

# Making Dictionaries of Technical Signs: from Paper and Glue through SW-DOS to SignBank

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## Abstract

Teaching mathematics and physics in upper secondary school for the deaf since 1975, this author has felt the need to collect signs for the various concepts. In the beginning illustration of signs were pasted into a booklet. Then SignWriting appeared, and signs were hand-written and later typed into the booklet. With the 3.1 version of SignWriter, the dictionary program appeared, and several thematic dictionaries were made. With the new SignBank program, there are new opportunities, and I can fill in what I before just had to code. Last year a Fulbright research fellow and myself were collecting signs for mathematics, and these are transferred into a SignBank file. From that file various ways of sorting and analysing is possible. Here these various stages are presented, with a focus especially on the SignBank and the opportunities and limitations that are present in this program.

## Paper and Glue

In Norway deaf students were educated according to the oralist method from 1880 until about 1960. Then signs were introduced in the schools through the system called 'Correct Norwegian Sign Language' (C-NSL), a system supported by the Norwegian Deaf Association. Generally, deaf students were regarded as unable to grasp abstract ideas, and they were educated accordingly. Thus, when we started to question these old 'truths' about the abilities of the deaf students, and to offer education in more subjects and at more advanced levels, there were no signs in the language for the new concepts. Discussing this problem with the deaf people on the committee who 'proposed' or 'ran' the C-NSL, we agreed that the use of available signs from C-NSL, from other Scandinavian sign languages, from Gestuno or from American Sign Language, could be a basis for such technical signs. These were the sign languages for which I could get hold of dictionaries. (Dictionaries are listed in the references). All signs were discussed with my deaf students, and to preserve those signs I photocopied them and glued them into a booklet, according to theme. Examples are shown in figure 1. The process of choosing or creating the signs is described in an article published on the Internet (Roald 2000). Although the creation of signs should ideally be done by consensus in a population of native signers well versed in the topic for which the signs are to be used (Caccamise, Smith et al. 1981), this would not be possible in a population that is just entering a field of knowledge. The process that was used in our case, has been reviewed by Deaf teachers later on (Roald 2002), and was deemed appropriate. It is also a fact that new technical terms are coined in all languages when new needs arise, (Picht and Draskau 1985). It is also a fact that often a whole new

vocabulary is made by one or a few persons who are working in a field and have authority. An example is Lavoisier (1743-94), who created the vocabulary of chemistry and laid down its rules of 'grammar' for times to come.

 <p>(b) energi (kraft) Bh kn med hlt inn, rykkes to ggr kraftig litt fram.</p>	<p><b>Energy</b> is the ability to perform work.</p> <hr/> <p>Energy can have different forms, but the total amount of energy in the world is constant. In Norwegian, the term 'energy' may casually be used to mean 'force' (kraft) The term 'kraftkrevende industri' really means 'energy consuming industry' Electrical power (kraft) is really electrical energy</p>
<p><b>ENERGY</b></p> <p>Symbol: E</p>	<p>Energy is measured in units of</p> <p>J = Joule</p> <p>1 J = 1 N·m = 1 W·s</p>

Figure 1: 'Energy' in paper and glue-version

## SignWriter-DOS

With SignWriting came the possibility to *write* the signs rather than relying on photos or drawings of persons signing. When I first met SignWriting, while visiting a Danish school for deaf pupils in 1982, I was fascinated and quickly adopted this way of preserving signs for my own benefit. With the arrival of the computer program, the SignWriter, came the opportunity to type and preserve the signs in a neat way. In its first versions the SignWriter did not have a dictionary program, but by utilising the word-processing possibilities and the possibilities to write in the Roman alphabet as well as in sign symbols, it was nevertheless possible to make short lists of signs for specific themes. An example is shown in figure 2.

