Hand in Hand – Using Data from an Online Survey System to Support Lexicographic Work

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Abstract

In the DGS-Korpus project the lexicographic descriptions of signs are based on available data of the DGS-Korpus, a reference corpus of German Sign Language (DGS). As this corpus is limited in size, number of informants recorded and topics included, it is in some cases helpful to obtain additional information from the larger sign language community via an online voting system. This is done using the DGS-Feedback System, a tool especially designed for online surveys conducted using a sign language. With this tool further information on e.g. sign forms and meanings and their use and regional distribution has been elicited. Data from the DGS-Feedback is used in several ways during the lexicographic process of preparing dictionary entries to supplement data from the corpus. In the following the consideration of the DGS-Feedback data in relation to the corpus data in decision-making, analysis, and lexicographic description is explained and discussed by way of examples.

Keywords: corpus-based lexicography, online voting system, community sourcing, German Sign Language

1. Introduction and Background

New technologies have made it possible to build sign language corpora of considerable sizes. The DGS-Korpus project has now a corpus consisting of 560 hours of recorded signed communication of which approx. 465.000 tokens have been annotated (23.02.2018). Nevertheless, this corpus is limited in size, in number of informants recorded and to the topics that were included as elicitation stimuli (Hanke et al., 2010; Nishio et al., 2010) or that came up spontaneously during the recorded conversations. Within the DGS-Korpus[1] project an online survey tool, the DGS-Feedback System, was developed to facilitate the use of a sign language throughout the survey for asking and answering questions and giving controlled comments (König et al., 2013; Langer et al., 2014). It was developed to address the DGS community, but could also be used for other sign languages (open source). Within the project this tool was first used for surveys to verify signs and their presumed meanings in previously published sign collections (Langer et al., 2014). Currently, the DGS-Feedback System is primarily used to supplement corpus data to be reviewed in the analysis stage when compiling corpus-based dictionary entries.

In the following we discuss how the data obtained through the DGS-Feedback are used and how they can help to complete the picture of a sign's use in addition to a corpus-based analysis.

2. Data from the DGS-Feedback

2.1 Sampling

The DGS-Feedback is open to all members of the DGS community who want to participate (Langer et al., 2014; Langer et al., 2016a). All participants fill out an initial questionnaire with information on their person and sign language use (metadata). This is needed for the analysis and interpretation of the results. Up to now, 279 persons (23.02.2018) have contributed to the DGS-Feedback. The sampling of the DGS-Feedback is subject to chance and therefore the group of language users participating is very heterogeneous including early and late learners, CODA, deaf, hearing, hard of hearing, and different age groups (Langer et al., 2016a). This is an important difference to the corpus, where the sampling of informants is balanced for gender, age group, and region. Also, all informants of the DGS-Korpus are native or near-native signers, as early learners were preferred over late learners. When using the data from the DGS-Feedback this heterogeneity of contributors has to be considered and weighted in the analysis.

2.2 Structure of the Survey

Different question types were developed to focus on different aspects of signs and sign use. In the first question type one sign form is presented to the user in combination with several meanings.[2] The second question type presents one concept and asks for different signs that are used for that meaning. For the purpose of this paper we will focus on the first question type. Questions of the first question type were the first to be released and are the first new participants are given to fill out before they can progress to the next level with the second question type. The goal of question type 1 is to check which meanings of a sign are used, known or unknown within the language community and to acquire more data on regional distribution.

