


Cognitive grammar hands-on: a design-based approach to the didactic integration of interactive grammar animations

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Abstract

Tutorial computer-assisted language learning tends to employ a deductive teaching approach, explicating grammatical concepts prior to practice exercises. This leads to a didactic gap, impacting learner engagement. Interactive Grammar Animations (InGA) aim to bridge this gap by enabling learners to explore the conceptual motivation and meaningfulness of grammar on their own. To harness the potential of InGAs, the selection of a suitable learning object and its didactic integration are pivotal. Only against the backdrop of media-adequate didactics, InGAs grant alternative access to the learning content and can become a means of insight and understanding. To bridge both the didactic and the knowledge gap, the research project on InGAs investigates the functionality of the interactive learning medium and its integration into a didactic concept. As a case study, the project uses grammar animations on the German passive voice whose visual interface is extended so that language learners can manipulate the content presented within them. Following a Design-Based Research (DBR) approach, the project is currently in its fourth cycle and this article reports on the challenges of developing and integrating an interactive learning application that adopts an inductive approach to grammar instruction in the foreign language classroom and reflects on didactic as well as methodological aspects.

Keywords: *cognitive grammar, interactivity, task-based language teaching, didactic integration, design-based research.*

1. Extending the didactic repertoire of tutorial CALL

InGAs are an innovative learning medium with the potential to shift paradigms in terms of how Computer-Assisted Language Learning (CALL) is used within the classroom and beyond. Usually, tutorial CALL follows a deductive teaching approach to grammar by presenting explicit explanations of grammatical concepts before providing exercises for practice (Heift & Vyatkina, 2017). This didactic procedure puts a curb on the involvement and activity of the learner, as they are initially relegated to absorbing metalinguistic information. Moreover, the focus on formal features in subsequent exercises gives them little opportunity to practice skills related to semantic and pragmatic aspects of grammar despite being equally important for the development of grammatical competence (Purpura, 2004).

InGAs, on the other hand, overcome this didactic confinement by using an inductive approach and enabling learners to explore the conceptual motivation and meaningfulness of grammar (Langacker, 2008) on their own. Representing a further development from conventional grammar animations (Roche & Scheller, 2008), InGAs inherit the principal feature of using visual metaphors to explain abstract concepts of Cognitive Grammar to language learners in a way that is illustrative and easy to understand. But unlike their predecessors, the visual

display of InGAs is extended by an input interface, enabling language learners to interact with the elements displayed in the animations. As the learner actively shapes the animated content, a dynamic process of mutual influence between the learner and the digital learning medium provides a sophisticated form of interactivity that stimulates cognitive interactions between existing knowledge on the part of the learner and new impulses on the part of the application (Domagk et al., 2010).

However, to harness the learning potential of InGAs, the decisive factor is the selection of a suitable learning object and its didactic integration (Beatty, 2010). Only against the backdrop of media-adequate didactics, InGAs grant alternative access to the learning content and extend the didactic repertoire of tutorial CALL. To address this puzzle, the research project on InGAs adopts Task-Based Language Teaching (TBLT) as a didactic framework, and employs both quantitative as well as qualitative approaches of DBR (McKenney & Reeves, 2014) to monitor the design and development of the didactic concept. Currently, the project is in its fourth iteration of (re-)designing, testing, and evaluating within a case study on the German passive voice (cf. Roche & Suñer-Muñoz, 2016). Preliminary findings of this evolutionary process shed light on the challenges of developing and integrating an interactive learning application that adopts an inductive approach to grammar instruction in the foreign language classroom from a didactic as well as a methodological perspective.

2. Design-based research

In terms of research methodology, the study on InGAs is situated within the paradigm of DBR, an empirical research approach that aims to test and optimise the design of learning concepts, environments, and materials within a cyclical process. Rodríguez (2017, p. 365) summarises the features of DBR as follows, whilst the characteristics may vary from study to study: "synergy between design and research processes, iteration, methodological pluralism, intervention, exploration, and collaboration." Although this research approach seems to be particularly suitable for CALL research because of the strong link between theory and practice, the weaknesses of DBR, such as the lack of uniform methodological guidelines, the involvement of researchers, and problems with the generalisation of results, must also be taken into account.

