Swedish Sign Language Resources from a User's Perspective

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Abstract

The Swedish Sign Language Dictionary [Svenskt teckenspråkslexikon] is one of the most visited websites at Stockholm University, with four million visits each year. The dictionary is an easy-to-use resource for the community, families, relatives, students, educators, researchers and other stakeholders that can be accessed through the website, app, and mobile platforms. STS-korpus is an online interface for the Swedish Sign Language Corpus that is linked to the STS Dictionary, enhancing its utility. Other applications, like TSP Quiz and the STS transcription tool, will also be evaluated. In January 2024, we conducted a survey to explore how users utilise Swedish sign language resources in their everyday lives, studies and work, regardless of hearing status and sign language skills. The purpose is to evaluate these resources from a user's perspective, including aspects such as user-friendliness, relevance, comprehensibility and effectiveness in aiding language learning or communication.

Keywords: language resource, evaluation, Swedish Sign Language

1. Introduction

One crucial aspect of any language resource is how representative it is of the language or languages it covers. Because of this, the resources also serve as language documentation. Sign language dictionaries are essential language resources to meet the needs of sign language interpreters, teachers, students, deaf communities, individuals with special needs, researchers and other users of sign language, not least to elevate the status of sign language (McKee and Vale, 2023). Signed languages are both visual and tactile and they play a significant role in certain communities. Developing sign language dictionaries has been an essential theme, and there are many different methodologies (e.g. (Bragg et al., 2015; Vlášková and Strachoňová, 2021; Schembri and Cormier, 2022; Mesch et al., 2012a). In this paper, we aim to improve our understanding of language resources for Swedish Sign Language (STS) by collecting feedback from users within sign language communities in Sweden. Specifically, we focus on enhancing the utility of the STS Dictionary and STS Corpus. By engaging with users, we seek to ensure that these resources effectively serve the needs of the community and contribute to the advancement of sign language communication.

1.1. Swedish Sign Language Dictionary

The STS Dictionary has served as the primary lexical database for Swedish Sign Language since its online launch in 2008. It is based on Brita Bergman's earlier phonological description and transcription efforts (Bergman, 1979). The STS Dictionary, Svenskt teckenspråkslexikon (2024), has been under development for an extended period and now serves as an online video dictionary, currently containing 21,000 entries and 6,700 sentence examples (Mesch et al., 2023). The latest version with several search functions was launched in May 2023 (see Figure 1). Each dictionary entry is represented by a video of the sign or phrase, sentence examples, a Swedish translation, phonological information, phonological variants and internal cross-links to phonologically or semantically equivalent signs – i.e., homophones and synonyms. The etymological description is also added. The STS Dictionary is enhanced by a quiz designed for studying sign language. A transcription tool is also available https://teckensprakslexikon.su.se/information/om-lexikonet. New signs are added to the lexical database on an ongoing basis. Crowdsourcing is crucial to developing and improving the STS Dictionary in collaboration with the deaf and sign language community (Riemer Kankkonen et al., 2018). The STS Dictionary also contributes to the Multilingual Sign Language Wordnet but this is not dealt with in the survey because it is still in the early stages of development (Bigeard et al., 2024). Complementing the STS Dictionary is the STS Corpus, which emerged from two projects conducted between 2003 and 2004 and 2009 and 2011 (Mesch, 2023). These language resources are freely available and interconnected, facilitating access and usability for users within the Swedish Sign Language community who are seeking comprehensive information and linguistic analysis.
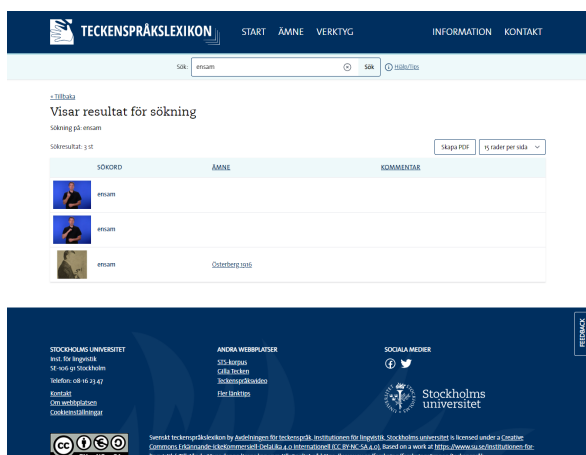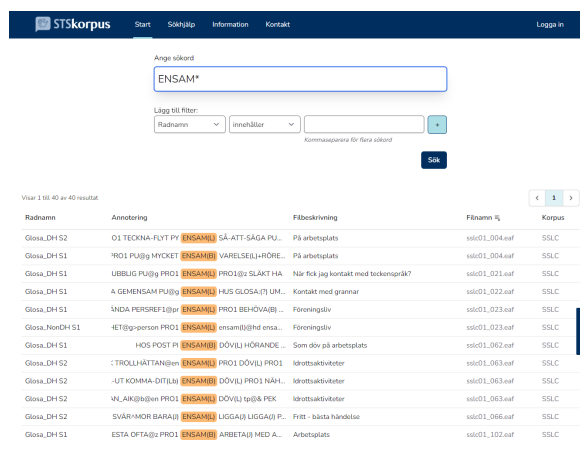
Figure 1: Swedish Sign Language Dictionary

