

## *A Visual System for Grammar Instruction in Foreign Language Learning*

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### **Abstract**

Complementary to verbal explanations, visual techniques are often implemented in grammar instruction as input enhancement to help learners process information. Highlighting using typographic features can help distinguish the structure in focus from its context, aiding information seeking and drawing attention to important features. Additionally, visual encoding can associate graphical traits with grammar categories to support the recognition of related structures and language patterns. An analysis of current grammar books for German as a foreign language has shown, however, that a combination of multiple encoding techniques representing coexistent grammar categories can be challenging to make sense of. The absence of an overall design strategy within a book generates inconsistent and sometimes conflicting grammar representations, which can lead to misunderstandings and create a hindered and fragmented learning experience. In order to avoid such conflicts, this research presents a visual design approach to grammar instruction that combines both techniques efficiently and introduces a visual system developed for German as a foreign language. In addition to indicating a word's class, similar to Montessori Grammar Symbols, this system uses text appearance and symbols to indicate further grammar features relevant for non-native speakers, such as grammatical gender, case declension, verb tense, etc. By maintaining a consistent visual character, the intent is to foster structure recognition and comparison as well as pattern identification throughout all grammar representations. Initially developed for the German language, this systematic approach of associating grammar categories with visual features could be adapted to create visual systems for other languages.

Keywords: grammar instruction, visual support, colour, highlight, input enhancement, encoding, visual system, consistency, visual conflicts

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## Introduction

Visual salience can be a helpful tool to organise information for perception and guide learner's attention to the target structure and its important features. The relevance of visual guidance and its influence in the learning process can be explained by the Noticing Hypothesis suggesting that learners intake is derived by the noticed input (Schmidt, 1990). Considering that the explicit use of colour in learning materials is known for enhancing information comprehension and retention (Malamed, 2011), it is tempting to believe that learning must be a natural consequence of the strong visual sensation provoked by colour and that merely adding colour to a given display should increase learning (Rieber, 1994). However, fundamentally, when visual information is meaningful and can be organised in a cognitive framework, it is generally remembered better than verbal information (Dueck, Bower, & Kaplan, 1975).

Input enhancement is a common strategy to create visual salience in the given input involving the use of typographic features such as bolding, underlining, colour or capitalization, to highlight specific linguistic features in the sample sentence. Studies around input enhancement have measured the perceptual efficiency of different visual cues (Simard, 2009) and analysed its effects on learning improvement of specific structures in comparison to other instruction methods (Jourdenais, Ota, Stauffer, Boyson and Doughty, 1995; and Leeman, Arteagoitia, Fridman and Doughty, 1995). Besides highlighting, visual encoding is also an often used technique to increase learners' noticing of features and targets in the input by explicitly indicating different linguistic categories.

This work proposes a discussion around both techniques from a visual design perspective and focuses on the relevance and challenges of maintaining visual consistency and coherence when combining techniques. We are convinced that a consistent representation of linguistic features can aid visual comparisons, recognize recurring language features, and reduce any semantic confusion (Qu & Hullman, 2018). Furthermore, considering that grammar structures are introduced in fragmented sections to learners, we believe a holistic approach to the visual support can increase its consistency throughout sections and play an important role when measuring learning improvement over a long term. Achieving this consistency involves design choices that consider not only the representation of a target structure in a specific lesson, but also how identical, similar, and different structures are shown in the other lessons. When analysing textbooks for grammar instruction of German as a foreign language, we observed how the absence of an overall visual strategy for the different lessons might present conflicting, inconsistent, confusing, and even misleading representations of the language, which could contribute to a fragmented or even hindered learning.

To avoid conflicting representations, we suggest specific design considerations for achieving a consistent visual representation of grammar, and introduce a visual system developed for German as a foreign language. Recognizing that learnability touches usability on many points (Peters, 2014), we believe that bringing the design perspective to the discussion can contribute to improve the potential influence visual support can have in the learning process of a foreign language.

## Visual Systems

The visual system of a learning material is composed of visual features and techniques. The system defines the visual features to be used and how they will be implemented as visual techniques to support learners. They can be specific to a single lesson or have a global approach covering an entire book, and should be considered part of the instructional strategy. In both cases, the aim of visually organizing verbal content is to shift information acquisition to the perceptual system to speed up visual information processing (Malamed, 2011). When effectively implemented, visual features can be easily detected by the brain and can speed up information processing (Ware, 2000).

