Zinnig zoeken: een cognitieve benadering van woordenboekdidactiek Grieks

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Summary

SENSIBLE SEARCHING

A cognitive approach to a dictionary use curriculum
for Ancient Greek

Introduction

This dissertation takes as its point of departure the many problems that Dutch secondary-school classics students have in using their dictionary while translating authentic texts. Each year, after the national exams of Latin and Greek, classics teachers are confronted with the most absurd translation choices by students, which are a direct result of their dictionary habits. In spite of this well-known problem, dictionary instruction plays only a marginal role in the classics curriculum. Furthermore, dictionary use is not clearly defined in the learning objectives of the school subjects Latin and Greek.

The main goal of this research project is to complete the first phases of an educational design study in order to lay the groundwork for a curriculum for dictionary use in classics education. These phases are defined by McKenney & Reeves (2019) as *Analysis & Exploration* and *Construction & Design*. The project consists of three parts, each with its own research questions and methods (see below for an overview).

	Research question		Method
Part 1	*How can we categorise the different dictionary mistakes made by students and how can we explain the connection between them?*		- literature study - focus group
Part 2	*What activities constitute successful dictionary use…*		
	Part 2a	*… during the translation process as a whole?*	- think-aloud study - literature study
	Part 2b	*… while navigating within a dictionary entry?*	- eye-tracking study - literature study
Part 3	*What is a fitting method for dictionary education and what concrete exercises can be designed accordingly?*		- literature study - collaborative design study - screening - walkthrough - try out

A number of methodological considerations were essential in this research project. First, we mention its qualitative and explorative nature. Due to the absence of comprehensive studies in dictionary use by classics students and its marginal role in teaching materials, fundamental research was needed on both the problem analysis and criteria for successful dictionary behaviour. As a consequence, the final phase of educational research, in which quantitative effect testing of an intervention takes place, is not included in this project. We did, however, perform formative evaluations on the exercises that were developed. Furthermore, as a success factor for implementing the curriculum that we propose, we involved the perspective of teachers in all stages of the project. This was achieved methodologically, by a focus group (Chapter 2) and a teacher design team (Chapter 5), but also by discussing intermediate results of the project during various teacher conferences. Lastly, it is important to note that we chose to direct the whole project specifically at the subject of Ancient Greek. Nevertheless, we expect that the results can be applied, *mutatis mutandis*, to Latin too.

Throughout the project, we have built a considerable theoretical framework, touching various research fields. Within dictionary studies, we have concentrated on dictionary use models as a possible source for successful dictionary activities. Studies on translation habits of classics students offered more insight into the nature of their dictionary mistakes. A research field of continuous interest during the different stages of the project was that of cognition studies. Our interest in this perspective was twofold: first, how can we explain, from a cognitive perspective, why students make their typical dictionary mistakes, and, secondly, what are successful strategies to solve complex problems involving high cognitive load? We adopted the following insights of cognitive studies: Cognitive Load Theory; the concept of *schemata*; Kahneman's two thinking systems; chess heuristics; 4E-cognition, situated cognition and situated problem solving; the concept of affordances. Finally, this common thread in the project also helped to identify the educational approach that we propose as a guiding principle for designing a dictionary curriculum (and indeed for classics teaching in general): Cognitive Apprenticeship.

This dissertation has a hybrid form: some chapters are written in Dutch, others in English. Furthermore, some chapters (1, 3, 4, 6) are written as articles and follow the guidelines of their respective journals. As a consequence, there is some overlap in the content of these chapters, and the rendering of the Greek changes according to the target audience of the relevant journals. We chose this hybrid approach, because we aimed at an international as well as a local audience of classics teachers. Because the primary 'end users' of our dictionary curriculum are classics teachers in the Netherlands, the main language is Dutch. They can also choose to read Chapters 7 and 8 separately from the rest of the book, as these contain the most concrete didactic instructions.