Figure 2: STS-korpus

1.2. STS Corpus

The Swedish Sign Language Corpus has been available via the online tool STS-korpus, teckenspråkskorpus (2024), since 2020 (Figure 2). The STS Corpus consists of 24 hours of video data (conversations, narratives, and presentations) from 42 different signers from three regions of Sweden collected during the period 2009–2011 (Mesch et al., 2012b). All 24 hours of data have been annotated with sign glosses and thus far approximately 76 percent of data has been translated into Swedish (free translation). The annotation work continues, and annotation conversations are still developing. A limited part of the collection of 190,000 sign tokens from this corpus is accessible online via STS-korpus at `https://teckensprakskorpus.su.se` (Öqvist et al., 2020). In addition to the existing data, the STS Corpus has integrated additional contributions from SSLC2017, including data from six young signers. Moreover, the corpus now includes the updated version of data from the European Cultural Heritage Online (ECHO) corpus for STS from 2004 and the Tactile Swedish Sign Language Corpus from 2016. As part of ongoing efforts, old video recordings and pedagogical materials are continuously being incorporated into the corpus, further enhancing its depth and breadth (Mesch, 2023). Previously developed and managed independently, the STS Dictionary and STS Corpus are now interlinked. It is this collaboration between those working on the STS Dictionary and the STS Corpus that led to the creation of the web-based tool STS-korpus, which facilitates seamless integration between these two resources (Öqvist et al., 2020).

1.3. STS Resources as Digital Tools in Educational Settings

Digital methods play a crucial role in sign language education and interpreting across all levels, including the first, second and third cycles of higher education. In 2013, Stockholm University launched the first three-year bachelor's programme in sign language and interpretation, which offers a blend of theoretical and practical courses focused on STS and interpretation between Swedish and STS. The programme emphasises practical learning, aiming to help students enhance their language skills from beginner to advanced level in both STS production and comprehension. Students begin using the STS Dictionary as a digital tool from the first semester of their first year. By the third semester of their second year, they are incorporating the STS Corpus into their studies (Björkstrand et al., 2022). These language resources are invaluable tools for students throughout their academic journey, allowing them to develop their skills progressively and at their own pace through study and practice (Leeson et al., 2019).

1.4. Linking of Two STS Language Resources

Here, we briefly present the two language resources and their linking to each other to enhance the functionality of the resources (Öqvist et al., 2020). Collaboration between the dictionary and the corpus pertains to lexical issues, primarily sign lemmatisation. Another significant issue concerns depicting (classifier, non-lexical signs) signs, which are difficult to describe in the STS Dictionary because it requires establishing limited meanings for the signs that do not align with their usage, as discussed in several earlier publications, e.g., (Johnston, 2008). This sign category exists in the corpus but not yet in the dictionary, and collaboration be-

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tween the two resources can be used to address this issue. Only some partially lexicalized signs have been added to the STS Dictionary.

