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How to improve metalinguistic awareness by writing a language without writing: Sign Languages and SignWriting

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Introduction

Sign Languages (SL) are visual-gestural languages used by deaf¹ and hearing people who recognize themselves as members of the Deaf community of their respective countries: in France, LSF is used; in the USA, ASL; in Italy, LIS; in Germany, DGS; in England, BSL (which has nothing to do with ASL although English is also spoken in the USA!); and so on², for a total of about 140 SLs worldwide (Ethnologue, a). SLs are not simple gestural transpositions of local vocal languages (VL), but they are real languages with their own syntax and lexicon, which allow to talk about any topic.

SLs have several characteristics that distinguish them from VLs, all due to the visual-gestural channel, which is the preferred one for the Deaf (for further information: Cuxac, 2000; Cuxac and

¹ The use of the word "deaf", instead of the more politically-correct "hard of hearing", is a deliberate choice of the author, which reflects the willingness of the signing deaf to be recognized as member of a linguistic community and not as people affected by a pathology.

² While these examples seem 1 country = 1 language, this is not always the case: a country can have several SLs or one SL can be used in several countries: e.g., Swiss Deaf utilize LIS (also used in Italy), LSF (also used in France) or DSGS (used only in German-speaking cantons).

Antinoro Pizzuto, 2010; Sallandre, 2014). First of all, the meaning in SL is transmitted by the simultaneous use of multiple articulators (hands, arms, torso, head, mouth, eyes, etc.), all equally important, thus making the SL *multilinear* languages (in opposition to the *monolinearity* of the VLS, which have the mouth as sole articulator). These articulators move in the 4 dimensions of space-time, allowing SL to exploit all of them to create and syntactically organize the meanings: they are therefore *spatial* languages. This spatiality favors the use of *iconicity* for the creation of meaning, that is, the description of a selection of visual characteristics to describe entities or actions³. Iconicity influences not only the lexicon but the whole SL syntactic structure.

Although the whole SL lexicon has an iconic component, the value to be attributed to iconicity varies according to the type of syntactic structure used. Cuxac and Antinoro Pizzuto (2010) distinguish two kinds of structures, the Lexematic Units (LU) and the Transfer Units (TU), which differ from the signer's intention to just say (which in VL would be equivalent to saying "yesterday I ate a lot of pizza") or to say something while in the meantime showing it (which in VL would be equivalent to saying "yesterday I ate a piece of pizza this big" accompanying this sentence with a gesture to show the size of the pizza slice). In "saying without showing" (a.k.a. "visée non-illustrative"), the signer looks the interlocutor straight in the eyes and, using almost exclusively the hands, communicates the information using lexicalized units whose canonical form could be found in a SL dictionary. In "saying and showing" (a.k.a. "visée illustrative"), on the other hand, the signer looks at the space where the signs develop and, in so doing, activates both the space and the signs themselves; furthermore, investing him/herself with the whole body (facial expression, head and torso movements, etc.) allows the interlocutor to see how a situation unfolded (that is called a "situation transfer"), how he/she acted and what a person looked like ("personal transfer"), or what physical characteristics typify an object or an entity ("transfer of size and shape"). The signs made with illustrative intention have long been considered pantomimic (Kendon, 1980), and for this reason these signs have struggled to be accepted as fully linguistic structures. However, Cuxac (2000) has demonstrated that these signs are linguistic elements with a structure and economy, and Sallandre (2003) has shown how, in some narrative forms, they can make up about 90% of what is signed.

Although the SLs origin is often associated with the moment of their institutionalization (i.e., the beginning of their use in schools for the Deaf⁴), there are traces of their existence already in the writings of the philosophers of Greek antiquity, like Plato or Aristotle. Thus, SLs are in fact historical-natural languages with peculiar characteristics, used by specific communities, and which allow to express any concept which can be formulated in any other language. However, the gestural nature of these languages has often led institutions to ostracize them: in 1880, for example, the concluding declarations of the Congress of Milan led, throughout Europe, to a ban on SL use to educate deaf children; this prohibition lasted almost 100 years, devaluing SLs both in the hearing institutions and in the Deaf community itself (Encrevé, 2012). Only starting from the '60s in the USA and then the '80s in Europe, with the movements of "deaf awakening", SLs were recognized as languages in all respects, starting a path of revaluation that continues (sometimes with difficulty) even today.

³ However, it is necessary to note that iconicity does not constitute an obstacle to the ability of SLs to express abstract concepts; in these cases, in fact, a visual metaphor corresponding to the abstract concept will be rendered iconically: for example, to indicate the soul, the sign describes a subtle and light entity which goes towards the sky or, to indicate learning, the sign describes the act of taking entities and letting them enter in the head.

⁴ In France, for example, institutionalization took place between 1760 (the year of the foundation by the Abbé de l'Épée of the first school for the deaf in Paris) and 1791 (the year of the transformation of this school into the "Institut National des Jeunes Sourds" [INJS]); this school, still active, is known today as Institut Saint-Jacques or INJS-Paris.

Deafness, literacy and Sign Language

Premise: in this section reference is made to France, where SL enjoys a relatively advanced linguistic recognition, especially since the promulgation of the Accessibility Law of 2005 which recognized the LSF as a language in all respects and which confirmed the right of deaf children's parents to choose how to educate their children. In Europe there are countries with even more advanced inclusive legislation, for example Austria, Finland and Hungary, which offer their SLs recognition in the Constitution; unfortunately, however, there are also countries with serious delays, such as Italy, where the simple recognition of the linguistic status of the LIS still seems far away and where the right to a bilingual education is denied (although not forbidden, little or nothing is done to favor it). Although countries offer their deaf children different educational possibilities, the following considerations can be applied to all European countries (and beyond).

