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**The Swedish FrameNet++: Harmonization, integration, method development and practical language technology applications**

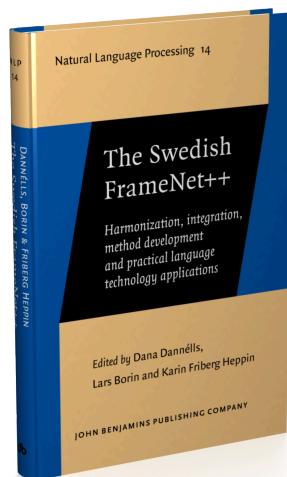
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# Language learning and teaching with Swedish FrameNet++

## Two examples<sup>1</sup>

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This chapter describes and discusses the use of resources connected to Swedish FrameNet++ (SweFN++) in the context of the teaching and learning of language proficiency and grammatical analysis in Swedish. We illustrate the way in which different resources in the SweFN++ context can be useful for language pedagogy, by employing two examples, the Swedish Constructicon and a semantic role exercise on the intelligent computer assisted language learning (ICALL) platform Lärka. These resources make use of the infrastructure developed within SweFN++ in fundamentally different ways, which are discussed and compared. In addition, we discuss the possibilities for further development of the language pedagogical potential of SweFN++, both in relation to ICALL and to other types of resources and descriptive databases, like corpora, constructicons and framenets.

### 1. Introduction

This chapter deals with various ways in which Swedish FrameNet (SweFN) (see Chapter 2 in this volume), and other resources within the wider Swedish FrameNet++ (SweFN++) context, have been used, and could be used, in language learning and teaching. Using these resources in a way that benefits language teaching and learning and complements more traditional approaches, requires, however, good knowledge of the resources and, in some cases, also relatively advanced linguistic knowledge. In the following we will describe two examples of how to make use of SweFN++ in a language pedagogical context in two fundamentally different

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1. Linguistic examples in this chapter are glossed using the *Leipzig Glossing Rules* <https://www.eva.mpg.de/lingua/resources/glossing-rules.php>, with the following addition(s): N: noun; NP: noun phrase; SUP: superlative.

ways. The two resources involved are the *Swedish Constructicon* (SweCcn; Lyngfelt et al. 2012; Prentice & Lyngfelt 2016), a descriptive resource, which can be applied indirectly to language learning, e.g., by creating teaching materials and classroom exercises based on the entries in the database, and *Lärka* (Volodina et al. 2014) – a digital platform for *intelligent computer assisted language learning* (ICALL) – i.e., developed specifically for, and hence more directly applicable to, language learning and teaching.

The idea that both frame semantics and construction grammar (sometimes in combination) can be of use in language pedagogy is, at this stage, not a new one any more and has been explored in a number of studies and projects, e.g., in relation to the learning and teaching of vocabulary and grammatical patterns (Atzler 2011; Boas & Dux 2013; Boas et al. 2016; Loenheim et al. 2016; Lindström Tiedemann et al. 2016). To illustrate the usefulness of resources within the SweFN++ context for language pedagogy we are mainly going to focus on the use of construction exercises based on SweCcn in the teaching of Swedish as a second language (Håkansson et al. 2019) and one of the exercises available in *Lärka*,<sup>2</sup> namely the semantic role exercise aimed at students of linguistics (Pilán & Volodina 2014). The chapter is outlined as follows: In the following section we briefly discuss the relationship between language technology and language pedagogy in general, before, more specifically, turning to different kinds of digital resources, both descriptive ones, for example framenets and constructicons, and so called ICALL resources, like *Lärka*. The central section of the chapter is illustrating how these types of resources can be applied to a language learning context. We conclude the chapter by discussing the potential development of language pedagogical applications within the context of SweFN++.

### 1.1 Language technology and language pedagogy

Language teaching and learning have always depended on language input as well as resources such as handbooks (lexica, grammars, etc.) and coursebooks. Today several of these resources have new formats and new resources exist thanks to language technology. This makes it possible to focus language teaching more on actual attested forms and frequencies of attested forms in the language, genre-dependent language, authentic texts etc., all of which can also to some extent develop with time and computerised resources can help you as a teacher to keep your advice up-to-date and your materials authentic.

Corpora in language teaching can be used either directly or indirectly (Römer 2011). Indirect uses are usually seen as uses in material design and curriculum

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2. <https://spraakbanken.gu.se/larkalabb/>

design, whereas direct uses are uses in the classroom or outside the classroom – by teachers and/or students. Similarly we can say that SweFN++ component resources such as SweCcn can be used indirectly as a way of deciding what to include in curricula, course books and exams for Swedish as a second language, by helping to answer questions such as: What kind of constructions are there in Swedish, what are their context of use and which are common concrete examples, etc. One of the aims of the SweCcn project is to describe constructions that can be challenging for second language (L2) learners of Swedish, which can be potentially benefitting e.g. for the development of teaching materials (Loenheim et al. 2016). SweFN can, for example, help us to better understand and analyse the relationship between semantic frames and their Swedish realizations. It also has the potential to illustrate the main differences in comparison to other languages if e.g. the first languages (L1s) in a group of L2 learners also have framenet resources (cf. Lyngfelt, Borin, Ohara, et al. 2018; Friberg Heppin & Friberg 2012). Or they can be used directly in the classroom, helping learners explore Swedish through that resource, or through an ICALL-platform such as Lärka where the exercises have already been developed based on the available SweFN++ resources and can be used straight away.

Direct uses of corpora and language technology in teaching can also be sub-divided into two further categories. We can use resources such as SweFN and SweCcn indirectly as teachers by using them in ways similar to handbooks, to find what is common, to find examples, to test constructions, etc. For instance, one might use a constructicon to find constructions which might be of interest to let the students compare it to other similar constructions in authentic texts (cf. Loenheim et al. 2016). On the positive side this provides teachers (and students) with rich sources of inspiration, which can be linked to authentic texts and which are continuously being extended. On the negative side, however, there are no ready-made exercises, only examples to inspire you and help you create your own (cf. Loenheim et al. 2016; Håkansson et al. 2019).

There are also ways in which the SweFN++ resources can be used directly, inside or outside the classroom to practice language use or analysis. ICALL is a field within language technology which reuses resources such as corpora and SweFN to create exercises that are ready to use. This is positive since it saves the teacher time and it provides exercises based on authentic material. The downside is that the type of exercise the teacher needs to give to his or her students or the type of texts he or she would like them to practice on might not be available. The language might be too advanced still for your learners, or the content might not be suitable for the age group you are teaching, since authentic materials can contain sensitive issues and language. In addition, the annotations might not match the theory and the categories used for a specific course. As a teacher you need to know this and which ways there are to work around it.

