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„Academic Writing as a Cognitive Developmental Process: An Enactivist Perspective“

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1. Introduction

> *It is a mistake to try to reform the educational system without revising our sense of ourselves as learning beings, following a path from birth to death that is longer and more unpredictable than ever before.*
>
> *Mary Catherine Bateson*

1.1 Context

Once my daughter could exert enough control in order to draw with a pen on paper, the first thing she did was scribbe lines in order to "write a book" – her "learning to write" started as soon as she could hold a pen. In this sense, "learning to read" starts even earlier, as soon as infant and caregiver start looking at books together.[1] Thus, by the time children who may grossly be characterized as belonging to Western middle-class start learning to read and write in school, they are already building upon years of literacy-related practices.[2] Reading and writing activities are interwoven into our daily lives and we are culturally driven as well as guided to develop our expertise throughout many years. Considering the time each of us spent acquiring literacy, the challenge which many experienced in sounding letters together in order to voice a syllable, mastering the size of a letter and leaving a gap between words, remembering spelling rules, etc., it is surprising that upon reaching each "learning step", these past strains seem to immediately become subject to amnesia. However, school teachers are experts in the steps and challenges to be mastered, and in formal schooling reading and writing development is well-guided and expectations are made explicit.

The picture changes when novice students enter the "German-language university" (universities in Austria, Germany, and Switzerland), which sees itself in a Humboldian tradition: students are expected to be able to write "appropriately" after secondary school. As Girgensohn & Sennewald, (2012, p. 7) point out, from now on writing is seen as a matter of talent, not as subject to teaching and learning. Accordingly, the writing training of students is treated as part of courses devoted to an introduction into scientific/academic working methods early on in the curriculum and is often limited to formalities like styles and reference formats. If writing an academic text is still experienced as problematic, it is up to the individual student to cope with it.

[1] When Nicole Rossmanith started out her research on early triadic interactions between care-giver, child, and an artifact, she was looking for triadic interactions involving children as young as 3 months which allowed for comparison across different European countries (Rossmanith, Costall, Reichelt, López, & Reddy, 2014). It turned out that a very common and easily comparable case were interactions involving a book (personal communication).

[2] A number of examples for such practices can also be found in Rogoff (2003, p. 302).

When switching perspective to university teachers, we are confronted with complaints that 'students cannot write anymore'. The problem is perceived as a rather recent phenomenon and ascribed to developments like the introduction of the Bologna three-cycle system (bachelor, master, and PhD), the rise of new media, and thus new genres of text, the fact that a greater percentage of a year-cohort is studying, and that these greater numbers of students come from very diverse backgrounds, to name a few. However, as Pohl (2007) could show, teacher's dissatisfaction with students' texts is not such a recent phenomenon. What has certainly changed with the higher education reform and increasing monitoring of study programs is an increase in actual or perceived pressure on students to finish their study programs "in time".[3] Actual pressure is imposed on the level of the seminar paper, which has to be handed in within a defined time frame. Moreover, students who will "give up" on a seminar paper will receive a negative grade (see Girgensohn & Sennewald, 2012, p. 86 for the general observation; a specific example can be found in the University of Vienna's *handbook for teachers,* "Handbuch für Lehrende"). These constraints certainly favor a tendency by students to hand in papers in a state in which teachers would not previously have seen a student paper.

This is not the context to debate whether problems perceived are actually a result of new curricular architectures or whether the focus on generic competencies, together with the closer monitoring of study programs and greater time pressure have made the difficulties that students perceive simply more apparent. In any case, the result is a greater focus on teaching and a willingness to invest in it. In Germany, the "Qualitätspakt Lehre" (pact for quality in teaching) yielded the funds for German universities to found writing centers, which resulted in there now being more than 60 writing centers and similar projects.

While there is little tradition in explicitly teaching academic writing in Europe, the US can look back upon more than a century of writing didactics and research (for an overview from a European perspective, see Bräuer, 1996). The new writing centers are connecting to these traditions by importing and adapting process-oriented writing didactics and by establishing writing research. The most important implication of these changes is the fact that writing is no longer seen as a matter of talent, but as a craft which can be learned. Research suggests that writing processes follow individual strategies, but at the same time developmental stages or phases can be identified, either via

[3] An important effect of the introduction of the three-cycle "Bologna system" was the debate about competencies and the directive to describe curricula in terms of what a graduate of a given cycle should be able *to do* in terms of learning outcomes, i.e. the subject-specific and generic competencies the student should "possess". Oral and written communication are among them, but in a very generic way. Strictly speaking, Bologna system and higher education reform are different reforms and many recent changes are not an effect of the introduction of the three-cycle Bologna system as such, but since they temporally coincided they are usually perceived as one reform. For a historical overview and detailed analysis of the perception of "Bologna" in Austrian media, see Westphal (2015; 2017).

identification of different underlying cognitive processes (e.g., Bereiter & Scardamalia, 1987) or through analysis of students' texts (e.g., Steinhoff, 2007; Pohl, 2007).

Naturally, there is quite some variance in methods and foci across locations, but there is a wide-spread agreement on basing services on process-oriented writing didactics. Methods focus on the writing process and the writer rather than on teaching the properties of a good text – although conveying standards is not being disregarded. Students and teachers accept this kind of didactic support and invest time to get it, which is a solid indicator that they perceive it as helpful. Since the rapid spread of writing centers and projects as well as the growth of the associated scientific community speaks for itself, I am not asking whether process-oriented writing didactics work, but rather *why*?

1.2 Goal and Method of this Thesis

Writing research prides itself on being research-based and the research it is grounded on is interdisciplinary and diverse in methods. As a cognitive scientist, my interest is in understanding writing as a cognitive developmental process. However, the cognitive process theories of writing as well as the cognitive developmental theory hail from the 1980ies, and while the cognitive sciences have altered and even overthrown some basic assumptions since, the cognitivist models in writing research remain uncontested. The goal of this thesis is therefore to offer a novel theoretical account of academic writing as a cognitive developmental process which allows a better understanding of process-oriented writing didactics.

In doing so, I am relying on an analysis of the predominant models of writing as a cognitive and developmental process and on literature review. The theoretical approach in this thesis is based on literature review, especially on current theoretical approaches in cognitive science, which view cognition as embodied and situated, here particularly enactivism, Piaget's and Vygotsky' developmental theories, writing research, including linguistic research on the development of students' texts, higher education research on student epistemological development, and anthropological literature framing writing as a technology.

1.3 Structure of this Thesis

In chapter 2, I will give an introduction into process-oriented writing didactics and its roots. The aim is mainly to provide the reader unfamiliar with this field with a basic idea of the phenomenon. I will provide a brief historical sketch of the origin of writing didactic in the US tertiary education system,

trace the family ties between cognitive science and writing research in the 1980ies, and the roots of writing didactics in German language universities. After providing the context, I will introduce key principles and methods.

Chapter 3 is devoted to an introduction and discussion of cognitive process theories of writing, with an emphasis on the first model provided by Hayes & Flower (1980). Since the aim of this thesis is to offer an alternative perspective on academic writing, it is necessary to point out the problems of this approach, particularly the understanding of writing as problem solving together with an understanding of knowledge as propositional knowledge, which is processed in a "writing module". I argue that this view leads to perceiving central issues of writing as external constraints to rather than being at the core of the writing process. Furthermore, the writer is strangely absent in the model, as is – despite being mentioned as being important – the role of the environment. I present some approaches to "fixing" the problems described, but conclude that eventually they rely on an understanding of knowledge as propositional and (academic) writing as problem solving. Based on the considerations taken, I develop a list of five requirements that an alternative model of writing as a cognitive process must meet in order to overcome the criticism voiced towards the current cognitivist models. An alternative model

1. needs to develop a different account of the role of knowledge in the writing process,
2. needs to place the "rhetorical problem" as central to rather than at the periphery of the writing process,
3. needs to consider the role of the environment, particularly the artifact produced ("text written so far") and with it
4. the very nature of writing as a cognitive process, which is widely understood to be "written speech", and
5. last, but not least, it needs to consider the (academic) writer.

In chapter 4, I introduce the predominant cognitive developmental theories of writing. They make apparent the problems and challenges writers have to master as they develop. I discuss them with regard to differences between them and the three "constraints" knowledge, rhetorical problem, and the understanding of writing as "written speech". I moreover show that the model of Bereiter and Scardamalia and the extension of Kellogg rest on the same assumptions regarding cognition as the cognitive models presented in the previous chapter.

Chapter 5 takes a step back and deals with the question of whether it is appropriate to talk about *development* of the academic writer. I present linguistic research on the development of students' texts as a complementary perspective to my focus on the cognitive process, which identified three or

four stages (depending on the author) of text development. However, developmental models usually consider the role of maturation and therefore cover childhood, so I need to pose the question in which sense it is possible to talk about writing development. Based on a discussion of the theories of Piaget and Vygotsky, with a particular focus on their complementarity, I argue that rather than talking about levels or stages as "given", it is useful to see how development proceeds in the interaction of individual and environment. In this context, "stages" can be seen as "environmental expectations" which have already been rectified by experience with regard to possible capabilities of those who are expected to meet these expectations. Whereas Piaget and Vygotsky are interested in the development of knowledge, Kegan suggests that the development of knowledge be complemented with the development of the 'self'. This allows for understanding adaptation to the environment not only in terms of knowing, but also as *becoming.*

In chapter 6, I propose that an important dimension of this becoming of the academic writer is his/her beliefs about the nature and status of the disciplinary knowledge encountered. In order to argue this point, I draw on research on personal epistemology carried out in the context of higher education research. I present and discuss the central approaches covering student development, with a particular focus on developmental models of epistemological development. While personal epistemology is not an issue in writing research, I show some relations, which can be found particularly in the work of Pohl and in the work on voice and stance rooted in Elbow's initial concept of voice. I argue that the notion of position in personal epistemology research and the notion that part of writing development is the development of a voice are strongly related. This renders academic writing as being about 'knowledge' as well as being highly personal, and I discuss this against the background of the role of discipline and genre.

This begs the question as to which cognitive theory could account for this. Chapter 7 introduces central concepts from embodied and situated cognitive science, offering a conceptual basis for this. In particular, the extended cognition hypothesis and an enactive "extension" are discussed. They are complemented by Goody's theory, which allows for understanding writing as a technology.

Finally, in chapter 8 I develop a theoretical framework of the development of the academic writer in interaction with his/her environment which meets the demands listed in the 5-point "checklist" above.

2. Process-Oriented Writing Didactics in a Nutshell

In this chapter I will provide a very brief sketch of the history of process oriented writing didactics and (mainly cognitive) writing research in the US and the current developments in German-language universities. I will then introduce the cornerstones of process oriented writing didactics with the ai m to provide the reader unfamiliar with the area with a rough idea.

2.1 The Roots of Writing Didactics - A Historical Sketch with a Bias towards Cognitive Theories

2.1.1 Origins and Scope

In the US, writing research and the tradition to teach writing explicitly in college, is more than a century old. Originally, there was no need for writing instruction, since it was perceived to be in the service of public speaking until, around 1870, writing began to take on a different role in several new professions: texts were no longer seen as substitutes for oral communication (Russell, 2002). With specialization in various professional fields, the role of writing in society changed, it "became central to organizing production and creating new knowledge" (Russell, 2002, p. 4).

In his work on US writing didactics, Bräuer (1996) gives an overview of the historical developments leading to contemporary writing didactics: In US colleges and universities, writing developed into a discipline with research, chairs, and compulsory courses, which applied writing didactics informed by research. Initially, as Bräuer (1996) reports, the focus of *English composition* classes was on learning grammar, formalities, text patterns, and "good language". Accordingly, one area in writing research was linguistic research with a focus on syntax. As Girgensohn and Sennewald (2012, p. 11) point out, such research was often carried out under the assumption that complex sentences are a sign of high writing competence – an attitude still prevalent in many academic texts written in German. Characteristic studies of the time correlated syntactic complexity with traits like social class, intelligence, gender, etc. The focus in teaching was solely on the text product, thus teaching academic writing meant teaching the properties of a good text.

It turned out that knowing the properties of a "good text" and teaching "*the* proper way of writing" did not automatically solve writing problems, because it denied the individuality of writing strategies. In the late 1960ies, a new school of writing didactics emerged: *expressionist rhetoric* (Girgensohn & Sennewald, 2012, pp. 79f.). To this day, one of the most prominent protagonist of this approach is Peter Elbow, who based his first book about the writing process, *Writing without Teachers* (Elbow, 1973), on an analysis of notes he had taken during writing his own PhD thesis in the second attempt

(Elbow, 2000, p. 10). Elbow is famous for promoting free writing (Elbow, 1981, p. 13), which will be described later and by way of introducing the notion of voice (Elbow, 1973, p. 280), to writing didactics. The notion of voice will be elaborated in more detail in the following chapter. In this context, it is important to note that writing research shifted from the text and syntactical structures to the *individual* and the writer's/students' *writing strategies*.

Janet Emig's (1971) work on the writing strategies of twelfth graders is usually referred to as the turning point for changing focus from the text to the writing process, but as Ruhmann & Kruse (2014) point out, while the quality of her work was singular, there was already previous work to draw on. Emig's (1971) central finding was that writing processes did not proceed as neatly and linearly as "prescribed" in the stages taught in composition courses, but rather iteratively. She was also able to show that even young writers had already developed individual writing strategies and that these differed. As Girgensohn & Sennewald (2012, p. 11) illustrate, these findings and theoretical developments were at the root of the paradigm shift that writing research saw in the 1970ies: the research focus moved from the question of which impact a particular factor had on the syntax of a sentence to the question of *how* writers write.