Today, profound deafness affects about 200,000 people in France and LSF is practiced (more or less well) by about 80,000 deaf persons (not all profoundly deaf) (Gillot, 1998). In most cases, deaf children are born into hearing families, where they are the first and only deaf (Cuxac and Antinoro Pizzuto, 2010); nevertheless, the child's parents will have to choose from birth which type of communication to favor. Analyses of children's language development show that if a deaf child is exposed to SL early (either because parents are deaf or because they decide to learn SL), his/her understanding and production (in SL, not in VL!) at age two are comparable to those of a hearing child of the same age (in VL, not in SL!) (Rinaldi *et al.*, 2014); if, on the other hand, oral communication is chosen, the child will be able to discriminate the form of different words, but will show a delay in both the development of comprehension and of oral production (De Santis, 2010), due to the difficulty of learning an oral language without being able to hear it. However, parents take the oral route more frequently, since at the time of diagnosis they know little or nothing about SL, and teaching the child to lip-read⁵ and talk seems, alas, the simplest way to promote his/her social integration and educational success.

Whatever the language chosen in the family, right from enrollment in kindergarten, French law (Assemblée Nationale and Sénat, 2005) allows parents to choose for their children an education with or without LSF⁶: the first case is called bilingual education, in where the "oral" language is the LSF and the "written" language is French, the use of spoken French being possible but not mandatory; the second case is called oral education, in which French is used both for the written and the oral part (thru lip reading). However, this freedom of choice clashes with the scarcity of schools and institutions that guarantee the bilingual education. ANPES estimates that parents have chosen a bilingual education in 3570 cases (out of 10,600 deaf children in school age), but that only 10% actually have access to a true bilingual class; for the remaining 90%, the way in which LSF is integrated into the school is not known (it could be just a purely oral education, associated with some course of LSF initiation).

⁵ Lip-reading requires long training and continuous practice: it is a question of discriminating what is said from the form of the mouth, but not all sounds results from different mouth shapes. The deaf must not only be at a short distance and perfectly in front of the speaker, but must also exploit clues from the facial expression, gestures and general context. This activity is therefore considered by the deaf as very tiring (DavSign, 2018).

⁶ This subdivision is here simplified to the extreme: there are many variations of the "bilingual method", e.g. methods which more or less integrate oral French, which have recourse to professors who teach in LSF or which use LSF interpreters who translate what the professor says in French; in the same way, the "oral method" encompasses many different educational systems, some of which prohibit any use of gestures while others integrate gestural forms (in different phases and with different values) and even involve sometimes the use of "true" signs (for a more complete view, refer to the thesis of Leroy [2010]).

Whatever the type of education chosen, the deaf child grows up in a world where VL is the primary environmental language and its written (and often oral) form is taught throughout school. Still, the assumptions that a deaf child has the same literacy skills of a hearing child of the same age, and that the number of illiterate adults among the Deaf is in line with that of the hearing people are both incorrect. In fact, the rapport Gillot (1998)⁷ indicates that 80% of deaf adults are unlettered, i.e. they have learned to read and write (they should be then literate) but do not have the necessary skills to understand and/or produce not even short texts. Most deaf people declare that they live negatively any situation in which writing is necessary, developing strategies aimed at avoiding recourse to writing and reading (Garcia *et al.*, 2007).

How to explain this data? Set aside the theories of the early '900 concerning a deaf's phantomatic cognitive defect (for more details see Perini, 2013), the responsibility was then attributed to the use of LSF: however, since it was prohibited until the 1980s and is used by less than 40% of the Deaf, it is unlikely that it could be responsible for such a debacle. Studying other possible explanations, Perini (2013) showed that the development of reading-writing skills is not so much linked to learning *how* to read and write (deciphering of letters, acquisition of phonological awareness) but to understanding *what* is written and read (knowledge of the world) and *why* (functions of writing). This link is also highlighted for hearing children, and in fact the discovery of both the world and the functions of reading and writing are part of the normal school curriculum since kindergarten (Ministère Éducation Nationale, 2015). For Perini, the development of reading and writing skills depends on the early constitution of a "favorable linguistic environment", in which the child's understanding is stimulated, rather than his linguistic production: it is therefore difficult to attribute the low level of literacy to LSF, especially since the number of deaf signers who claim to be at ease in writing is greater than that of deaf oralists (Garcia *et al.*, 2007) and since in profound deaf children the knowledge of a SL smoothes acquiring writing skills (Niedeberger and Prinz, 2005).

With the same understanding of the world, however, the level of literacy of the deaf remains lower than that of their hearing peers (Dubuisson and Daigle, 1998). This statement is supported by the low number of profoundly deaf people who access the University, only 300 in 2016 (Micouleau, 2018). Another explanation can therefore be in the natural under-exposure of the deaf to the dominant VL, i.e. the language normally used to read and write: whether they have been educated with SL or without, the deaf cannot take advantage of the linguistic bath that every hearing child is exposed to (parents, relatives, television, passers-by, all speak in front of them even when they are not talking *to* them). Although SL allows deaf signers to access content, the lower linguistic exposure to VL makes them less able to express themselves in VL; and, for the deaf oralists, the greater exposure to VL does not compensate for the problems related to the difficulty of lip-reading, a tough and tiring exercise that "occupies" the child in an effort of deciphering rather than understanding and which works only in mutual direct communication. Considering this lower exposure, some people (e.g., the researchers of the LSQ group at UQÀM) have proposed to compare the deaf's difficulties in reading-writing not so much with that of their hearing peers, but with that of foreigners who are learning to read and write French.

⁷ It has been 30 years since this report, but deafness experts continue to cite its data because: 1) no similar study has been carried since then; 2) the situation, albeit improved thanks to the Accessibility Law of 2005 (Assemblée Nationale and Sénat, 2005), has not radically changed and, even if the number of deaf illiterates may have dropped, it is still about 10 times higher than that of the hearing people (a level estimated at 7% of illiterates in France in 2011 (ANLCI)).