### 1.1.1 *Framenets, digital lexical and constructionist resources and language pedagogy*

The two theoretical frameworks that our two examples are based on are frame semantics and construction grammar. The frameworks have been intertwined since the start of their development by Fillmore and colleagues (Fillmore 1988; Fillmore 1982) and they still are very much connected, e.g. through the development of framenets and constructicons for different languages (Lyngfelt, Bäckström, et al. 2018; Gilardi & Baker 2018; Boas et al. 2019). Data from these resources can, in turn, be used in other resources, such as online lexica and exercises in the context of ICALL, but also as the base for other types of teaching materials, e.g., for the second language classroom (see further in the following sections). In several cases, framenets and constructicons have been developed as interdependent resources, more or less integrated or closely linked to each other (Boas et al. 2019). Boas, Lyngfelt & Torrent (2019) describe constructicon resources for different languages in terms of a *frame-relatedness continuum*, with the English Constructicon at the one end, as the most integrated in its framenet, and the Russian Constructicon, which does not include any direct reference to any framenet, at the other end. Between those two poles of the continuum there are two other *framenet-derived constructicons* – for Japanese and Brazilian Portuguese – and two resources which are located between the framenet-derived Ccns and the framenet-independent end of the continuum, namely the German Constructicon and SweCcn (Boas et al. 2019). SweCcn is (described in further detail in Section 2 below) in other words, not as integrated with SweFN, as some of the framenet-derived constructicons, which e.g. are dependent on their respective framenets in their description format (and vice versa) (Boas et al. 2019). However, there is an explicit strategy for achieving and maintaining compatibility between the two resources. As one central element of this strategy, explicit pointers are used to link between constructions and corresponding frames and vice versa in both resources (Lyngfelt, Torrent, et al. 2018; Boas et al. 2019).

There are several reasons for linking the two resources (for further details see Lyngfelt, Bäckström, et al. 2018; Boas et al. 2019). In a language pedagogical context, being able to compare descriptions of constructions and corresponding frames, and the comparability of constructions from different constructicons (for different languages) are two potentially useful features (cf. Lyngfelt, Bäckström, et al. 2018; Boas et al. 2019; Loenheim et al. 2016).

Both framenet and construction databases are being used in language learning and teaching. Friberg Heppin & Friberg (2012) discuss the potential of framenet databases as resources for communicative language teaching, using examples from the English, Chinese, and Swedish framenets (see further in Section 3). The English FrameNet has also served as a basis for the German Frame-Based Online Lexicon (GFOL), a lexical resource specifically developed for English-speaking learners

KONSTRUKTIONEN ▾ 1 TRÄFF (VISAR 1)	
NAMN	en_tids_aktivitet – fyra veckors semester
TYP	konstruktion genitiv tidsuttryck inlärningsfokus
KATEGORI	NP
RAM I FRAMENET	Measure duration
DEFINITION	[En aktivitet] <sub>Activity</sub> utförs eller äger rum under [den tid som tidsuttrycket i genitiv] <sub>Quantitative</sub> anger.
STRUKTUR	[Det N <sub>gen</sub> NP <sub>index</sub> ]
KONSTRUKTIONSELEMENT, INTERNA	Det: cat-POA <sub>index</sub> grundo-Det Quantitative: cat-N <sub>gen</sub> role-Quantitative Activity: cat-NP <sub>index</sub> role-Activity
EXEMPEL	[ [En halv] <sub>Det</sub> [timmes] <sub>Quantitative</sub> [tv-titt] <sub>Activity</sub> ]en_tids_aktivitet och [ [en] <sub>Det</sub> [timmes] <sub>Quantitative</sub> [matlagning] <sub>Activity</sub> ]en_tids_aktivitet kanske kunde vara formeln i stället för tvärtom som nu. Han behövde [ [en] <sub>Det</sub> [veckas] <sub>Quantitative</sub> [vila] <sub>Activity</sub> ]en_tids_aktivitet . Efter [ [en] <sub>Det</sub> [stunds] <sub>Quantitative</sub> [dividerande] <sub>Activity</sub> ]en_tids_aktivitet var priset nere i 25 pund. Räkna med [ [några] <sub>Det</sub> [dagars] <sub>Quantitative</sub> [väntetid] <sub>Activity</sub> ]en_tids_aktivitet . Efter [ [några] <sub>Det</sub> [dygns] <sub>Quantitative</sub> [nervkrig] <sub>Activity</sub> ]en_tids_aktivitet gav Saddam upp. Men just nu bedriver jag tillämplig grov kriminell verksamhet, som kan ge mig [ [två] <sub>Det</sub> [års] <sub>Quantitative</sub> [fångelse] <sub>Activity</sub> ]en_tids_aktivitet . [ [Fyra] <sub>Det</sub> [decenniers] <sub>Quantitative</sub> [forskning] <sub>Activity</sub> ]en_tids_aktivitet ger entydigt svar på frågan om kolesterols roll för hjärtinfarkt .

Figure 1. Pointer from a SweCcn entry to the corresponding frame in SweFN

of German (Boas et al. 2016). The dictionary applies both frame semantics and construction grammar to provide more in-depth information about its German–English entries (Boas et al. 2016). Basing the entries on semantic frames and including constructional information, sheds light on some interesting lexico-grammatical and semantic-pragmatic differences between the languages. Consider the following example, provided by Boas et al. (2016), based on the Grooming frame:

The *Grooming* frame, for instance, is particularly suitable for the resource, as it contains common words that are typically taught in introductory language courses and are necessary for describing one’s everyday activities. There are some instances of translation difficulties [...]: for instance, while English uses the same verb, *brush*, for brushing one’s hair and one’s teeth, German employs different verbs for the different body parts (*bürsten* ‘to brush’ for hair, and *putzen* ‘to clean/scrub’ for teeth.). The *Grooming* frame is also grammatically interesting from a cross-linguistic perspective, as English sentences realize the possessor of the *BODY\_PART* with a possessive determinator (*to brush my teeth*), whereas German expresses this participant as a reflexive dative object with a definitive article preceding the *BODY\_PART* (*putze mir die Zähne*, lit. ‘brush myself the teeth’). (Boas et al. 2016: 310–311)

The Russian construction is an example of a resource more specifically developed for language pedagogical purposes (Janda et al. 2018). The development has thus originally been focused on the coverage of multiword expressions which are seen as relevant and useful for learners of Russian, but which are not found in dictionaries. Ultimately the project aims to represent the Russian language “in terms of constructions at all levels from morpheme to discourse” (Janda et al. 2018: 165). The resource is being developed within the same infrastructure as SweCcn, hence it is also accessible through Karp (Janda et al. 2018; Boas et al. 2019).

