neurath and Modley, in 1942, indicated three phases for the conception of iconographies:

1. Analysis of the fact or the situation that you want to conventionalize and to select the main illustrative elements;
2. Selection of the images that can be simplified and, therefore, are more adequate to represent the fact or the situation to be drawn;
3. Development of layouts that allow a simple and fast understanding of the information, essential to its history [14].

Aicher and Krampen [1] made reference to Neurath and Modley who also deal with the history of the modern pictograms.

During the conception and elaboration of logograms, we perceived that, according to the definition of the Dictionary of Symbols [6], we were dealing with "signs" and not with "symbols". When drawing logograms we traced "conventional signs", i.e. marks and ideograms, that have symbolic meaning in its origin and in the way they influence those who contemplate or use them". When calling them "conventional signs" we intended to nominate more or less arbitrarily established relations. Hydraulic codes, topography, meteorology, and the mathematics, all use systems of conventional signs that are also used in the traffic signs, in the industry, and even in music [6]. Our logographic system (Figure1) is based on stenography:

(a) The configuration of the logogram can be visually distinct from the original iconographic element;
(b) The seminal meaning can be extended to analogous situations [9];
(c) Its configurations offer more possibilities of structural combination than imitative sketches [5].

Logograms charts were systematized as a set of arbitrary signs relating to: creative movements, types of ideas association; symmetry laws; basic graphic elements of designing; intellectual capabilities; types of design meetings; main creative techniques; taxonomy of educational objectives and the stages, steps and phases of the creative process applied (Figure 2).

**Fig. 2.** First set of logograms designed as memory aid for learning. Illustrative elements for the situations were selected; images were simplified and the more adequate to represent design process were drawn. Seminal meanings were extended to analogous situations to apply to product design, graphic design, packaging design, etc.

One of the difficulties in conducting research on the usability of logograms is the lack of applicable assessment methods to measure and monitor students' learning. Current research has been done using observation and interviews with students as they interact with the logograms [10, 11].

In 2008/2009, a new set of logograms was designed to teach the urban signaling systems; and one of the findings was that the assessment of students' learning became easier: they could straightforwardly dissertate about each of methodological design moment from a single arbitrary sign sketched (Figure 3).

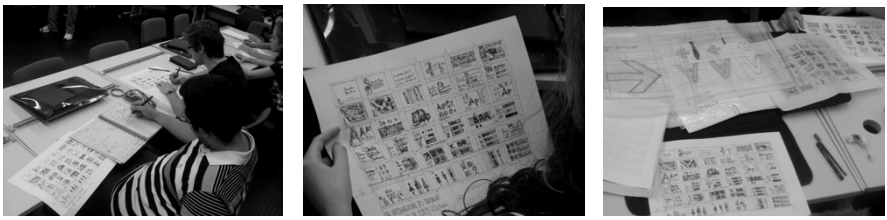

**Fig. 3.** Assessment of the learning process made easier through the recognition and application of logograms. When students know the learning objectives and how to achieve them, teachers and students together can monitor the learning progress.

## 3 Improving Teaching Methods to Suit Students' Needs

Logograms have been employed as memory aid to guide project works as varied as graphic analysis of the Brazilian vinyl record sleeves [15] and the design of urban signs system for Porto Alegre city [7]. From all teaching experiences, the more thought-provoking was the one that included a deaf student in the classroom. To cope with that challenging situation, teacher and interpreter expanded a methodology previously developed to help deaf people in manufacture industries from the South of