Role of comparison between different languages in metalinguistic development

In the '90s, Dabène and Ingelmann (1996) conducted an experiment involving two classes (about 50 children age 9-11 years) of an elementary school in Grenoble (France). These classes were characterized by a large presence of bilingual foreign children (speaking, in addition to French, Italian, Turkish, Arabic or Spanish); moreover, in these classes was active the "awareness of language" (Hawkins, 1987), a teaching methodology of Anglo-Saxon inspiration which, in the description of the authors, corresponds to:

"It is a question of arousing, in the child, from observations and manipulations carried out on a supporting language (L1) - French or a language of origin, but even on a set of languages as varied as possible -, the awareness of what is the language universe in its variety, its functioning and its acquisition. We hypothesize that this type of work is likely to promote both the reasoned mastery of L1 and the learning of foreign languages, while integrating the contribution of the original languages of the allophone children, which are thus legitimized." Dabène and Ingelmann (1996:3) [translated from French by the author]

For example, working on tenses, children were asked what they thought of a phrase like "tomorrow I disguise myself" and, letting them reflect in group, they were led not only to give the correct version "tomorrow I will disguise myself" but also to find how to justify to comrades why this form was correct, using examples based both on French and their native language. In another exercise, bilingual children were asked to explain to other children the difference between the morphology of the verbal system of their native language and that of French (of course, without using the word morphology, too complex for children of that age).

The authors stress the advantages of such an approach not only for bilingual but for monolingual children too: in fact, parallel to the improvement of French, bilingual children developed a reflection on the language of origin which, not being the language of schooling, was used without explicitly knowing its rules, while monolingual children discovered new linguistic dimensions hitherto unknown; furthermore, the use of their language in the classroom allowed allophone students to perceive their linguistic diversity as a richness for the whole class and not as an obstacle to their integration, effectively enhancing their language of origin.

Numerous studies on bilingualism (for a critical synthesis, see Besse *et al.*, 2010) have shown how knowing more than one language allows children to develop a strong metalinguistic awareness, that is "a subdomain of metacognition which concerns language and its use, in other words comprising: 1) reflections on language and its use; 2) the abilities to control and plan own linguistic processes" (Gombert, 1990:27; translated from French by the author); it should be emphasized that developing a metalinguistic awareness does not necessarily mean knowing the specialized vocabulary necessary to express it (Dabène and Ingelmann, 1996).

In fact, deaf signer children are bilingual children, so why not try to use their knowledge of SL to improve their relationship with VL?

Metalinguistic awareness and writing

The development of metalinguistic awareness is strongly linked with writing: apart from perhaps that made by Pānini⁸, there is no systematic study of the organization of a language that has been done without a system for writing that language; therefore, the linguist approaching a new language wonders, right from the start, about how to represent and transcribe it, in order to study it. According to Goody (1977), one of the major innovations resulting by the invention of writing is precisely that of allowing to reflect on language using the language itself.

Now, as illustrated in §2, bilingual education for deaf children means written French and LSF replacing spoken French: the written form of LSF is not taken into consideration at all, although it would seem a good idea to use this knowledge to explain to children why French works in a certain way, or to show how the functions of writing are the same for SL and VL.

The reason for the total exclusion of written SL from school teaching is simple: there is no writing for SL! In fact, like most of the world's languages, none of the 140 SLs currently registered⁹ has ever developed a writing system accepted and adopted by the Deaf community, so it is not possible to use any SL writing system within a bilingual education. Since SL institutionalization, however, there have been several attempts to represent SL, some aimed mainly at linguistic research and others more focused at use in education.

Historical attempts at SL writing

Attempts to represent SL can be divided into three broad categories (Bonnal-Vergés, 2008a), of which only the last one will be the scope of this paragraph: the design of the sign shape (Fig. 1a); the description in words of the sign shape (Fig. 1b) or of the image to which the sign seems to refer (Fig. 1c); the representation, through specially designed characters, of the parameters that make up the signs, which can be arranged linearly (Fig. 1d) or in a two-dimensional space (Fig. 1e). Drawings were, for a long time, the only way to try to represent SL because, as well summarized by Br. Louis, monk and educator of the deaf, "I would rather jump over the cathedral of Nantes mounted on a mule than Mr. Bouchet and company would create a universal signs dictionary without including drawings" (Bonnal-Vergès, 2008b:140; translated from French by the author).

8 The Indian Pānini was the author of the first grammar of Classical Sanskrit, consisting of about 4000 rules. The dating of his work is very controversial (Filliozat, 2020): on one hand, it describes the classical Sanskrit, which places it around the 7th century BC; but on the other hand, the extent of his work is such as to seem impossible to be done without having recourse to writing, which appeared in the region of India where he lived only in the 3rd century BC. Supporters of older dating hypothesize that Pānini was able to compose his grammar without recourse to writing because he used the memory of his many disciples to "record" the rules he identified.

9 Ethnologue (b), an inventory of world languages, states that about half of the currently spoken languages have never developed a form of writing; of the other half, it is not possible to determine how many actually have a writing system that is still normally used and how many remain just purely oral, despite the existence of a graphic form. Given that Ethnologue's statistics are based only on the languages currently spoken, it can be said that, since humans developed the language, almost all the languages that have existed on earth have been solely oral.

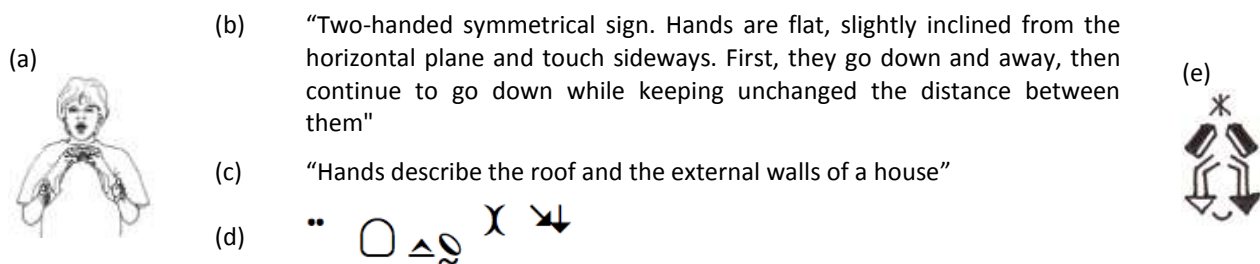


Fig. 1 – The sign [HOUSE] represented: (a) using a drawing (from Hanke (2004)); (b) describing its shape; (c) describing the picture to which the sign relates; (d) by a linear string of characters (HamNoSys); (e) by characters placed non-linearly (SignWriting)

The first example of this type of representation is due to the French Auguste Bébien (1825), educator of deaf children, who had the intuition to describe SL through three series of symbols: one for the visible parts of the body; the second for the possible movements of these organs; the third for the facial expressions that accompany signs. In this way, the author hoped that "the deaf mute could express his thought on paper, as and more clearly than by gesture and without needing to translate it linearly into any language" (quoted by Renard, 2004; translated from French by the author).