### 1.1.2 *Language teaching and ICALL*

ICALL commonly refers to digitally supported language learning approaches (CALL proper) enhanced with artificial intelligence (AI) or natural language processing (NLP) technologies. AI and NLP can process human language in a fine-grained manner that allows for the analysis of learner language or language materials (Borin 2002). Although a number of examples of the successful integration of ICALL systems in language instruction exists (see Amaral & Meurers (2011) for some examples), there are a number of challenges to consider when developing such systems. The book by Heift & Schulze (2007) has been called a “depression diary” of ICALL since it describes system after system which never got used by the intended user – with only a few fortuitous exceptions. There are a number of reasons for that,<sup>3</sup> one of them being that ICALL focuses foremost on technological possibilities rather than on learners or teachers and their needs. With existing language resources like tagged corpora, wordnets, lexicons, part-of-speech taggers, syntactic parsers, etc., it is a shame that language teachers still have to produce a lot of learning materials and tests manually. At a time when pedagogical literature and curricula emphasize that authentic materials should be used, this is something that could be simplified a lot through ICALL. (Similarly, as discussed in Section 2, this can be facilitated by using electronic resources such as SweCcn, with links to other materials and resources within SweFN++.)

In ICALL application development, there is a sequence of steps that need to be followed, one of the most important ones being the development of specific resources and/or collections of data that could be used as the foundation of instructional activities. This is where SweFN (Borin et al. 2010; see also Chapter 2 in this volume) takes a prominent place – either as a primary or as a secondary resource in an automated language learning activity (see further Section 2.6).

## 2. Using resources within SweFN++ for learning and teaching language proficiency and grammatical analysis

In this central section of the chapter we will present two resources within the SweFN++ context, SweCcn and Lärka, and discuss how they can be used in the teaching of language proficiency and/or grammatical analysis. One of several differences between SweCcn and Lärka is that the former is not primarily developed as a pedagogical resource, which also sets it apart from construction resources for other languages, e.g. Russian and German (Janda et al. 2018; Ziem et al. 2019). SweCcn is a descriptive linguistic resource, based on the framework of construction grammar

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3. <https://spraakbanken.gu.se/blogg/index.php/2020/04/30/common-pitfalls-in-the-development-of-icall-applications/>



(Fillmore 1988; Goldberg 2013). One of its aims is to describe constructions (see further in the following sections) that are potentially problematic for language learners and to make the framework of construction grammar accessible in a way that enables e.g. teachers of Swedish or Swedish as a second language to apply it in a classroom context (see further Section 2.3). In this way SweCcn can be seen as an indirect language pedagogical resource, partially linked to SweFN and SweFN++. This means that in some ways SweCcn is similar to a handbook, like a grammar or a lexicon that one can consult to find examples and detailed descriptions of possible constructions in the language. In addition, similar to handbooks aimed at L2 learners, it flags items which are of particular interest when learning Swedish as a second language. It is a growing resource and it has the added bonus of links to SweFN and to *framenets* for other languages, which makes it possible to make comparisons between constructions in different languages (Lyngfelt, Bäckström, et al. 2018).

Lärka is a platform which generates pre-designed exercises for both learners of Swedish as a second language and for training students in the grammatical analysis of Swedish (see further in the section below). The different features that Lärka offers reuse material from other resources in Språkbanken Text, such as corpora and SweFN (Alfter et al. 2019; Volodina et al. 2012, 2013; Lindström Tiedemann et al. 2016). The platform provides the user with exercises based on authentic language, something which today is often desired in language teaching; and the exercises are already there so they require no further work by the teacher and can hence be useful for flipped classroom settings, where digital resources play an enhanced role, making it possible for students to go through materials at home, freeing classroom time for problem-solving tasks. Exercises can also be given as homework without adding extra hours for exercise creation for the teachers, instead letting them focus on explaining possible issues in completing the exercises.

In the following sections we describe both resources from a language pedagogical perspective. Their connection to SweFN is just one aspect of several from this perspective and both resources are linked to and make use of other resources within the research infrastructure of Språkbanken Text in general and the lexical infrastructure of Karp in particular (Borin, Forsberg, Olsson, et al. 2012; Lyngfelt, Bäckström, et al. 2018).

## 2.1 The Swedish constructicon as a pedagogical resource

SweCcn is an electronic resource, comprising descriptions of Swedish constructions, i.e., “conventional, learned form-functions pairings at various levels of complexity and abstraction” (Goldberg 2013: 17). At the time of writing SweCcn includes c. 400 entries. The resource is freely available through the lexical infrastructure of Karp at Språkbanken Text, through which it is also connected to SweFN. SweCcn is not an actual part of the SweFN++ project, but through its incorporation in Karp it has



become integrated into the lexical macroresource that has been developed within SweFN++ (Lyngfelt, Bäckström, et al. 2018; for details about the SweFN++ project see Chapters 1 and 3 in this volume). In other words, SweCcn has been developed as an independent resource, within an independent research project, but it is partially linked to SweFN and, furthermore, included in one of the research objectives for SweFN++, namely the integration and harmonization of several freely available lexical resources, within the lexical infrastructure of Språkbanken Text (Lyngfelt, Bäckström, et al. 2018; Lyngfelt et al. 2012; Ahlberg et al. 2013; Loenheim et al. 2016; Prentice & Lyngfelt 2016).

There is a potential for pedagogical implications of the connection between SweFN and SweCcn, since frame semantics and construction grammar are compatible frameworks, but also because the links between some of the constructions and the corresponding (evoked) frames in SweFN provide additional semantic information for the construction (and vice versa) and, in addition, make it possible to compare constructions in different languages via the links to their respective (interconnected) framenets (Lyngfelt, Bäckström, et al. 2018). However, this potential has not yet been explored further for SweCcn and is rather to be seen as an area for future research. In the following we will, therefore, focus on language pedagogical applications of construction grammar based on SweCcn.