2.1.2 Rediscovering Family Ties between Writing Research and Cognitive Science

At this point I depart from the "official" history of the field of writing research in order to highlight earlier intersections between writing research and cognitive science. From a cognitive science perspective it is interesting to view cognitive and developmental theories of writing in the context of classical cognitive science, emerging in the 1950ies, with the *MIT Symposium on Information Theory* often described as its "birth event". It was here that Newell and Simon presented their first "logic theory machine", Chomsky proposed an early argument for transformational grammar, and Miller presented his paper on the magical number seven (plus minus one). Beyond being a place where seminal work was presented, the symposium became so important in retrospect, because it made apparent that the common ground of these various fields of work was the idea that cognition is information processing; for a detailed description of the events see Bechtel, Abrahamsen, & Graham (1999). As they point out: "One of the first sustained collaborations in cognitive science was between psychology and linguistics" (p. 41). Noam Chomsky, who introduced his ideas at the MIT symposium and in 1957 published *Syntactic Structures*, had since revolutionized linguistics by introducing the idea of transformational grammar. As Nystrand (2006) reports, his ideas were known to the young academics from such diverse disciplines as English, linguistics, psychology, and education who participated in the *Anglo-American Conference on the Teaching of English* in 1966 at Dartmouth, later referred to as "the Dartmouth Seminar". The participants postulated that language (spoken and written) should be understood as a cognitive and expressive process and that writing didactics should

target personal development and the question of how language could be learned rather than what it is (Girgensohn & Sennewald, 2012, p. 12). The cognitive dimension as well as the procedural dimension of writing could now move into focus. Nystrand (2006) attributes this influence to Chomsky's 'revolution of linguistics' and the newly emerging field of psycholinguistics. Girgensohn & Sennewald (2012, p. 13) report that two PhD students in the field of psycholinguistics at MIT and Harvard, respectively, were to become central figures of writing research: the above-mentioned Janet Emig and James Moffet.

We may thus safely assume that there was an intellectual convergence between writing research and the cognitive science of the time, which substantially influenced how writing research developed in the 1970ies. What helped the establishment of the new research focus on writing as a process and, following this, a change in writing didactics, were generous research funds made available in the wake of political worries in the US concerning a decline of writing competencies in the mid 1970ies. The question of whether this decline was real or imagined in a context which demanded an increase in writing competencies due to technological and economic developments remains unresolvable (Nystrand, 2006). Nystrand suspects that recurring worries concerning the decline of reading and writing competencies reflect changing societal demands in industrial countries rather than an actual decline.

Family ties between writing research and cognitive science appear to run even deeper: In 1980, the still well-known book "Cognitive Processes is Writing" (Gregg & Steinberg, 1980) was published with the aim of giving an overview of what was known about how people write. It was based on talks given at an interdisciplinary symposium at Carnegie Mellon University two years earlier. In this context the role Collins & Gentner (1980) ascribed to understanding human cognition as well as to the role of the computer for writing comes as no surprise.

> *Cognitive science, which brings together the disciplines of cognitive psychology, artificial intelligence, and linguistics, has begun to provide us with the theoretical means for constructing formal process theories in human cognition. … It should be possible to merge these two developments [understanding human cognition and using the computer for writing] in "Writing Land" for teaching and assisting people in writing. … It is our view that it is possible to develop a view of the writing process that can incorporate some of the insights of artists and rhetoricians, but that is precise enough to be testable, at least in part. … through computer implementation and psychological testing, we can refine the initial theory of writing and achieve a more sophisticated understanding of the writing process. (Collins & Gentner, 1980, pp. 51f)*

The theory envisioned by Collins & Gentner (1980) should at the highest level conceptualize writing as a process of producing ideas and producing text (divided into text generation and text editing), while considering (good) structure, content, and purpose as constraints. A linguistic theory of good

(as opposed to well-formed) structures was seen as achievable, despite the fact that Collins and Gentner did not specify what "good" meant. This is interesting in the historical context of writing didactics as composition: The goal of the "good text" persisted.[4]

Gregg & Steinberg's (1980) book set the agenda about writing as a cognitive and developmental process. The chapters contributed by Hayes & Flower (1980) and Bereiter (1980) – another important figure in the realm of cognitive science – are still considered to be indispensable foundational literature. Hayes & Flower's (1980) cognitive model of writing processes was situated squarely within the "theory program" Collins & Gentner (1980) proposed. It was developed further by Hayes in 1996 and 2012, and even to this day, Hayes' and collaborators' models dominate the field of writing research (Alves & Haas, 2012; Ruhmann & Kruse, 2014). These will be discussed in detail in the following chapter.

Another participant of the 1956 MIT symposium exerted massive, albeit more indirect, influence on how writing research understands writing as a cognitive process: Herbert Simon. Together with Allen Newell, he can be considered to be one of the founding fathers of cognitive science and even more so of artificial intelligence: They had jointly presented the computer program Logic Theorist, the precursor to the General Problem Solver, which was published only a year later (Newell & Simon, 2000). While linguists and psychologists among the participants of the 1966 Dartmouth conference were familiar with Chomsky's works in psycholinguistics, Allen Newell and Herbert Simon were working in the then rather new domain of artificial intelligence (AI). Being a research branch in its own right, at first glance the connection between AI and writing research may seem less obvious, but AI added a constitutive methodology to cognitive science, computer simulation. Simon became Hayes' mentor and Hayes and Linda Flower's approach to writing as a cognitive process is a direct application of Newell and Simon's approach reported in their publication of "the General Problem Solver".

While Hayes & Flower (1980) were extremely careful about generalizations and the scope of their interpretations throughout their paper, they adopted the view of human cognition advocated by Newell and Simon as a firm and unquestioned basis. While I will introduce and discuss their work in detail in chapter 3, I would now like to point out that in retrospect writing research of the 1980ies can be considered to be a *real life* testing ground for cognitive science. While the Cognitive Sciences

[4] Some writing research cited in Gregg & Steinberg (1980) focused on natural language understanding and the structure of or schemas for stories (e.g. Rumelhart, 1975, 1977, Mandler & Johnson, 1977). Since it is targeted at products of writing rather than the cognitive process itself, the results are not relevant in the context of this thesis; what should be recognized, however, is the fact that writing research was carried out using concepts from cognitive science and AI and the researchers were central figures-to-be in cognitive science. In retrospect it is interesting to see how relations between two formerly related fields were lost completely.

have seen rapid development and at least one paradigm shift since, the cognitive theories of writing from the 1980ies are still considered to be state of the art.[5] This indicates that a once fruitful interdisciplinary venture has been cut off long ago and this thesis can thus be read as an attempt to revive it.

2.1.3 Roots in German-Language Universities

Compared to the US, the history of process-oriented writing didactics in German-language universities is short. In contrast to the Anglo-American university system, there is no canon in teaching writing and rhetoric, and there are no institutionalized composition studies. In 1993 Otto Kruse published the first German-language student guide addressing the writing *process* in "Keine Angst vorm leeren Blatt" (which roughly translates to *"No fear in the face of the empty page",* Kruse, 1993), which became a great success. In the same year, the first German-language writing center, the Schreiblabor (writing lab) of the University of Bielefeld, Germany was founded. In Austria, the writing center of the Alpen Adria University Klagenfurt, Austria was established in 2005.

However, time was not ripe they remained exceptions. Generations of students were still advised to work their way through Umberto Eco's (2003, first published in Italian in 1977) "Wie man eine wissenschaftliche Abschlußarbeit schreibt" (which roughly translates to "*How to write an academic thesis*"). The book offers much valuable practical advice but does not address the 'fear of the empty page' and how to organize the writing process itself. Some problems that novice academic writers experience regularly are similarly neglected: Do I know *enough* about my topic to be fit to say anything about it? Am *I* fit to say anything? What do I have to *say*? How do I start? How do I organize myself as a writer? Process-oriented writing didactics addresses these questions and aims at guiding the writer through his/her writing process and the following subchapters will give a brief overview of the cornerstones of process-oriented writing didactics.[6]

2.2 Key principles of process-oriented writing didactics

In a nutshell, rather than teaching the desirable properties of a text product, process-oriented writing didactics focus on the writing *process*, encompassing all steps *leading to* the final version of a text. A number of didactic methods are available to foster the individual writing process during planning, text production, and revision. These (following, e.g., Wolfsberger, 2009) can be further broken down into five phases from an initial phase of orientation to finalizing the text. The ordering

[5] For example, in 2014, Dreyfürst & Sennewald (2014) published texts from the 1980ies (Bereiter, 1980; Flower & Hayes, 1981; part of Bereiter & Scardamalia, 1987) as well as work directly building upon it (Hayes, 1996; Kellogg, 2008) in German translation in order to make them more accessible to German writing research and process-oriented writing didactics teaching and peer-tutor education.

[6] The reader familiar with process-oriented writing didactics may therefore safely skip this chapter.

structure for the introduction of process-oriented writing didactics is provided by table 1, which gives an overview of the phases that any writing process is assumed to progress through (columns). The first row shows which task must be typically mastered during an academic writing project, the second row gives possible products of this phase. As reading and writing are seen as inseparable, the third row lists probable reading strategies in the specific phase. Feedback, be it by peers of teachers, plays a central role in process-oriented writing didactics. As the last row shows, it should be directed at different levels of the text according to the phase of the writing process. Last but not least, writing is seen as an individual process, thus fostering a reflection of ones' individual strategies is an indispensable part of process-oriented writing didactics.

Ruhmann & Kruse (2014, p. 17f.) identify six basic principles of process-oriented writing didactics, which give an impression of underlying assumptions, working ethics, and approaches taken by most writing centers at German-language universities[7]:

1. Writing is more than "writing down" in the sense that it is not only a tool to "write down" knowledge but a means to learn and create knowledge: During the struggle for "the right words", thoughts are being fabricated which one could not have expressed prior to the writing process.
2. Writing is an iterative and recursive process which, step by step, leads to a solution (the text). Rather than algorithmic planning, a slow groping search, involving repeated revision of content, structure, and language, will lead to the fitting solution.
3. Writing is a complex process which demands continuous problem solving and making decisions concerning content, communication, and language. To support writers means to help them realize these problems and handle them in a productive manner.
4. Writing is learnable and teachable. It needs autonomous engagement, which will be fostered effectively through instruction, reflection, and collaboration. Instruction will help to break down the writing process into smaller procedures, reflection fosters the sense of self and considerate use of language, while collaboration supports the communicative and discursive dimension of writing.
5. Individual differences in writing routines and strategies are an advantage. Instruction should not demand uniformity but foster individual reflection of methods and strategies proposed. Differences in style of thinking and working are to be respected.

[7] These six points are a close translation and do not necessarily reflect my view, particularly with regard to viewing writing as problem solving. However, I will argue against this in detail based on my specific perspective as a cognitive scientist; for now, I merely want to represent the predominant view most practitioners share.

6. Writing should be viewed from the writer's perspective. Writing didactics should focus on existing competencies and development, a focus on text and language may hinder such development.

Ruhmann & Kruse (2014, p. 18) remark that in the beginning the focus of process-oriented writing didactics was on reflecting on the individual experience of the writer and his/her competencies. Nowadays, other aspects of writing such as context, language, genre, rhetoric, and discourse may be included, also through instruction. Methods target either a specific phase of the writing process, particular problems, or the writer.

2.3 Phases of the Writing Process

As point of departure will serve a phase model originally proposed by Rohman (1965), which assumes that writing starts with planning quite some time before writing the text itself is begun; this earlier stage is referred to here as the *Pre-Write* phase. It is followed by the actual *Write* phase and completed after *Re-Write.* Ruhmann & Kruse (2014) refer to these as *pre-writing*, *writing*, and *re-writing*. For training and counselling settings, a more differentiated division is often used, which usually comprises five phases (e.g., Wolfsberger, 2009; Girgensohn & Sennewald, 2012; Ruhmann & Kruse, 2014) and breaks down the writing process into finding the topic and research question, literature research and devising the structure, writing a first draft, revision, and finalizing. It is important to realize that, despite the fact that this model is seen as generic with respect to genre or discipline, it does not assume a linear progression of the writing process in neat steps; in practice, the "phase model" for writing serves communicative purposes: It is used to provide orientation with respect to the steps the writing process has to proceed through – which is why I find it advisable to refer to the scheme as 'phases of a writing process'.

This division does not only provide useful orientation for students (or writers in general), I also use it as an ordering framework for the elements of process-oriented writing didactics I am going to introduce in the following subchapters (an overview is provided in table 1).