PART ONE

Part one of this dissertation is primarily concerned with the first phase of educational design research: *Analysis & Exploration*. We analyse the problem of dictionary use within classics education in the Netherlands and explore what could be *partial design requirements* for designing a dictionary use curriculum. In addition to an analysis of the relevant literature, a focus group study with Dutch classics teachers was performed.

Chapter 1

In Chapter 1 we first provide an overview of the relevant studies on the translation habits of classics students. Although none of these studies is devoted entirely to dictionary use, they do inform us on the (highly problematic) look-up behaviour of students. On the basis of these publications and the results of our focus group study with classics teachers, a five-fold classification of typical unsuccessful dictionary behaviour is offered:

(1) *excessive use*: students look up almost every word in a sentence, from left to right, without prioritising;
(2) *not arriving at the right lemma*: students do not perform a morphological analysis of the form they are looking up, and are not aware of dictionary conventions of lemmatising;
(3) *navigating with semantic tunnel vision*: within a lemma, students direct their attention solely to semantic information (i.e. direct

options for translation), ignoring other information. A specific type of tunnel vision occurs when one of the translation options matches a preconceived translation;

(4) *wrongly sticking to a choice*: students do not consult the dictionary again, not even when they have difficulties formulating a coherent translation as a result of a wrong translation choice;

(5) *creating a 'bridge-language'*: as a first step in their translation process, students replace all Greek or Latin words in a sentence, one by one, with their respective primary translations from the dictionary. This garbled collection of words in the target language, rather than the (morpho)syntactic and semantic features of the classical source language, forms the new groundwork from which students build up their translation.

Despite the evident problems of students' dictionary use, both the relevant literature and experiences of the focus group teachers suggest that dictionary instruction plays a marginal role in the classics curriculum, and sometimes even none whatsoever.

Exploring dictionary use models intended for learning modern languages, we found that they often do not fit the specific circumstances of the (unseen) translation task in classics education. In these models, the look-up process is regarded as mostly linear, consisting of steps which can be performed in isolation of the text. In classics, it seems that successful dictionary behaviour is a more complicated process, which needs constant critical assessment in close contact with the text to be translated. One dictionary use model (Bogaards, 1993) *does* effectively illustrate this process by using the concept of the *feedback loop*.

In the last part of the chapter, we apply Cognitive Load Theory (CLT) to better understand the connection between the five characteristics of unsuccessful dictionary behaviour. CLT illustrates that all characteristics are examples of *extraneous cognitive load*, which means that the students' dictionary activities do *not* build towards a better understanding of the semantic and syntactic relations between the words in a sentence. Their dictionary use shows that students regard the look-up process as an isolated

activity, not integrated in the translation task itself. Because of the high *intrinsic cognitive load* of the translation task, students seem to consult the dictionary as a 'quick fix' to be relieved of cognitive strain. The so-called 'bridge-language' is the best illustration of this approach: students mechanically replace all Greek and Latin words with their respective modern-language dictionary equivalents. By doing so, they can solely use the *schemata* of their own language to 'translate' the text. In order to be successful, however, dictionary activities should consist of *germane* cognitive load: activating or stimulating the schemata relevant for performing the task. In this case, this means schemata which help to understand the (morpho)syntactic and semantic *interconnectivity* within Greek and Latin sentences.

We conclude this chapter optimistically by stating that the dictionary, if applied in a germane manner, can indeed offer the cognitive relief that secondary-school students are (often desperately) looking for. However, it still remains unclear how classics teachers should instruct students in successful dictionary behaviour, as the specific contents of this kind of expertise seem to be hidden even from them.

Chapter 2

Chapter 2 reports in detail on the specifics of the focus group study with Dutch classics teachers. We wanted to include the perspective of teachers from the earliest stage of the research project. We organised two sessions with the goal of making an inventory of both successful and unsuccessful dictionary activities of secondary-school students. To further categorise these activities, we applied two concepts from relevant literature: (macro) translation stages (orientation, notation, first draft, and revision) and types of activities (cognitive, metacognitive, and affective).