To search for constructions (a single one, or a group of them that share certain features) in SweCcn one can either choose from a list of construction entries or types of constructions, or formulate a search expression. Regarding the latter there are different options, such as searching for particular components of an entry, such as the unique name of a construction in the database, the definition or the formal structure of a construction – which requires a certain familiarity with the database on the part of the user – or a free text expression, which results in a list of all entries that contain that expression (Prentice & Lyngfelt 2016). Within a language pedagogical context, the target groups for SweCcn are primarily teachers and textbook writers, since the design of the resource and its interface require a certain amount of linguistic competence. In other words, it is a resource with the potential to be used in curricula design, creation of teaching materials, and education of teachers and linguists (in both Swedish and Swedish as a second language), rather than directly by learners of Swedish as a second language. The project has, however, had language learning in mind as a context of use from the start (Loenheim et al. 2016), an aim which is twofold, since construction entries that, for various reasons, are considered particularly relevant for learners of Swedish are added to the resource, at the same time as SweCcn is also being developed as a linguistic resource for research in second language acquisition (cf. Prentice & Lyngfelt 2016). There are two features of SweCcn (both still being developed) that directly correspond to this twofold aim; one is the category (or type) *L2-focus* (Swe. *inlärningsfokus*, circled in Figure 2), a searchable category containing entries that have been tagged as relevant

for L2 learners of Swedish, based on the constructicographers' own experience of teaching Swedish, as well as, in some cases, learning Swedish as L2, and on the analysis of constructional deviations in texts produced by L2 learners of Swedish (for a detailed description of the category and a discussion of its validity see Prentice & Tingsell 2019). The other feature, also shown in Figure 2, is a link to *pedagogical applications*. Currently the user can find several films and video clips, containing recorded instructions of how to search the database and how to search for examples of constructions in the corpus infrastructure Korp in Språkbanken Text (Borin, Forsberg & Roxendal 2012) as well as some examples of classroom exercises built on the entries in the database. The idea is to gradually build a bank of exercises that teachers can use as inspiration for construction-based activities in the language classroom (Loenheim et al. 2016). In collaboration with students of Swedish as a second language at the University of Gothenburg (most of them teachers, or in teacher education), a cluster of small-scale classroom studies are currently being conducted, in order to test construction-based L2 teaching (Håkansson et al. 2019). The latter is described in the following section.

## 2.2 Exploring the usefulness of SweCcn and construction grammar for the teaching of Swedish as a second language

The use of construction grammar in language teaching has not come far yet, and teaching materials for second language learning in Sweden are mostly based on other, more traditional grammatical frameworks, treating grammar and lexicon separately (Loenheim et al. 2016). However, construction-based language teaching methods have been suggested by several researchers (Wee 2007; Holme 2010) and teaching with SweCcn as a basis has also been tested in practice with two different methods; pattern finding and type cases (Håkansson et al. 2019). In the following, the methods are described as well as two minor studies where the methods have been tested in the classroom.

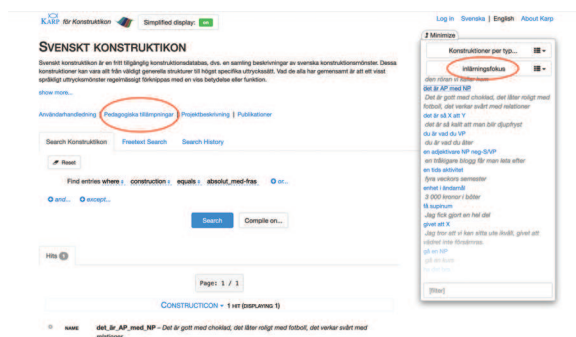


Figure 2. SweCcn features for L2 research and language pedagogy

## 2.3 Pattern finding

One of the methods is built on the idea of pattern finding which can be defined as “the ability to create analogies (structure mapping) across two or more complex wholes, based on similar functional roles of some elements in these different wholes” (Tomasello 2003: 4). Tomasello’s research concerns pattern finding as an important cognitive process for first language acquisition but these strategies have also been discussed in the context of second language teaching (Wee 2007; Holme 2010). An exercise with pattern finding typically means that the students are provided with a list of sentences, which can be based on the authentic examples that are provided for every construction entry in SweCcn, and then asked to draw conclusions about the recurring pattern. The exercise can look like the following example:

### Pattern finding exercise

- A. Read the sentences below. Can you find a recurring pattern in all of the sentences? Highlight the pattern.
- B. Try to describe the pattern.
  - a. Form: Which parts can you find? Which parts are the same in the pattern and which parts can vary?
  - b. Function: What does the pattern/expression mean? How is it used?
- C. Make up your own examples of the pattern. Sentences
  - (1) en halv timmes tv-titt och timmes matlagning  
 a half hour.SG.GEN tv-watch and hour.SG.GEN cooking  
 kanske kunde vara formeln i stället för tvärtom nu.  
 ‘Half-an-hour of watching tv and one hour of cooking could maybe be the formula, instead of, like now, the other way around.’
  - (2) Han behövde en veckas vila.  
 a week.SG.GEN rest  
 ‘He needed a week of rest.’
  - (3) Tio minuters båtresa från Marstrand ligger ön Ärholmen.  
 ten minute.PL.GEN boat.ride  
 ‘A ten-minute boat ride from Marstrand lies the island of Ärholmen.’
  - (4) Räkna med några dagars väntetid.  
 a.few day.PL.GEN waiting.time  
 ‘Expect a waiting period of a few days.’

More example sentences are normally used in the exercise to illustrate the pattern. The construction used here is called *en\_tids\_aktivitet* ‘a time’s activity’, [DET N.GEN NP.INDF] in SweCcn. The form-function relationship for the construction is defined as ‘an activity that takes place during the time that the time expression in the genitive specifies’.

After reading the examples the first steps in the exercise consist of finding and describing the recurring pattern. The exercise lets the students discover how the pattern varies, but also allows them to find the fixed parts of the pattern. In steps (A) and (B) it is possible to work with different degrees of difficulty, e.g. by the extent to which a grammatical meta-language is used. In student groups with lower language proficiency, it is not necessary to specify the different parts of the construction with linguistic terminology, it can be a sufficient challenge for these students to find the pattern and see which parts belong together. In such groups, the meta-language can instead emerge through joint discussions under the guidance of the teacher, or it can of course also be left out. It can be enough to learn how to use the pattern (cf. Wee 2007). For students who have a higher degree of language proficiency and perhaps also a higher degree of metalinguistic knowledge and analytical skills, the exercise can be used differently. For these students, it may not be challenging enough to find the pattern itself, but instead more developing to try to describe the construction as accurately as possible and to use linguistic terms.

The exercise also gives the students the opportunity to discover the productivity of the construction. By reading the different examples the students will see the lexical shift and discover how the parts of the construction can vary (Holme 2010). The final step of the exercise, where the students are asked to create their own examples, also contributes to the understanding of the productivity of the construction.

## 2.4 Type case

Implicit constructional learning seems to benefit from skewed input, i.e. frequent repetition of a certain instantiation of the category (Casenhiser & Goldberg 2005; Bybee 2010). The type case method builds on the idea that frequency plays an important role in language learning (cf. Bybee 2010). The method has a two-step set-up where the students first learn one frequent example of the construction, such as a fixed phrase, and use it several times before extending the construction in the next step, to show the productivity of a more general construction.