For *pre-writing* there are methods for pinning down the topic, coming up with a precise research question, working on the structure or line of argumentation on various levels and granularities. As Flower and Hayes (1980, p. 44) point out, good writers are better planners and since plans (or planning) can be taught, they see improving planning processes as a way to improve writing. There are a number of didactic methods to support this phase, ranging from worksheets supporting closing in on the research question to creative methods like drawing ones' thesis as a landscape. As it is

beyond the scope of this thesis to introduce didactic methods, in this context I simply want to point to guides and collections of methods fit for academic writing, either directly addressing students (for example Frank, Haacke, & Lahm, 2007), coaches (for example Scheuermann, 2011; Grieshammer, 2013) or focusing on teachers of writing-intensive courses (Lahm, 2016). As there is no writing without reading, they usually include reading methods as well.

	pre-writing		*writing*	*re-writing*	
	Orientation & Planning	**Material & Structure**	**Writing Raw Text**	**Revision**	**Finalizing**
Task	Narrowing down the topic **Research Question**	Researching and choosing material, planning of text	Text production	Re-writing, revision	Correction, etc.
Product	Journal, notes, freewriting, cluster, working plan, topic	Journal, cluster, statement of research question, excerpt, freewriting, exposé	Raw text to first draft, freewriting, journal, cluster, mind-map	Additional text, revised or rewritten text	Final text
Reading	Fast reading of material, getting an overview	Focused /analytical reading of material	Reading material (excerpts, notes, mind-maps, etc.)	Reading own text focusing on different aspects	Proof-reading of text
Feedback	Content	Content, structure	Content, structure, language	Structure, language	Language
Reflection	What works for me for this particular project under the given constraints?				

Table 1: Phases of a writing project, corresponding task to be solved, possible products (including intermediate products), way of reading and text level addressed by feedback. The table builds of a graph by Girgensohn & Sennewald (2012, p. 102) and adds feedback and reflection as categories as well as pre-writing, writing and re-writing at the top.

Revision is natural to the writing process[8] and seen as quite distinct from correction. However, this critical view of ones' own text may hinder the writer in getting started or getting his/her ideas on

[8] The work of Emig (1971) had shown that writing processes "in the wild" did not obey the linear sequence of *pre-writing*, *writing*, and *re-writing*. This had a particular impact on the understanding of *re-writing*: Emig could

paper in the first place. Thus, balance is needed: too little revision may not yield a good text, while too much may lead to no text, because the often-cited "inner critic" (e.g., Wolfsberger, 2009, p. 176) becomes too strong. In order to circumvent the latter problem, methods for the *writing*-phase usually employ some variant of *free-writing* (Elbow, 1973), just writing without censoring oneself. These methods aim at rapid text production "before thinking about it" and often work with constraints like a time limit or guiding question(s). The rationale behind this is to artificially separate writing and revision in order to foster the courage to write and increase productivity. Once there *is* something to be re-written, writers can engage in revising their text.

The phase *revision* in the "phase model" is proposed under the assumption that readers will systematically revise a first draft of a complete text or chapter; naturally, smaller units of text can also be revised. Revision is simplified by focusing on a particular aspect, roughly on content, structure, language or on another particular aspect. Here, too, the principle is thus to break up a complex task into components which can be handled with more ease.

2.3.1 Products of the Writing Process

While the goal of any writing project is a text, conversely this does not mean that a writing project always yields only one particular text. In academic writing, there usually are intermediate products like a thesis statement or the research question, notes, sketches, lists, tables, clusters, or mind maps, an overview of existing research, a structure or outline of the argument. There are even fully developed genres for not-yet-completed projects, like the exposé, some forms of conference abstract, or grant applications. From the point of view which holds that a whole writing project must yield a publication or thesis, may take the role of an intermediate product. Just as different didactic methods can be related to a phase, so can different text products. Despite their tentativeness with regard to the final text product, working on them is part of the process and acknowledging this may come as a relief. At the very least, it provides a basis for the student to understand why writing always takes *more* time. The (obviously very rough and global) estimate that each phase takes equally long provides a basis for estimating the time needed for a writing project.[9]

2.3.2 The Role of Feedback

The role of feedback in process-oriented writing didactics cannot be overestimated. In line with the phases of a writing project, it should ideally progress from *higher-order concerns* (HOC), for example

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show that writers do not write a text and then correct it *after* the text has been written, but that writing and re-writing can hardly be separated: writers continuously revise their text and maybe even their plan.

[9] See, for example, the formula provided by Wolfsberger (2009, p. 63), which is based on the assumption that one may write approximately 2 pages per day. For a text of 10 pages it would then be advisable to allocate 25 days of writing time; this estimate also considers that writers are usually not productive 8 hours a day, especially when starting a project.

giving feedback on the intended structure of the text, towards *lower-* or *later-order concerns* (LOC) (e.g., Grieshammer, 2013, 100), like working on academic language. Depending on the respective phase, feedback may focus on different levels of the text and address content, structure, or language. Text feedback plays the central role in conveying to the author whether readers grasp his/her aim and how his/her voice is being heard. It can be given not only by teachers or writing tutors, but also among peers. Texts are personal. Writers often feel vulnerable and insecure of their personal abilities. Thus, a feedback-culture is required which offers a supportive atmosphere in which writers can trust their readers and feedback will be valued. Detailed descriptions can be found, for example, in the appendix "Responding and Sharing", where Elbow & Belanoff (2002, pp. 351-407) present and discuss a whole range of feedback methods. For descriptions in German, see, for example, Wolfsberger (2009, pp. 199-211) or Grieshammer (2013, pp. 223-237).

2.3.3 Reflection and Working on the Writer

There is considerable variance in how people write and under which conditions they may write well. So while the phases of a writing process are targeted within a rather generic framework, there is awareness that there are as many writing processes as there are writers. Therefore the didactical methods referred to above are never 'prescribed recipes', but suggestions. The writer is invited to try and reflect whether a particular method is useful to him/her for the current writing project.

A peculiar contradiction to the idea that writing is highly individual (see principle No. 5 above) is the fact that many writing counsellors work with questionnaires yielding the "type of writer", e.g., the four types proposed by Scheuermann (2012) is quite common. However one may judge the validity of types and corresponding tests, in practice they do work for triggering a reflection of one's writing preferences, not only because students like doing these little "psycho tests". When reframed as "writing strategies", they can be used to communicate that there is no one ideal approach to proceed in any writing process; rather, there are personal ways to tackle the next particular project and that the strategy may change due to personal development, context or nature of the writing task at hand. Naming different strategies may work as a relief, because they allow for variations in proceeding through the phases of a writing process.

Part of reflecting on one's writing is looking at circumstances: Which time of the day is the most productive for writing, early morning, office hours, or the quiet of the night? How sensitive is one to disturbances of which kind? One person may write well in the anonymity and murmur of a coffee house, another will need the silence of a library, the privacy of his/her room, or an office. This may also relate to the writer needing his/her own desk, an empty table, a sofa, or a bath tub. The behaviorist B.F. Skinner (1997) proposes to condition oneself to always writing at the same place at the same time of day. A weaker version of this is to advise people to reflect where they can write

well and where not and, consequently, to avoid constellations which they previously experienced as non-productive.

2.4 Summary

This chapter aimed at giving those outside the field a brief impression of process-oriented writing didactics as it is currently being implemented in German-language universities: Any writing process is seen as describable within the framework of the phases, pre-writing, writing, and post-writing. While these phases are grounded in research, practitioners in academic writing in German-language universities often work with the five phases introduced in table 1 (orientation and planning, material and structure, writing raw text, revision, finalizing). Beyond being useful in providing orientation to writers, I use this phase model as an ordering structure for key elements of process-oriented writing didactics. The first row shows which task must be typically mastered during an academic writing project, the second row gives possible products of the respective phase. As reading and writing are seen as inseparable, the third row lists probable reading strategies in the particular phase. Feedback, be it by peers or teachers, plays a central role in process-oriented writing didactics. As the last row shows, it should be directed at different levels of the text according to the phase of the writing process. Last but not least, writing is seen as an individual process, thus fostering a reflection of ones' strategies is an indispensable part of process-oriented writing didactics.

Various disciplines are involved in writing research and German-language universities have seen attempts to establish it as a field in its own right. As a cognitive scientist, my own focus is on the theoretical basis for understanding writing as a cognitive process and the development of academic writing. In order to provide such a theoretical basis, in the following chapters I will therefore provide an overview of the predominant theories regarding writing as a cognitive process and its development.

3. Cognitive Process Theory of Writing

This chapter will give an in-depth introduction of the cognitive process theory(-ies) of writing by Hayes & Flower (1980) and its revision by Hayes and collaborators in order to be able to discuss some fundamental problems rooted in theoretical assumptions they adopted for their research.
Instead of repeating the ongoing discussion regarding cognitivism within cognitive science, I will proceed directly to discussing the models known in the field of writing research and their theoretical consequences. Particularly the first model I will present in great detail, since this will provide the necessary basis for the criticism I voice. I argue that the central problem of the cognitivist approach chosen lies in the idea that knowledge is propositional and writing means manipulation of propositions in order to solve problems. A central consequence is that Hayes and Flower render *central* issues of academic writing as *external* to the writing process: *knowledge*, *written speech*, and the '*rhetorical problem*' of creating a text which contributes to a particular discourse within a community are seen as *constraints*. Interestingly, despite the fact that the models include the *task environment*, they do not accord it any role beyond being mentioned. I will present some attempts of writing research to address the problems of this theory, but show that they ultimately fail to do so. Based on these considerations I conclude that a theory of writing as a cognitive process should be able to account for the so-called constraints as central to the writing process and that it should consider the role of the environment the writer is interacting with.

3.1 Hayes & Flower's Original Model of Writing as a Cognitive Process

The still predominant theory (e.g., Pohl, 2007, p. 12; Alves & Haas, 2012) was proposed by John Hayes and Linda Flower and revised twice. It was in the Gregg & Steinberg-book mentioned above that Hayes and Flower published their first version of their cognitive process model of writing (Hayes & Flower, 1980) as well as their research and considerations on the dynamics of composing (Flower & Hayes, 1980). At the time, empirical studies of writing *processes* were extremely rare and Hayes and Flower were the first to present a model based on empirical research. While they did not explicitly target their research at *academic* writing, it should be noted that all examples of data reported or cited in the texts came from students' exploratory writing as they were working on their assignments.

3.1.1 The Organization of the Writing Process – A Cognitive Model

The aim of Hayes & Flower (1980) was to understand writing as a cognitive process, inspired by the cognitive science mainstream of their time. For their methodology to derive a model, they adopted a technique that had been used for ground-breaking research in cognitive science: protocol analysis as

developed by Newell & Simon in the context of their work on the General Problem Solver (Newell & Simon, 2000, originally published 1959). Because they were interested not only in the observable behavior of their subjects, but mainly in not directly observable cognitive processes, they used thinking-aloud protocols, for which subjects are asked to verbalize what they think while they are performing a given task. The utterances produced are taken to be a keyhole into the subject's psychological processes used to perform the task. Additionally, Hayes & Flower (1980) drew on theories and task knowledge to inform assumptions on how to interpret such protocols:

> *Typically though, protocols are incomplete. Many processes occur during the performance of the task that the subject can't or doesn't report. The psychologist's task in analyzing a protocol is to take the incomplete record that the protocol provides together with his knowledge of the task and of human capabilities and to infer from these a model of the underlying cognitive processes by which the subject performs the task.* (Hayes and Flower, 1980, p. 9)

Giving a measuring problem as an example, they explain that their previous knowledge of the task and their knowledge that human problem solvers "in the wild" often use for search or means-ends analysis helped in analyzing the thinking-aloud protocol (Hayes and Flower, 1980, p. 8). Thus, while they are careful to point out that the protocols only reveal brief glimpses of the underlying mental processes, it should be realized that this way of approaching data analysis is highly theory-laden: The interpreter assumes to have not only full knowledge of the task, but also of "human capabilities" or knowledge of cognitive processes. These are shaped by the very strong assumption that the aim of cognition – and thus also of the cognitive processes underlying writing – is problem solving. Problem solving, in turn, is conceptualized in an algorithmic sense: the explanations and examples given are in line with a method introduced by Newell and Simon to cognitive science, i.e. means-end analysis. This is a particularly successful method for finding a solution to a problem, as long as the problem is well-defined (making mathematical problems ideal) and have at least one proper solution (otherwise the algorithm goes on forever); thus, the resulting problem space must be finite (or closed, so the solution of the problem lies within this problem space).

THE MODEL

Hayes & Flower's (1980) research yielded a model of expository writing (see Fig. 1) derived from sub-processes identified through protocol analysis and their organization as well as different editing modes which may account for individual differences. The model comprises not only the Writing Process, as its main module, but also encompasses two parts representing the context in which the model operates: Task Environment (the writing assignment and the text produced) and Long-Term Memory. Within the Writing Process module, Hayes and Flower (1980) propose three major

processes (processes and sub-processes are written in capital letters): PLANNING, TRANSLATING, and REVIEWING. PLANNING in turn consists of GENERATING, ORGANIZING, and GOAL-SETTING, whereas REVIEWING is distingtuished into the sub-processes READING and REVIEWING.