In general a questionnaire (hereafter work package) consists of several question pages (hereafter questions). A question may include several question items. Within a question of the question type 1 first the respective sign is shown without mouthing and the participants are asked whether they know the presented sign form or not. If they know the form and chose *yes* further question items concerning the sign's meanings are presented. For each

[1] http://dgs-korpus.de, last access: 23.02.2018

[2] In the context of the DGS-Feedback we use the term *meanings* to refer to linguistic knowledge (on a sign) and with regard to corpus data to refer to the contextual meaning of an actual token. We use the term *sense* when it comes to the lexicographic analysis and description of such meanings, as it implies taking context patterns and actual use into account and describing them in a summarised way as a list of senses a sign can cover.

meaning the following stimuli are given: 1) a video clip of the single sign produced with a corresponding mouthing or mouth gesture, 2) written German equivalents, sometimes followed by a disambiguating written hint in brackets, and 3) in some cases a video clip with a signed context. In most cases the DGS context consists of a competence example of the sign. A DGS context is added in cases where the written information alone seemed insufficient or the German equivalents may not be well-known. A DGS context is also shown in cases where the distinction between closely related meanings has to be made particularly clear, and in cases where rather peripheral meanings are contrasted with presumed core meanings.

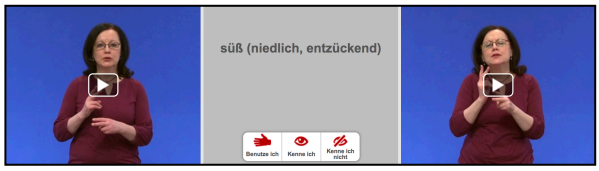


Figure 1: Stimulus and answer-buttons for one form-meaning combination in the DGS-Feedback

For each form-meaning combination the participants have the choice between three responses (see figure 1), which are: 1) *I use it* myself, 2) *I know it* from other signers, but do not use it myself or 3) *it is unknown to me*. In this paper these answers are referred to as *used*, *known* and *unknown*[3]. The answer *known* is the response option to select when participants are aware of an existing sign that they normally do not use themselves (passive vocabulary). At the end of each question concerning one sign form, the user is asked whether they miss a meaning they would like to bring to our attention. Answers can be given in writing or sign via a webcam. Once a work package is completed it can be submitted to the project. The results of returned work packages are imported into iLex[4] and can be analysed through queries and special list views. Up to date we released 42 work packages of type 1 of which 14 work packages with 71 different sign forms have more than 100 returns (23.02.2018).

3. Analysis Stage of Corpus-based Lexicographic Work

With a growing corpus and higher numbers of tokens per type available we have started with what Atkins and Rundell (2008:98-103) have called the *analysis* stage of dictionary making, that is, to analyse the available data of the sign in question and to document relevant facts about it. Central to this lexicographic work is the description of the sign's meanings and uses and grouping them into senses and sub-senses, a step sometimes called Word Sense Disambiguation (WSD) (cf. Atkins & Rundell, 2008:269). Basically, this is done by reviewing a substantial number of tokens in context, determining their contextual meaning and conditions of use, grouping these uses and describing them as senses. Other important issues are lemmatisation (lemma establishment, Svensén, 2009:94) and describing form variants and regional distribution of signs (McKee & McKee, 2013; Zwitserlood et al., 2013; Fenlon et al., 2015). Descriptions and decisions on these issues are based on the corpus data available[5].

In this process, corpus data have priority over additional data as it is usage data in comparison to elicited answers stemming from the DGS-Feedback. However, as we are dealing with a highly variable and non-standardised language (DGS) and as the corpus is relatively small – compared to the multi-million word corpora used for written language lexicography – it is helpful to have also other sources of information available when making lexicographic decisions. Data obtained by the DGS-Feedback adds information on the signs, supports the lexicographic work and therefore helps to improve the later product – the dictionary.