The exercise with the construction `I_ADJEKTIVASTE_LAGET` ‘to the ADJ-est extent’ illustrates how the type case method works (Håkansson et al. 2019). The corpus tool Korp from Språkbanken Text makes it possible to find a type case with high frequency which is of importance for the exercise. The construction `I_ADJEKTIVASTE_LAGET` consists of two fixed parts, the preposition *i* ‘in’ and the NP *laget* (approximately ‘the extent, the order’). The adjective attribute in the definite superlative form can vary. The meaning of the construction is to describe a phenomenon that is a bit too expensive, too short, too warm, and so on.

## Type case exercise

A. Read the sentences aloud and think about the meaning of the expression *i dyraste laget*. The sentences are authentic examples from newspapers and blogs.

- (5) Pizzorna kostar en 100-lapp, vilket är i dyraste laget  
in expensive.SUP extent  
'The pizzas cost 100 Swedish crowns, which is a little expensive.'
- (6) Lite i dyraste laget kanske men sååå fin!  
in expensive.SUP extent  
'A little expensive maybe, but sooo nice!'
- (7) Tyvärr så var det i dyraste laget för en skjorta.  
in expensive.SUP extent  
'Unfortunately, the shirt was a little too expensive'
- (8) Mysig lägenhet men i dyraste laget.  
in expensive.SUP extent  
'Cozy apartment but a little expensive'

After reading the sentences a discussion about the meaning of the construction follows. The students work in pairs or the whole group together with the teacher. When they have jointly found a definition and an understanding of the meaning of the construction, a couple of exercises with the same example of the construction follow. For instance, by creating their own sentences with the construction or through discussions of pictures representing the construction. For this specific construction, *I\_ADJEKTIVASTE\_LAGET*, there is also a need to discuss the form of the adjective, which in this case has the definite superlative form. The students have to understand how to inflect the adjective in order to use the construction with other adjectives.

The next step (B) is extending the construction to include more variants (Håkansson et al. 2019). The students first read the sentences with the variants and try to find the patterns that are the same in all the sentences (C). While they have now done several exercises with *i dyraste laget* they will see the pattern with *i ... laget* that is repeated in the sentences. Through further exercises where they define which parts that are fixed and which that can vary (D), and also through discussions about the meaning, the students will see the productivity of the construction. The final step (F) is to create examples for the extended construction.

One difficulty with this specific construction is that Swedish has two different inflectional suffixes for the superlative in the definite form, as in (regular) *dyr-aste* 'most expensive' and (irregular) *min-sta* 'smallest'. It may be an option to avoid this difficulty if the students are not yet ready to discuss the different inflections. In that case the exercise can just include examples with the regular form (*-aste*). But

it could of course also be used to challenge the students and raise discussion about the different inflections of the Swedish adjectives. The exercises below exemplify the extension of the construction.

B. Read the sentences below.

- (9) Jag tycker att min frisyr blev i kortaste laget men den är snyggare  
in short.SUP extent  
än förut.

‘I think my new haircut is a little short, but it looks better than before.’

- (10) Vårt kök är i minsta laget för fyra personer men det går.  
in small.SUP extent

‘Our kitchen is a little small for four people, but it works.’

- (11) Tyvärr var fisken i saltaste laget  
in salty.SUP extent

‘Unfortunately, the fish was a little salty.’

- C. Which expression is being used in all the sentences? Underline that expression in all of the sentences.
- D. Compare the form of the expressions in the sentences in (B above) with *i dyraste laget*. Which words vary and which are the same?
- E. What do the expressions mean?
1. i kortaste laget
  2. i minsta laget
  3. i saltaste laget
- F. Make up your own examples with the expression *i \_adjektivaste\_laget*.

## 2.5 Applying construction-based L2-teaching in the classroom – two small-scale studies

The pattern-finding exercise and the type-case exercise, have been tested in the classroom in two minor studies (Håkansson et al. 2019). The first study explores pattern finding with different constructions and with different conditions for the students. The students tried pattern-finding exercises in the classroom where the teacher could support the understanding of the exercise, but they also tried pattern-finding exercises in homework and in an exam. In the second study the two methods were compared.

The students in the two studies differ in their knowledge of Swedish (Håkansson et al. 2019). In study one the participants were university students with advanced knowledge of Swedish and in study two the students were all at a lower proficiency

level of Swedish. The constructions for the two studies were chosen to fit the proficiency level of the students. The data from these two limited studies do not allow for any general conclusions regarding the effectiveness of the two methods, but there seems to be a similar outcome for both methods. Type case seemed to be easier in the first step but the extension of the construction was as demanding as the pattern-finding exercise. Although there was a difference in the students' language proficiency, the two studies show the same result when it comes to how challenging the exercises are. Defining form seemed to be easier than describing the meaning of the pattern and identifying the pattern is easier than creating of own examples or characterizing the pattern (Håkansson et al. 2019).

More research is needed to test these two methods in teaching and there is also a need to further develop pedagogical applications for the material in SweCcn. Research about language acquisition and construction grammar is growing stronger, and the development of teaching materials is just beginning. Using and further developing SweCcn as a pedagogical resource can contribute to this work.

## 2.6 SweFN for learning linguistic analysis – semantic roles in Lärka

Lärka is an ICALL platform (Volodina et al. 2012, 2013; Lindström Tiedemann et al. 2016; Alfter et al. 2019) which initially had two components – one for learning Swedish as a second language through proficiency exercises and one for learning to analyse Swedish grammar. However, it has been extended to other purposes in relation to second language acquisition research (for more information see Alfter et al. 2019). The exercises for training of the analysis of Swedish grammar all offer the learner sentences from authentic texts and consist of three types of exercises: (1) parts of speech; (2) syntactic functions; and (3) semantic (or thematic) roles. It is this final exercise type that integrates SweFN (Pilán & Volodina 2014).

Semantic roles, i.e. the descriptions of the participants involved in a situation or an event expressed in language, in Lärka are trained on a reduced set of frame elements, equivalent to participants defined in semantic roles (Friberg Heppin & Friberg 2012), where the SweFN elements have been mapped to a set of 12 semantic roles (see Table 1) to make them easier to grasp by students just beginning to learn about semantic roles. The mapping between the original SweFN roles and the coarser grained roles was performed based on the frame element taxonomy (Litkowski 2010). For additional details about the mapping, see Pilán & Volodina (2014). These particular roles were chosen after careful consultation of Fillmore (1968), Teleman et al. (1999) and Jurafsky & Martin (2009). However, twelve roles are still a lot more than the roles usually covered in introductory textbooks and during introductory lectures. In addition, textbooks tend to vary as to which roles they include and how they modify the meaning of certain roles to be able to use



Table 1. Semantic roles in Lärka

English terms	Swedish terms
agent	agent / agens
experiencer	upplevare
theme	föremål för aktionen
recipient	mottagare
instrument	verktyg / instrument
location	plats
goal / direction	mål / riktning
source / origin	källa / ursprung
time	tid
manner	sätt
purpose	syfte
cause	orsak

them for somewhat broader categories. Still, working with the exercises in Lärka is beneficial for students.