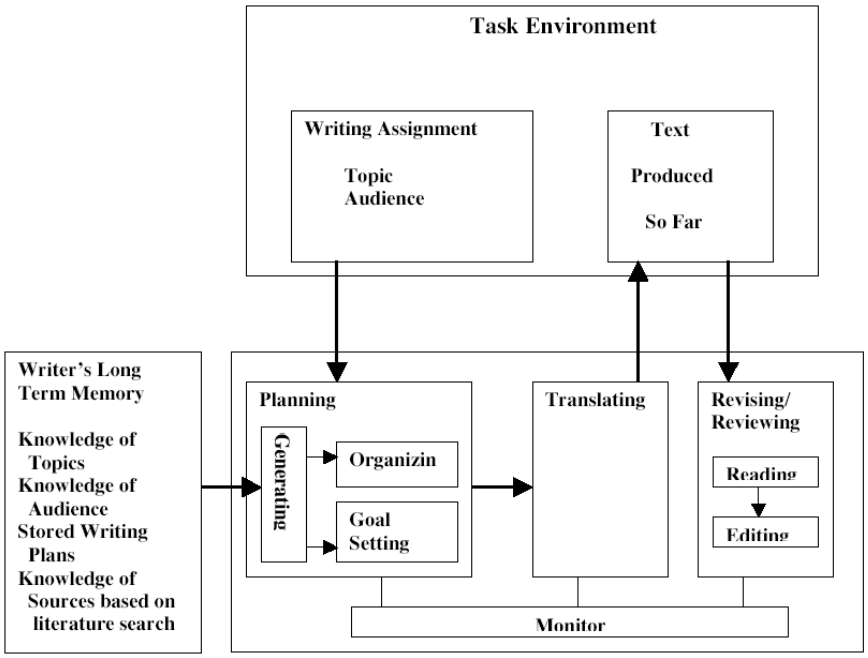

Fig. 1: Hayes and Flower's cognitive process model of writing; for a detailed explanation see the text (based on Hayes and Flower, 1980, p. 11)

Each of these (sub-) processes has been analyzed in detail, resulting in a use-case-like diagram. The model proposes that PLANNING yields a writing plan which determines which material TRANSLATING will use from Long-Term Memory. This "memory material" is assumed to be stored in propositional form as concepts, relations, or attributes, taking the shape of

[(Concept A) (RelationB) (Concept C)(Attribute D)], etc.

Hayes and Flower (1980, p. 15) state that TRANSLATING can be identified by two features: It is in the form of full sentences and the protocol often contains a question, seeking the next sentence part. At each step of the procedure, a halting condition determines whether an activity is completed or whether a further iteration must be taken, until the process is completed.

Hayes and Flower give the following example to show the process at work:

1. Get next part of writing plan: “I’ve covered the early years, now I have to say how he got the painting.”
2. Plan next sentence: Retrieve propositions.
   Proposition A: [(Rosseau)(showed)(some early promise)]
   Proposition B: [(Rosseau)(did)(very little painting until 40)]
   Sentence plan: (Proposition A) but (Proposition B)
3. Express next proposition part: “Rosseau…Rosseau, what? Rosseau displayed…. Although Rosseau displayed…. Although Rosseau displayed some early promise…, etc.”

(Hayes and Flower, 1980, p. 15)

In addition to the processes PLANNING, TRANSLATING, and REVIEWING, a process called MONITOR is part of the model structure (see fig. 1), but not described further in the text. Thus, while the individual processes of the writing process are explained, the question of how they act together is actually not addressed but “outsourced” into a cognitive structure which, while not described, is assumed to organize the writing process.

The authors do state that GENERATING and EDITING may interrupt other processes at any time. Beyond the elements named in the figure, there is no further comment on the role of task environment and Long-Term Memory and how they interact with the writing processes. This comes as a disappointment, considering that this model is (also) hailed as the first to include the task environment (Molitor-Lübbert, 1996).

3.1.2 Testing the Model

In order to test the model, Hayes and Flower (1980) matched it against a particularly clear writing protocol, consisting of a thinking-aloud protocol, notes, and a page of the essay written by the student. The thinking-aloud protocol was divided into 458 segments (each comprising a comment or statement), which were in turn classified into three categories: *Metacomments* (sic!) on the writing process, *task-oriented or content statements* reflecting the current tasks, and *interjections* like “ok”, “umm”, etc. Based on the meta-comments, the protocol was divided into three sections:

1. Section: GENERATING is the most frequent process, occasionally interrupted by EDITING
2. Section: ORGANIZING, interrupted by GENERATING and EDITING
3. TRANSLATING, interrupted by GENERATING and EDITING

The authors made three predictions on the protocol:

1. The form of the written material should reflect the main process of the section: many single words in section 1, organized material in section 2, and many complete sentences in section 3.
2. The content statements should correspond to the distribution of processes in each section.
3. In section 1 GENERATING should be more persistent.

Based on the judgment of three raters, who came to very similar conclusions, Hayes & Flower (1980) concluded that their model's predictions had been well-confirmed. Furthermore, they concluded that while English teachers had long talked about writing processes such as planning, organizing, writing, or editing, this model specifies the organization of these processes as goal-directed and recursive. It allows for interruptions of processes and can account for individual differences.
Interestingly, they observed that not all writers contributing data went through all processes described by the model, one of the writers observed failed to organize and could thus not be described as a competent writer. Since the model was not able to predict such behavior, Hayes and Flower take the cognitive process model to be a model of a *competent* writer. The practical application they propose is using the model for the diagnosis of writing difficulties.

From a methodological point of view, one may ask whether this way of conducting the test is a safe way to produce a self-fulfilling prophecy: Thinking aloud-protocols are used to derive the categories and a particularly representative or, in the words of the authors, "clear" protocol is used to test the derived categories against it. Thus, it should be noted that this test can reveal whether the model works within its own logic, but can*not confirm the validity of the model as such*.

3.1.3 The Task of Composition

The second paper Flower and Hayes published in "Cognitive Processes in Writing" (Gregg & Steinberg, 1980) sheds more light on the ideas behind the conclusion that the Cognitive Model of the Writing Process proposed was not a stage model. Here, they took a reverse perspective. Deriving the model had yielded a number of well-described (sub-) processes. In terms of the model published, Hayes and Flower had specified what they considered to be the core processes of writing, but not of the other components, and the question remained as to how these processes were integrated into the process of composition.

> *… when composition models describe writing as a series of tidy sequential steps, the role of the writer is like that of a cook baking a cake or a CPA preparing an income tax return. The writer is advised to follow certain steps: Select a topic, limit it, gather information, write it up, then remove errors and add commas. … The writers we have studied, however, give is a very different picture. A writer caught in the act looks much more like a busy switch board*

> *operator trying to juggle a number of demands on her attention and constraints on what she can do. (Flower & Hayes, 1980, p. 33)*

In other words, Flower and Hayes realized there was an explanatory gap between the (sub-) processes they had described and the overall task of composition: In changing the perspective, they recognized that an account was lacking of how these processes or sub-skills of writing, which according to them have to be carried out more or less at once, would be orchestrated in order to yield the "macro-activity" of composing a text. They conclude that, "[v]iewed in this way, a writer is a thinker on a full-time cognitive overload" (Flower & Hayes, 1980, p. 33). The metaphor used for a 'writer in action' is that of a switchboard operator, who must attend to many things at once, who is continuously jumping between PLANNING, TRANSLATING, and REVIEWING, making plans under various constraints.

3.1.4 The Role of Constraints

Constraints are described as attributes of a goal that shape the writing process and as such determine what is done and how. According to Flower and Hayes, constraints "take up time" (1980, p. 34) and fall into three categories: knowledge, written speech, and rhetorical problem. Knowledge is a resource if it is sufficiently organized and conceptually integrated. If it is unorganized or even consists of contradictory perceptions, memories, or propositions, it becomes a constraint in the sense that the writer must come to an integrated notion first by relating information or transforming incoherent thought. Retrieving knowledge and coming up with an "adequate conceptual structure", which Flower & Hayes (1980, p. 36) depicted as a graph they refer to as "knowledge map", can be demanding and time-consuming. They see the task of written speech, of expressing "that knowledge map within the linguistic and discourse conventions of written prose", as even more demanding (p. 36). The difficulty ascribed to this task is rooted in the assumption that, in contrast to spoken language, "we expect that the meaning in written speech will be fully contained and explicitly present in the text itself" (p. 39). In order to be able to produce such a text, a writer must know the conventions of written speech (as opposed to utterances, which can rely on the rich context provided by prosody, gestures, etc.) and have acquired a repertoire of composition skills in order to be able to master the long process of composition.

The constraint perceived being the largest is that of rhetorical problem:

> *Whatever writers choose to say must ultimately conform to the structures posed by their purpose in writing, their sense of the audience, and their projected selves or imagined roles. … In practice that means that writers must adapt both knowledge and written speech to solving this rhetorical problem. … Although the Rhetorical Problem is an added constraint, it can't conveniently be "added" at the end, because … it should direct the entire process of generating knowledge and language.* (Flower & Hayes, 1980, p. 40)

Flower and Hayes here describe the task of writing as dealing will all three constraints at the same time rather than passing through clearly defined stages: "The writer's problem then is how to keep all of these balls in the air given the limits of our short-term memory – our capacity to juggle" (1980, p. 44)[10]. However, the sense in which the "rhetorical problem" is an "added constraint" is not discussed by Flower and Hayes. I will come back to this point in the discussion of this section.

The goal of writing (including the linguistic standards) is defined by the respective assignment, which is part of the task environment; in contrast, inherent motivation to write is not part of the model. Having said this, the fact that Hayes and Flower initially did not consider intrinsically motivated writing may be an artifact caused by the research paradigm of studying students doing homework. In a revised version of the model, Hayes included the emotional dimension (Hayes, 1996).

3.1.5 The Role of Planning

While the ideal writer according to Flower & Hayes (1980) may be able to attend to all constraints at once, the real writer, who experiences problems in trying to do so, seems to be the more common case. They see the putative cause in the limits of our short-term memory and humans in general being "serial processors", aiming to ease the "cognitive strain" or "cognitive load". They present several ways to do so, while cautioning the reader that such techniques may violate the need to integrate all constraints simultaneously while writing (p. 41):

- throwing a constraint away (e.g., coherence between paragraphs),
- partitioning the problem (e.g., dividing writing and revising),
- setting priorities and "satisfice" (setting a goal in one dimension and/or defining what is just acceptable),
- drawing on a routine/well-learned procedure or stored frames (e.g., an experienced writer may not have to worry about grammar or a particular text genre),
- planning.

Flower and Hayes (1980) consider plans to be most useful, since they can reduce *and* integrate constraints by isolating relevant goals and issues. According to Hayes (1978, cited in Flower & Hayes, 1980), they can work by modelling, by abstraction, or analogy.[11] Since a fair share of time when composing a paper is spent with planning, it is interesting that good writers are better planners: they

[10] The technical term in cognitive science would be constraint satisfaction problem. Such problems are characterized by a very large number of mutually interacting constraints, which must be satisfied by the solution to the problem. "Classical" cognitive architectures as proposed by Hayes and Flower are less suited to solve such problems than the connectionist networks, which became state-of-the-art in cognitive science starting in the mid-1980ies (Rumelhart, 1989).

[11] I must confess that I do not understand the difference they make between a model, "essentially a miniature" (Flower & Hayes, 1980, 43) and abstraction, which is compared to a designer's sketch showing the essential features, since I do not quite see the difference in principle, only in degree of elaboration.

“appear to have more flexible, high-level plans and more self-conscious control of their planning than poor writers” (Flower & Hayes, 1980, p. 44). Plans can be taught and therefore Flower and Hayes see improving planning processes as a way to improve writing.

Plans for solving a rhetorical problem fall into three categories, which are hierarchically related, starting with the top category of the taxonomy, the ‘plan to do’ or rhetorical plan, followed by the ‘plan to say’, and the ‘plan to compose’. Flower and Hayes point out that the more specific the ‘plan to do’ is with regard to the audience to be reached with the text to be produced, the less likely the writer is to produce writer-based prose. They consequently suggest aiding the student by specifying the audience. The ‘plan to say’ is a content plan, for example an outline. It is “essentially a scale model of the final product” (Flower & Hayes, 1980, p. 45). While this product-based plan is widely taught, the ‘plan to compose’ is process-based and taught less frequently. Such a plan can be very formal, as in the field of classical rhetoric, or inspirational, like the use of meditation or freewriting for coming up with ideas. Indeed, Flower and Hayes claim that good writers constantly develop their plans as they write and conclude that teaching composition should encompass teaching such planning.

Although their original model on “The Organization of the Writing Process” (Hayes & Flower, 1980) was published in the same volume, the authors do not discuss how their division of plans into ‘plan to do, to say, and to compose’ relates to the sub-processes of the PLANNING module, namely GENERATING, ORGANIZING and GOAL-SETTING. The question which springs to mind is whether MONITOR has a role in planning. Or, as Flower & Hayes (1980) critically observe themselves: having constructed the elements of the module, it remains unclear how they are being orchestrated to work together as a piece of writing is being produced.

Hayes and Flower themselves did not deny loose ends, but pointed out explicitly and more than once that a model is always a working model in the sense of fulfilling the role to spark further questions and research. Despite the open issues, their work was groundbreaking in providing some deep insights into writing processes as students learn to write academically. In the meantime, Hayes, partly with collaborators, has published two major revisions, in 1996 and 2012 respectively, which I want to briefly include before discussing this approach.

3.2 Revisions of the Cognitive Process Theory of Writing

3.2.1 Developing the Original Model

The 1996 revision of the original model, which Hayes published under the title “A new framework for cognition and affect in writing” in a volume called “The Science of Writing” (Levy & Ransdell, 1996), is essentially a follow-up of the 1980 book “Cognitive Processes in Writing” in the aim to present a concise overview of the field of writing research.