4. Contribution of DGS-Feedback Data

In the analysis stage of the lexicographic work the corpus data of one sign is analysed with regard to all dictionary-relevant facts, including meaning, form variation, regional distribution, and variation across different age groups. For all these facts corpus data may contain sufficient evidence to provide a clear-cut picture of the sign's properties and uses to be described. However, the corpus can only provide positive evidence of e.g. a variant form, a sense or regional distribution. Areas of uncertainty remain when there is only very little evidence in the corpus. Little or no data can either result from non-existence or from non-appearance of this feature in the corpus due to size, chance, and frequency of a sense. In these cases, additional data from the DGS-Feedback can be useful to obtain a clearer picture of the sign's properties. Furthermore it may add weight to the decision on which signs and meanings are to be selected for description in dictionary entries. The results of the corpus analysis are compared to the results from the DGS-Feedback to cross-check and supplement the findings. Doing so, we encounter different cases. The DGS-Feedback results can either confirm corpus data findings, or considerably differ from them. So far it does not seem useful to formulate strict guidelines or thresholds on how to weight *used* or *known* answers in comparison to corpus tokens, as all available information has to be taken into account to arrive at a comprehensive view on the sign's properties. DGS-Feedback results have to be interpreted carefully as a variety of factors can have influence on the outcome. These are e.g. the accidental participant sampling with respect to sociologic factors or the way question items are presented. In the following examples, we will discuss the most important ones.

[3] Within the charts representing DGS-Feedback results the different answers are represented in red (*used*), blue (*known*) and grey (*unknown*). Beige signifies areas where no participants contributed so far.

[4] iLex is the annotational and lexical database and working environment that is used for the DGS-Korpus project (Hanke & Storz, 2008).

[5] A more detailed description of the analysis of corpus data for lexicographic purposes are presented in Langer et al. (2018) in this issue.

4.1 Cases of Confirmation

DGS-Feedback data can confirm corpus findings in different respects – a good evidence of corpus tokens corresponds to many *used* responses, a scarce one to few positive responses.

4.1.1. Strong Corpus Evidence and High Positive DGS-Feedback Response

Strong corpus evidence alone would suffice for inclusion of a sense into the entry. If there are many *used* responses, DGS-Feedback results confirm this finding. This is the case for the form-meaning combination in example 1.

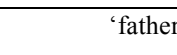
Example 1	
'father' 	
Sense	male parent, man who rears a child
Number of corpus tokens	156 from 63 informants
Total number of responses	147
Used	116
Known	27
Unknown	4

Table 1: 'father'

4.1.2. Weak Corpus Evidence and Low Positive DGS-Feedback Response

If only few corpus tokens and a relatively low percentage of *used* or *known* answers are found, a closer look at the data is needed especially with regard to region, age, hearing status, and age of language acquisition, as these factors may have an influence on sign use of informants and response behaviour of DGS-Feedback participants.

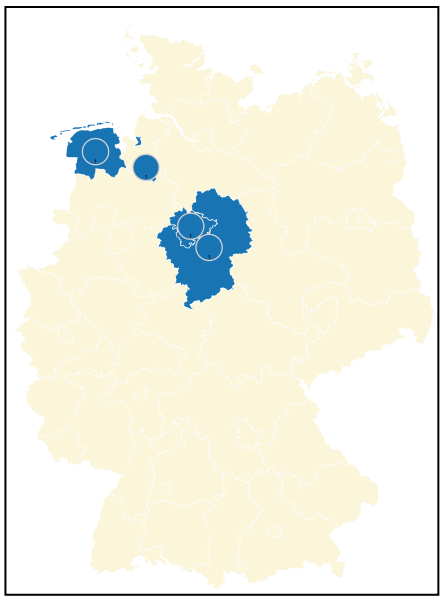


Figure 2: Distribution of corpus informants using 'Monday'

In some cases low token numbers and a low DGS-Feedback percentage of *used* and *known* answers are both by themselves not conclusive while in combination can stabilise the findings and suggest an explanation. E.g. the low proportion of *used* in the case of 'Monday' (example 2) appears to be the result of a very regional distribution in Lower Saxony (see figure 2).