The field of grammar instruction in foreign language teaching represents simultaneously a big opportunity and a challenge for implementing visual aids. Whereas visuals can be used to emphasize the linguistic target in the given input, make relationships within structures visible, and indicate multiple categories, an inconsistent visual system can leave important information concealed, create visual similarities between non related structures, or create potentially confusing representations of a grammar rule. Therefore it is important to understand the function a certain visual feature has within the system and what aspect of learning it aims to support. Furthermore, it is important to align the visual design with the instructional strategy, since the former can inadvertently interfere with the latter. The visual design choices should take into consideration whether the material provides an instruction focused on form, or if the focus lays on communication with minimal attention to linguistic features. A lesson that involves consciousness-raising tasks, where learners are encouraged to identify linguistic patterns within given examples (Loewen, 2018), can be visually supported by an implicit highlighting of the targets or an explicit colour coding of the linguistic categories. Comparative tasks are however best supported by designs that explicitly address comparison, because if the comparative targets are not accommodated by the design, the viewer might need guidance towards what has to be compared or else they may not even think about comparing them (Gleicher, 2018).

Although there are many different approaches to add visuals in learning materials and the available visual features might vary depending, for example, on the content, the learner, and the learning context or the medium, this work focuses on two of the most commonly used visual techniques: highlighting and encoding.

## Visual techniques

When verbal information is displayed without a given visual direction, the amount of information can be overwhelming and the viewer might focus on the wrong information (Malamed, 2011). Through appropriate **highlighting**, also known as input enhancement, important information can be visually discriminated from its context through preattentive processing (Treisman, 1985), a pop-out effect caused by contrast in its appearance. This pop-out effect is, however, only efficient when the difference between objects is great enough to cause brain cell activity (Wolfe, 2004). This visual contrast is useful to emphasise important features and direct the eyes to elements that should be analysed under the focus of attention, aiding information seeking. Working as a visual cue, the aim of highlighting is to guide attention and ensure that the

highlighted information is perceived. Sometimes language learning materials make use of a double highlight. Often the first discrimination indicates the target structure and the second emphasises an important feature within the structure, such as an inflection or vowel change for example. Common visual features used for that purpose are text colour, underlining, font weight or, in case of multiple highlighting, a combination of those features (see Fig. 1).

Er kauft ein Auto.	Er kauft ein Auto.
Sie fahren mit der Bahn.	Sie fahren mit der Bahn.
Context	Context
Highlight 1	Highlight 1
	Highlight 2

Figure 1: Highlighting is a technique used in input enhancement to indicate the target structure within the context. It can be employed once or multiple times.

Although input enhancement through highlighting may have some effect on second language acquisition, its implicit aspect may not make target structures salient enough for learners (Loewen, 2018). When the visual system simply highlights the linguistic target, it might not be clear for some learners which aspect of the highlighted structure they should pay attention to. A study around the influence of input enhancement in noticing reported that although enhanced forms were detected, their relevance and importance was not clear for many learners (White, 1998). It is important therefore to consider the knowledge and skills of the learner to determine if a combination of a more explicit technique is necessary.

Whereas information discrimination is used for guidance, **visual encoding** gains an explicit informative aspect. Also known as information association, encoding associates a visual feature with a category, in a way that all information belonging to this category receives the same visual indication (see Fig. 2). In this case, the visual feature is also a carrier of the primary message.

Er kauft ein Auto.	Er kauft ein Auto.
Sie fahren mit der Bahn.	Sie fahren mit der Bahn.
Nominative	Masculine
Accusative	Neutral
Dative	Feminine
	Plural

Figure 2: Textbooks for German as a foreign language often use visual encodings to indicate variables of categories such as case and grammatical gender for example.

The aim of visually encoding information is to make categories and relationships visible by following the Gestalt principle of similarity, where objects with similar

appearance tend to be grouped together (Wertheimer, 1938). Therefore, information with similar appearance would be perceived as being part of a group (Ware, 2000) and grouping in turn enhances the meaning of a given graphic when viewers know that similar looking elements are related to each other (Malamed, 2011).

Once learners understand the meaning behind each visual feature they can group information with a common appearance and search for similarities, differences, and patterns across the underlying grammatical categories. Considering that grammar instruction focuses on different structures at a time, learners must rely on their memory in order to recognise and compare information across lessons. When the visual code is consistently used across all segments of an explanation, a visual convention is formed. The benefits of working with conventions is that they maintain a visual unity that can aid learners to recognise previously seen content and identify relationships within the segments. Furthermore, when connections are reinforced they become stronger and more durable (Dirksen, 2016). Thus it is beneficial to ensure that both verbal and visual representation of a grammar structure in a lesson is consistent and coherent to the previous and following lessons.