The STS Corpus and STS Dictionary are connected through reciprocal linking. The links within the corpus show users summarised information from the dictionary, including a sign video, a description of the sign and a transcription of the sign. There is also an option to go directly to the associated entry in the dictionary in order to learn more. Similarly, dictionary entries for signs that appear in the corpus show the total number of times the sign is used in the corpus. When clicked on, this information takes the user to a list within the corpus that includes every occurrence, to explore further. The integration also has a more systematic feature called "missing corpus". Each night, an automated process cross-references every annotated term in the corpus with the dictionary database. Before this comparison, terms are checked against a global ignore list, which excludes unhelpful terms from the analysis. This process helps us find discrepancies and refine and enhance the data in both systems, such as missing glosses in the dictionary and misannotated terms within the corpus. As the discrepancies are rectified, the dictionary itself grows with new additions and the annotations used in the corpus become more accurate. This leads to a systematic evolution of both the dictionary and the corpus, effectively enhancing each of them.

2. Evaluation of Sign Language Resources

Although the STS Dictionary has been available online since 2000, it has never been evaluated. To assess the use of Swedish Sign Language resources, a questionnaire was sent to both old and new users. A web-based survey tool called Survey, commonly used for course evaluations at Stockholm University, was used for this purpose. This interface is versatile and suitable for various types of surveys. In this instance, it was used to evaluate the use of Swedish Sign Language resources. A link was provided to a signed version of the questionnaire containing 25 questions. The survey was conducted in Sweden over a two-week period in January 2024. The questionnaire included both open-ended and closed-ended questions. A total of 249 responses were collected from Sweden's three regions: 7.2 percent from Norrland, the northernmost region; 56.2 percent from Svealand in south-central Sweden; and 34.5 percent from Götaland in southern Sweden (see Figure 3).

Demographically, 43 percent of the respondents identified as deaf, 14.5 percent as hard-of-hearing, 1.6 percent as late-deafened, 0.8 percent as deafblind, 4.4 percent as children of deaf adults (CODA),
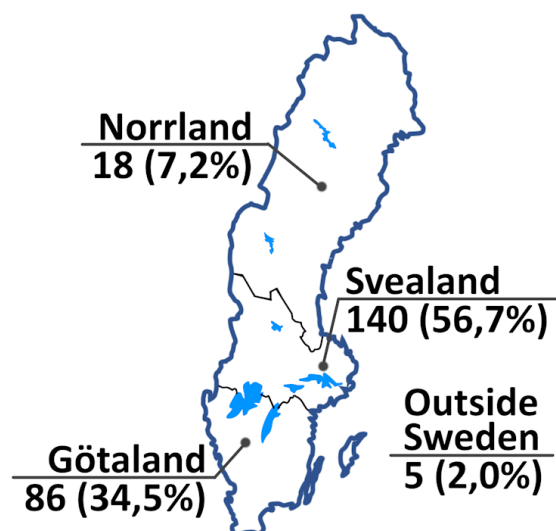
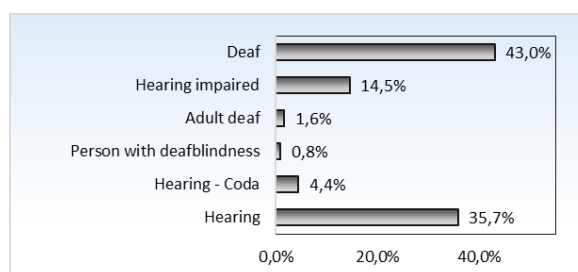Figure 3: Percentage of responses from each of Sweden's three regions.

Figure 4: Demographic data on the deaf/blind/hearing status of the respondents.

and 35.7 percent as hearing (see Figure 4). The majority reported being born in the 1960s, 1970s or 1980s, with these three decades accounting for 73 percent of respondents. The remaining respondents were born in the 1950s or 1990s, with approximately 7–10 percent falling in each of these categories (Figure 5).