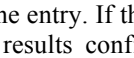
Example 2	
'Monday' 	
Sense	Monday, name of the first day of the week
Number of corpus tokens	9 from 4 informants
Total number of responses	104
Used (red, see figure 3)	5
Known (blue, see figure 3)	15
Unknown (grey, see figure 3)	84

Table 2: 'Monday'

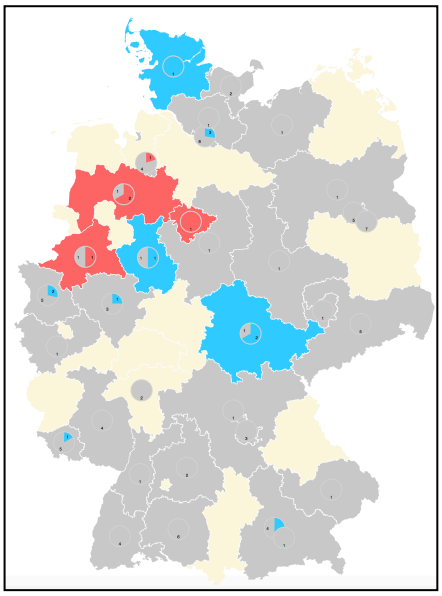


Figure 3: Distribution of DGS-Feedback responses concerning 'Monday'

Example 2 is also a case where a more clear-cut picture of regional distribution results from the DGS-Feedback data. Although we recorded 330 different informants from different regions the information on regional signs is often rather scarce. Not every informant from a certain region uses every regional sign from his or her region. DGS-Feedback participants add here with their information on use and knowledge. In this case the majority of *used* or *known* responses either match with the region of Lower Saxony or come from participants living in adjacent parts of the country (see figure 3).

4.1.3. No Corpus Evidence and No or Low Positive DGS-Feedback Response

For some items there are no tokens in the corpus and also no or few *used* or *known* answers (see example 3). The core meanings of the sign in example 3 are 'food' and 'to eat', which are well attested. Another meaning is 'menu' in the sense of 'a list or range of food offered'. In spoken German the polysemous word *Menü,* which is the basis for a corresponding mouthing, may also denote the menu options of computer programs. Because of this, the sign from example 3 could possibly be used to express 'menu (computer)' although this meaning is not related to food. In this case, the DGS-Feedback data supports the impression from the corpus that this sense is very likely not an established use in the sign language community. Unless further evidence emerges such a sense will not be included in the dictionary entry.

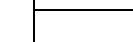
Example 3	
'menu' 	
Sense	small display on the computer to choose editing options
Number of corpus tokens	0
Total number of responses	103Beispiele
Used	3
Known	14
Unknown	86

Table 3: 'menu (computer)'

Example 3 is a result of the workflow established to verify or disprove data from previously published sources. Here all listed and presumed form-meaning combinations of the sign in question have been put into the DGS-Feedback for verification independently of corpus evidence (Langer et al., 2014).[6] Many of the previously published sources are sign collections that are based on German wordlists (see e.g. Johnston 2003 for a critical view on publications based on wordlists). Asking signers for their sign equivalents for words off a word list is a method that elicits not only established signs. It is also prone to produce some spontaneous isolated sign uses that are not actually established in the signing community. Especially when the items concern technical terms or new concepts that may not have established signs yet. Some of these artefacts have made their way into sign collections. This might also apply to example 3 taken from *Fachgebärdenlexikon Computer* (Arbeitsgruppe Fachgebärdenlexika, 1994). Findings like example 3 show that the DGS-Feedback can be useful in filtering out such artefacts.

4.2 Cases of Discrepancy

In some cases corpus and DGS-Feedback results differ considerably from each other. These cases require a closer look and ask for an explanation.

4.2.1 Strong Corpus Evidence and Low Positive DGS-Feedback Response

If there is a high token number for a certain meaning but little *used* or *known* answers in the DGS-Feedback, it would still be included as a sense in the dictionary, because corpus data has priority over the DGS-Feedback data. However, we always try to find a plausible explanation for discrepancies in the two data sources. For example, they may be a result of differences in sampling as in the following example 4. While there is good corpus evidence for the sign of example 4 to have the meaning of 'bread', DGS-Feedback responses do not seem to confirm this finding.