Figure 3 shows the user interface of the semantic role exercise. The student is presented with a sentence where one part is highlighted. They then have to select the semantic role which they find most appropriate from a drop-down menu with one correct answer and four distractors (i.e. the wrong answers in the drop-down menu).

Semantic roles can be practised in three different modes:

- self study
- diagnostic test (3 sentences for each of 12 roles)
- test

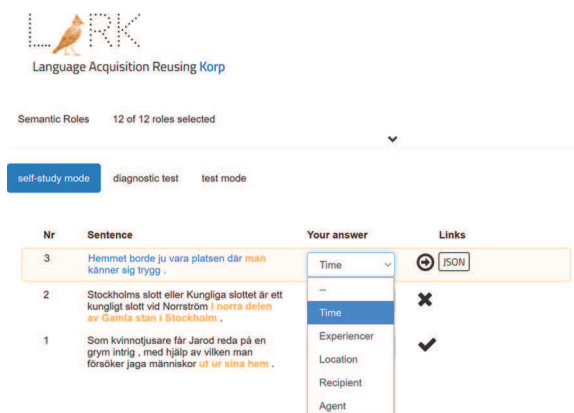


Figure 3. The user interface of the semantic-role exercise in Lärka

**Table 2.** Semantic groupings of roles

Actor	Undergoer	Place	Other
experiencer	theme	location	purpose
agent	patient	origin (source)	cause
–	recipient	direction (goal)	manner
–	–	–	instrument
–	–	–	time

All exercises consist of a sentence selected from the manually annotated sentences in SweFN. This amounts to c. 6,000 sentences, from which sentences shorter than seven tokens were excluded to allow for a sufficient amount of context to make a decision. In each exercise, one word or phrase (see Figure 4) is highlighted in the sentence based on the manual annotations from the resource. The learner then gets a drop-down menu where they have to choose between five different roles and decide which best fits the highlighted segment.

Setting up the distractors proved a challenge, but this was finally solved through a combination of three principles (1) grouping the semantic roles into four larger groups (see Table 2); (2) relying on frequency information; and (3) randomness (see Pilán & Volodina 2014). Hence the first distractor should be one that is semantically related (i.e. from the same group), the second and third distractors should be from the same frequency-band and the fourth should be random. The roles in Lärka are given both in Swedish and English.

After selecting your answer you find out whether it was right or wrong. If you are using self-study mode you get a chance to reconsider and choose another option if you were wrong, whereas in test and diagnostic mode you will be told the correct answer straight away. The diagnostic test also gives you a summary of your results at the end including the sentence, your answer, the distractors and the correct answer so that you can consult your teacher for further explanation or save it and come back to it later to see if you understand it better after some more practice (see Alfter et al. 2019 for further details).

Practising and learning semantic roles with Lärka is something which learners often find difficult, but still rewarding. It is best done in pairs since it is quite common that the learners' answer (especially the first time they do this exercise) is different to the one given in Lärka, because the roles or definitions they are used to may not be the same as those in SweFN. However, if learners work in pairs and use the example as a basis for discussion with a peer or a teacher, practising to argue for their own choice and to analyse the reason for the choice in SweFN, they can reach a much deeper understanding. In an initial user study most learners also did

say that they found the exercise rewarding, even though the teacher found that she had to explain these exercises more than the Lärka exercises for parts-of-speech or syntactic relations (Pilán & Volodina 2014; Lindström Tiedemann et al. 2016).

The fact that Lärka uses authentic material from manually annotated corpora means that learners meet the type of language that they may need to be able to analyse at a later stage, rather than constructed textbook examples. Course books in Swedish grammar and linguistics also quite rarely include any type of examples or exercises on semantic roles, which means that learners often find these quite hard to grasp, since analysis and grammar are very much something that has to be learnt through exercises and trial and error. In Lärka there is a large set of exercises, which makes it possible to come back and practice again with a different set of sentences.

During the implementation of the semantic-role exercise in Lärka, the structure of SweFN facilitated an easy and fast automatic extraction of the example sentences. A major challenge when developing the SweFN-based exercise in Lärka was mapping the original fine-grained labels to coarser roles which would be more suitable for pedagogical purposes. One of the reasons for this was that the number and the names of the semantic roles differ across different sources in the literature.

A potential improvement of the exercise design would be incorporating additional linguistic annotations to the example sentences. This would also offer the possibility for learners to observe and better understand the interaction between linguistic elements at different linguistic levels. Such annotations could be added to the resource either manually or, with a small margin of error, automatically, with the help of a syntactic parser and word sense disambiguation tools. A variety of such tools for Swedish are available via Sparv (Borin et al. 2016), an annotation pipeline developed at Språkbanken. Further possibilities for improvement and development are discussed in the next section. SweFN++ is also available in a Linguistic Linked Open Data format, a standard which allows for easier automatic processing and interlinking of lexical resources. This could be leveraged in future pedagogical NLP applications to group information from other SweFN++ component resources, such as Saldo and the Swedish WordNet (see Chapters 3 and 5 in this volume).

### 3. Developing the language pedagogical potential within SweFN++

Anyone who has been involved in teaching languages can confirm that there is always a need for new materials. Wilson (1997), for instance, writes about the problem of addressing students of different levels and creating materials for learners with varying previous knowledge:

In language course-design there are two major problems:

How to provide a range of materials to meet the needs of students with different abilities.

How to provide at every ability level enough exercises to ensure that a student is confronted by a different set of examples whenever he or she uses the language-learning program. (Wilson 1997: 117)

Corpora are a valuable source of additional learning materials since they demonstrate authentic language use and offer easy access to a substantial amount of examples illustrating a wide variety of linguistic phenomena. The positive effect which the use of corpora can have on learners' progress has been shown, among others, by Cobb (1997) and Cresswell (2007). There are a number of studies which showcase the usefulness of corpora in ICALL applications targeting L2 teaching, among others for automatically determining the proficiency level of texts. François & Fairon (2012) and Xia et al. (2016) re-used texts from L2 coursebooks and exams for this purpose, while Salesky & Shen (2014) employed texts written for L1 readers and reassessed by second language teachers. Corpora have also been a popular choice for automatically generated exercises. In addition, web texts have been used as a basis for reading exercises (Heilman et al. 2008) and grammatical exercises (Meurers et al. 2010) for L2 learners as well as L1 reading material (Mitsakaki & Troutt 2008).