This is therefore a first attempt to give deaf a way to write their language, without having to resort to written VL. However, this system was never adopted: at the time a movement against SL use in education was emerging in France, which led to Bébien's sacking and, 60 years later, to the prohibition of sign utilization which was sanctioned by the Congress of Milan in 1880.

Between 1880 and 1960, even in countries not directly affected by the Congress of Milan, such as the USA, SL underwent a process of devaluation, due to rapid medical-scientific progress which seemed ready to solve the problem of deafness at its root. However, in 1960, at Gallaudet University¹⁰, linguist William Stokoe (Stokoe, 1960; Stokoe *et al.*, 1965) launched the revaluation process of ASL through the first modern study aimed at understanding the linguistic nature of SL (through the demonstration of their double articulation) and at creating an ASL dictionary. Stokoe considered that the minimum distinctive unit endowed with meaning (called *kinema* and not morpheme) corresponded to the whole sign, while the minimum distinctive unit without meaning (*cherema* and not phoneme) was to be identified in 4 "manual parameters": configuration (shape of the hand); orientation (direction of the carpus and metacarpus, this parameter was added only in 1965); place (area of the body in which the hand is located); and movement (action performed by the hand). He proposed to associate a character to each identified cherema and to organize his dictionary no longer on the alphabetical order of the English translation of the signs, but on the shape of the signs. To do this, it was necessary to be able to transcribe the signs with a common typewriter of the time: he therefore chose to use normal letters, numbers and mathematical symbols as characters, and to arrange them linearly according to a rigid syntax that would have allowed to put in "cheremic order" the signs in the dictionary. In this way, the Stokoe Notation (SN; Fig. 2a) was born, considered the first modern system for SL transcription.

The SN could only encode ASL, since not only the names identified were those in use in the USA but the names chosen were in direct connection with the ASL: for this reason, numerous linguists (e.g.: Kyle and Woll, 1985; Radutzky, 1992; Thoutenhoofd, 2003; Bergman and

¹⁰ Gallaudet University, founded in 1863, is the first and only University for the Deaf in the world: the numerous courses offered, all in the field of Human Sciences and often in connection with deafness and SL, are provided exclusively in ASL. Contrary to Europe, the impact on the USA of the Congress of Milan was marginal, thus making the existence of such a structure possible, despite the general process of SL devaluation. In the 1980s, a visit by a delegation of the French Deaf to the Gallaudet University was among the triggers of the "ReveilSourd" movement in France.

Björkstrand, 2015), proposed adaptations of the SN but maintaining both the 4-parameter structure and the rigid linear formula; among these adaptations, HamNoSys stands out (Prillwitz *et al.*, 1989; Fig. 2b). Compared to SN, HamNoSys allows encoding a greater number of cheremas, through the use of basic symbols to which modifiers are added; it also allows representing some facial expressions; furthermore, the character design is iconically motivated, so that the system is exportable to other SLs and is easier to manipulate; finally, particular attention was paid to the computer integration of the system, so as to facilitate its use in the scientific field.

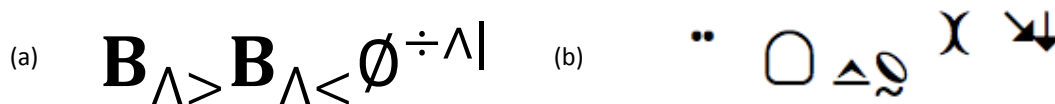


Fig. 2 – The sign [HOUSE] transcribed with: (a) the Stokoe Notation; (b) HamNoSys

SN and its subsequent adaptations were tools designed by linguists for the sole purpose of research. On the contrary, SignFont (Newkirk, 1989; Fig. 3a), in addition to aspiring to be able to transcribe the SL, explicitly tries to establish itself as a writing system for SLs (Camurri and Volpe, 2003). However, the system has very few differences compared to HamNoSys: iconic characters, use of modifiers, the possibility of encoding some facial expressions, presentation in the form of a rigid formula; the only difference is in the lower number of characters, 90 instead of HamNoSys's 200. This number was then further reduced for ASL-phabet (Supalla *et al.*, 2014; Fig. 3b), a version of SignFont developed for children to find signs in an ASL dictionary.



Fig. 3 – The sign [HOUSE] transcribed with: (a) SignFont; (b) the ASL-phabet

In addition to linguists, educators too tried to develop systems for SL writing. Paul Jouison (1949-1991), an educator specialized in deafness, was among the first (Jouison, 1995), to try to teach LSF to parents of deaf children. During his first "cours de gestes" he decided to teach the LSF lexicon and, separately, mime, which he thought was preparatory to the acquisition of transfer units (TU, whose linguistic nature was still denied). However, he soon realized that his method was not working and decided to better understand the nature of TUs, trying to transform his epilinguistic knowledge of LSF into metalinguistic proficiency useful for transmitting LSF to other people. He therefore decided to film deaf speakers in order to analyze both the SL lexicon and its syntax (Jouison, 1995): the exercise not being possible without writing, he developed D'Sign (Jouison, 1978), a transcription system that, unlike SN, was born with the intent to transcribe the whole speech and not just isolated signs. Like his predecessors, whose works he probably did not know (Jouison, 1995), he opted for a linear arrangement and did not choose particularly iconic characters.