### **Visual features**

In the same way that a language has its linguistic features organised in categories, so are visual elements classified and arranged in the information visualization field. Also called visual variables, basic graphical features can be organised into distinct groups. Depending on the research and author, this grouping can receive different names. As seen in Figure 3, Ware refers to this group as visual channels or visual encoding variables and so do Chen & Floridi (Ware, 2000; and Chen & Floridi, 2012). Text specific features are also called typographic variables (Parnow & Dörk, 2015).

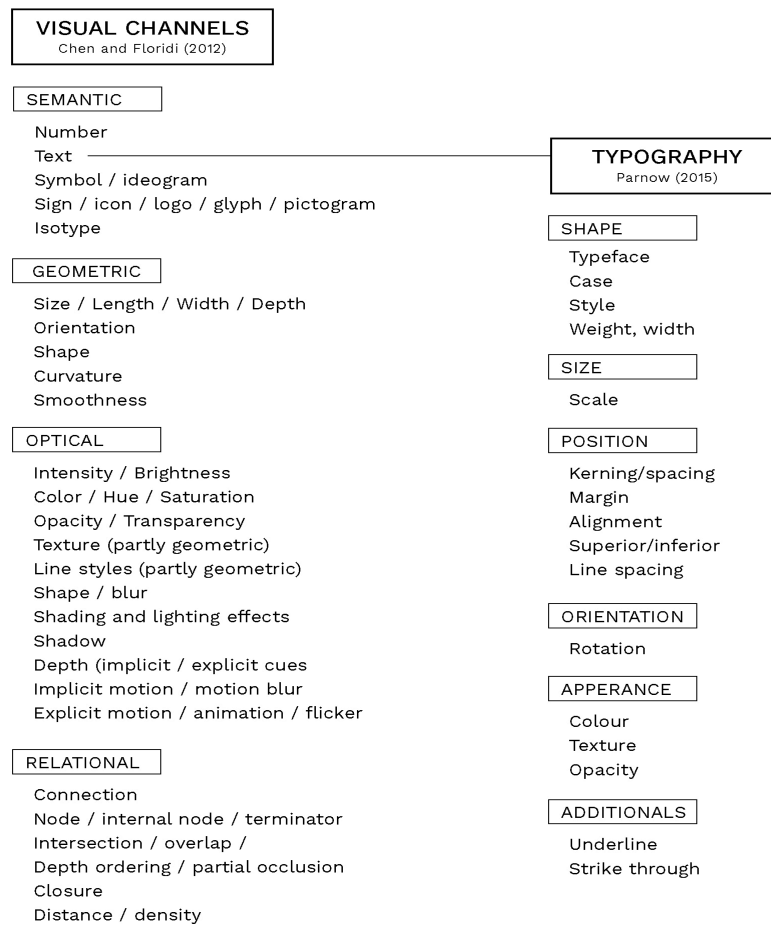


Figure 3: There is a limited set of visual channels and typographic features to be reliably used to encode information.

## Visual Conflicts

Despite the diversity of visual features, our analysis of input enhancement used by didactic materials for German as a foreign language shows that some materials rely almost exclusively on colour for implementing both highlighting and encoding techniques. The dominant use of colour is understandable since the common consensus of perceptual studies that have evaluated the pop-out effect of visual features claims that colour is the most noticeable channel, followed respectively by size, shape and orientation (Borgo, 2013). However, the inflationary use of colour for multiple purposes can generate **conflicting techniques**, since learners might not be able to distinguish if the colour is encoding a grammatical category or if it is simply emphasizing a specific aspect. Consequently, learners may not be able to decode the visual message and search for a grammatical pattern in a highlighted information or perceive encoded information as a simple highlight.

Furthermore, using the same visual feature, for example, colour, to both encode and highlight is problematic because it suggests a grammatical relationship between the highlighted aspect and the encoded information that may not exist (see Fig. 4). Since

encoding grammar features makes categories visible, the viewer becomes aware of the existence of different groups and is encouraged to seek out similarities within similar looking information.

Wo?      in + **Dativ**      im Haus

Wohin?   in + **Akkusativ**   ins Haus

Wo? Ich bin **zu Hause**.

Wohin? Ich gehe **nach Hause**.



Figure 4: The use of the same visual feature for both highlighting and encoding information leads to visual representations that are in conflict with each other.

One of the challenges of highlighting and encoding information is therefore combining both strategies in a way that they do not interfere with one another's effectiveness. Highlighting works best when the pop-out effect is strong, meaning the contrast between objects should be great enough to be perceived immediately. However, visually encoding categories also creates a contrast in the encoded appearance. Consequently, it is important to carefully choose which visual features to use, so highlighting the information in focus and encoding the existent categories do not create representations with overwhelming visual contrasts.