To explore those factors in the complexion of the teaching-learning process that condition and influence the didactic functionality of InGAs, various interaction-centred methods are used to achieve a multi-perspective documentation with particularly rich data: user tracking to collect data on user behaviour; semi-structured interviews to obtain insights into the perceptions, feelings, and assessments of learners as well as of teachers; questionnaires to gather further information about the respondents and their language learning biographies; and work materials (participants' worksheets, the teacher's lesson plan as well as their reflection report).

To expedite the development of the didactic concept, three testbeds, differing in the degree of the ecology of the learning environment, were used (see Fig. 1). Testbeds differed as to the size and consistency of the learning group, the teacher, and observers sitting in on the language class. At the lowest level, the field of enquiry consisted of a particularly small learning group that was formed sporadically and instructed by the researcher in the role of the teacher; a more natural setting was when the researcher taught in an established language class with a regular practitioner as an observer. In future cycles, the researcher and the practitioner will switch positions. While the test environments varied, the characteristics of the test subjects were kept constant throughout. All of them were undergraduate or graduate students at Otto von Guericke University of Magdeburg with different cultural backgrounds, and consequently with different first languages, and language skills in German varying between A2 and B1 (CEFR).

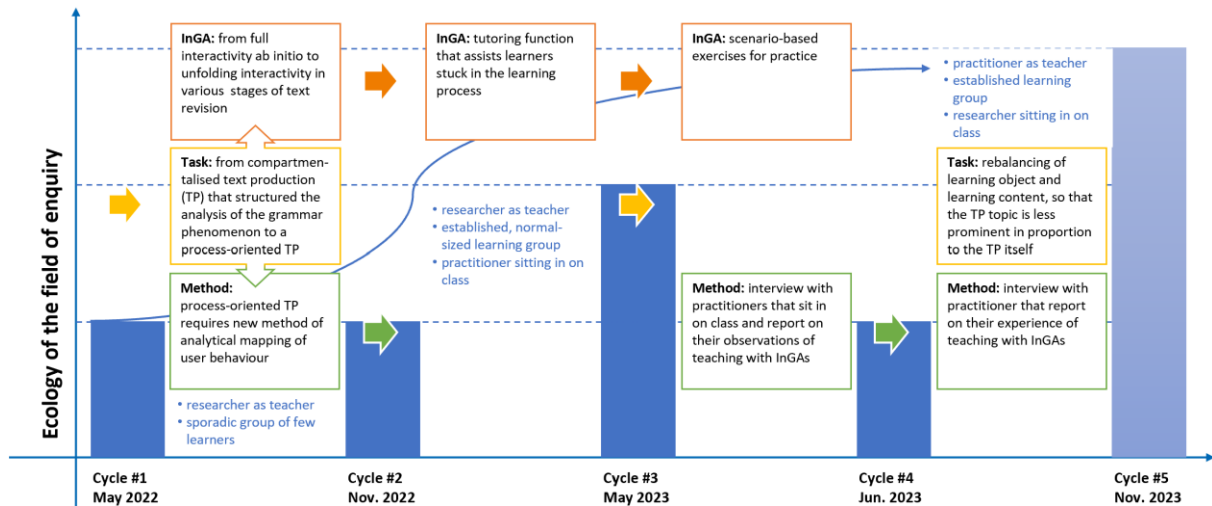


Figure 1. Evolution of the didactic concept for InGAs within four cycles of (re-)designing, testing, and evaluating (cycle #5 planned for the future at the moment of writing)

3. The evolution of a didactic concept for InGAs

3.1. TBLT

Given the exploratory approach to grammar afforded by the high degree of interactivity of InGAs, TBLT provides a didactic design that is ideally suited to engaging learners in active learning and meaningful language use mediated by technology (González-Lloret & Ortega, 2014). Tasks in language learning contexts can be understood as a framework within which learners carry out activities designed to achieve a goal through linguistic means (Van den Branden, 2006). While the design principles of TBLT have served as a foundation throughout the evolutionary development of the didactic concept for integrating InGAs, the tasks that guide the learning process underwent significant changes with the most notable modification after the first cycle.

For providing a linguistic activity that is authentic and oriented towards a communicative goal, learners were set the task of writing a protocol for a harmless animal experiment depicted in the animations (see Fig. 2). Initially, the text production was divided into three tasks each dealing with two of the six scenes of the animal experiment and each focusing on a different aspect of the diathesis in German. This compartmentalisation turned out adverse to the learning progress. Learners struggled with an analytical approach that focused primarily on meaning, and on form only in a second step. For this reason, the redesign of the didactic concept involved restructuring the text production from a product-oriented approach to a process-oriented approach, in which learners were guided through three stages of drafting and revising their texts. This new procedure has proved successful and the only adjustment that remains for the forthcoming fifth cycle is the balancing between the learning object and the learning content. This adjustment has turned out necessary as participants still find the prominence of the dilemma the animal faces within the experiment, which is intended to arouse their interest in the subject matter and prepare them for the subsequent virtual experiment, distracting from the grammatical phenomenon.