Example 4	
'(loaf of) bread'	
Sense	food made of flour, water and yeast
Number of corpus tokens ("non-tokens" excluded)	26 from 16 informants
Total number of responses	71
Used (red, see figure 5)	3
Known (blue, see figure 5)	14
Unknown (grey, see figure 5)	54

Table 4: '(loaf of) bread'

The relatively high token count for this meaning is a result from a particular elicitation task. With this task signs for certain concepts (e.g. bread) known to be highly variable from region to region were elicited.[7] It was to be expected that otherwise findings of such regional signs, that we want to document, would be scarce. But, even though the majority of tokens (19) appear in the context of this task, there are also findings of the sign (7) within tasks that have conversational character. In the corpus data, regional

[6] At the present stage of the project lexicographic descriptions are fully based on corpus evidence. That means the DGS-Feedback now is only used to check meanings of low token evidence but not items that have no token evidence at all.

[7] Only in one of the 20 tasks in the corpus elicitation the participants were directly asked to show their sign for a given concept and to give an example sentence. All other tasks used within the DGS-Korpus project aimed at more natural signing or for free conversational data (Nishio et al., 2010). A direct elicitation of this kind produces metalinguistically aware answers as opposed to spontaneous sign use. Informants often do not only show their own sign but also other signs they know for the concept, which should not be counted as an evidence of their personal sign use. This problem was addressed in the paper on so-called "non-tokens" (cf. Langer et al., 2016b).

distribution as a variant for ‘bread’ in the Bavarian and Hessian area is well evidenced (see figure 4).

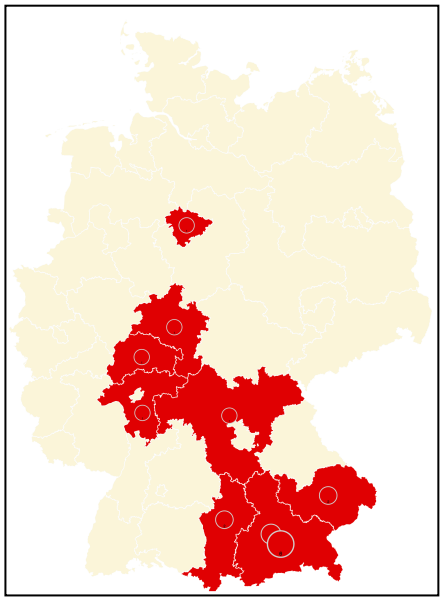


Figure 4: Distribution of corpus informants using ‘bread’

In the DGS-Feedback data, 3 of 8 of the participants from Bavaria answered with *used* and further 4 answered with *known*. Up to date only one user from the Hessian region participated and voted *unknown* (see figure 5). Altogether only few DGS-Feedback participants were from the area of sign use that is evidenced from the corpus data.

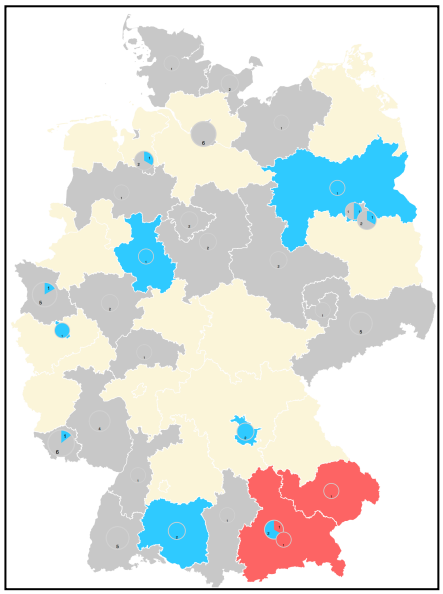


Figure 5: Distribution of DGS-Feedback responses concerning ‘bread’

Taking the information from corpus and DGS-Feedback data together a rather restricted region (see figure 6) becomes apparent. Most tokens and *used* answers (orange in figure 6) stem from Southern Bavaria indicating that the sign is mainly used in that area. For the dictionary this would mean a note on regionality.