A further challenge of working with visual codes is to avoid **conflicting encodings** when representing elements of multiple categories. Returning to examples of German as a foreign language, materials often use colour codes for indicating gender and case (see Fig. 5). Although these two categories coexist producing intersections, the visual system can inform only one category at a time, because both visual encodings use colour as the distinguishing feature. The disadvantage is that learners have to constantly switch between colour codes and remain attentive to which association is meant in a given context, making it difficult to visualise the intersections between the represented categories.

Visual encoding when teaching cases:

Er gibt **der Frau** **den Schlüssel**.

Sie schickt **den Leuten** **die Einladung**.

Nominative case  
Dative case  
Accusative case

Visual encoding when teaching relative pronouns:

Das ist **der Schlüssel**, **den** er **hat**.

Die sind **die Leute**, **die** sie **einlädt**.

Gender  
Case  
Relative pronoun

Figure 5: When the same set of colours is used in different encodings, a visual relationship is established that may not exist.

The last kind of visual conflict we observed refers to **inconsistent representations** of the same content. The concept of visual consistency relates to whether two views share similar or different encodings and whether they share all, some or none of their data (Munzner, 2014). The same way information with similar appearance tends to be perceived as somehow related, information with different appearance tends to be considered from different groups. Presenting identical or similar content with a different visual system, requires learners to re-learn how to interpret the new visual information in order to understand how to process the verbal one. This inconsistency creates an unnecessary obstacle for recognizing previously seen structures and it is originated by a change in the way information is highlighted or a change in the visual code (see Fig. 6).

Visual representation when teaching cases:

Er kauft ein Auto.

Sie fahren mit der Bahn.

Nominative  
Accusative  
Dative

Visual representation when teaching active/passive voice:

Die Firma **ruft** Herrn Meier **an**.

Nominative

Accusative

Highlight

Herr Meier **wird** von der Firma **angerufen**.

Nominative

von + Dativ

Figure 6: Inconsistent representation of similar structures in textbooks may impede the identification of relationships within structures and the recognition of previously seen content.



## **Towards a consistent visual system for grammar instruction**

Just as there are multiple instruction strategies in foreign language teaching, there are various approaches to build a visual system. The way visual features are implemented in textbooks and other learning materials is specifically related to the implemented instructional strategy. The availability of these visual features may vary depending on the content, the learning context, the learner, and the medium. Even though there is no single way to represent language features, there are, however, important aspects that should be contemplated when developing a new visual system in order to avoid visual—and ultimately cognitive—conflicts. With the aim of providing support for design considerations, we suggest the following reflections:

- 1. Choosing visual techniques:** Highlighting is the simplest form of input enhancement, it is useful to draw attention to a linguistic target in the input, but it leaves further aspects of the target implicit. Implicit form-focused approaches may not be salient enough for some learners (Lyster, 1998; Ellis, Loewen, & Erlam, 2006) and more problematic structures may need more explicit attention (Spada and Lightbown, 2008). Therefore, instruction strategies that aim to encourage learners to analyse the given input might be better supported by encoding techniques. In addition, the skills and needs of the learner also play a role on whether an explicit and stronger visual support is needed or not.
- 2. Identifying categories:** When working with encodings, it is important to ensure that the primary message can be decoded by the viewer. This can only happen when the associations between visual features and language categories are clear and have an exclusive meaning. In order to facilitate the association process, we suggest to identify all categories that should be encoded before choosing visual features.
- 3. Identifying intersections:** When dealing with multiple categories it is important to identify which categories co-exist and if—and how—their intersections should be visually represented.
- 4. Attributing visual features:** Consider the available options and reflect on which feature could best communicate each linguistic category. When representing category intersections is desired, it might be useful to combine different features such as colour, text style, size, or position.
- 5. Highlighting:** Once all relevant categories have been encoded as visual features, consider how to visually emphasise information that needs to be put into focus at a given time. The visual feature used for highlighting should not be associated with any encoded category, but remain exclusive to indicating the linguistic feature in focus. It should, however, be possible to combine it with the established encodings without interfering with their meanings. A way to test that is to highlight an information when it belongs to an encoded category and when it does not belong to any category.

While they are not readymade instructions to devise a consistent visual system for grammar instructions, these reflections provide practical considerations when approaching this challenge.

## Creating a consistent system with multiple encodings

While reflecting on the aforementioned considerations we questioned the feasibility of a visual system that could accommodate multiple encodings of linguistic categories while maintaining visual consistency and coherence throughout all structure representations. In order to avoid conflicting encodings, such a system would have to ensure that each visual feature has a single exclusive association, meaning the amount of features would have to correspond to the amount of encoded categories. Despite the variety of features, by maintaining a visual unity, such a system could potentially accommodate explicit representations of grammar, fostering recognition and comparison of structures in the sample sentences. This would be a similar visual approach to Montessori Grammar Symbols (Montessori, 1995), in which the visual features colour, shape, and size have been used to represent the different parts of the speech. The main difference is, however, that instead of combining visuals to indicate one category, i.e., word class, the new system would also have to accommodate other German specific categories, relevant for non-native speakers, such as gender, case, and declension. In order to assess if such visual consistency could be achieved, we engaged in developing a new system for German as a foreign language.