Among the respondents, 47 percent stated that Swedish Sign Language (STS) was their first language, and nearly 47 percent that Swedish was their first language. Three percent stated that some
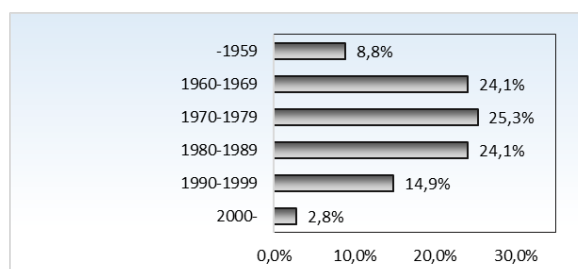
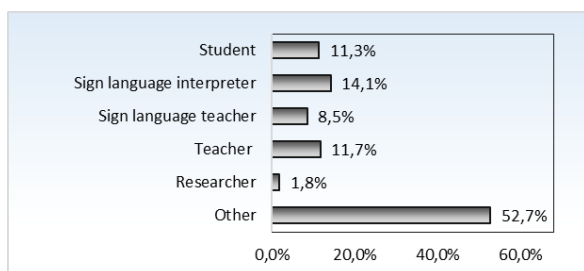Figure 5: Demographic data on the year of birth of the respondents.

Figure 6: Demographic data on the occupation of the respondents.

Figure 7: Respondents' use of sign language resources.

other signed language was their first language. Regarding competence in STS, 80 percent of the 249 respondents assessed their proficiency as high or relatively high. In terms of occupation, 12.9 percent of respondents were students, 16.1 percent sign language interpreters and 22.8 percent educators/teachers/instructors at levels varying from preschool to university. Only two percent were researchers. See Figure 6).

3. Results

The popularity of online sign language resources has been evident for many years. However, the survey provides valuable insights into users' views on STS resources. The results are divided into the following categories:

- Facebook group

- Use of language resources

- Frequency of use of the STS Dictionary and STS Corpus

- Searching for signs/words, topics, functions, tools

- Opinions about resources (grammar, function, manual)

3.1. Facebook Group

The Facebook group *Teckenspråkslexikon* [Sign Language Dictionary] was established in 2014 and is managed by the STS Dictionary team. It currently boasts some 6,998 members and continues to gain in popularity, with 93.2 percent of the 249 respondents stating that they are a member of the group. The survey conducted for this paper included both closed- and open-ended questions regarding respondents' engagement with the group. In response to an open-ended question asking what they liked about the group, 182 respondents provided brief answers. Positive feedback included comments such as "good", "excellent", "fascinating discussions", "many new signs" and "have learned
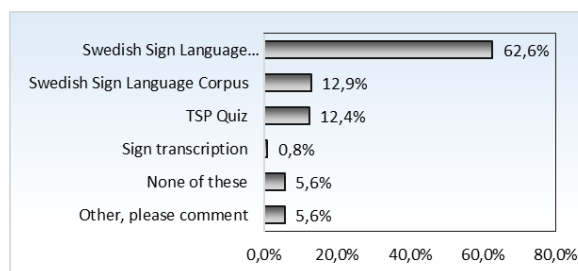
new signs". There was also, some critical feedback, with comments such as "good, but it is hard to follow those who sign fast", "want to know about sign semantics", and "why do many write when it is possible to sign". Overall, the Facebook group serves as an important platform for individuals to engage in various discussions and exchange information related to sign language usage, lexical variation and sign formation.

3.2. Use of Language Resources

Statistics on the use of all or selected STS resources are not available. However, traffic statistics for the STS Dictionary and *STS-korpus* show the number of visitors to the websites. Between January 2023 and January 2024, there were over four million visits and 93,977 unique visitors. Two peak months for visits are February and October (1–2 months after course start). The survey provides insights into the use of specific STS resources (Figure 7). According to the 249 respondents, 90.7 percent use STS Dictionary, while 18.7 percent use *STS-korpus*. Additionally, 17.9 percent use the TSP Quiz tspquiz.se, primarily for self-learning purposes, while 1.2 percent use the sign transcription tool. Other resources not administered by Stockholm University include *Spread The Sign* and *Teckenspråkspedagogerna* [Sign Teachers], which 8.1 percent of respondents use. Notably, 8.1 percent of respondents chose not to disclose this information. Most respondents learned of these resources via the internet (42 respondents), Facebook (39 respondents), educational settings (38 respondents), friends (15 respondents) or colleagues (13 respondents).