The results include a preliminary overview of dictionary activities. More importantly, we found that teachers found it easier to describe how students make dictionary mistakes than how they should avoid them. This observation revealed that teachers, successful dictionary users themselves, are generally unaware of the content of their own expertise. In this respect it is interesting that the teachers' collection of unsuccessful dictionary activities contains more

metacognitive activities than the successful ones. Metacognition involves conscious and strategic thought processes. Apparently, the participating teachers are more familiar with metacognitive student activities that lead to mistakes than with the ones that should lead to success.

Moreover, the teachers argued that the macro translation stages did not work well to further organise the dictionary activities. Most found them confusing, as it was difficult to define clearly when one stage ends and the other begins. A reason could be that first more insight is needed in the look-up process on the micro level, before stages on the macro level can be used effectively. A preliminary division in 'before, during, after' (consulting the dictionary) served as a functional manner to describe this process.

We conclude the chapter with the observation that the participating teachers were convinced that effective dictionary use should play a more prominent role in their classrooms. As a design criterion for a dictionary curriculum the teachers stated that dictionary instruction should be integrated in the regular lessons of reading authentic texts. Also, it should not be too time-consuming, as most teachers experience time pressure working through the regular programme.

The most important implication of this study, however, is that summarising an exhaustive list of dictionary steps does not answer the question how students use their dictionary effectively under high cognitive pressure. More precisely, the question should be reformulated as: what strategy do successful students employ to know when they need to take which step in the process (and which steps they can skip)?

PART TWO

In the second part of this dissertation, we provide a more in-depth analysis of successful dictionary behaviour by secondary-school students. We report on empiric research consisting of two studies with so-called expert learners: Dutch secondary-school students who have proven to have excellent translation skills.

Chapter 3

Chapter 3 presents the method and findings of a think-aloud study with expert learners. The participants were selected based on their translation performance. In the experiment, students conducted an unseen translation task while verbalising their thought processes. Audio as well as video recordings were made of their behaviour. Key parts of the recordings were played back afterwards as *stimulated recall*.

The concept of the *feedback loop* served as our primary framework for analysing the think-aloud protocols. We wondered how these students managed to 'stay in the loop' and avoid the five dictionary mistakes described in Chapter 1. In terms of CLT, we wanted to investigate how the participants activated and stimulated relevant *schemata* in order to cope with cognitive pressure. Key episodes were analysed in detail, dividing the look-up process in three feedback loop stages: initial, middle, and final.

The results of this experiment include the observation that successful students reduced their cognitive load by performing 'informed searches': they formed various morphological, semantic, and syntactic hypotheses in the initial stage, before consulting the dictionary. By doing so, they seem to activate the schemata necessary to reduce cognitive load. A specific type of this strategy is to formulate a preliminary translation of a word group with recognition of the (morpho)syntactic construction, e.g. 'to the prison of τίσεως and δίκης'.

In the middle and final stages, the most important finding is that the participants use metacognitive skills to stay in the loop. They closely monitor their decision-making process and critically test their hypotheses. The expert learners keep an open mind and often move back and forth between multiple lemmas. They are not reluctant to revise a preliminary translation or to re-open the dictionary. Furthermore, their strategies are not restricted to the (meta)cognitive level, but also occur on a motor level. The participants use their fingers (or pencils or the ribbon bookmark) to quickly switch between pages of the dictionary or to focus on a certain point in the text. These observations point to *embodied* and *extended* cognition. Finally, we found that

having a metalinguistic apparatus is critical for monitoring the look-up process and decoding the dictionary's terminology.

Chapter 4

In Chapter 4 we discuss the second experiment with expert learners, an eye-tracking study. The participating students performed six short translation tasks in an eye-tracking booth. To examine how expert learners navigate a lemma, each task sheet consisted of both a Greek sentence and a lemma of a target word, i.e. one of the words in the sentence to be looked up. Directly after completing all tasks, the participants were shown the recordings of their eye movements. Following the method of *stimulated recall*, the students were asked to verbalize what was going through their minds, commenting on moments of eye fixation or specific movement paths.