The first step was to identify the linguistic features of the German language that are typically explained as a foreign language. For this we analysed and listed all categories and their elements that are often encoded or highlighted by learning materials (see Fig. 7).

Grammatical gender	Type of verb
Case	Type of conjugation
Type of declension	Time
Comparison form	Mood
Word class	Type of connector
Type of preposition	

Figure 7: Textbooks focused on grammar instruction use highlighting and encoding techniques to draw learners' attention to these linguistic features.

The next step was to decide which visual features we would work with and then define which would best represent each grammar category. Since the goal of our system was to accommodate multiple categories and enhance important linguistic features, we decided to work with both typographic and graphic variables. In this way the symbol's appearance can provide visual context and create awareness around the classification of the word, and the typographic variables can draw attention to important features in the input without interfering in the sentence readability. Through a juxtaposition of words and symbols, we intend to stimulate learners to search for relationships between visual and verbal information.

When choosing the association between visual features and grammatical structures (i.e., the visual encoding) we took into consideration the specificity of each structure by itself, yet also its relation to other structures and the system as a whole. The process of deciding on the final associations required many experimentations, iterations, and considerations before arriving at a final state as presented here. In the following, we briefly present the final visual design and the considerations that lead to each decision.

The first grammar category introduced to learners of German as a foreign language are the noun's **grammatical gender** and the declension of articles in singular and plural. Although plural is not a gender, it is often represented as a fourth category next to masculine, neutral and feminine, since all genders have the same declension in plural. Indicating a noun's grammatical gender is important because the accompanying article or adjective is not always indicative of its gender. For example, the article “der” indicates that a noun is masculine in the nominative case, and feminine in the dative case. Since colour is the most noticeable channel (Borgo, 2013), and grammatical gender is inherent to the noun, we chose to associate colour to gender to ensure that a noun is consistently associated with the same colour and its influence on the declension of articles, adjectives, and pronouns become visible (see Fig. 8). Considering that colour is perceived as a visual code, verbal content shown with colour have a higher chance to be dual encoded by the brain (Paivio, 1987), and dual coding it in turn could support memorability (Brzezińska, 2009). Besides, word sequences shown with the same color tend to be processed as a whole, contributing to an automatic chunking (Petterssons, 1997). This is an important aspect, considering that learners of a foreign language tend to focus on learning single words instead of meaningful sequences, i.e., chunks (Handwerker & Madlener, 2013). Although colour coding gender is already a common practice, we consider it important to discuss the choice of colours to indicate each grammatical gender. As already pointed by some authors (Wegener, 1995 and Schirrmeyer, 2015) using biological sex to explain grammatical gender is problematic, since in German this association only applies to a limited amount of words (and language-learning textbooks already seem to brim with gender stereotypes). Instead, it is suggested to encourage learners to observe the word's form and suffix, since in most cases, the grammatical gender of a noun originates from its morphology or root (Wegener, 1995). Besides, words such as “das Kind” or “die Person” have a grammatical gender and, yet, do not refer to the social construct of gender. For this and other reasons, we opted for using colours that are not traditionally associated with gender (see Fig. 8).

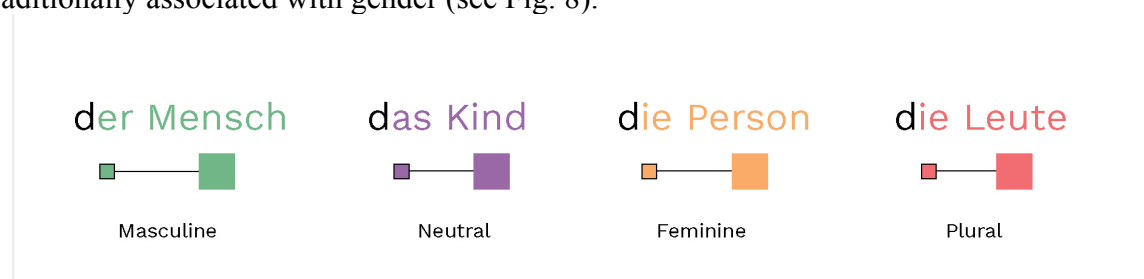


Figure 8: Colour coding indicates the three grammatical genders and plural words.