Figure 2. InGA screenshot of scene 1 of the animal experiment (version of cycle #4), conceptualised with the focus on the containers while the researcher and the pigeon are faded out, producing the verbalisation displayed. The bulbs next to the scene selector (left) represent feedback; the help button (right) provides hints on what to do next.

3.2. InGAs

To enable learners to cope with the challenging task of writing an experiment protocol, InGAs support them in composing the text. Since the support has to be adapted to the task demands, restructuring the writing task also meant adapting the functionality of the InGAs. This adaptation provided an opportunity for tackling another problem that occurred in the first cycle. While being helpful, the complex functionality of the various interactive elements can also be strenuous. Having all functions available to them as of the first task, participants felt initially overwhelmed in the first cycle, and the confusion caused by the complexity of the operations of the various parameters only dissipated as they worked through the tasks. But adopting a process-oriented approach for the text production in various stages made it also possible to introduce the functionality of the InGAs step by step, so that its complexity is gradually revealed to the learners.

While the interactivity of the elements in the animations enables learners to explore the relationship between the conceptual composition of a scene and its verbal realisation, thus providing them with suggestions for the wording of the experiment protocol, the InGAs are also equipped with a simple feedback system. This is meant to give learners orientation in the process of discovering different conceptualisations of the same scene and to alert them of ungrammatical sentences or sentences that are inadequate with regard to the communicative goal. However, as user behaviour continued to show difficulties in following learning paths after the second cycle, an additional support system was implemented to intervene when learners encountered obstacles and to provide hints on how to proceed. This intervention resulted in positive outcomes, as participants produced less unproductive input. Moreover, scenario-based exercises were introduced as of the fourth cycle to also give learners opportunities to practice the grammatical phenomenon by ‘helping’ avatars to complete their experiment protocol.

4. Adaptations of research methods

As a result of adjusting the tasks that facilitate learning with InGAs and the learning application itself in the development of the didactic concept, it was also necessary to adapt research methods accordingly. User tracking

is generally used to collect data on the learners' behaviour, providing information on the use of learning paths or deviations from them. Since learning paths depend on the structure of the task, restructuring the writing task after the first cycle also involved an adaptation of the analytical approach. Rather than looking at the participants' behaviour in performing a task on a particular scene, the process of drafting and revising the experiment protocol required a more extensive analysis of how they made use of InGAs to develop the text procedurally, compared to the text products.

A complementary source of data are interviews, which not only serve to gather information about the participants' perceptions, but also to obtain the expertise of practitioners for advancing the integration of InGAs, either as observers or as teachers depending on their role. Therefore, the interview guides for data collection have been constantly adjusted relative to the didactic arrangement and the different testbeds. Similarly, when interpreting the interview data by means of qualitative content analysis (Mayring, 2021), the categories for coding had to be repeatedly re-evaluated and, if necessary, adjusted. In circumstances of continuous optimisation, the flexibility of DBR allows for adapting research methods according to the variability of the object of investigation as well as of the field of enquiry.

5. Conclusions

Though the suitability of TBLT as a didactic framework for the use of CALL is by now an accepted fact and technology can also promote TBLT in turn (Lai & Li, 2011), the integration of InGAs in the foreign language classroom is more than just another positive example of the synergistic effects between these two fields of research. On the one hand, the inductive approach to grammar instruction with (semi-)open tasks shifts the paradigm of conventional tutorial CALL by expanding the didactic repertoire associated with it; on the other hand, it shows how digital learning media can be used to track each step of the learner's processing of the task. This in turn helps to achieve a better understanding of task in process in relation to task as workplan, as well as to align task demand and task support. Finally, the study provides evidence for the integration of a new CALL application using DBR through various stages of testing, evaluation, and redesign, and for making the best possible use of different testbeds. In the future, the InGA research project will advance by further testing, and potentially optimising, the didactic concept in various learning environments and with different types of learners. Another goal is also to test the effectiveness of InGAs in comparison with their non-interactive predecessors.

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