In this experiment, we were particularly interested in how these students deal with the different types of (meta-)information available in a dictionary entry. We identified four different types of lemma-information: definitions, signposts, labels, and examples. We used the concept of *affordances* to define what students can *do* with these types of information (e.g. exclude or select parts of a lemma). Although employing the affordances of (meta-) information can greatly facilitate the navigation and decision-making process, it also comes with cognitive costs. Therefore, we expected that an implicit cost-benefit analysis would determine what type of lemma-information the participants would use in which circumstances.

We found that the most prominent navigation strategy of our expert learners was to jump from one boldface definition to the other. This in itself is a way to limit cognitive load, as the bold typeface has the affordance of 'steppingstones'. They critically tested each translation possibility and mostly avoided 'semantic tunnel vision' (one of the typical dictionary mistakes). The decision to use meta-information seemed to be the outcome of an implicit cognitive cost-benefit analysis: the investment of employing meta-information is weighed against the reduction of boldface translation options that can be gained. *Signposts* were employed to discard sections of a lemma, but only when the decoding costs were relatively low. The students seemed to prefer

(morphological) meta-information which is directly relatable to formal features of the text. Even these excellent students experienced difficulties with more abstract terms like 'intransitive', 'conjunction' and even 'adjective'.

Labels and examples, which are on a lower hierarchical level and do not have the same 'shortcut benefits' as signposts, received less attention in the navigation phase. In a later stage of their decision-making process, however, students did focus on these types of meta-information. They used them to find confirmation for a promising translation, or, alternatively, to shift their attention because they found themselves stuck and needed a different perspective. This observation showed that expert learners are flexible in their approach and can switch between multiple strategies.

PART THREE

In the third and last part of this book, we move to the educational research phase of *Design & Construction*, in which we explore how the explorative results of the first two parts of the project can be translated into concrete recommendations for everyday classics teaching. In this part, the dual character of educational design research is evident. On the one hand, it contributes to theoretical understanding (Chapter 6), and on the other hand, we present practical results in terms of a dictionary-curricular overview (Chapter 7) and five educational principles for effectively implementing dictionary instruction (Chapter 8).

Chapter 5

Chapter 5 is primarily a methodological chapter, describing the process of a design study with a *teacher design team* (TDT) as part of *collaborative curriculum design*. The goal of the study was twofold: (1) to define a *design framework* for dictionary instruction and (2) to make a start with developing actual exercises in accordance with the framework. In the chapter, we discuss the methodological considerations for working with a TDT and elaborate on the criteria to do so effectively. The most important reason to include a TDT in our research process was to be able to *culturally embed* our preferred general educational principle *Cognitive Apprenticeship* (CA; see Chapter 6) in the

practice of classics teaching. We challenged the participating classics teachers to 'translate' the methods of CA in terms that are *situated* in their own classroom practice. Throughout the study, we stimulated the teachers to put themselves in the position of fellow teachers who had not taken part in the research project.

The study was built in two phases, the meetings of which were all organised online due to the Covid pandemic. In the first phase, the participants developed the design framework, first by validating and subsequently refining the so-called *Look-up Curriculum (Opzoekcurriculum,* a comprehensive curricular overview of the look-up process in terms of learning objectives, skills, and knowledge) and, secondly, by formulating five educational principles for dictionary instruction. In the second phase, the participating teachers designed concrete exercises according to the guidelines of the design framework. Following a cyclic process of *formative evaluation*, participants acted as their critical friends to improve draft versions of exercises. Through methods of *screening* and *walkthrough* they presented and revised their products. They conducted *try outs* of their teaching materials in their own classes. The process of the entire study was iterative in the sense that experiences during the design phase produced valuable improvements of the design framework constructed in the first phase.