3.3. Frequency of Use of Language Resources

The survey collected data on the average frequency of everyday use of sign language resources. When asked "How often do you use the Swedish Sign Language Dictionary?", 13.5 percent of the 249 respondents replied that they use the STS Dictionary on a daily basis, 18.8 percent that they use it
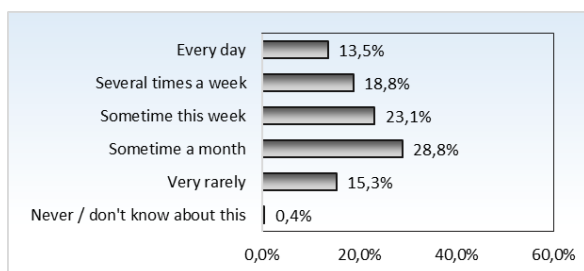
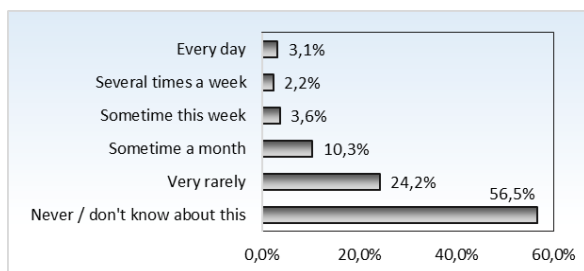Figure 8: Respondents on how often they use the STS Dictionary.

Figure 9: Respondents on how often they use of the STS Corpus.

Figure 10: Respondents on the user-friendliness of the STS Dictionary.
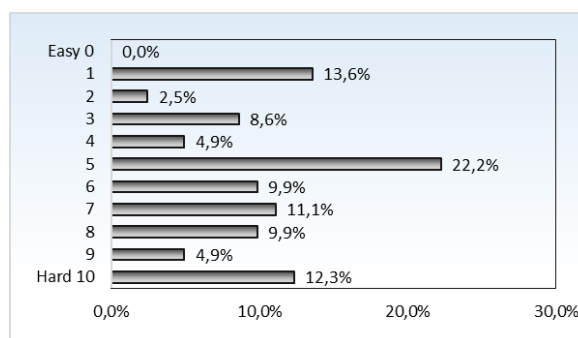
Figure 11: Respondents on the user-friendliness of the STS Corpus.

several times a week, 23.1 percent that they use it at some point during the week and 28.8 percent that they use it once a month (Figure 8).

Regarding the STS Corpus, many respondents indicated that they were unfamiliar with it; specifically, 24.2 percent reported using it very rarely and 56.5 percent that they never used it or had not heard about it (Figure 9). Two main reasons were cited for not using it: some users only need to find a sign and do not require analysis of linguistic constructions in conversations or narratives.

With regard to the question "How do you feel about using the Swedish Sign Language Dictionary?", the parameters user-friendliness, relevance, comprehensibility and effectiveness in aiding language learning or communication were rated on a scale ranging from "easy" = 0 (left) to "hard" = 10 (right). The scale is wide at both ends, with ratings of 1–3 indicating ease (easy) and 8–10 indicating difficulty (hard). See Figure 10 for a graphical representation.