**Case** is a grammar category that indicates the syntactic function of a complement in a sentence and together with gender, it determines the declination of articles, adjectives, numbers, pronouns and nouns. Similarly to the grammatical gender issue, it is not clear for non-native speakers when to use each case. Thus, learners often learn the

verb or preposition together with its required complement, for example, the preposition “für” requires the accusative case and the preposition “mit” requires the dative case. To indicate the case and help learners remember the different declension patterns, we encoded each case in a unique shape (see Fig. 9). In addition, shape can be easily combined with colour, enabling the system to represent the intersections between case and gender.

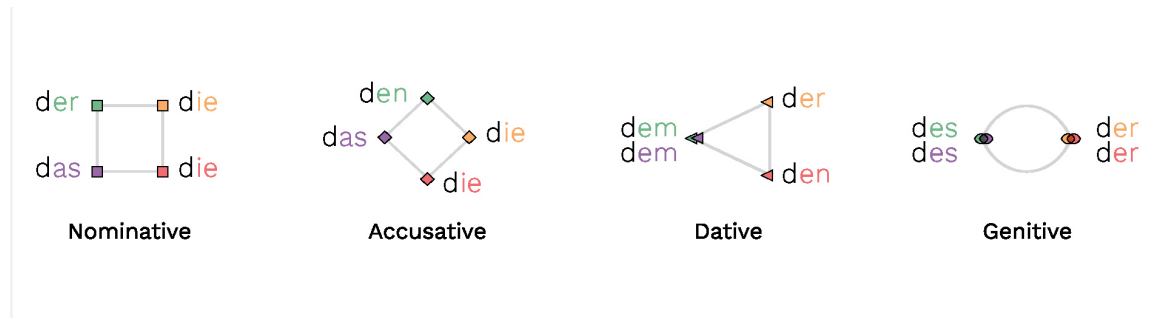


Figure 9: The four cases in German are indicated through a shape, which relates to its declension patterns.

A further specificity from German **declension** is the existence of weak and strong inflections. In our system, the different inflections are represented through the filling in the signs, where a full shape indicates strong inflection and a half-full sign stands for a weak inflection. The following example illustrates how a form-focused representation allows the perception of declension patterns throughout articles and adjectives (see Fig. 10).

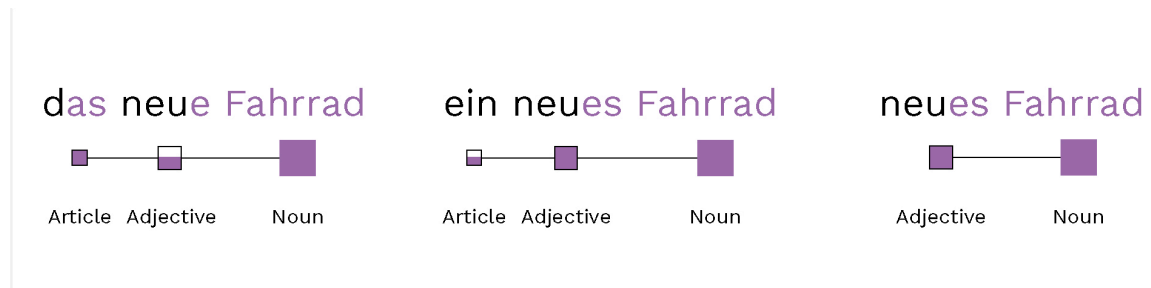


Figure 10: Weak and strong declension of articles and adjectives, with an example of a neutral word in nominative.

The three levels of **comparison** have been associated with the thickness of the sign’s stroke and their inflections have been emphasised through the text in bold (see Fig. 11). In this way we could visually distinguish the gender derivative inflections from the comparison degree derivative inflections.