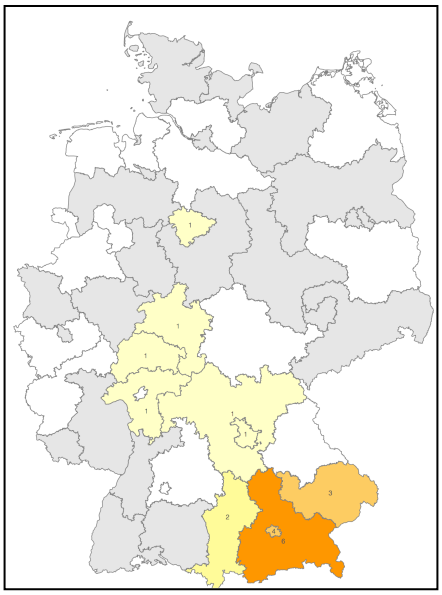


Figure 6: Distribution of corpus informants and DGS-Feedback participants using ‘bread’

4.2.2 Weak Corpus Evidence and High Positive DGS-Feedback Response

Example 5	
‘earring’	
Sense	jewellery worn on the ear
Number of corpus tokens	6 from 4 informants
Total number of responses	139
Used	121
Known	14
Unknown	4

Table 5: ‘earring’

In some cases there are only few corpus occurrences but the percentage of *used* answers is high. It is reasonable to assume that corpus evidence is low because the sign or sign sense is a low-frequency item, or because it is not appearing in the corpus very often as no relevant topic has come up during elicitation sessions, or because the sign with this sense is rarely used in communicative events as recorded. In this case the DGS-Feedback provides us with a good reason to include a sense into an entry. Otherwise it would have been held back until token count for the sense would have risen.[8] In a case like this the

[8] Senses that have only weak corpus evidence are nevertheless documented in the internal pre-dictionary database and put to the status of *under surveillance*. As corpus annotation is ongoing further corpus evidence may emerge. Items *under surveillance* will not appear in the dictionary entry at the current state but

DGS-Feedback results provide an additional basis for decision-making. An example for such a case is the sense ‘earring’ (example 5). The iconic value of the sign is a representation of a ring or bud in the ear. This sign may be used for ‘earring’ as well as for the well-evidenced senses ‘woman’ or ‘girl’. So, even if the sense ‘earring’ is not well represented in the corpus, the DGS-Feedback gives a good reason to include the sense as many *used* answers indicate it as a conventional meaning of that sign.

4.2.3 No Corpus Evidence and High Positive DGS-Feedback Response

In the last case to be discussed no corpus evidence for a sense could be found but in the DGS-Feedback there was a high percentage of *used* answers. This leads to a preliminary description of this sense within the pre-dictionary database, but with the status *under surveillance*. We prefer corpus evidence over DGS-Feedback data as the goal is to produce a corpus-based dictionary. Additionally, senses are usually illustrated by examples taken from the corpus. So senses without corpus evidence will not be included into the product until there is at least some evidence from corpus data.

Example 6	
‘medical’	
Sense	of a or concerning a doctor
Number of corpus tokens	0
Total number of responses	124
Used	87
Known	19
Unknown	18

Table 6: ‘medical’

Even though *used* answers are high for example 6 other factors need to be considered. It is not always easy to create good stimuli for the surveys, especially if we try to verify or disprove meanings expressed by German words (translational equivalents) stemming from word lists of sign collections. Transferring a sense like *ärztlich* (‘medical’, see example 6) into a signed context is not easy. Knowledge of German and the presented translational equivalents can have an influence on the responsive behaviour of the participants. Thus an overall acceptance of a certain form-meaning combination is possible if the German word is known, even though the concept might usually be expressed differently within the community. So language contact might play a role here.

may be included in the future if sufficient evidence can be found.