Additionally, responding to open-ended questions, fifteen respondents commented that they found the STS Dictionary to be clear, user-friendly and easy to navigate. They expressed appreciation for the explanations provided in STS through videos. Six respondents occasionally find navigating the system challenging and request the return of the previous "Slow down" function to help them keep pace. Additionally, five respondents find it difficult due to the lack of words and uncertainties about which sign variants are predominantly used, especially with limited knowledge of STS. They also
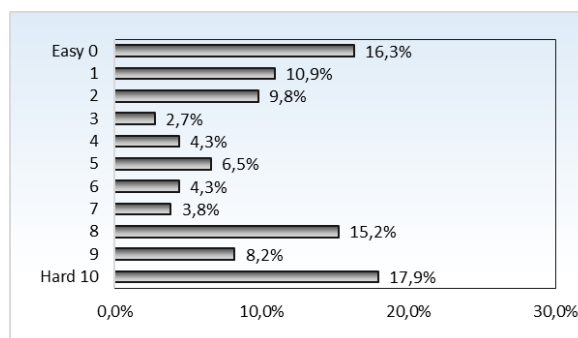
express confusion about which regional and social sign variants should be used. The question regarding the user-friendliness of *STS-korpus* is posed similarly: "How do you feel about using *STS-korpus*?". On the scale from "easy" = 0 (left) to "hard" = 10 (right), responses to this question generally fall in the middle of the scale, as shown in Figure 11).

In addition, 25 respondents state that they do not use or are unfamiliar with *STS-korpus*. Four respondents consider *STS-korpus* to be user-friendly. Three respondents stated they would like to use it more frequently and require more information about its functions, such as a link between *STS-korpus* and STS Dictionary.

3.4. Searches

Various tools have been developed to facilitate sign searches in the STS Dictionary. These tools provide several different search paths, including:

- searching with Swedish words

- searching for signs

- exploring other meanings of signs

- identifying alternative signs
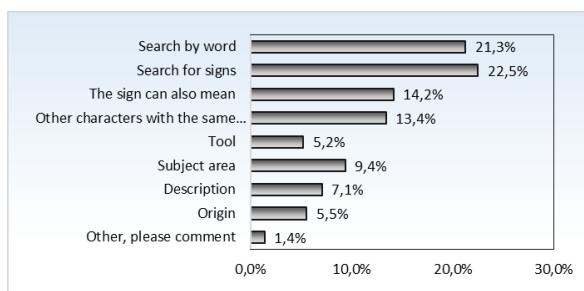
- filtering signs by handshape

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Figure 12: How respondents use search functions in the STS Dictionary.

Figure 13: Respondents' awareness of links between the STS Corpus and Dictionary.

- browsing signs by subject area

- searching with English words

Additionally, users can search for signs directly within the STS corpus, thus enhancing the comprehensibility and usability of the STS Dictionary. These features collectively improve the accessibility and effectiveness of sign language lookup and comprehension for users. Typing a Swedish word into a search box is the most common search procedure. The four most commonly searched words and phrases are "jag älskar dig" [I love you], "mamma" [mother], "hur mår du" [How are you?] and "jag heter" [My name is]. However, this does not necessarily imply that each sign corresponds directly to a word in Swedish. Instead, users search for signs that have an equivalent meaning in Swedish. Another common method of searching for signs is to enter subject categories and select a topic, such as healthcare, or a subcategory within a topic. One unique feature of the STS Dictionary is the ability to search by sign form, allowing users to specify particular characteristics of signs they are looking for.

The survey results confirmed that 64 percent of the 249 respondents searched for signs directly, while 60.5 percent searched using Swedish words. Additionally, 40.4 percent wanted to find signs with other meanings, and 38.2 percent searched for synonyms for signs they already knew. Furthermore, 26.8 percent of the 249 respondents searched for signs within specific subject areas, while 20.2 percent searched for descriptions of signs and 15.8 percent were interested in etymology. Finally, 14.9 percent selected tools for searching in various ways. (See Figure 12) for a graphical representation.)

3.5. Opinions about STS Resources

When asked "Do you use the manual for each language resource?", 61 percent of the 249 respondents replied that they were unaware that there were manuals available for the STS resources, or where they could find written and signed instructions on using the STS Dictionary and the STS
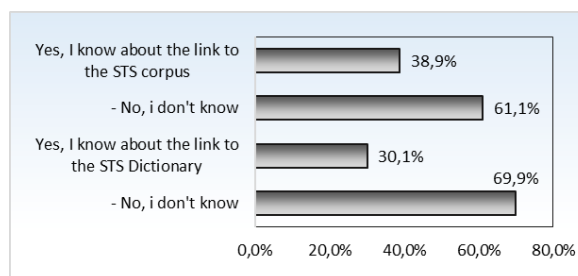
Corpus. On the next question, "Do you know that you can click on a place next to a sign entry in the STS Dictionary to see its use in the STS Corpus?". 61.1 percent were unaware of the link from the dictionary to the corpus and 69.9 percent were unaware of the link from the corpus to the dictionary (Figure 13).