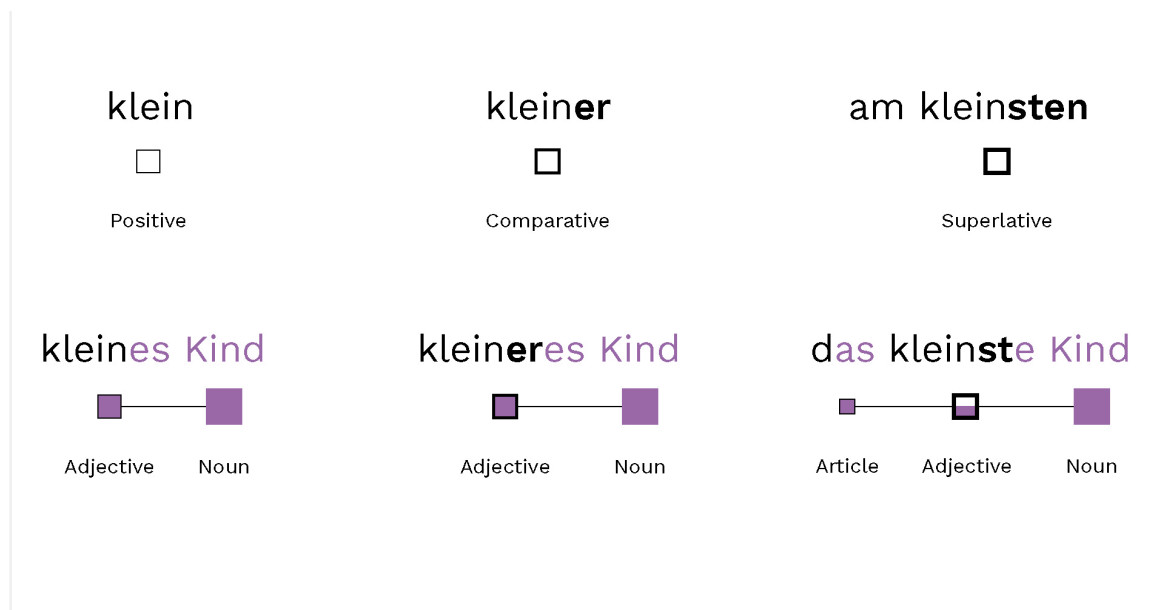


Figure 11: Adjective in its positive, comparative, and superlative forms.

The first four categories—gender, case, type of declension and comparison form—determined the appearance of articles, adjectives, nouns, and pronouns. Additionally, in order to distinguish the **word classes**, we implemented a three-size scale to the different signs: nouns, pronouns and verbs received the large size, adjectives and adverbs the medium size, and articles, prepositions, particles and connectors the size small (see Fig. 12).

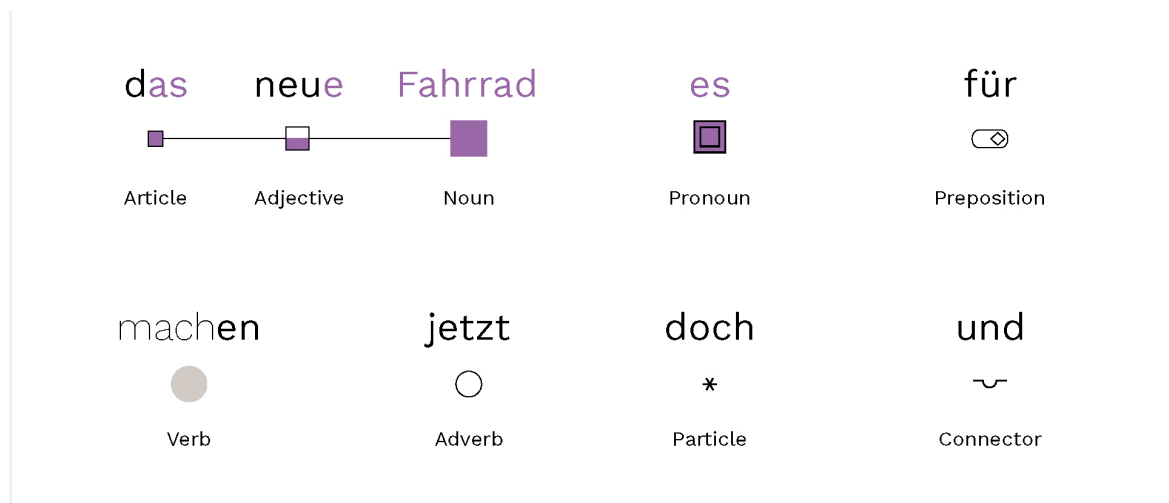


Figure 12: German word classes are distinguished by different symbols that vary in size and complexity according to the various additional grammatical features they need to accommodate or refer to.

German **prepositions** can either demand a specific case as a complement, or they can be a two-way preposition, meaning the case required will depend on the context. The sign for prepositions works as an indicator for the required case, creating a bridge between the determinant structure, i.e., the preposition, and the declined complement (see Fig. 13).