4.3 Participant Comments on Sign Use

Participants are given the option to comment on sign use. These comments give interesting insight into homonyms, additional senses, further form variation, lexical variants, and problems of understanding concerning the presented stimulus. Such information is valuable for the dictionary writing as well as for the enrichment of the lexical database. Signs having same or similar forms are cross-referenced in the lexical database and in the dictionary entries. Comments from the DGS-Feedback provide hints on such relations between signs that have been missed so far.

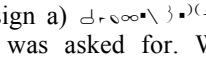
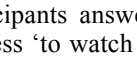
Example 7	
Sign:	
Core sense	‘eye’
From related sign:	
Core sense	‘to try’
Number of written comments	11

Table 7: Form-related signs

Example 7 shows such a finding that resulted from the comments that were given on the sign form with the core sense ‘eye’ at the end of the question concerning that form. There were 11 written and 1 signed answer(s) that this sign could also mean ‘to try’. In iLex we have two well evidenced sign type entries for ‘eye’ and ‘to try’ showing slightly different citation forms. The only difference is the location of the sign. The form with the core meaning ‘eye’ is usually signed close to the eye at the upper part of the cheek. In comparison, the sign with the core meaning ‘to try’ is signed at the cheek but not necessarily close to the eye. Both signs are so similar in form that, when presented in isolation, they could be mistaken for each other. Following the comments of the participants a new cross-reference was added in the annotational database for these two signs.[9]
Cross-references within the database that can be established through these findings are beneficial for transcription, as they help annotators to find signs within

[9] The location of a body-anchored sign in actual use may be within a more ore less extended area of contact rather than only one specific spot. Areas of different signs with different locations can be overlapping. For the purpose of quick type identification in the database a citation form of each sign type is defined by a HamNoSys Notation (Hanke, 2004). When working on an entry the review of token data can lead to a correction of the citation form. When establishing lemmas it has to be checked whether the two type entries in the annotational database ‘eye’ and ‘try’ have to be merged into one dictionary entry or whether they are better described in two separate entries (cf. Langer et al., 2016c). Cross-references in the database support this step by bringing sign types that are similar to the respective entry candidate to the notice of the lexicographer and making them easily accessible in the database for inspection.

the database more easily. Additionally the dictionary entries profit from this information as cross-references to similar signs are included in the entries of the future dictionary.

Some participants also use the video function to show their sign for a meaning. This is usually the case when a presented form-meaning combination is not accepted by them. For example within the DGS-Feedback questions the sign a)  with the meaning 'to watch out' was asked for. Within the video comments two participants answered that they use sign b)  to express 'to watch out' instead of sign a) . In some cases it makes sense to conduct a spot transcription. Such transcribed video answers supplement the corpus findings. So when WSD for the sign form starts these "tokens" are available in the database and may be consulted in addition to the corpus findings.

5. Conclusion

Data from the DGS-Feedback adds valuable information on the signs, their forms and meanings in addition to the findings from the corpus. It can confirm uncertain sign use, help to find special characteristics of signs (e.g. regional use, form variation, age effects) and can be utilized to improve the content of the annotation database.

Up to now DGS-Feedback data has been collected with question types targeting basic vocabulary. To suit the needs of the corpus-based WSD and dictionary writing process better, new questions types for the DGS-Feedback System will be developed. One question type already in preparation focuses on specific senses that have only very weak corpus evidence. This means that evidence is not stable enough to base a well-informed decision on inclusion or exclusion of the sense into the entry or not on the grounds of corpus data alone. Thus supplementing data from the DGS-Feedback may be helpful here.

In general, the data from the DGS-Feedback System need to be analysed and interpreted carefully when compared to the corpus findings especially if they seem to differ from the corpus evidence. As we have shown in the examples 2 and 4 to 6, there is no reliance on numbers of response alone. However, in combination with corpus evidence they often are helpful in lexicographic decision-making.

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