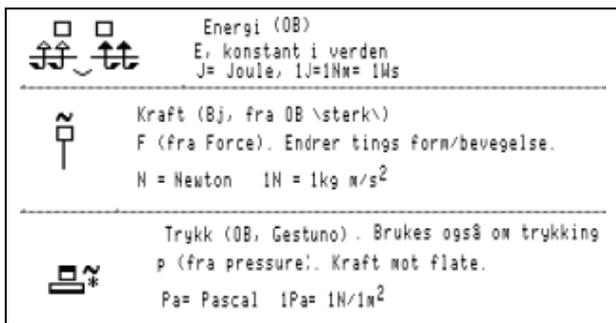


Figure 2: Energy etc. in early SignWriter version

### SignWriter®-DOS Dictionary Program

In the early to middle 1990's I was given the task by my resource centre to develop materials for the teaching of deaf students. Signing was by now well established as the language of the deaf education in Norway, even if Norwegian still was necessary for dealing with the outside world. With the 3.1 version of the SignWriter program came the attached Dictionary program. This program made it possible to create real dictionaries of signs for concepts and words. Each sign was written separately either in the dictionary itself, or uploaded from a written sign text. Each sign had to have a name, and the dictionary was sorted alphabetically by these names. Sometimes more than one sign would correspond to the same Norwegian word. They might be variant signs for the same concept, or they might be signs for different concepts covered by the same name-word. These were coded by (1), (2), (3), etc. Often a short explanation would also go into the name field. The source of the sign would also be in the field, as a coding or a short note. As the writings, or spellings, of signs are not yet established, at least not in Norwegian Sign Language, I often gave multiple written versions of the same sign. These were coded by using (i), (ii), (iii) etc. Examples are given in figure 3.

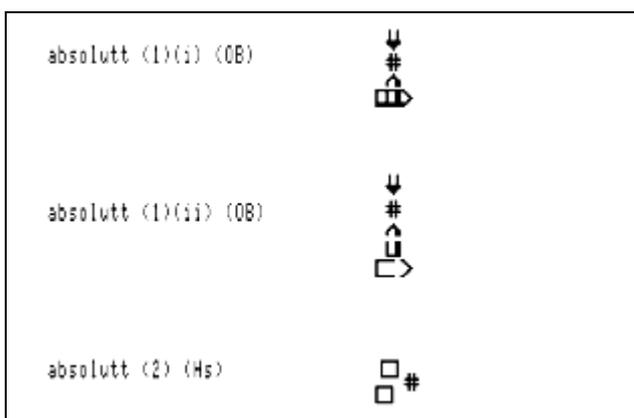


Figure 3: 'Absolutely' in SW 4.3 Dictionary program

### Problems with SW's Dictionary Program

The Dictionary program has a feature called 'merging'. My hope was to use this feature to build a large dictionary from several smaller dictionaries. That way it would be possible to make a dictionary of 'Spring Flowers' and merge this with a similar dictionary of 'Wild Flowers',

one of 'Summer Flowers' and so on, and merge these together and make a dictionary of 'Flowers', which again could be merged with other small ones to make 'Botany' and 'Biology' and 'Science' and finally 'Norwegian Sign Language'. Several attempts along this road were made, but the program would often fail in the merging process. Figure 4 shows result of a failed attempt to merge two smaller dictionaries. This was a setback, as it is considerably harder first to make a large dictionary and the weed out everything that is not inside your chosen theme. Each time a new sign is added, it has to be added separately to each of the appropriate theme dictionaries, rather than doing the merger process over at regular intervals. The building of dictionaries for signs other than my main subject, physics, therefore halted. In my computer are several small dictionaries for marine life, for instance. They will be used to fill the Norwegian SignBank.

Another time-consuming problem, not related to the Dictionary program, has been the changes in symbols and which key they are allotted to. The newer versions have not been compatible with the older ones, and strange pictures have resulted from this.

In addition, SignWriter and the Dictionary program can not be run from newer computer platforms, such as Windows 2000 or Windows XP.

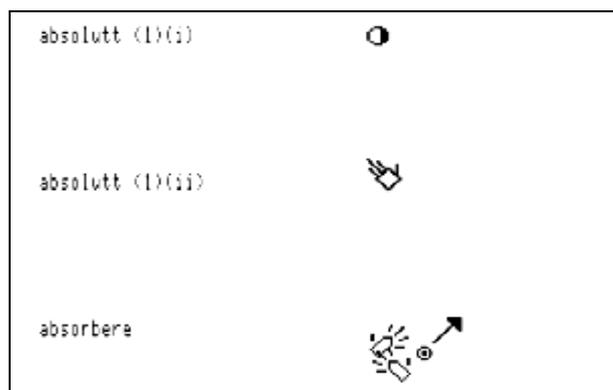


Figure 4: Result of merger failure with SW Dict program. The sign called 'absorb' is really 'language'

### The SignBank® Program

The SignBank is a very different program. It is built as relational databases in a FileMaker® environment. The program is not suited to write signed texts, but is a toolbox for creating good Sign dictionaries in a variety of styles. It can be searched alphabetically by sign-names, but it can also be searched from the sign itself. In addition, it can be searched by themes or other criteria that the editor may choose to use. Chosen signs, making up a large or small dictionary, can be printed in a variety of ways. Video explanations of the signs can be added, as can photographs or drawings like those from the paper-an-glue era. Other illustrations and explanations, in spoken-language text or in signed-language text can be added.