SignWriting

SignWriting (Fig. 5) has been invented in 1974 by choreographer Valerie Sutton, already author of DanceWriting, a dance notation system. Contrary to the SL writing systems presented so far (D'Sign excluded), SignWriting was created with the intention of writing SLs and not of transcribing them. For this reason, great attention was paid to the reading process which is made simple by the use of the analogy between the signing and the writing spaces.



Fig. 5 – The sign [HOUSE] written using SignWriting

In SignWriting, (4-dimensional) signs are represented in a 2-dimensional vignette (x,y) where the width (x) and the height (y) correspond to those of the signer, while the depth (z) and the temporal deployment (t) of the sign are represented by graphic expedients. For example, a curved movement away, ascending and then descending, will be represented by ↗ (see it larger in Fig. 6a): the use of the arrow allows to add information on the sign temporality, transforming in a simple drawing element the trace that the hand seems to design in space; the use of a thickening at the origin of the arrow (its "tail") allows to give indications about the depth of the sign, transforming it into mere perspective (the closer, the bigger). Fig. 6 shows this movement and its opposite, that is, a curved approaching movement, with the thickening towards the tip of the arrow (its "neck").

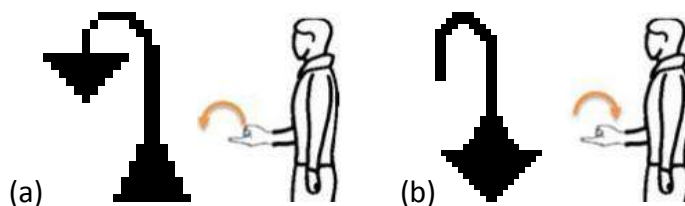


Fig. 6 – Upward and then downward curved movement that (a) moves away or (b) approaches the signer's body

The vignette is therefore an analogical reduction of the signing space, like that found in drawings that were, and still are, used to create SL dictionaries. It takes into account all the parameters of SL, whether manual (configuration, orientation, position and movement) or non-manual (facial expressions, positions and movements of the body, shoulders and head, etc.), without a priori view on which components should or should not be considered as participating in meaning transmission.

Still, SignWriting is not a simple drawing. Inside the vignette there are characters, called SignWriting Symbols (SWSYM) or glyphs, which rigorously encode the way in which each occurrence of each parameter must be represented: the straight movement of above will not be encoded by any arrow, but by a specific SWSYM, which will be different from that used to describe a shorter or more curved movement, a movement opposite or directed in another direction, performed with the right or the left hand.

The high number of SWSYMs (over 37,000) is compensated by the systematic nature of their organization (Tab. 1), since there are 432 "prototypical" SWSYMs to which they are associated in a relatively rigid way (Bianchini, 2012) of rules that allow to decline them and to obtain the total

number of possible SWs¹². For example, a prototype representing a configuration of the hand will require 4 rules: hand (the right hand and the left hand are drawn mirrored); plane (the union or separation between the dash representing the fingers and the shape representing the palm makes it possible to distinguish whether the palm is resting on the horizontal or vertical plane); orientation (the angle of the glyph allows you to know the orientation of the hand on the plane); color (the color of the hand, white, black or two-tones, makes it possible to distinguish which part of the hand is visible to the signer). Thus, knowing the 4 rules that apply to all configurations, and knowing how to design the prototype of a specific configuration, 96 SWs can already be used; knowing how to design the prototypes of the 242 configurations will permit 23232 SWs, that is more than half of the existing SWs.

SWs _{YM}	options								
hand	(right) (left)	D	G	D	G	D	G	D	G
plane	(vertical) (horizontal)	V	V	V	V	H	H	H	H
orientation	(0° to 315°)	0°	45°	90°	135°	180°	225°	270°	315°
side	(palm) (side) (back)	P	C	D	P	C	D	P	C

Tab. 1 – Characteristics driven by different SWs_{YM} representing the configuration (hooked index)

The 432 prototypes are easy to learn, as almost all (402 out of 432) have an iconic connection with their referent: the hand SWs_{YM} looks like a hand, the mouth SWs_{YM} looks like a mouth, the SWs_{YM} of a movement looks like the trace left by the movement (Fig. 7).

flat and spread hand	flat and spread hand with hooked fingers	smiling closed mouth	open mouth with angles oriented down	segmented movement	curved movement

Fig. 7 – Examples of iconic SWs_{YM} prototypes

These characteristics of SW mean that 6-8¹³ hours are often enough for students¹⁴ to acquire basic SW skills. Bianchini (2012) showed that the ease of SW use is linked both to its frequency of use, and to the subject's competence in SL.

¹² While these rules are clearly stated Sutton, SW development over the years resulted in many exceptions (Bianchini and Borgia, 2012). In her dissertation, Bianchini (2012) has suggested a reclassification of SW that guarantees, without changing its basic principles, an application without exception of the rules established by Sutton.

¹³ 6 hours is the training time that a group of deaf signers required to produce the first text in SW (see Infra); 8 hours is the time dedicated to SW classes within the degree course in "Sciences of language and French sign language", at whose end students are able to read isolated signs and write signs of simple movements.

¹⁴ The competence in SL greatly influences this figure: in the SW course taught by the author, students with a better SL level obtain better scores on both reading and writing tests than colleagues with lower levels; moreover, the lack of SL knowledge seems to prevent even the simple decryption of the vignettes (i.e. their "reading aloud" without understanding the meaning).

Between 1998 and 2010 (Di Renzo *et al.*, 2011), under the impulse of Elena Antinoro Pizzuto (EAP; 1951-2010), SW has been at the center of numerous linguistic studies, carried out at the ISTC-CNR in Via Nomentana in Rome (currently known as LaCaM), by a team called "Written-LIS Lab" ("Laboratorio di LIS Scritta"; LLISS) which brought together both deaf and hearing sign researchers¹⁵. Since the first days, SW has shown its ability to be learned very quickly, to be read easily and to stimulate metalinguistic reflection among the deaf who used it.