SweCcn makes use of corpora by illustrating the authentic use of the constructions with example sentences from the material accessible through the Korp infrastructure in Språkbanken Text (Prentice & Lyngfelt 2016; Lyngfelt, Bäckström, et al. 2018). The corpora are also used as an empirical basis in the analysis involved in creating new construction entries in the database (Lyngfelt, Bäckström, et al. 2018). In a similar way, the Korp infrastructure has also been used in training students of Swedish as a second language (at both linguistic, and teacher-training courses) in constructional analysis. SweCcn has an indirect connection to Korp via the Saldo lexicon (Lyngfelt, Bäckström, et al. 2018) but there is no direct link between the examples for a given construction in SweCcn and the corpora they have been extracted from. A closer connection between SweCcn and Korp, e.g. by enabling a direct link between examples and their wider context in the corpus or incorporating corpus statistics, e.g. regarding the frequency of examples or the most common lexical components, into the construction entries, would have a potential to benefit the language pedagogical relevance of SweCcn (and, to some extent, Korp). This, however, requires both further system development and linguistic analysis and might not be easily accomplished in the foreseeable future. At the present stage, the pedagogical usefulness can be increased by greater parallel use of SweCcn and Korp, e.g. to extract the most frequent examples of a certain construction (in different types of language use) for construction-based teaching materials and classroom exercises. For more advanced (adult) learners, searches for given constructions (taken

from SweCcn) in Korp can even be integrated into construction-based teaching. Another way to further develop SweCcn as a pedagogical resource is, of course, creating a larger bank of exercises and other construction-based teaching materials, which can be accessed through the database (Håkansson et al. 2019; Prentice & Lyngfelt 2016), work that is currently still in its beginnings.

The pedagogical potential of the links between constructions in SweCcn and the corresponding frames in SweFN has, at the time of writing, not been explored in any depth, even though it has been mentioned (cf. Ehrlemark 2014). Experiences from other projects, e.g. GFOI (Boas et al. 2016), suggest that combining frame semantic and constructional information can provide a more in-depth description of the relationship between form, meaning/function, and usage that is potentially beneficial for learners. Also the contrastive aspect of comparing constructions via the corresponding frames (Lyngfelt, Bäckström, et al. 2018) is a potentially useful feature from a language pedagogical perspective. In recent years an important aspect of construction development has been the effort to align constructions for different languages (Lyngfelt, Torrent, et al. 2018). This allows for contrastive research in construction grammar, which also is a potentially interesting field from the perspective of second language learning and teaching. Regarding the SweFN, as well as the SweCcn database and their user interfaces, there is the need for a linguistically competent person to edit the material according to the proficiency level and metalinguistic knowledge of the learners, before it can be used in the classroom or in teaching materials.

In ICALL development, the success of a pedagogical application depends largely on three forces joined together: linguistic resources, pedagogical design and NLP-based implementation. The interaction of these forces can be described like this: major success lies with the resources used as the basis for an application or exercise, next in importance is the pedagogically motivated and mature design and format of a learning activity, and finally – given that the two building blocks are robust and appropriate, comes the implementation of an algorithm and user interface. Resource(s), according to this, are at the heart of any educational (and not only educational) NLP application and have a considerable impact on its strength and weakness. The value of a digital resource as a building block for automated language learning applications, in turn, depends on:

1. the *focus* of the original resource, its theoretical and linguistic dimensions. How well does it align with the learning objectives? Sometimes it takes a fair amount of creativity to find a way to align a linguistic resource with a language learning syllabus. A focus that could be useful for a language learning application is, for instance, correction annotation (also known as error correction) of learner texts.

2. the *type of annotations* and consequently their usefulness for language learning and teaching. If we take the example of correction annotation (aka error annotation) as a focus, the tagset can be based on linguistic structure (orthography, morphology, syntax), on a type of formal corrections (replacement, deletion, addition, etc) or the source of an error (transfer, closeness of keys on a keyboard, etc). The type of annotation will influence how/where the resource can be applied.
3. the *reliability of annotations*. The granularity of tagsets can be useful for building linguistic theories or generalizations, but it can also become a source of inconsistencies. Practice shows that the coarser the tagset, the more reliably it is applied during the manual annotation stage. If it is difficult for manual annotators to agree on a judgment, it will be even more difficult to replicate it with automatic approaches. (cf. Hovy & Lavid 2010)

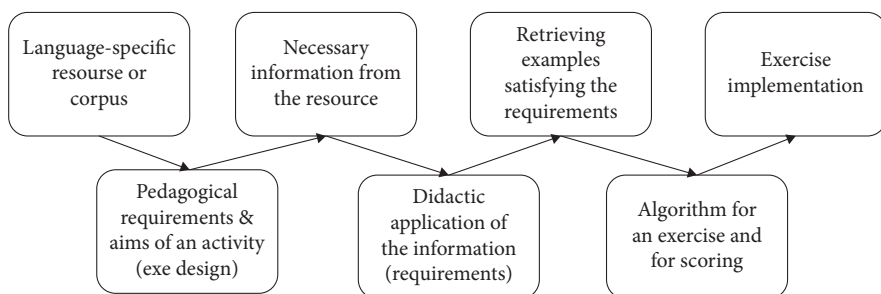
We have seen that the semantic roles used in the Lärka-based exercise for linguists have caused a number of disagreements on the side of teachers and students. There can be several reasons for that – difference in theoretical views between university syllabi and FrameNet’s theoretical approach, inaccurate mapping between the original frame elements and the more abstract semantic roles, or simply lack of consistency in the annotation process. However, we have also seen that even a weakness of this kind can be turned into an advantage by creatively thinking teachers, since it can be used as grounds for discussion and a way of illustrating the fact that there are often different ways in which something can be analysed and that this is why you need to be able to argue for your analysis. Often students have an initial belief in everything having one right answer and many wrong answers. This way we can clearly illustrate that this often is not the case since there are different theories and different ways of interpreting linguistic phenomena.

Reusing accessible corpora and lexica for exercise generation, however obvious or natural it might seem, is not necessarily easy or wide-spread. There are various reasons for that, among others that exercises need to be based on appropriate (from a learning point of view) texts, sentences or target vocabulary and grammar. The process of manual pre-selection of those is labor-intensive, whereas automatic pre-selection is relatively error-prone. Luckily, SweFN can boast the manual pre-selection and annotation of a set of lexical items and sentences (for a certain range of features) that can be effectively reused in language learning-and-teaching scenarios, as has been witnessed by a successful implementation of an exercise for training semantic roles for students of Swedish linguistics (Pilán & Volodina 2014). The exercise has been in use at some Swedish and Finnish universities since its implementation (see Lindström Tiedemann et al. 2016). SweFN can also be used in

other language learning scenarios, as argued by Atzler (2011), Boas & Dux (2013) and Friberg Heppin & Friberg (2012).