There is divided opinion on whether the STS Dictionary website should include grammar or if grammar should be available on a separate website: 42.6 percent of the 249 respondents believe it is beneficial to integrate reference grammar into the dictionary, 13.5 percent would prefer reference grammar to be on separate pages, while 43.9 percent have no opinion on the matter.

Ultimately, the decision depends on factors such as user preferences, usability, and the overall design and functionality of the dictionary. Respondents were asked: "Do you think the Swedish Sign Language Dictionary should include grammar, or should grammar be on a separate website?." It is not easy to evaluate the response to this question, even among respondents who are sign language teachers, instructors or educators (only 22.8 percent of all respondents) or whether they have been informed about reference grammar. However, the survey results show that integrating grammar directly into the STS Dictionary might provide convenience for users who prefer having everything in one place, while having it on separate pages could offer a more organized and focused approach to learning grammar.

The tool *STS-korpus* retrieves material from the corpora and is used for the expanded presentation of how signs occur in natural language usage. Additionally, the survey highlights a need for grammar description and other functions, indicating the importance of considering user feedback and incorporating necessary features to enhance the usability and effectiveness of the resources. A reference grammar is a planned project.

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4. Conclusion

The development work is intended to make the web-based dictionary more user-friendly and useful across different platforms. STS-korpus is an online interface for the Swedish Sign Language Corpus linked to the STS Dictionary, enhancing its utility. The extensive experience and language skills of the dictionary team are indispensable in the work of developing, updating, and improving the dictionary. The survey results confirm that work on STS language resources is on the right track.

The results of the survey concerning how the resource are perceived by users are both expected and unexpected, but valuable nonetheless.

- The Facebook group is much-appreciated as a forum for discussion and asking for specific signs in the signing community.

- Unsurprisingly, the STS Dictionary is the most used resource. The survey provides insights into the use of specific STS resources and how often people use them.

- Respondents describe how they search for signs/words, topics, features, and tools, which helps the team develop the features in the STS language resources.

- The survey also reveals varying opinions on ease of use, search functions, manuals and integrated grammar. While the results confirm what was suspected and anticipated, it is useful to have objective and quantifiable confirmation. The responses will guide future work on the language resources, including improving instructions and developing an interface linking the STS Dictionary and STS Corpus with a planned STS grammar resource.

5. Bibliographical References

Brita Bergman. 1979. *Signed Swedish*. Liber, Stockholm.

Sam Bigeard, Marc Schulder, Maria Kopf, Thomas Hanke, Kiriaki Vasilaki, Anna Vacalopoulou, Theodor Goulas, Athanasia-Lida Dimou, Stavroula-Evita Fotinea, Eleni Efthimiou, Neil Fox, Onno Crasborn, Lianne Westenberg, Sarah Ebling, Laure Wawrinka, Johanna Mesch, Thomas Björkstrand, Anna Kuder, and Joanna Wójcicka. 2024. Extended interlingual index for the project's core sign languages and languages covered in WP9. Project Note D6.5, EASIER Consortium, Hamburg, Germany.

Thomas Björkstrand, Eira Balkstam, and Josephine Willing. 2022. Svenskt teckenspråkslexikon som ett digitalt verktyg i andraspråksundervisningen: Poängberäkning av meningar [Swedish Sign Language Dictionary as a digital tool in second language instruction: Point calculation of sentences]. Report, Department of Linguistics, Stockholm University, Stockholm.

Danielle Bragg, Kyle Rector, and Richard E. Ladner. 2015. A user-powered american sign language dictionary. In *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing*, CSCW '15, page 1837–1848, New York, NY, USA. Association for Computing Machinery.