We end the chapter with several (methodological) reflections on the study as a whole. They include considerations with respect to the corona pandemic. The circumstances made it difficult for the participating teachers to find time in their curriculum due to various school lockdowns. We found that it was effective (and indeed necessary) to keep individual contact with the teachers, ensuring that they felt on-going engagement with the project and support from the researcher. A crucial observation regarding the outcome of the design phase is that a few teachers found it challenging to limit the design of their exercises to the principles of the design framework. This demonstrated that, in order to be effective, classics teachers (some more than others) need to change their own teaching views and habits. This is a cultural change, which naturally has consequences for the implementation of dictionary use in classics teaching (see also Chapters 7 and 8 below).

Chapter 6

Chapter 6 sets out the full theoretical groundwork for the didactic approach that we propose for classics education in general and dictionary use in particular. We argue that the task of translating authentic Greek and Latin texts requires a complex form of problem solving. There is no 'one size fits all' approach, but a large repertoire of strategic knowledge is needed, which especially consists of metacognitive skills to monitor one's progress (see also the results of Chapter 2). Classics teachers possess this type of expertise, but their problem-solving apparatus is mostly automated and is stored in their long-term memory as *implicit knowledge*. This type of knowledge is notoriously difficult to transfer to students. It is necessary, therefore, that classics teachers follow an educational approach that is devoted to *explicating* their expertise to students.

Cognitive Apprenticeship (CA) has the characteristics of this approach, as it has the goal of making cognitive processes visible. CA borrows elements from the traditional apprenticeship method, by which learners are gradually introduced by a master-teacher into a certain physical craft, such as pottery. CA proposes six methods: modeling, coaching, scaffolding, articulation, reflection, and exploration. The development of metacognitive skills plays a crucial role in all methods, stimulating self-monitoring and self-correction. Furthermore, CA points out the importance of immersing students in the whole set of practices, terminology, and rules that govern the learning domain.

Furthermore, we relate the concept of CA to *situated problem solving*. This theory holds that, instead of introducing abstract problem-solving models, we should teach students to solve problems *situated* in the relevant domain-specific context. This means that students should be taught to use situational aspects of a 'real-world' solving process. Often, these include features of embodied and extended cognition, such as the use of a finger, pen, a handbook, a ruler, etc. For the context of classics teaching, this theory warns us to be wary of abstract translation models which inevitably fall short of the 'real world' in question: authentic texts. Affordances can be a valuable instrument to teach students how to deal with the various text-situations they are confronted with.

In the remainder of the chapter, we apply the methods of CA to the subject of dictionary use in classics teaching. We present six exercises and clarify for each which methods of CA are included. We conclude the chapter with the suggestion that CA can be fruitful for different areas of classics, such as interpretation, intertextuality, and actualization.

Chapter 7

Chapter 7 presents the first part of the design framework developed in collaboration with the teacher design team: the so-called *Look-up Curriculum* (*Opzoekcurriculum*). This is an elaborate didactic instrument describing the look-up process in terms of learning objectives, explicating the required skills and knowledge. The *Look-up Curriculum* is divided in four parts, the first three of which follow three stages of the look-up process (starting, executing, and closing a search action). The fourth section is concerned with activities that are relevant throughout all look-up stages. To each learning objective student quotes are added to illustrate what it means, in terms of student activities, to achieve the goal.

We describe the details of the creation process of the *Look-up Curriculum*, first explaining how the data analysis of both the think-aloud and eye-tracking study contributed to its formation. Secondly, we report on the validation process by the TDT and the improvements that it produced.

Furthermore, we emphasise the function of the *Look-up Curriculum*, explaining that it is primarily meant for teachers, not so much for students. It is explicitly not intended as a step-by-step model for students. It is designed as a framework for teachers, for instance to decide the learning objective of a certain exercise, or as a diagnostic instrument reflecting on students' performance after a test.

We conclude the chapter by sharing the three most important evaluating experiences by the members of the TDT. Teachers reported that, because of the *Look-up Curriculum*, their own 'dictionary awareness' had increased considerably. While designing exercises, they found that it was challenging to isolate a certain stage of the look-up process: in practice, these stages often

overlap. Finally, some teachers clearly had a preference for the *Look-up Curriculum*, while others felt more comfortable with the five principles (see Chapter 8).