Before using any corpus, lexicon or library of examples for a pedagogical activity, one should be well acquainted with those resources (Peters 1997). Corpora and lexica are rich sources of linguistic information, yet there are a number of constraints that come with them. It is not only a question of which linguistic features that are present in them, e.g., in the form of added annotations. It is also a question of what the topic of a randomly selected text or sentence is, what their difficulty level is, and a number of other aspects that are relevant to language teaching. Thus, technology, language resources, and pedagogy need to go hand-in-hand in ICALL development. Figure 4 shows relations and dependencies between the resources used and pedagogical considerations, where the top layer demonstrates the role a language resource plays, and the lower layer shows how the pedagogical requirements and aims influence the resulting use of the resource in a pedagogical activity.

Regarding the further development of the language pedagogical potential of Swedish FrameNet, there are various ways of using SweFN both as a *primary resource* and as a *secondary resource* in an NLP-based language learning application. An example of the latter is mapping lexical units to the frames they evoke and using those as topical/domain information for analysis of texts used for language learning, or for classification of vocabulary items by language proficiency level, where it was shown that topic as a feature is a very strong predictor (Alfter & Volodina 2018). Division of vocabulary into grammatically important subclasses for language learners, such as into stative and durative verbs, could – hypothetically – also be performed through verbs classified under certain types of frames, e.g. the *Awareness* and *Cogitation* frames would be suggestive of stative verbs, like *know*, *imagine*, *presume*; whereas the *Self\_motion* and *Change\_posture* frames would most



**Figure 4.** Interplay between linguistic resources and pedagogical/didactical considerations in ICALL application development



likely list dynamic verbs, such as *trod* and *dart*. The same feature could be explored for capturing stylistic effects in sentences where LUs with clearly opposite frames are used, e.g. *How wonderful to be robbed when you are abroad!* where *wonderful* and *robbed* are clearly opposite in sentiment (whether this is captured by frames or not needs to be tested).

One of the most appealing features of SweFN for the pedagogical context is the possibility to list related vocabulary for each *lemma* that is defined with respect to a frame in SweFN and the *lexical units* that evoke the frame. A set of related words can be used as a sort of explanation of a word which a learner is unfamiliar with (see Figure 5, listing words related to *sibling*, like *lillasyster* ‘younger sister’, *bror* ‘brother’, or *tvilling* ‘twin’), to generate a list of semantically related words as distractors in an exercise, or to suggest an alternative (but semantically related) word to avoid repetition in student writing.

Friberg Heppin & Friberg (2012) argue for the usefulness of *framenets* for communicative language teaching purposes. The authors emphasize the potential of the resource to aid the development of course syllabi, especially regarding decisions around the order of presentation of new linguistic phenomena. A guiding principle behind a FrameNet-inspired organization would be the semantic relationships between frames and frame elements. Elements belonging to the same frame could be introduced together, and related frames could be taught in a sequence. According to the authors, the advantage of such an organization is that it reflects a more communication-centered, “natural flow” compared to a grammar focused syllabus.

Since FrameNet is based on semantic units and the frames allow for interoperability and easy re-use across languages (cf. Boas et al. 2016), the resource is particularly suitable for multi-lingual NLP applications in general and pedagogical applications in particular as also Friberg Heppin & Friberg (2012) have pointed out and as has been applied e.g. by Boas et al. (2016) in GFOL (see Section 1.1.1).

#### Relaterade ord (SWE-FN)

##### Kinship

lillasyster	trilling	storebror	storasyster	sexling	tvilling
fyrting	bror	femling	svärson	halvbror	syskon
syster	ättling	syrra	svärdotter	styvson	dollarprinsessa
styvdotter	småsyskon	sjuling	halvsyster	kullsyskon	släkting
styvsyskon	dotter	storasyskon	lillebror	halvsyskon	anfader
minsting	son	helsyskon	tsardotter	brorsa	niece

Nu vill Singh att hans föräldrar och ska komma, men de tycker att resan är för lång.

Figure 5. Related words for the word *syskon* ‘sibling’

To sum up, there are multiple ways in which Swedish FrameNet++ can be explored further, regarding the (automatic) generation of materials for language learning. It is worth studying SweFN++ and associated resources in more detail to grasp their versatility and their applicability to language learning. Users must know what's inside the database or corpus if they are to be able to interpret the data drawn from it properly and be able to use the richness of manual annotation invested into it. "Know thy database" is our twenty-first-century commandment to students, teachers and researchers alike. Don't be dazzled by the sheer size of the database, and be sure that you critically evaluate its appropriateness for the task at hand (Peters 1997: 176).

#### 4. Concluding remarks

At a time when pedagogical research and curricula are emphasizing the use of authentic material and student-centred teaching (Loenheim et al. 2016; Boas et al. 2016; Lindström Tiedemann et al. 2016) there are many reasons to emphasize and to further explore the possibilities which lie in computational resources such as those that are part of, or connected to SweFN++. This can be done both in the way of ICALL (cf. Lärka) and in less technical solutions such as exercise banks, highlighting of certain constructions, which can pose challenges for learners, and illustrations of what the resources are and how they can be used (cf. SweCcn).

In addition we can note that making use of resources through ICALL can also make it possible to log what learners can and cannot do to facilitate further research on how things can best be learnt, and possibly also as a way of collecting crowd data on alternative analyses of language. Valuable impulses for research about second language learning can also come from the further analysis of the data in SweCcn. One aspect that is looked at more closely, is the development of systematic selection criteria for the L2-focus category (Prentice & Tingsell 2019). An important step in this undertaking is further research about constructional properties, and usage that can cause challenges in the context of second language learning. Adding to the knowledge about this issue would not just be an important contribution to the development of SweCcn but also to the research fields of usage-based second language acquisition and construction grammar in general. In this article we have presented how two resources connected to SweFN++, SweCcn and Lärka, have made use of constructions and frames for pedagogical purposes, as well as given some examples of how this could be extended in the future. Research areas such as ICALL and frame semantics and constructional (usage-based) approaches to language learning have become increasingly important and are constantly evolving. The resources and approaches discussed in this chapter have the potential to

complement more traditional approaches to the teaching of language proficiency, metalinguistic knowledge and linguistic analysis in important ways, the possibilities for active, analytical, and self-sufficient learning being one of them.

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