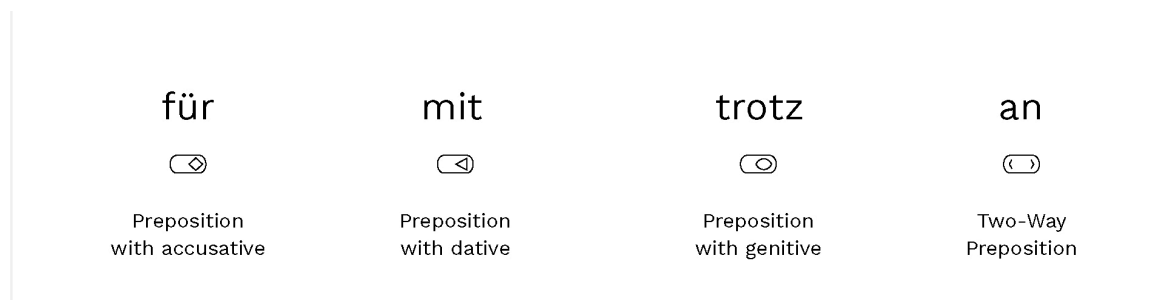


Figure 13: German prepositions and their required case.

**Conjugation** forms another group of multiple categories, whose associations combine and produce intersections. The visual features used to indicate types of verbs and conjugation, time, and mood had to work together and yet be distinguishable. After experimenting with different features, we opted to represent the **type of verb** through the shape of the symbol, the **type of conjugation** through its contour, the **time** through orientation and the different **moods** through a pointer.



Figure 14: Types of verbs and types of conjugation.

As seen in Figure 14, the appearance of the verb's signs aim to imitate their behaviour in the language. The shape indicates whether the verb is a full-verb "Vollverb", a separable verb, a modal verb or an auxiliary verb. The empty middle of modal and auxiliary verbs has as a goal to remind the learner that those verbs need a full verb to complement their meaning. Furthermore, the contour of each shape indicates whether that verb conjugation is regular or irregular. In order to draw attention to the different linguistic features of each verb, i.e., change of vowels and separable prefixes, we opted to leave the verb stem in extra light.

Through the symbol's orientation we intend to conceive the idea of **time**, in a way that a 90 degrees angle stands for a verb in the present and a symbol in 135 degrees indicates that the verb is in the past (see Fig. 15). Since in German the future is built with an auxiliary verb in the present, there is no need to associate a further orientation to it. The last conjugation-related category to encode was **mood**, which we chose to indicate through a pointer attached to the sign that could be easily combined with orientation, or removed in the case of infinitive.



Figure 15: Conjugation of the verb “machen”: the orientation indicates if the verb is in the present or past and the pointer informs whether the verb is in the infinitive, indicative, subjunctive or imperative.

The final category in the system to encode was related to the **type of connector**. As shown in Figure 16, there are three types of connectors that influence the position of the verb in the following subordinate clause. In order to draw attention to the different verb positions, we combined the shape of the connector with the verb position they determine.



Figure 16: The shape of conjunctions, sub conjunctions, and conjunctive adverbs acts as an indicator of the verb position in the following sentence.

Once all associations in the system have been made, it was time to consider how to discriminate the target structure in a given lesson. We are aware that showing fully encoded sample sentences could be overwhelming and adding an extra visual feature to emphasize the information in focus without creating visual conflicts would be challenging. Therefore, we implemented an **inverted highlighting** to achieve the necessary contrast (see Fig. 17). This means that instead of highlighting the target structure, we opted to partially conceal the contextual information. By showing only the word in focus with all its features and applying a light gray tone to the contextual words, we created enough contrast to guide attention without overwhelming.



Figure 17: In an inverted highlight, the contextual information is partially concealed.

The presented system proposes an alternative visual approach to grammar instruction by combining multiple encodings in order to make the different categories and their intersections visible. Its consistent quality was designed to foster structure recognition and comparison throughout explanations, and aid learners by language pattern identification. We believe that learners with greater need for visual support could benefit from such an explicit grammar encoding. The signs provide visual context and guidance for examining examples, and their appearance could encourage learners to seek meaning in the similarities and differences in the given input.

A sample lesson given to learners has shown that the visual approach could be useful to help intermediate learners mentally organise the seen structures, but complete beginners might need prior or accompanying instructions on how the system works. The presented approach is in the process of being implemented in a textbook and will go under first evaluations soon. Lastly, since each grammar category has an individual association, the encodings could be adapted to other linguistic specificities in order to create a visual system for other languages.

## Conclusion

Two main techniques are commonly utilised to incorporate visual features in input enhancement: highlighting and encoding. We discussed the importance of visual consistency when combining multiple encodings. We commented on visual conflicts observed in textbooks for grammar instruction of German as a foreign language, and



how they could influence the instruction strategy as well as learners' perception of the input. Furthermore, we elaborated practical considerations for the combination of highlighting and encoding techniques, in order to avoid visual conflicts.

Lastly, we introduced a visual system that encodes multiple grammar categories of German as a foreign language and uses inverted highlighting to draw attention to the target structure. Besides achieving consistent representation, the system presents an alternative on how the intersection of different grammar features can be simultaneously represented. We commented on first feedback from learners and suggested a direction for future work.

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