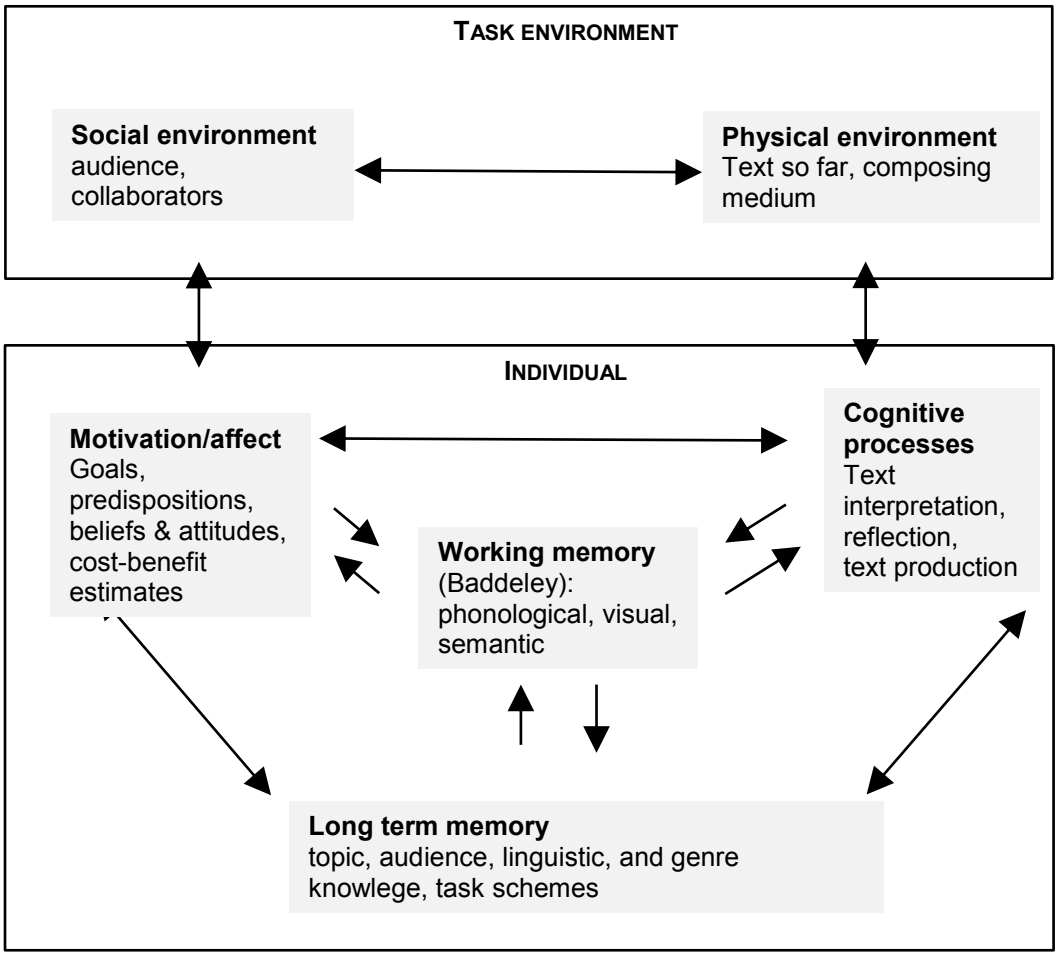

Fig. 2: Hayes (1996) refers to his new model as framework. It consists of task environment, divided into social and physical environment, and the writer (individual). Modules are motivation/affect, working memory, long-term memory, and cognitive processes.

Hayes (1996) discusses four changes, or rather groups of changes regarding four modules, to his model, which is depicted in figure 5.

1. Hayes includes Baddeley's (1986) model of working memory as a central module, which also contains visual-spatial representations. This is to account for the fact that texts often contain graphs, tables, etc. He adds a semantic store, "because it is useful for semantic text generation" (Hayes, 1996, p. 8).
2. A second new module is Motivation/affect, which "delivers", among others, goals to the writing process which, in turn, are relevant to problem-solving. Three areas are of particular relevance: the nature of motivation in writing, the interaction among goals, and affective responses in reading and writing.
3. The core of the former model, comprising the processes PLANNING, GENERATING, and REVIEWING, has undergone major revisions: PLANNING has become 'reflection' and is understood as problem-solving (including planning), decision-making, and inferencing. TRANSLATING has become part of 'text production'. For this, Hayes proposes a provisional model developed with Kaufer and Flowers (Kaufer, Hayes, & Flower, 1986):
    a. A package of semantic content is retrieved (based on cues from the physical environment 'text produced so far' and the plan) and stored in working memory.
    b. A surface form is produced and stored in the articulatory buffer.
    c. The sentence is produced (vocally or subvocally) when all content is expressed or when the buffer is full.
    d. A sentence is written down if the articulation is positively evaluated.
    e. Process is repeated.

    The originally separate process REVIEWING is now omitted. Instead, Hayes conceptualizes it as 'text interpretation', 'reflection', and 'text production' (p. 15). He discusses three kinds of *reading* as being relevant: reading source texts to comprehend, reading to define tasks (e.g., assignments), and reading to evaluate when one is revising one's own text. In addition, the writer's persona as inferred by the reader from the text as well as the spatial display of the text may play a role in reading.

    Hayes thus proposes a model of revision where the cognitive processes are controlled by a *revision task schema*, "a package of knowledge, acquired through practice, that is useful for performing the task and is retrieved as a unit when cues indicating the relevance of the schema are perceived. This package might be thought of as a set of productions – that is, condition-action rules – that mutually activate each other" (p. 16).
4. The 'social environment' is included into the task environment, because "[w]riting is a communicative act that requires a social context and a medium" (Hayes, 1996, p. 5).

Hayes refers to this revised version as framework, rather than model, but does not give a reason for this. The most obvious change is that the new framework is more complex than the original model. Instead of proposing a more or less serial processing stream, the modules in the box "the writer" are seen as mutually influencing each other. The changes are based less on Hayes' own empirical work than on developments in the field of cognitive psychology of the time, including recognition of the role of affect and emotion in decision making as well as the introduction of Baddeley's working memory. However, what might constitute such a "semantic store", let alone how it would be grounded in psychological research, is not touched upon. Since Baddeley's notion of a visual-spatial sketch pad and phonological loop are conceptualized as a short-term memory for "incoming sensory information", both could provide the "channel" for representing "semantic information". In addition to the lack of an empirical basis, the semantic store remains conceptually unclear. Furthermore, given that Baddeley's model contains a 'central executive' which has a similar function, one can only assume that the module 'working memory' was meant as a replacement for the process MONITOR in the old model. Again, the question of how the modules in the box 'the writer' interact in order to 'run' a writing process remains open, since Hayes does not comment on this change. The idea that motivation/affect, and emotional states in general, are not an inherent part of a cognitive process, but take the role of "qualifiers", as a connotation, is in line with cognitive psychology.

The result is a conceptualization of writing as a cognitive process which is less clear than the original model with regard to offering a description of writing *as-it-is-happening*, less grounded in a close analysis of writing data, while incorporating more findings of cognitive psychology.

3.2.2 Second Revision

The most recent revision of the cognitive processes model of writing (Hayes, 2012) resembles the layered structure of the review model proposed in 1996 (Hayes, 1996). The four layers comprise three levels: Control Level, Process Level (with the layers Writing Processes and Task Environment), and Resource Level. On the level of resources, 'Attention' and 'Reading' were added. As to the writing process itself, 'Proposer', 'Evaluator', and 'Transcriber' were added. The control level consists of 'motivation', 'Goal Setting' (with the sub-goals plan, write, and revise), and 'Current Plan' and 'Writing Schemas'.

Hayes (2012) compares the most recent model to the 1980 model (Hayes & Flower, 1980) rather than the 1996 framework. He claims to have removed the monitor, as well as the planning and revision/reviewing processes from the original model. However, 'Proposer' and 'Evaluator', as well as a whole Control Level haven been added to the model, which may be understood as a more specific description of the tasks a 'monitor' would be carrying out.

Whereas REVISION is subsumed under writing, the functions of PLANNING have been distributed over 'Goal Setting' and 'Current Plan' on the Control Level. Written plans are mentioned explicitly in the model as part of the Task Environment and as a text genre in the paper. The Transcriber owes its addition to the writing process to research showing that even in adult writers transcription is not fully automated, but slows down when verbal working memory does. The publication offers a review of interesting research findings for various components of the model, but very little explanation as to why the components of this writing model are integrated in this particular way. For example, it remains completely unclear why Reading is not considered to be a cognitive process, but placed on the Resource Level and why the Evaluator is not part of the Control Level.

I have included the 2012 version of the model merely for reasons of completeness. The visualization of the most recent version of the model (fig. 6) appears "more modern", but it is also more complex, while still resting on the same assumptions as the original, failing to add clarity. This is probably the reason why the community still mainly refers to the 1980 model and the 1996 framework.

3.2.3 Developing the Role of Planning

Just like in "Cognitive Processes in Writing", the presentation of the 1996 model in "The Science of Writing" was followed by an article considering planning. Hayes & Nash (1996) developed Hayes and Flower's initial ideas on planning further, starting from the assumption that a "goal and the sequence of steps (the means) to achieve that goal is called a *plan*" (p. 32). The means can be expressed as a sequence of actions, specifying what to do, or as a sequence of sub-goals, specifying when something is done. The less defined the task is, the more goal-definition will be necessary as part of a planning process. Architecture, software design, or engineering are characterized by making decisions about a product in a separate space, "an environment different from the task itself. … The medium of the planning environment may be thought, but it may also be scratch paper, or clay" (p. 31). They therefore differentiate between a *planning environment*, which allows for an inexpensive representation, and an *action environment* in the "real world". In analogy to these classical design tasks, Hayes sees writing as a task which is commonly ill-defined. Hayes and Nash (1996) follow Newell & Simon (1972) in describing the planning process in two steps:

1. Representation of the task in the planning environment, including goal and resources
2. "carrying out the task as it is represented in the planning environment" (p. 31) by exploring alternate (sub-)goals and means/paths to goals until a combination of specified goal and means (the steps to reach the goal) is found: the plan.

Hayes and Nash refer to plans as control structures, which can be either tight and work like an algorithm, or loose, as for writing processes. Here, a plan will guide action by providing suggestions,

rather than control it. In their view, the use of planning is a means of cost reduction as well as a means to provide flexibility concerning problem-solving strategies (pp. 33f).

While the steps are still very much in line with the 1980 work of Flower and Hayes, I would like to highlight a short passage on the nature of plans:

> *The plan may be embodied in any number of media. For example, in chess, where planning is conducted in thought, the plan is stored in memory. In design, where planning makes heavy use of sketches on paper, the plan is typically a drawing. In writing, plans often consist of both internal and external components. For example, certain goal specifications may be stored in memory (e.g., "keep it simple") and others (e.g., the topic outline) may be recorded in writing, especially if they may be hard to remember. The plan, then, may be either a mental construct, a physical artifact, or a combination. Planning is a cognitive activity but the resulting plan may either be a mental artifact, a physical artifact, or a blend of the two.* (Hayes & Nash, 1996, p. 33)

In this understanding, planning necessarily precedes translation, but does not necessarily happen only in the individual's mind anymore. Instead, it may involve interaction with the physical environment. Thus, the planning environment can be a physical environment, which is probably the reason why Hayes and Nash choose to refer to a plan as being *embodied*. Unfortunately, the pending question of how a plan, which is distributed over internal and external components, can still be perceived simply as a linear sequence of steps (see beginning of this sub-chapter), is not explored further by Hayes and Nash.

A further deviation from Newell and Simon's very abstract idea of planning as a cognitive process is what Hayes and Nash refer to as "interweaving plan and action" (p. 41): writing, just as other tasks like programming, produces an output in the *action environment* which changes the task environment and thus influences further planning by imposing constraints. When a task reveals unanticipated information, this is seen as opposed to abstract planning as conceptualized by Newell and Simon (1972). Hayes and Nash reject this (at least partly) as event-driven. They would describe a "bottom-up planning" as opportunistic, but would not call it planning (p. 42).
From the point of view of contemporary cognitive science, Hayes and Nash touch upon the question of embodied cognition, without rethinking the underlying assumptions of the model or framework. They do not discuss what "embodiment" means and its implications for our view on cognition, nor do they explore possible consequences of this view for understanding writing as a cognitive process. The passage on the 'embodied plan' is relevant, because it points to a loose end: it highlights the role of artifacts produced in the writing process. However, it lacks an attempt to provide clarity: in Hayes' 1996 framework, text produced so far (and I would hold that a written plan is an intermediate product towards the final text) is part of the physical environment and therefore of the task

environment. In the very same volume, Hayes and Nash start blurring the boundaries: using terminology from current cognitive science, a plan may be cast in an artifact, in a person's mind, or distributed over both. For now, I will suspend exploring this "loose thread" in more depth. Part III of this thesis will give an overview of the current theoretical stances regarding embodied cognition, which will provide the theoretical basis to expand on this[12]. At this point, I will briefly discuss the models presented so far and then introduce the dominant models in writing as a cognitive developmental process.