Trevor Johnston. 2008. Corpus linguistics and signed languages: no lemmata, no corpus. In *Proceedings of the LREC2008 3rd Workshop on the Representation and Processing of Sign Languages: Construction and Exploitation of Sign Language Corpora*, pages 82–87, Marrakech, Morocco. European Language Resources Association (ELRA).

Lorraine Leeson, Jordan Fenlon, Johanna Mesch, Carmel Grehan, and Sarah Sheridan. 2019. The uses of corpora in L1 and L2/Ln sign language pedagogy. In Russell S. Rosen, editor, *The Routledge Handbook of Sign Language Pedagogy*, pages 339–352. Routledge.

Rachel McKee and Mireille Vale. 2023. Recent lexical expansion in New Zealand Sign Language: context, scope and mechanisms. *Current Issues in Language Planning*, pages 1–22.

Johanna Mesch. 2023. Creating a multifaceted corpus of Swedish Sign Language. In Ella Wehrmeyer, editor, *Advances in Sign Language Corpus Linguistics*, chapter 9, pages 242–261. John Benjamins Publishing Company, Amsterdam.

Johanna Mesch, Eir Elisabet Cortes, Thomas Björkstrand, Nikolaus Riemer Kankkonen, Joel Bäckström, and Patrick Hansson. 2023. Teckenspråkslexikografi – utmaningar i en annan modalitet. [Sign language lexicography - challenges in a different modality]. In *Nordiska studier i lexikografi 16: Rapport från 16:e konferensen om lexikografi i Norden, Lund 27–29 april 2022*, pages 225–240, Lund/Göteborg. Skrifter utgivna av Nordiska föreningen för lexikografi. Skrift nr 17.

Johanna Mesch, Lars Wallin, and Thomas Björkstrand. 2012a. Sign language resources in Sweden: Dictionary and corpus. In *Proceedings of the LREC2012 5th Workshop on the Representation and Processing of Sign Languages: Interactions between Corpus and Lexicon*, pages

127–130, Istanbul, Turkey. European Language Resources Association (ELRA).

Johanna Mesch, Lars Wallin, Anna-Lena Nilsson, and Brita Bergman. 2012b. Dataset. Swedish Sign Language Corpus project 2009–2011 (version 1).

Zrajm Öqvist, Nikolaus Riemer Kankkonen, and Johanna Mesch. 2020. STS-korpus: A sign language web corpus tool for teaching and public use. In *Proceedings of the LREC2020 9th Workshop on the Representation and Processing of Sign Languages: Sign Language Resources in the Service of the Language Community, Technological Challenges and Application Perspectives*, pages 177–180, Marseille, France. European Language Resources Association (ELRA).

Nikolaus Riemer Kankkonen, Thomas Björkstrand, Johanna Mesch, and Carl Börstell. 2018. Crowdsourcing for the Swedish Sign Language dictionary. In *Proceedings of the LREC2018 8th Workshop on the Representation and Processing of Sign Languages: Involving the Language Community*, pages 171–176, Miyazaki, Japan. European Language Resources Association (ELRA).

Adam Schembri and Kearsy Cormier. 2022. Signed language corpora: Future directions. In Jordan Fenlon and Julie A. Hochgesang, editors, *Signed Language Corpora*, pages 196–220. Gallaudet University Press.

Lucia Vlášková and Hana Strachoňová. 2021. Leksikografija znakovnega jezika: študija primera spletnega slovarja. *Slovenščina 2.0: empirične, aplikativne in interdisciplinarne raziskave*, 9(1):90–122.

6. Language Resource References

Svenskt teckenspråkslexikon. 2024. *Swedish Sign Language Dictionary Online*. Sign Language Section, Department of Linguistics, Stockholms University. PID https://teckensprakslexikon.su.se.

Svensk teckenspråkskorpus. 2024. *STS-korpus [web-based corpus tool]*. Sign Language Section, Department of Linguistics, Stockholm University. PID https://teckensprakskorpus.su.se.