The recording of signs into the SignBank is rather time consuming, but this is necessary to make the program able to sort by sign. To make this sorting by sign possible, a standard sequence of the different symbols in SignWriter,

along with a few extras from the Sutton MovementWriting® system, is established. The full version, called SSS-04 (Sign Symbol Sequence) a large number of symbols, a shorter and more compact version created for the American Sign Language contains a smaller number of symbols in 10 categories, divided into groups, again divided into symbols and their variations. Now, the large numbers may seem overwhelming, but the system itself is largely transparent, and the huge number stems from the fact that a hand shape can have 16 rotations and 4 ‘flippings’ (shadings) for the right hand alone, making a total 128 symbols for that handshape (both hands included), all neatly derived from one basic symbol. With all possible hand shapes from all the signed languages, this makes the inventory of hand symbols huge. In addition, there are the symbols for movement (again having variations in direction and size, as well as which hand is moving) and dynamics, and the symbols for the face and other parts of the body, both as articulators and as places of articulation. The symbol sequence is used both in the SignWriter programs and in the SignBank, and will constitute the International Phonetic Alphabet. In the SignBank, this Symbol Sequence is used to order and look up the signs by the signs themselves. Thus, it becomes possible to have a dictionary for one signed language only, with definitions and explanations in the same signed language, without having to restore on any spoken language. It will also be possible to have dictionaries between two or more signed languages.

For a sign to be recorded, it first has to be written in SW-DOS or SW-JAVA, and then made into a .gif-file or a .png-file. The writing rules of signs in SignWriting are still somewhat ambiguous, as writing rules for the different signed languages have not had time to make the orthography settle. Thus, a writer may have several ways of writing the same sign, as a way to for the signing community to settle for one or the other. This I have done by using the coding (i), (ii), (iii), etc., for different ways of writing the same sign.

The term ‘spelling’ in SignBank parlance, means the symbols chosen for the ordering of the sign into the sequence, and the ordering of these symbols. For that purpose, most signs are seen as consisting of three ‘syllables’: starting configuration, movement, and ending configuration. The rules now are:

1. Initial dominant hand in shape and rotation and shading
2. Non-dominant hand similarly, if that hand is taking part in the sign.
3. Initial symbol for other articulators
4. Place of articulation
5. Movement of dominant hand (fingers first, then hand, etc.)
6. Movement of non-dominant hand
7. Movement of other articulators (brows, eyes, mouth, ...)
8. End dominant hand
9. End non-dominant hand
10. Dynamics

All these steps are optional, except for step 1. A few signs will have only this one symbol: most of the letters and numbers are given that way. Also, the few non-manual signs will have step 3 only.

For step 4, the place of articulation, extra symbols may be required that are not written in the sign. For the written sign, the placement in relation to the body is given by the structure of the written sign and its relations to the guiding (imagined) lines in the text. These are not part of the spelling for entering the sign into the SignBank. For use whenever necessary, symbols depicting the body and place of articulation are part of the SSS.

Once all the relevant symbols are entered into the spelling of the sign, the sign should be saved into the bank. A copy of the sign and the spelling can be made, for use with other signs that share the same features. Sometimes the exact same sign will cover more than one word in the spoken language (as for any two-language dictionary). Editing can also be done on this copy, so that a sign varying from the first in one or a few of the symbols can be entered with less entering work.