3.3 Some Problems of the Cognitivist Models of the Writing Process

Looking at the development that Hayes' and collaborators' models/framework have undergone, one can observe an increase in complexity which mirrors the increase in findings in writing research. A closer look reveals that, despite the fact the central components of the model have been renamed or redistributed over various cognitive processes at different levels, the underlying perception of writing as a case of problem solving by manipulating propositions remains untouched. The cognitivist view on writing as a cognitive process prevails.

In the writing community, there is still wide-spread agreement with the idea of conceptualizing writing as problem solving. In fact, it can be found at the heart of the key principles of process-oriented writing didactics, which frames writing as an iterative and recursive process, which step by step leads to a solution (Ruhmann & Kruse, 2014, p. 17). In other words, this is the idea that writing is a heuristic process. If one wanted to frame the underlying idea in a more rigid and algorithmic way, this description could also be used to characterize means-end analysis. The algorithm achieves its goals by breaking the initial goal down into simpler sub-goals and then solving them (i.e. reducing the difference between the current state and the goal state) step by step though applying appropriate rules (called methods). It will eventually attain the initial goal (or continue running forever). Although Hayes & Flower (1980) do not state this explicitly, the cognitive scientist looking at their methodological approach to the first model cannot help but see that their project can be viewed as an implementation of the approach Newell and Simon describe in their seminal publication on the

[12] For the reader already familiar with cognitive science and the notions of embodied cognition: Hayes cites Hutchins' book *Cognition in the Wild* (Hutchins, 1995) in the "framework-chapter" (Hayes, 1996) with regard to collaborative writing, referring to his research on socially distributed tasks (the "navy-example"), but not in the chapter with Nash (Hayes & Nash, 1996) in the same volume. The framing of planning as a task in which the plan can be represented in the mind, artifacts in the environment or distributed over both, to use Hutchins' terminology, is very much in the spirit of distributed cognition, which can be subsumed under *embodied cognition broad* (Fingerhut, Hufendiek, & Wild, 2013b). In chapter 8 I will return to this point.

General Problem Solver (Newell & Simon, 2000/1959): Using thinking-aloud protocols, complete knowledge of the task, together with the strong assumption that the human mind is based on symbol manipulation as a basis for analysis and for coming up with a system architecture, which is then tested against a protocol.

To put this into context for the reader without a cognitive science background (there is a range of overviews and introductions, for example Posner, 1989; Bechtel et al., 1999; Varela, 1990; Clark, 2001): the mantra at the time was *cognition is information processing* and the alleged aim of cognition was to represent the world in order to solve problems. These representations were taken to be symbolic, hence the idea was that thinking means symbol-manipulation according to rules (or syntax). Philosophically, this approach is called *computationalism*, a variety of functionalism, because an underlying idea is that the mind, in principle, works like a computer program which can be either "run" on hardware or "wetware" (the brain). Analogously, in the relation between cognitive architecture and cognitive process, the architecture is thought of in a rather static sense as providing "the frame within which cognitive processing in the mind takes place" (Newell, Rosenbloom, & Laird, 1989). Thus, loosely speaking, much of cognitive science research of the time can be understood as the attempt to reveal the "algorithms of cognition" (or *symbolic architectures* as Newell et al. termed it). As Fodor (1975) phrased it with unmet clarity: "No representations, no computations. No computations, no model."

This approach comes with the assumption that the core of the cognitive process can be described in terms of logic and is thus in a sense universal; "external" influences, like limits of working memory, 'disorganized knowledge' in long term memory or simply lack of it, damage or disease, motivation, affect, or emotion, are considered to be distorting factors. To organisms, a particularly useful "format" of a problem solution is a decision for a particular action. Based on this assumption, Fodor (1975) argued that decision making is a kind of computation which requires the representation of possible actions as well as their possible outcomes within the (again, represented) world. Such a representational system, he argued, must share relevant characteristic features of natural languages, which he referred to as *language of thought* (LoT). He thought of the relation between natural language and the conceptual LoT as a kind of translation into serial order. Although they do not refer to Fodor explicitly, this may be the reason why Hayes & Flower (1980) originally called their "text production" module TRANSLATING. Thus, when Hayes & Flower state that the basis on which they inferred their model is "the incomplete record that the protocol provides together with his *knowledge* of the task and *of human capabilities"* (1980, p. 9), I read it within the context of the dominating paradigm at the time. It determined the authors' basic assumptions about human cognition and thus their method and the data recorded, potential data not considered, as well as the

structure of the model. In other words, their approach is heavily theory laden. This is certainly not a particular flaw of Hayes and Flower's approach, in two ways: their approach is firmly rooted in the paradigm of cognitive science of the time[13] and still accepted in writing research today - to use Kuhn's (1962) wording, they were doing "normal science" within the "mainstream" of their time. Secondly, they were particularly careful in pointing out that they see their model as a working model. Furthermore, in Flower & Hayes (1980), by stating that they had no idea how the writing processes identified played together in order to produce a text, they in fact acted as their own greatest critics.

Given the previous interaction of writing research and cognitive science, from today's perspective it comes as a surprise that the still predominant cognitive theories of writing remained untouched by the long history of criticism of cognitivism in the field of cognitive science (starting with Dreyfus, 1979 and Winograd & Flores, 1986), the theoretical developments driven by connectionism (e.g., Rumelhart & McClelland, 1986), the consequences for the concept of representation as mental image of the world (e.g., Peschl, 1994), the discussion of modularity and innateness (Fodor, 1975), and the realization that cognition is not *information* processing understood as the manipulation of disembodied symbols which are a representation of the world and touched by neither time nor culture. Instead, starting at the latest with Varela, Thompson, & Rosch's The Embodied Mind (1991) there is a growing consensus that minds are embodied and situated in and interacting with a physical, social, and cultural world (e.g., Nunez & Freeman, 1999, pp. ix-xix). When Bereiter and Scardamalia stated that "[a] theory of writing that could explain writing in all its fullness could pretty much send all other psychological theories packing" (1987, xiv), they clearly did not conceive of the job to be done.

The reasons why writing research has lost its interest in cognitive science and cognitive science in the high level cognition case of writing can only be subject to speculation. Altered funding policies may be a reason as well as a shift in focus on the side of cognitive science, which resulted from the theoretical developments sketched above. The field paid less attention to "high level" cognition (like chess playing) and more to "low level" cognition (like perception, walking). Despite this, language has always been an issue in cognitive science(s). However, as Molitor-Lübbert (1996, pp. 1017) describes, language production models do not strictly differentiate between spoken and written language. They do not differ on a conceptual level but with regard to the detail: models of spoken language production tend to focus on sentence construction and the role of the lexicon, while models of written language production place emphasis on the pre-verbal, conceptual level. This causes the

[13] Although at the time as a model for the human mind met fundamental criticism and latest with the publication of *Parallel Distributed Processing* (Rumelhart & McClelland, 1986) connectionism, which used artificial neural networks as models to simulate cognitive processes, was widely perceived to provide the more plausible model for the human mind (see, e.g., Varela, 1990).

dialectic relationship between plan and text, the basic rationale being that the plan determines the order of sentences, while flaws in the text are discovered in the course of text production, which leads to changing the plan. Thus, planning was and remains a focus of research on the cognitive processes involved in writing, whereas *writing* as a cognitive act has received little to no attention. A reason may lie in the, as Ong (2002, p. 5) phrases it, "persistent tendency, even among scholars, to think of writing as the basic form or language". In our literate culture, we tend to think of the written word as simply an alternative form of a spoken word, of written text as a "recording" of spoken language (which is often taken to be an expression of thought). At the very least, experimental practice in cognitive psychology and linguistics, where research on language often involves written words or text, is well in line with Ong's observation. In other words, writing is often seen as an instantiation of the more general topic of language production.

I will cover developments in the cognitive science(s) since the 1990ies, in particular the concept of extended cognition and enactivism, in more depth in chapter 7 and suggest an alternative view on writing.

For now I invite the reader to bear with me for a discussion of a number of critical, but not necessarily directly related issues regarding these models:

- the writer,
- the recursive nature of writing processes,
- the consequences of the cognitivist approach for understanding writing as a cognitive act with regard to seeing writing as problem solving,
- the role of constraints,
- and the role of the environment.

3.3.1 Eluding the Writer

The cognitive process models of writing presented above break down writing into a number of processes. I do not want to enter into a discussion of whether the mind 'is' modular at this point. Fodor (1975) clearly argued for this point. Whether one agrees or not, a characteristic of these models is that the modules grouped under 'the writer' need an "overall process model" which is not further described: The first model (Hayes & Flower, 1980) contains a MONITOR, which is to determine which procedure is to be called upon. In the second version (Hayes, 1996), MONITOR disappears, instead 'working memory' (mainly as conceptualized by Baddeley, 1986) takes on a central role, with the 'central executive' module in a similar function. Finally, in the most recent version of the model (Hayes, 2012) an 'executive' and a 'control level' can be found. In all of these models, what may be described as "the control of the overall writing process' is conceptually put into

a different box and none of them is described in even a fraction of the detail devoted to the other sub-process of writing. In other words, the models are fit do describe procedures which are part of an individual's writing process, but they do not to describe how "a whole writer" organizes his/her writing process. In this sense, 'the writer' is not part of those theories.

3.3.2 The Recursive Nature of Writing

Composition studies at the time were proposing a writing process which was linearly proceeding from first idea to final text. Opposing this view, Hayes & Flower (1980) were careful to point out that they objected to the idea that writing proceeds in a series of stages. The analysis of their data revealed that writers do not go through the cognitive processes PLANNING, TRANSLATING, and REVIEWING in this particular order, but instead carry out all cognitive processes of writing in all phases of the writing process, a finding which they used to argue their point.

Despite this, they also showed that the writing phase was characterized by a dominant cognitive process. I would interpret the data presented by Hayes & Flower (1980) differently: On a micro-level, all the cognitive processes can occur in every possible sequence. On a macro-level, the "classical" phases of a writing process, for example Rohman's pre-write, write and re-write (1965), are defined by the *statistically* dominant cognitive process. Gould's (1980) *iterative model of composition* (fig. 3), which was published in the same volume edited by Gregg & Steinberg (1980) as Hayes and Flower's seminal work, perfectly captures the point I am trying to make; therefore, I will briefly introduce it here. Gould (1980) maintains that fixed-order stage models are straw men. He proposes a model based on the four processes planning (observable behavior: pausing), generating, reviewing, and accessing other information (observable behavior: acquiring).

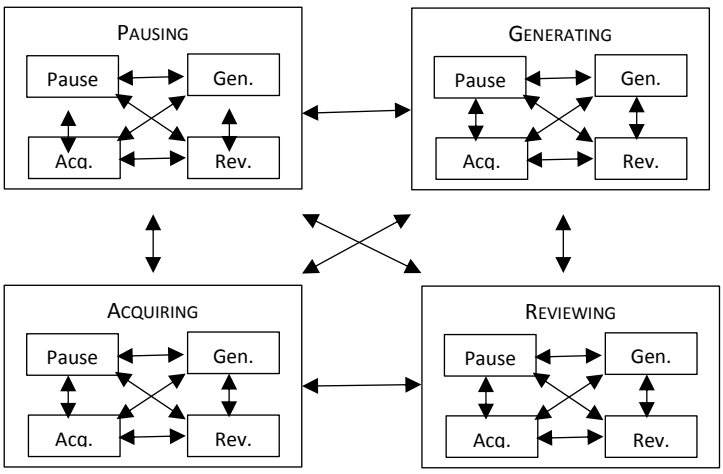

Fig. 3: Iterative process model of document creation (after Gould, 1980, p. 111). Gen. = generating, Acq.=acquisition, Rev. = revision.

The processes are not necessarily called upon in a linear order, instead he proposes an iterative process model of composition in which process can also be recursive: A function like planning or reviewing can “call” itself at a lower level, each part of the composition process at the higher level subsumes all behaviors at the lower level.

A reason why this model has not gained widespread recognition may be that Gould framed it not as a cognitive model, but as a framework for investigating composition. In a sense, his model was “behaviorist”, while Hayes and Flower worked within the cognitivist paradigm: For both, planning processes are opaque in the sense of being conceptualized as non-observable “thinking” or mental processes. While Gould stuck with the observable behavior of “pausing”, PLANNING is a result of overcoming this inherent opaqueness with the research methodology.
Nevertheless, when looking at the research results described by Hayes & Flower (1980), Gould’s model may be regarded as a good description of their results concerning the occurrence of writing behaviors in different phases of a writing project. Hayes and Flower do mention that they understand the writing process as recursive (Hayes & Flower, 1980, p. 29), but if we follow the general understanding that a recursive function is one which can call itself, we see that the cognitive processes of writing are called centrally according to the writing strategy by MONITOR.

The interpretation that writing is recursive would also be in line with counselling practice in process-oriented writing didactics, where phase models are used for orientation on a macro-level. I am mentioning the obvious in pointing out that in talking about “the writing process” one may address at least two temporal dimensions: the process of composition of the whole text and cognitive activity of writing-as-it-is-happening.

Practitioners never get tired of pointing out that there is no linear progression from one phase to the next, but a going back and forth between phases, which depends on the individual writer (examples of written advice on this point can be found in Scheuermann, 2013, p. 39 or Frank, Haake, Lahm 2007, p. 13). For practice, i.e. the interaction with students, I thus find it advisable to refer to the phase model of the writing process as model for the “phases of a writing *project*”.