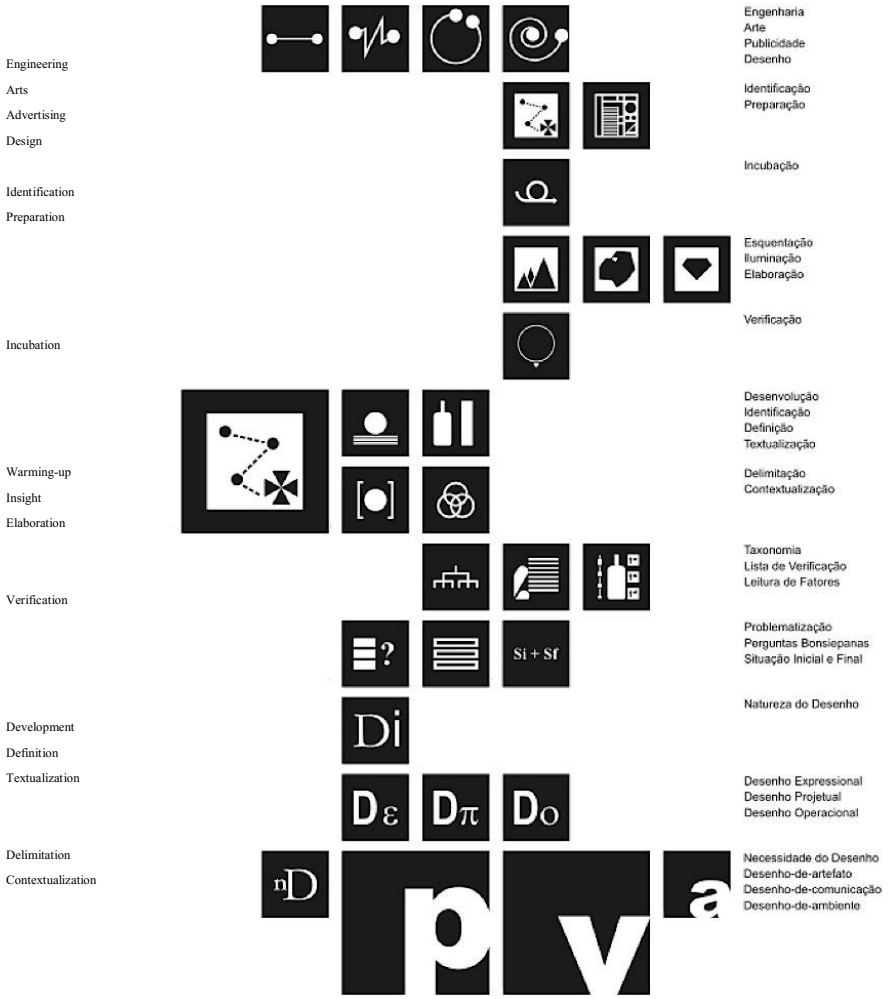


**Fig. 4.** Example of one of the large format posters displayed in the classroom for explanation of the design process, the meaning of logograms and their use as memory aid

Brazil. The theoretical basis was explained not only on the PhD thesis [4] but also on academic papers [3, 10, 11] and in a book [12]. The process of creation the visual aids for teaching design to deaf students was divided into steps. Initially, the theoretical basis of the design process was studied with the entire class, making sure that interpreter and students grasp the meaning of the keywords for procedures and techniques. Posters were displayed in the classroom for explanation of the logograms and their meaning (Figure 4).

Denotative and connotative analyses for keywords were made to find precise definitions and to corroborate their appropriateness, avoiding undesirable hidden meanings. Special attention was paid to prevent reappearance of words to designate different concepts. Signs within the Brazilian Sign Language were searched to match those keywords.

It became evident that new gestural signs were necessary, what is perfectly acceptable, since deaf people and interpreters regularly improve and supplement their vocabulary. The process of creating signs and testing their suitability and understanding was a meticulous job of the interpreter with the help of the student, in an iterative process. The new gestural signs were thoroughly recorded through photographs and the verbal description of the way in which the signs should be performed was reported so that other people could reproduce them as accurately as possible.

Figure 5 demonstrates four moments of the process. First column contains some of the concepts to be learned, represented by words. Second column contains logography, that is, visual symbols representing words rather than the sounds or phonemes that make up the word. The columns with photographic pictures contain the documentation of the gestures required to perform each key concept. The column on the right contains the verbal description of the gesture.

The deaf student, presently a graduated designer, stated: “When I started the Design course I was concerned if I could follow the lectures and other activities. When Rejane (the interpreter) arrived, my learning was very much facilitated, but sometimes we could not find the better words to represent the design techniques because there were no signs for them. Rejane and I created new signs relating words and meanings. It helped me to understand what the teacher was explaining. First was the contextualization of words and then the search for applicable signs, the combination and adaptation of them. The teacher had the wonderful idea to make a manual and posters with logograms, so it helped me and other students. After deciding the signs, I started drawing many own logograms for an easier learning of the signs. The objective is to engage the deaf person in the creation of new signs as well as logograms related to the meanings.”

In 2013, in design classes at the Federal University of Santa Maria, students have demonstrated an amazing capacity to understand the logograms as a technique for learning industrial design. In some of their written exercises, taken as research protocols, students revealed an enjoyable self-oriented learning process and quickly begun to draw their own category of logograms (Figure 6).