SignWriting as a metalinguistic tool

In 1998, after about 6 hours of SW tutorial, Tommaso Lucioli (TL) spontaneously wrote the short story "Home", which can be considered the first text in Written-LIS produced by a member of the LLISS. *Written-SL* (W-SL) is the formalization, directly in written form, of a thought in SL; it differs from *Face-to-Face-SL* (FF-SL), that is the formalization in "oral" SL of the aforementioned thought, which is then recorded and subsequently transcribed in order to analyze it. Within the LLISS, the system to formalize both W-SL and FF-SL is SW, but this could also be achieved with other SL writing systems: however, SW seems to allow, compared to other systems, a greater ease to develop metalinguistic reflections.

At the following meeting, TL proposed his text to the LLISS team then present (all deaf signers). The subsequent discussion led not only to the correction but also to the spontaneous analysis of different aspects of TL's text (Pennacchi, 2008): the combined use of different types of structures (i.e., [SNOW]¹⁶ is a LU that allows to say that there was snow, while [THICK like that] is a TU that allows to show how the snow layer was); the role of the facial expression in differentiating signs with similar meaning (e.g., [FORCED] is associated with a particular shape of the mouth, the use of which makes it possible to identify this sign as "forced by the situation" and not "forced by a person"); the use of punctuation to define a set of signs as text (punctuation is typical of the written mode, in FF-SL no one would ever end a narration with [FULL STOP]).

¹⁵ SW was introduced to the ISTC-CNR in 1998, when P. Rossini and B. Pennacchi, both deaf signers, self-taught SW using Sutton's manual (1995); later, they taught SW to 4 other deaf signers, T. Lucioli, A. Di Renzo, L. Ponzio and L. Lamano. The LLISS was created when the SW research received some funds in 2005. In 2007, SW was also taught to 3 graduate students, G. Gianfreda (deaf signer), G. Petitta and C.S. Bianchini (both hearing signers). All these people (but L. Ponzio), together with E. Antinoro Pizzuto, constituted the LLISS.

¹⁶ Conventionally, in the LS study, glosses are written in capital letters between square brackets. However, it should be emphasized that the use of glosses to describe SL is highly controversial (Pizzuto and Pietrandrea, 2001). The author of this article thinks that using a gloss in VL (a researcher's subjective interpretation, which "flattens" the SL on his/her own VL) without connecting it to the very sign appearance does not allow to take into account the peculiar SL characteristics and leads to profound biases in the analysis. The considerations carried out in this paper are therefore always made on the sign shape and not on its gloss. However, since it is unlikely that the reader of this article knows SW and LIS, for his/her convenience a *verbal label* (a term more appropriate than "gloss", according to Antinoro Pizzuto, 2008) is associated with the configuration, but always coupled with an image showing the sign form, and the label is used here for the sole purpose of facilitating understanding by the reader. Without adequate consideration for the sign structure, a verbal label is nothing more than the reflection of the (over)simplification/reduction into VL of a SL sign.





























	1	2	3	4	5	6	7
original text							
amended text							
verbal labels	HOUSE	MINE	SNOW	THICK(like this)	I	EXIT	IMPOSSIBLE
translation	At home there is a very thick snow blanket: I can't go out						
	8	9	10	11	12	13	14
original text							
amended text							
verbal labels	FORCED	HOUSE	STAY	WORK	SIGN	WRITE	FULL STOP
translation	I have to stay at home: I'm working on written signs [Full stop]						

Fig. 8 – House”, the first narrative in Written-SL produced at the LLISS (author: T. Luciola), in the original (no background) and corrected (grey background) versions

In the following months and years, countless texts of different lengths and types were written at the LLISS: real or fictitious stories; texts produced spontaneously or for needs related to LLISS research; texts in FF-SL or in W-SL. In particular, in 2009 the “Pear stories in LIS” corpus was created, consisting of different versions - both in FF-SL and in W-SL -of Chafe's “Pear Story” (1975). Whatever the nature of the texts produced, their sharing with the other members of the group has always led to a comparison of the older texts with the new ones and to spontaneously formulate reflections which gained in complexity and depth, as the group became more familiar with SW and competent in concepts of SL linguistics. The observation of this phenomenon led C.S. Bianchini, who reached the LLISS in 2007, to retrace the reflections made before his arrival (thanks to the consultation of the lab notebooks) and to stimulate new reflections through the analysis of texts produced within the LLISS (especially the “Pear” corpus): all these reflections are collected and examined in her doctoral dissertation (Bianchini, 2012) and will be summarized below. To these, new reflections will be added, reflections that emerged from the work of SL students (most hearing) who have followed the SW lessons of C.S. Bianchini from 2010 to today at the Université de Poitiers (France) and other training centers.

a. Reflections on the text typographic structure

The distinction between a shopping list, a Shakespeare's play, or a newspaper article is not only in its content but also in its form. Thus, part of the reflections that emerged at the LLISS focused on the question “what form must a text have to be considered a written text?”. Already in “Home” we see that TL inserts [FULL STOP] at the end of his story, arguing that since it is a written text, it must necessarily end with a period. The choice is linked to the lack of knowledge, at the time, of the punctuation provided by SW, which provides SW_{SYM} for the full stop, comma, semicolon, and colon, exactly as in Latin writing. A few months later, after the team learned how to use these SW_{SYMS}, numerous discussions developed about the need for a comma in W-SL, or the use of colons. Furthermore, such discussions were related to the FF-SL too, leading the LLISS members to question whether it is right or not to attribute a punctuation mark to the different pauses present

in the marked speech, but also to situations in which the pause is absent but punctuation could provide a complement of information (e.g., at the beginning of an enumeration, which would be announced in written VL by a colon and divided by semicolons).