3.3.3 What is the Problem to be Solved?

The cognitivist approach to writing comes with a price: Newell & Simon (1972) viewed cognition as information processing with the aim of problem solving[14]. This demands a closed and finite problem space which ”contains” one or several “proper” solutions (the goal state), which may be reached

[14] For a brief introduction into problem solving, including a definition of ill-defined problems, see Mayer (2012) and/or Ward (2011).

from an initial state by applying a set of operators. Such a *well-defined problem* would be "win tic tac toe (the goal), a full description of the game and the rules for possible moves (the operators), you start (the current state)". If cast in an algorithm, there is a well-defined and limited problem space consisting of all possible combinations of moves, a set of rules, and a definition of the end of the game allowing for possible solutions. In contrast to this, an ill-defined problem may lack any of those features, demanding a reflection as well as decisions on how to interpret the problem and how to define it in order to be able to approach it. The problem solver does not know the operators, the goal, or the state the system is in (Dunbar, 1999). As Dunbar points out, writing assignments are notorious for this, a typical one being along the lines of "in the end of the semester you must write a 25 page seminar paper on a question concerning [the topic of the seminar]". So if we take a writing assignment plus the writer's knowledge about content and genre to be the problem description, would this be sufficient to describe the entire task lying ahead of the reader? What would be the (a) solution? Could a finite set of rules explain how the writer reached his/her text?

Thus, writing assignments are typical *ill-defined problems*: If you take look at the issues students seek help with, much of the work with students is focused on finding, defining, and thus creating 'the problem' itself: students often start with topics allowing for a lifetime of research (and beyond) and much work goes into narrowing down the topic and eventually formulating a feasible research question. Academic writers (and writers-to-be) also research and decide on literature, write excerpts, design and revise a structure, develop arguments, wonder how and where to start, write, and revise. If we are to include empirical work, academic writers also document their data, write lab journals, report results and interpret them, etc. If all of these operations were to be represented and carried out within one problem space, how would it be defined? If there was more than one problem space, which of these tasks would constitute a problem space and how would these problem spaces relate to each other?

If one wants to frame academic writing in terms of "problem solving" in an iterative model, this would amount to defining the "overall problem" as well as a number of problem spaces in an iterative manner. A change in the problem, the "overall problem space" as well as a change concerning any goal, operator, or state of the "sub problem spaces" (which may in turn contain sub-problem spaces) would potentially lead to a redefinition of the other problem spaces at various level or the problem itself. The resulting model would be rather dynamic. Almost two decades after Hayes & Flower (1980) published their model, Dunbar states in an overview on problem solving: "While a number of the models, such as Anderson's and Newell's, have incorporated problem solving into a general account of cognition, problem solving and search in problem spaces have been regarded as applicable only to well-defined problems such as puzzles" (1999, p. 297). The cognitive processes

involved in academic writing are too complex, dynamic, and open-ended to be modeled as a problem solving process, and certainly defy the simple, straight-forward manner proposed. Thus, while in the 1980ies it may have seemed theoretically possible to come up with some very complex model of nested problem spaces which interact, how to get there from the "ill-defined" stage of the problem would still remain completely open from a practical point of view. Therefore, it is not useful to continue framing academic writing as problem solving, especially not in such a very narrow sense. Analogously to the observation that *doing* research is not about reproducing knowledge, but about asking questions and *seeking* the answer in a methodological way, it may be more useful to think about academic writing as a way of exploration.

3.3.4 Constraint or Core of the Writing Process?

In Flower & Hayes' thinking, constraints are hindrances in the sense that they "take up time" (1980, p. 34), sorting them into three categories: written speech, knowledge, and rhetorical problem. I strongly oppose this view and will argue that, instead of conceptually pushing them to the periphery of the writing process, they should be considered as central to it.

WRITTEN SPEECH

For a cognitive process model of writing, it comes as a surprise that *written speech* is seen as a constraint to the model. In order to understand the term "written speech", it is important to realize that writing is usually understood as being equivalent to speech production in the sense that thought is translated into language (Molitor-Lübbert, 1996, p. 1016). In his reception of the Hayes & Flower-model from 1980, Wrobel points out the model misses the central point of interest, a theory of text production which allows for understanding the connection between the 'inner-mental' processes and linguistic structures (Wrobel, 1995, p. 22). Taking into account that Wrobel is a linguist, it is conceivable that he insists that writing is the result of linguistic utterances, texts, and criticizes that the cognitivist approach actually postulates an approach which is independent of them, since the processes proposed, i.e. goal setting and planning, are relatively universal (1995, p. 21). In my understanding, Hayes and Flower include the "mechanism" from 'inner-mental' process to linguistic structure by framing writing as ordering propositions in planning and then translating concepts into sentences (implicitly in line with Fodor). However, I do agree with Wrobel's conclusion that, in treating the act of 'putting thought into words' in this resolution, Hayes & Flowers model does not provide a framework for linguistic research.

KNOWLEDGE

In the spirit of cognitivism, Hayes and Flower conceptualize memory analogously to computer memory, in which knowledge may be stored and retrieved as propositions (Hayes & Flower, 1980, p.

15). It is worthwhile to briefly reflect on the consequences of this concept of knowledge. Conceptually, propositions are units describing the world and cognitivism takes them as the basis for a mental representation of the world. They are the necessary substratum for mental operations. This description can be correct or not (true or false), i.e. it comes with realism and the notion of objectivity as an epistemological consequence. Propositions can be combined to build more complex knowledge structures, i.e. they can be re-contextualized and de-contextualized again, so the smallest units are context-independent. They are also independent of a particular physical structure, so hardware (computer), "wetware" (the brain), and other media can 'store' them without qualitative change. In this sense, propositional knowledge is disembodied. If it is to be processed, it must be retrieved from memory, thus in a sense it is transferable. An important consequence is that knowledge and cognitive process are separate (for a more detailed discussion, see Roemmer-Nossek, Zimmermann, & Peschl, 2011).

Generally, propositional knowledge is the resource to the writing process. Like models of verbal speech production, writing models build on the assumption that both describe the translation of (presumably) non-verbal thought into language (Molitor-Lübbert, 1996, p. 1016). However, when knowledge is "disorganized", it is seen as a constraint; what takes time is the structuring and restructuring of the propositions according to the writing assignment. If in the writing process knowledge can only be restructured, it is beyond its scope to be a process producing new knowledge in the sense of producing propositions which are not a composition of existing ones. Hayes & Flower's model (1980) is a feed-forward model for "loading" propositional knowledge from long-term memory, translating the propositions into natural language (thus also ordering them serially), and improving the text according to linguistic standards. There is no arrow pointing back towards long-term memory (see fig. 1), the process does not feed back upon itself. Such a system leaves no potential for new ideas to emerge as a result of the act of writing, it is a "closed process"; to use an image, it is more like knitting, where the wool may be "rearranged" but remains qualitatively unchanged, than a design process, which is open-ended. Ortner (2000) makes a similar point when he describes writing as an activity interweaving and connecting propositions („das Schreiben als propositionsverwebende und -verknüpfende Tätigkeit …"). Such a process will allow for inference, whereas qualitatively new knowledge, thinking "outside the box", or even creativity in the sense of innovation (personal or "absolute"), cannot be accounted for.

Rhetorical Problem

Another consequence is that we can understand the "rhetorical problem" as the question of how to tailor the "surface" of this knowledge to the particular context, i.e. the writing task with all its demands and complexities due to purpose, genre, and potential readers. Only then can we understand in which sense they conceive of the rhetorical problem as "added". Flower & Hayes

(1980) themselves point to the problem that knowledge of the audience and purpose of the text cannot be treated as an add-on to the writing process, despite shaping it at each stage and level. With their "three constraints", Flower & Hayes address the core of the composition process in the sense that they touch upon the central challenge to the writer: what do I have to say to whom in a way which will have the desired effect?

In contrast to the prevalent cognitive theory, a principle of process-oriented writing didactics (introduced in chapter 2) is that writing should be viewed from the writer's perspective. An often-heard expression by practitioners in the field is "we are working on the writer"[15], not the text. Many didactic methods are geared towards working on different aspects of the "rhetorical problem", towards working out the position of the writer and how to communicate it to the academic community. A cognitive theory of writing should not treat this aspect as an "add on", but account for it as central to the process of writing.

3.4 Attempts to Save the Approach

So far I have discussed Hayes' and collaborators' work from the perspective of cognitive science. In German-language writing research, there are attempts to widen the picture in order to overcome the problems mentioned above. There is a common understanding that academic or literary writing areunderstood as a creative process potentially leading to understanding and new knowledge.

3.4.1 Trying to Redefine the Concept of Knowledge

In this sense, Ortner (2000, p. 1) is interested in knowledge-creating writing ("das Wissen schaffende Schreiben"), yielding "a text as a version of the world". As pointed out above, one problem of the cognitivist approach to writing as a cognitive process is that these systems can operate on existing knowledge within the problem space defined, but not beyond it. Ortner is very much aware of those limitations of propositional knowledge, he sees it as a basis for reproduction (probably in the sense of *knowledge-transforming writing*, which will be introduced in the next chapter). He therefore attempts to widen the concept of knowledge and lists his presuppositions (Ortner, 2000, p. 10): he describes propositions as the phonemes of (linguistic) thought. As such, they can be structured to form symbolic-declarative knowledge which acts as knots in networks of knowledge. Writing then means to determine points and draw the lines (references to propositions via subroutines) between them and eventually creating figures and *Gestalts* from points and lines (Ortner, 2000, p. 10). According to Ortner, for this to happen, an "Archimedean point" must be found in problem space, or created from chaos, by solving an equation with two unknowns: the problem not given and the fact

[15] E.g. Paula Gillespie, who has educated and influenced numerous practitioners and is currently director at the Center for Excellence in Writing, Florida International University, at EWCA in Frankfurt Oder, Germany 2014.

that the knowledge is not yet organized, which is why relevant knowledge is yet to be found. Based on it, relations have to be established; in Ornter's metaphor, the points have to be determined and lines drawn in order to create a *Gestalt* (Ortner, 2000, p. 28).

As sketched above, Ortner recognizes the closed nature of a problem space and propositional knowledge, which does not allow for creativity in writing. He attempts to move beyond this by widening the focus to other kinds of knowledge. In doing so, he refers to the classical memory model of cognitive psychology[16], with its central distinction of declarative and procedural knowledge (or memory). Additionally, he cites Bruner und Olson's distinction between enactive, iconic, and symbolic knowledge as well as Chiompi, who argues for an emotional basis of knowledge. The rationale behind this move seems to be the following: in contrast to representationalism, which theoretically will not deny procedural knowledge, but practically ignores knowledge which is not propositional, Ortner's idea is that non-propositional concepts of knowledge offer a way out of the trap of the "closed procedural knowledge space". His concept of epistemic-heuristic writing, which understands "writing as thinking" – which he sees realized in knowledge transforming writing, as Bereiter & Scardamalia (1987) term it (see next chapter) – is not an act of translation, but an editing, compiling, and processing of knowledge in the medium of language and in the form of a text. In this sense, it relies on propositional knowledge. In his view, the process of knowledge-transforming writing does not replace non-declarative knowledge, but refers to it. Sense epistemic-heuristic writing, then, means building a parallel (but not isomorphic) structure to existing knowledge (Ortner, 2000, p. 10). Unfortunately, Ortner does not explain what he means when he claims that propositional knowledge "refers to" procedural knowledge, nor does he discuss the particular choices he makes concerning the other kinds of knowledge or comment on the "parallel structure" he postulates. Ultimately, the question of how his views on knowledge relate to his metaphor of setting points and drawing lines in order to create *Gestalts* remains open. Thus, the reader is left with a number of loose ends. While his attempt to break out of the "propositional cage" is nonetheless important, in my understanding it fails, because in drawing on the distinction between declarative – procedural (plus other kinds of) knowledge and the idea of changing "modalities" from logical thinking to the metaphor of drawing *Gestalts*, he seeks to bypass the cognitivist framework, but does not leave it after all.

[16] The cognitivist model of memory is characterized by a primary division between declarative and procedural memory ("containing" the respective knowledge categories); another often-used distinction is that between explicit and implicit memory. The idea is that declarative memories fall into the category of either "general" semantic knowledge or "personal" episodic knowledge and can be expressed in language, whereas procedural memories cannot, hence also the notion of implicit memory. Motor programs, habituation, priming cues, etc. would fall into this category. A classic example to explain this distinction is that it is not possible to explain verbally how to ride a bike.

3.4.2 Trying to Redefine the Problem Space

Another approach to circumvent a very narrow conception of problem space comes from Wrobel's understanding of writing as action, which is based on speech act theory (Wrobel, 1995). He (Wrobel, 1995, p. 22) criticizes that Hayes and Flower (Hayes & Flower, 1980) do not focus on text production as a linguistic phenomenon. Furthermore, he points out that "problem" can be situated at two levels, as rooted in a "constellation of states of the world", where writing a letter would be a solution to the problem of communication, or professional writing to the problem of earning ones' living or in "the organization of the writing process itself". Situation the former class of problems in the task environment, the latter in the writing process, he proposes that the two interact in non-trivial ways.