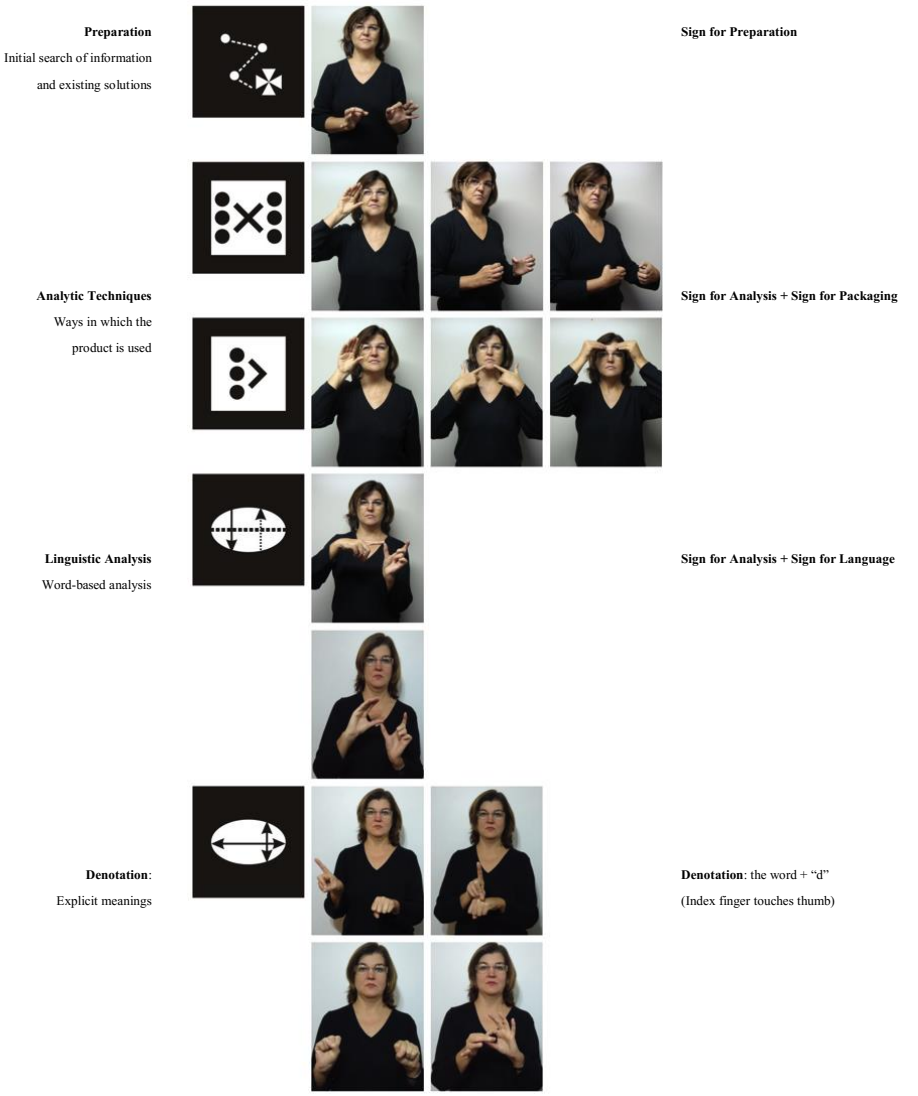


**Fig. 5.** First column contains words for some of the concepts to be learned. Second column shows the related logograms. Photographs demonstrate the gestures required to perform the key concepts. Verbal descriptions for the gestures are presented on the right column.

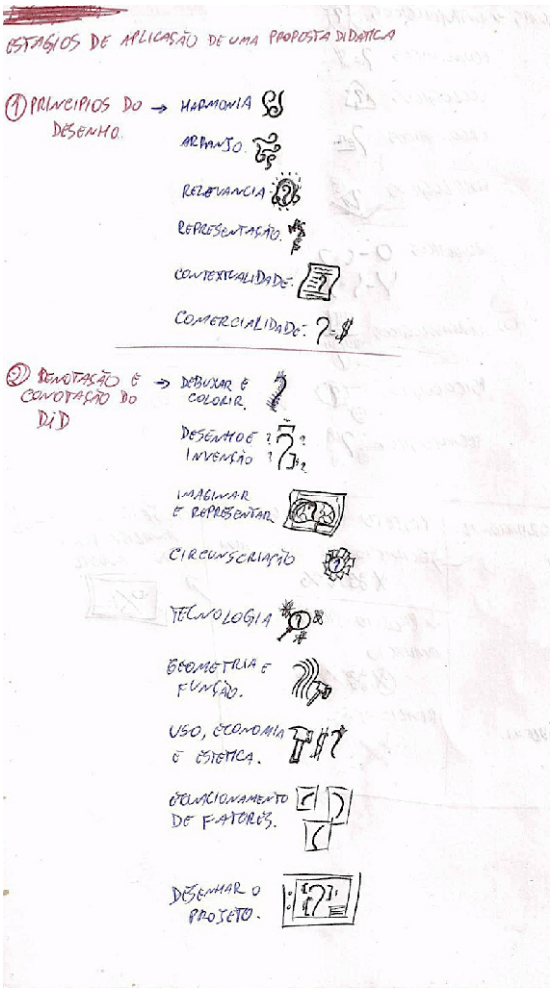


**Fig. 6.** Experience of students as users of logograms as a technique for teaching/learning product and graphic design

When used in association with theoretical basis and practical activities logograms assisted the students in their creative actions, increasing an awareness of their learning process. When creating their own logograms, students enrich their project with a powerful and yet synthetic piece of graphic-visual communication. Now, after the creation of 210 signs in LIBRAS, we are in the process of reviewing the manual that illustrate the correlation of word and logograms employed in the learning of the design process. Logograms are perceived as an innovative way to teach product and graphic design in undergraduate and graduate courses, and their use can be combined to software programs and Internet resources in new curricular approaches.

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