Chapter 8

In Chapter 8 we report on the most practical outcome of the research project, offering five specific 'rules of thumb' for implementing dictionary education in classics. This set of guidelines forms the other half of the design framework for dictionary instruction. It is the result of the process of situating the methods of CA in the everyday teaching practice of classics. We first present a general overview of the rules, under the shorthand titles *integrate, limit, demonstrate, observe,* and *reflect*. Each is provided with a short explanation with practical instructions.

We then describe in detail the creation process of the five principles in collaboration with the TDT. This includes an account of jointly deciding the criteria of the form, tone, and terminology of the principles. An important criterion for the rules was their accessibility for teachers who had not participated in the project: the rules should inspire teachers to implement dictionary instruction in their own curriculum. On the other hand, the TDT agreed that the rules needed to direct teachers to design exercises that meet the requirements of CA. We report on how we first formulated draft versions of the principles (using Android's design criteria as inspiration) and validated them during the design phase, after which we agreed on making a number of refinements.

The remainder of the chapter contains a comprehensive presentation of all five principles, each with example exercises and teachers' experiences. The most important conclusion of this process is that, for some participating teachers, using these principles required a considerable behavioural change in their teaching habits.

Conclusion

In the conclusion, we return to the different research questions and summarise the results of each question. Furthermore, we express several methodological

reflections, formulate suggestions for both further research and the implementation of a dictionary curriculum in classics teaching.

The overall outcome of the project is twofold, corresponding to the dual nature of educational design research: theoretical understanding and practical implementation. A considerable part of the dissertation is concerned with understanding the complexity of dictionary use from a cognitive perspective. In analysing the behavioural data of both unsuccessful and successful secondary-school students, we employed different cognitive theories. The most important insight came from the perspective of situated cognition and, more specifically, situated problem solving. By taking this approach, we learned that the complexity of dictionary use is caused by the fact that it is embedded in the translation task as a whole. Translating authentic classical texts is inherently complex, because the lingual 'situations' that the students need to deal with are never the same. This means that a 'one size fits all' procedure to manage these 'problems' is not a sensible approach. Using a dictionary can facilitate the translation process, but necessarily takes place in these continually changing situations. A step-by-step dictionary use model, therefore, will inevitably fall short: such a model is either too elaborate to handle or too concise to be effective.

The expert learners who participated in our studies, illustrated how to practice situated problem solving: deciding efficiently when to employ the *affordances* available in a dictionary (and when not to do so), depending on the ever-changing situations in both text and lemma. This decision seems to be the outcome of an implicit cognitive cost-benefit analysis. Their lookup process can be described as a *feedback loop*. They open the dictionary in an informed manner and subsequently engage in a process of going back and forth between the text and the dictionary. During this process, metacognitive skills are crucial. These students critically test their hypotheses, keep an open mind, and closely monitor their progress.

This analysis stipulates the most important principle for designing a dictionary curriculum: it must be integrated, or situated, in the everyday practice of classics education, in which reading and translating texts are central. Isolated dictionary exercises can be useful to introduce the dictionary

and show some of its technical features, but are not effective in teaching dictionary expertise. An effective didactic method needs to uncover the different cognitive steps that correspond to the different linguistic and lexical situations. This dissertation argues that *Cognitive Apprenticeship* is an educational approach that fits this criterion.

The second, more practical outcome of this research project follows *Cognitive Apprenticeship* as the leading principle. It consists of two parts: the so-called *Look-up Curriculum* (*Opzoekcurriculum*) and five principles for dictionary instruction. The *Look-up Curriculum* offers an elaborate account of the look-up process, from a curricular point of view, including learning goals, skills, and knowledge. It can be used by teachers to specify the learning objective of dictionary instruction (the 'what'). The five principles concern the different aspects of the preferred didactic method by which a teacher can design dictionary instruction (the 'how').