Another recurring reflection concerns the management of the sheet space: for example, after discussing the need or not to give a title to narrative texts, numerous reflections arisen on how to highlight it with respect to the rest. In fact, SW does not provide the possibility of underlining, bold or italics. For this reason, LLISS members discussed different solutions on the frontier between orality (write "the title is XXXX") and writing (write the title horizontally instead of vertically like the rest of the text¹⁷; frame it; write it in another color; etc.).

b. Reflections on the differences between writing and transcribing

Since the beginning, the LLISS members note that SL writing implies considering the absence of immediate context and of the interlocutor but also the presence of co-text: the W-SL cannot therefore be a simple transposition of the FF-SL. This leads the team to speculate about "what differentiates FF-SL from W-SL?", so much so that a member asked EAP "are the books you read written or transcribed?".

Comparing different texts in W-SL and FF-SL, it initially seemed necessary to prefer LUs over TUs, since understanding of the former is less linked to the context. However, this choice would have distorted the SL, since in narrative texts TUs constitute about 90% of the signs produced (Sallandre, 2003)¹⁸. By comparing, in the "Pear" corpus, the same part of history but expressed in FF-SL and in W-SL it was possible to deepen the reflection, leading to the conclusion that it is not a question of replacing TUs with LUs, but of making more explicit the concepts expressed by TUs by using both LUs and TUs. For example, in the "Pear Story", a farmer collects pears by putting them in the pocket of his apron (Fig. 9). In FF-SL, this scene is described by the LU [PEAR] followed by a TU [PICK like so] and a unique TU that condenses [PUT like so PEARS IN THE POCKET like so PLACED there] (Fig. 9a). In W-SL, on the other hand, the same sequence is described by the same author by 3 TUs [CORD BEHIND THE NECK like so] [TRIANGLE IN FRONT like so] [POCKET like so], then by 2 LUs [EQUAL] and [KANGAROO], the renewal of the TU [POCKET] but used this time to say without showing (as if it were a LU), followed by the LUs [INSIDE] and [PEAR] and finally by the same condensed sign used in FF-SL [PUT like so PEARS IN THE POCKET like so PLACED there]¹⁹(Fig. 9b). The explication can be done by using LUs which clarify the various parts of the TUs, by more detailed LUs and by procedures such as the use of metaphors and comparisons with other visual realities (e.g., "a pocket like that of a kangaroo").

¹⁷ Apart the very first texts, such as "Home", the SW texts produced at the LLISS are written vertically, since the LLISS members had noticed that this made it easier to maintain the spatial references necessary to SL; also this choice is the result of metalinguistic reflections on the use of the sheet space.

¹⁸ The Deaf's fear that SL writing may "distort" the language is often reported in research on the impact of a writing system on the deaf community (Garcia *et al.*, 2007; Bianchini, 2012).

¹⁹ It is possible to notice slight differences in the choice of SWsymms to encode this sign. In fact, there is still no orthographic standard in SW, and is therefore possible to write the same sign in slightly different ways: however, the reading of this sign will be identical.






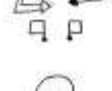


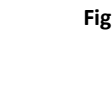
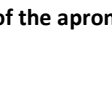
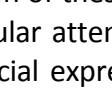
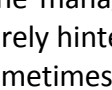

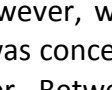
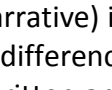
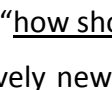
(a) FF-SL		(b) W-SL	
	PEAR		CORD BEHIND THE NECK like so
	PICK like so		TRIANGLE IN FRONT like so
	PUT like so		POCKET like so
	PEARS IN THE POCKET like so		POCKET
	PLACED there		EQUAL
			KANGAROO
			INSIDE
			PEAR
			PUT like so
			PEARS IN THE POCKET like so
			PLACED there

Fig. 9 - The introduction of the apron pocket by TL is (a) implicit in Face-to-Face-SL and (b) explicit in Written-SL (with approximated verbal labels)

A further examination of these reflections has led to the identification of situations in which it is necessary to pay particular attention to being explicit, as in the expression of emotions (usually conveyed orally by the facial expression alone, while in W-SL it is often necessary to make them explicit with a LU) or in the management of spatial references for deixis and anaphora (in FF-SL, deictic elements can be barely hinted with a finger or a head or body movement, while in W-SL they must be underlined and sometimes made explicit by LU or TU- especially in situation transfers).

c. Reflections on the concepts of spelling, standard and error

In Fig. 9, the complex sign [PUT like so PEARS IN THE POCKET like so PLACED there] is identical in both FF-SL and W-SL. However, while the text in W-SL was conceived and written by the same author, the text in FF-SL was conceived and signed always by the same author but was transcribed by another LLISS member. Between the two “writers” (the writer of the W-SL text and the transcriber of the FF-SL narrative) it is possible to notice a difference in the choice of SW_{SYMS} used to encode the sign. These differences, highlighted from a search in the “Pear” corpus for signs with equivalent meaning but written and/or transcribed by different LLISS members, allowed the team to reflect on the question “how should a certain sign be written in SW?”

Since SW is a relatively new system, with a small number of users, for which Sutton itself neither imposes nor proposes strict rules, it is not possible to speak of SW “spelling”. However, while sharing the texts, the LLISS members were able to state with absolute certainty that a vignette needed correction, and this was already evident from “Home”. From the first discussions on the subject, the criterion of “readability” emerged: if the reader can easily read the sign and if what he/she signs (the form) and what he/she understands (the meaning) correspond to the intention of the author, then the sign is written correctly. However, this criterion involves “testing” each text with numerous readers in order to be sure that the own spelling is correct.