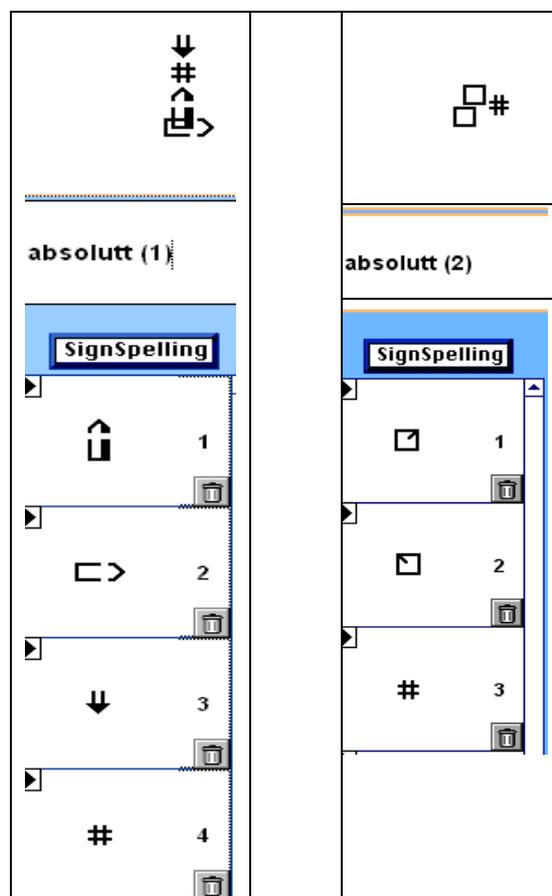


Figure 5: Sign spellings of ‘absolutely’

In addition to entering the spelling of the sign, and a word-name for it, the editor has the possibility of entering linguistic data, the sign in a sign-context or a sign-text explanation of the sign like in any one-language dictionary. It is also possible to make dictionaries covering more than one signed or spoken language. Video, animations and still picture illustrations may also be added. In all, the possibilities are available for

whatever one may want, as the program itself may be augmented with new features in new related database files. Below is shown a few of the features in the program

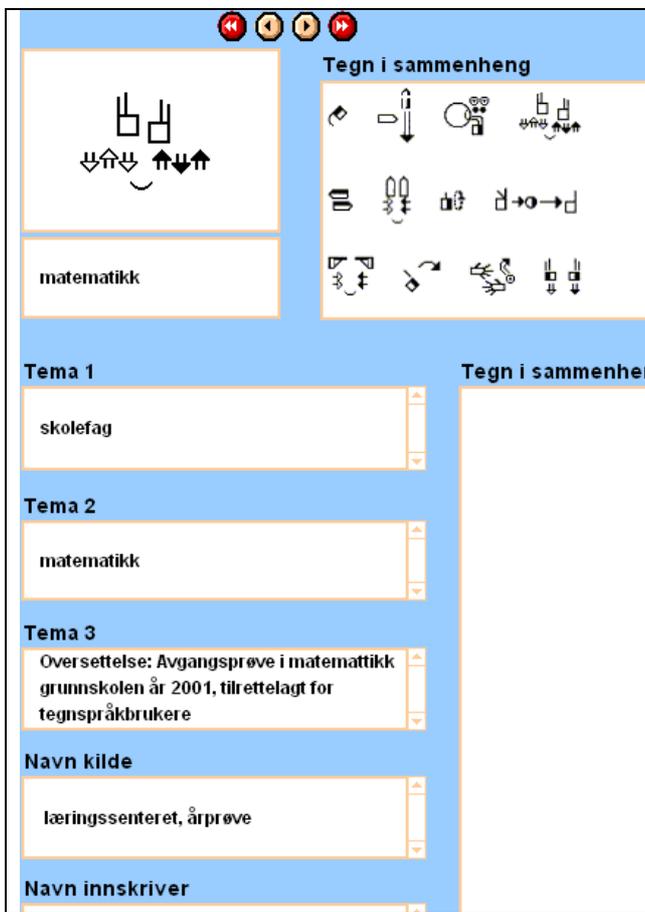


Figure 6: Linguistics page for 'mathematics'



Figure 7: Page with snapshot from video

	v		M
	Peru (2)		manh
	Irland (2) (irsk T5)		Martin
	matematikk		matematikk

Figure 8: Parts of dictionary, sorted by sign or word

In a short article like this one, it is not possible to present all the features of a program like the SignBank. Suffice it to say that the program opens a new era in dictionary creation for the signed languages, combining the written sign, sign illustration, video of sign and of sign in context, translation between signed languages and between signed and spoken languages. We have only begun to scratch these possibilities.

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