The reflections carried out in this area did not, in the end, lead to the definition of any SW “good spelling”, but allowed to underline numerous things to do or to avoid in order to produce readable texts. For example, it is necessary not to overload the vignette with information (e.g., it is better to divide the sign into two vignettes or to leave out details that are not relevant for understanding); you must try to be redundant in the fundamental information (e.g., to indicate that the whole body moves to the right, it is better to place the indication of movement at both head and shoulder height); once chosen how to code a certain information, keep consistent; etc.

d. Reflections on the concepts and the metalinguistic vocabulary

The reflections on how to express the concepts also led the LLISS members to deepen the concepts of LU and TU, questioning on "how to distinguish a TU from a LU in writing?", e.g. [POCKET like so] from [POCKET] (see Fig. 9). According to Cuxac (2000), author at the origin of the distinction between "saying without showing" (i.e., the LUs) and "saying while showing" (i.e., the TUs), the gaze is different in the two types of structure: in the LUs it is directed towards the interlocutor while in the TUs it is directed towards the hand or in any case the signing space. But in writing the interlocutor is absent, which makes it difficult to decide whether a gaze represented by a SWSYM is directed to the surroundings or at an imaginary interlocutor. For this reason, after several reflections arising from text misunderstandings (establishing a "showing glance" where there is none can completely change the meaning), a solution was developed: inventing a new SWSYM, a "look at the interlocutor" (Fig. 10a) to be inserted in each sign of LU type.

This reflection led the group to better understand concepts such as LU and TU, but also to question "how to provide SL with a specific terminology for such concepts?": while in the VL it is possible to import a word from one language to another, the change of expressive modality between VL and SL requires giving a "visual identity" to the concepts, which requires understanding them in depth. Thus, while at the beginning of the LLISS concepts like LU and TU were simply expressed through the realization of the letters U.L. and U.T. in manual alphabet, the subsequent metalinguistic reflections led to the creation of true signs for different linguistic concepts: "lexematic unit", "transfer unit", "iconicity", "visée illustrative" and other terms related to Cuxac's theory, but also "SignWriting", "Written-SL", "Face-to-Face-SL". The creation of a new sign requires a strong understanding of the different implications of the different concepts, which can only arise from the metalinguistic reflections made about the concepts themselves. Seeking how to establish a sign allowed to deepen the concepts, having a sign to express them allowed to simplify the manipulation of concepts and to strengthen their understanding, favoring the possibility of further reflecting on them.

Similarly, a sign has been attributed to different SWSYMS, so as to be able to more easily talk about the way an element is written: this is the case of the SWSYM "gaze looking at the interlocutor" (Fig. 10a), which represents two "i" resting at eye level and that soon was also used as a sign for "lexematic unit" (Fig. 10b).

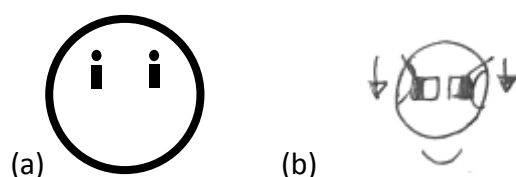


Fig. 10 - (a) the SWSYM invented by the LLISS members to write "gaze looking at the interlocutor" and
(b) the sign associated first with this SWSYM and then with the concept of "lexematic unit"
(in which the gaze is turned towards the interlocutor)

A particular phenomenon is worth noting: in 2010, Cuxac and Antinoro Pizzuto decided to rename the "standard sign" to LU. Several sessions followed in which the LLISS members discussed, starting with the texts and theoretical explanations of EAP, on what this name change implied. Eventually, the sign "standard sign" became obsolete and was replaced by "lexematic unit" (first in the form of initials "L.U." and then as a real sign).

Conclusions

The development of metalinguistic skills allows to pass from simply using a language to also understanding why it works in a certain way. Letting bilingual children to compare their languages has shown great benefits in acquiring these metalinguistic skills, and this is true whether you work on the oral or written part of the language. Numerous researchers have shown that deaf children are in a SL/VL bilingual situation, and that knowing an SL facilitates the VL knowledge too.

However, these analyses are always conducted in a trans-modal way, i.e. measuring how knowledge of the “oral” SL facilitates VL writing skills; of course, this is dictated by the absence of a written form for SL.

The various attempts to write SLs are inadequate to favor metalinguistic awareness as they omit fundamental parts of the sign (such as the non-manual components) and reduce a multilinear and three-dimensional language to simple string, a one-dimensional representation. The only exception is SignWriting, which tries to propose an analog representation of the sign, showing both manual and non-manual components through a system that focuses on readability.

From its very first uses at the LLISS, it was possible to note that SW is a tool capable of stimulating metalinguistic activity both in those who write, and, above all, in those who read with it. Over the years, reflections have emerged on punctuation and notes, but also on layout and other formal characteristics that help define concepts such as sentences and paragraphs, together with the type of text under examination and the function of the different text parts. SW allowed also to reflect on the notions of orthography, standards, errors, even without the basic spelling rules of Western VLs. Its use has led LLISS members to reflect on both the lexical and syntactic structure of SL, highlighting the importance of non-manual components and the presence of nuances of meaning conveyed by small form variations. It also allowed to perceive the difference between writing and transcribing. Finally, SW brought out the need for a new terminology in order to formulate the metalinguistic reflections that it caused to spring out.

Thus, SW constitutes a valid tool to allow the deaf to compare the written modality of SL with that of VL, facilitating the understanding of the functions of writing, essential to successfully penetrate the realm of written VL.

However, the metalinguistic reflections collected by Bianchini (2012) in her thesis were almost all produced during the reading of SW. In fact, one of the "winning" features of SW, in terms of the development of metalinguistic skills, is its very high readability. Unfortunately, ease of reading does not go hand in hand with ease of writing, which turns out to be a long, laborious process and which, in the absence of clear spelling rules, requires continuous revisions to ensure correct readability of the text. In a school setting, therefore, the child could use SW to reflect on texts produced upstream by the teacher, but he could hardly use SW to write for himself; in the same way, the teacher could program the production of texts but could hardly improvise a text in SW during the lesson. SW is therefore a tool that can satisfy only a part of the functions that are required from a scholastic writing system. At present, this has led to exclude the use of SW in schools in almost all instances.

Nevertheless, In light of the advantages that the introduction of a form of SL writing may bring on the metalinguistic development of deaf children, one wonders whether it would not be worth trying anyhow to introduce SW in schools a.s.a.p., putting forward its potential above its limits, pending a more performing system (or a substantial evolution of SW to overcome the problem of its writability).

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