Being a linguist, Wrobel strives for a conceptual framework which makes writing accessible as a language-constituting process. His approach is to differentiate between the social-communicative tasks and inner organization of the writing process. This should allow for a consideration of the range of tasks and writing procedures and activities as well as the influence of factors like routine, individual knowledge, competencies, strategies, etc. in a way which allows for establishing a connection between them (Wrobel, 1995, p. 23). He sees this realized in conceptualizing writing in an action-theoretical perspective and gives an example where an overall *intention*, based on personal *motives*, causes the individual to set a *goal* to serve the *purpose* intended. The goal is to be attained by a using a *plan* as defined by Miller, Galanter, & Pribram (1973): A plan may consist of more or less detailed representations of partial plans – or *sub-plans* – and *strategies*.[17] As an example, Wrobel uses a trip to Rome for leisure and education as an example to point out that some activities will not be planned, because the traveler can draw on routines (Wrobel, 1995, p. 25).

The scheme (see fig. 4) introduces the two levels of problem solving Wrobel h sees as necessary. It is meant to put the focus on writing as action. He acknowledges that while "inscribing" is observable, planning and phrasing usually are not; he therefore has to rely on the author to make his/her internal process of organizing knowledge explicit and complements observation and analysis of products of writing with recall interviews and thinking-aloud protocols (p. 36). In contrast to Gould (1980), who adheres to observation of behavior, the concept of action allows Wrobel to switch between "internal" and "external actions" and thus to alternate methodologies at will. The resulting scheme is

[17] Their model of TOTE units assumes that human problem solving works in an iterative way:

- **T**est (Obtain a representation of the problem state.)
- **O**perate (Do something in the attempt to solve the problem.)
- **T**est (Obtain a representation of the problem state. If the goal state is attained go on to Exit, otherwise go to Operate.)
- **E**xit (Stop if problem is solved.). TOTEs constitute plans and can be nested (i.e. comprise sub-plans).

It is quite apparent that this algorithm is not qualitatively different from Newell and Simon's approach to problem solving.

strikingly reminiscent of the plot of a writer's action following Gould's graph (fig.3) in time, while using a Hayes & Flower-like vocabulary, dividing TRANSLATING into the two actions "phrasing" and "inscribing".

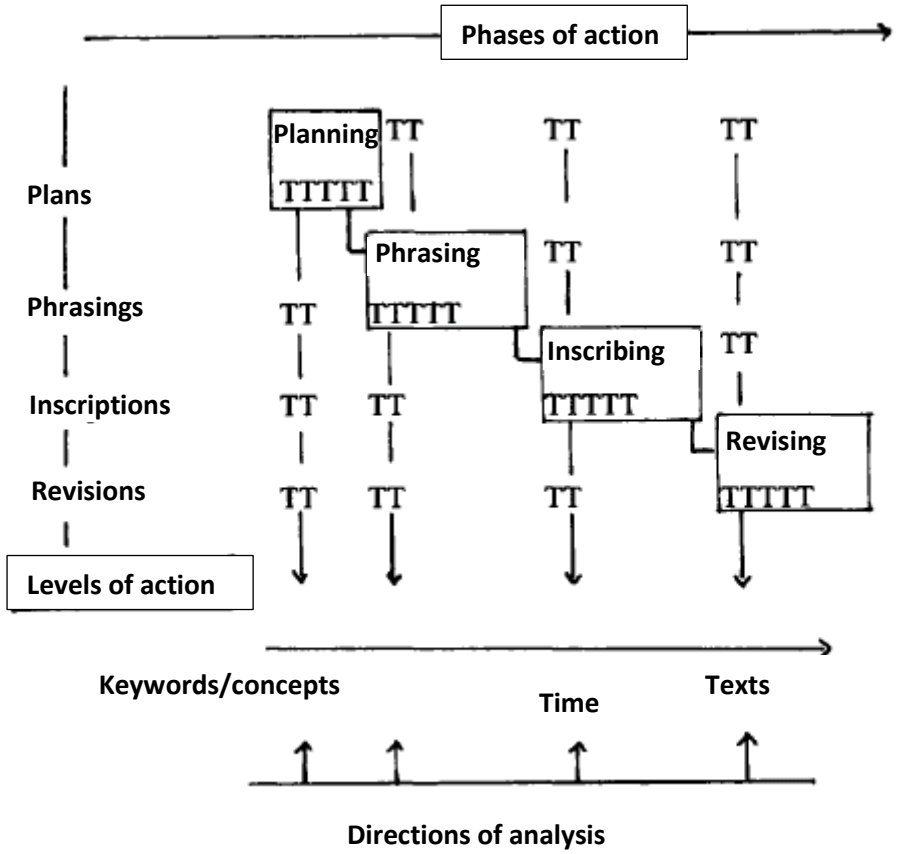

Figure 4: Phases and levels of writing activities (*Sprachhandlungsprozesse*), T stands for *Tun* = doing (translation of Wrobel, 1995, p. 33)

It should be noted that, beyond the "umbrella" of intentions and personal motives (which could theoretically be modelled as another plan to nest the plan as a sub-plan) in this approach, there is almost no conceptual und functional difference to Newell and Simon's goals, plans, sub-plans and methods – indeed, it would be surprising if there was. After all, George Miller, Eugene Galanter, and Karl Pribram are central figures of the cognitivist cognitive science of the time.

The difference that Wrobel (1995, p. 23) points out lies in the conceptual understanding of "problem". While novelty is no category to problem-solving tasks as suggested by Newell and Simon, he juxtaposes "problem" with "routine" and argues that at both levels not all tasks pose a problem, but can also be solved by routine. Here, I suspect that he is confounding the formally defined concept of problem solving as used by Newell and Simon (and, following this, also Hayes and Flower) with the

notion in everyday language, which simply sees problems as difficult or problematic tasks. In Newell and Simon's diction, the latter would be more akin to ill-defined tasks as opposed to well-defined tasks, which suit their problem-solving algorithm. Thus, where Wrobel sees not problems but routine, Newell and Simon's problem solving works; where Wrobel sees a problem which is worth being called a problem, Newell and Simon see an ill-defined task, which must be defined before it can be solved in a routine way. Consequently, despite the fact that action theory is not as mathematically formalized as Newell and Simon's problem solving, it should be noted that the underlying rationale is the very same: the writing process can be cast into a plan – or in Wrobel's case several levels of plans – which are then carried out.

Therefore, while Wrobel's approach widens the perspective on the problem space and thus points to the fact that writing is situated in a rich context, ultimately his approach does not overcome the cognitivist framework of thinking.

Passionate opposition to the view of writing as goal-directed problem solving comes from Ortner, who criticizes writing research as 'representationalist to the bone'[18] (Ortner, 2000, p. 97), seeing language as a mere tool to translate thoughts, with *what to say* on one side and *language* on the other (p. 101). He polemicizes that approaches based on action theory, which view writing as problem solving, are best compatible with viewing humans as rational intentional automata (Ortner, 2000, p.99), who rationally and step-by-step execute? PLANS, EXECUTES, CONTROLS, IMPROVES by using language as a means. He draws on Ryle's (1969, p. 13) notion of the "ghost in the machine" in pointing out that, in this view, language and intention are completely separate, with intention taking the role of the engine (p.106). He furthermore questions whether every producer of a text is able to anticipate goals of the writing process. Although Ortner at times opts for polemic instead of argument, I agree with the message and hope that I have provided some argumentative foundation in the preceding chapters.

3.4.3 Trying to Redefine the Task Environment as Part of the Process

Hayes and Flower include the task environment in the graph of their 1980 model, but its role for the cognitive process of writing it not discussed in the paper. Here, Molitor-Lübbert's (1997) model adds a different view. It is based on the observation that professional academic writers spend their time switching between reading, thinking, and writing. She thus views the production of academic texts as cycles of knowledge acquisition, knowledge production, and knowledge communication. During the production of text, knowledge is developed in a continuous discussion between author, sources, and product. In this, reading plays one – if not the most – important role. Writing, in a more narrow

[18] „Schreibforschung ist bis auf die Knochen repräsentationalistisch." (Ortner, 2000, p. 97)

sense, subserves a variety of functions, ranging from archiving, different kinds of knowledge reproduction, to complex creative writing activities. Her model distinguishes four groups of processes: planning, production, reception, and evaluation processes.

1. Planning processes are the first steps towards making thoughts concrete and translating them into language. They serve to build a representation of the text intended.
2. Production processes serve to materialize these representations. They are encoded in order to be stored externally.
3. Reception processes are an automatic feedback loop for each production process (reading for control) as well as a focus in the context of text production in phases of knowledge acquisition. All forms of reading lead to a building-up of mental representations of what can actually be seen on paper or screen, to a representation of the text realized.
4. Evaluation processes serve to control action by comparing the text realized with the text intended or with the presumed intention of another author.

Molitor-Lübbert's model (see figure 5) differs from the models discussed before insofar as it represents author (the author's cognition) and medium (external storage) as equal *partners in interaction*.

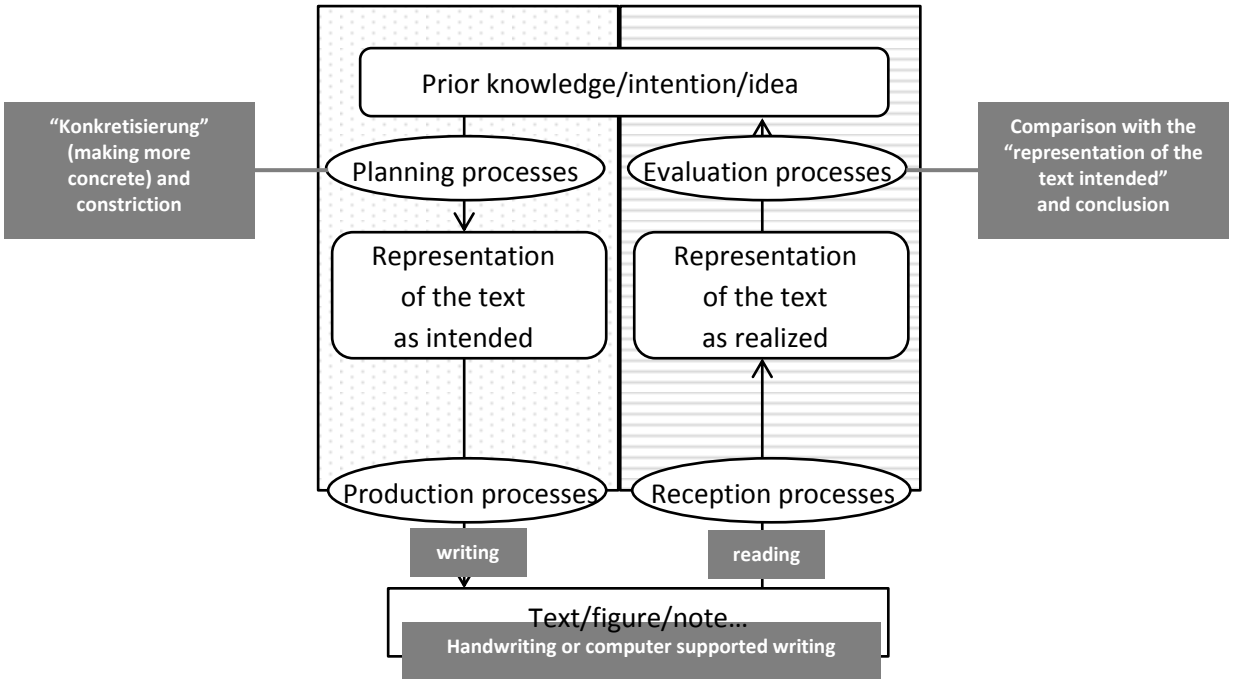

Fig. 5: Flow of information in production strategies for academic texts (after Molitor-Lübbert, 1997, translation by me). The central graph contains all parts of the model and their relations. The grey fields with white text replace figures and the detailed models of the planning- and evaluation processes (p.58 and 60 respectively.)

Thus, instead of being merely a constraint and therefore somewhat external to the cognitive process, the "text written so far", as part of the task environment, is an integral part of the writing process. This view allows for theorizing the role of the medium used for the writing process, including its cognitive dimension.

Figure 5 depicts the flow of information in production strategies for academic texts. The left processing strand, the *planning* and *production processes,* is controlled internally and aims towards the "outside", at the materialization of thought into word ("Materialisierung vom Gedanken zum Wort", p. 51). The right strand of the model, the *reception* and *evaluation procesess*, symbolizes the dematerialization from word to meaning ("Entmaterialisierung vom Wort zur Bedeutung", p. 51). Mental *representations* are the cognitively relevant and specifiable interface between "inside" and "outside". They emerge during information processing and mark intermediate states ("Zwischenzustände") in the flow of information. Both groups of processes are to be understood as in rank and change knowledge structures in head and medium. The processes are understood to be recursive, there is no specific order in carrying out the processes (p. 53).

While I value the interactive nature of the model, specifically the role ascribed to the task environment, I find Molitor-Lübbert's (1997) use of the concepts data, information and flow of information, knowledge, representation, and structures of meaning highly problematic. Molitor-Lübbert (1997, p. 49) claims that even without knowing about content and direction of these processes, what circulates again and again between head, paper, and/or screen is obviously *information*[19]. According to her, the flow of information allows data, knowledge, and representations (the differences between these terms remain conceptually unclear) to be materialized inside and outside, e.g., as an addition to knowledge in memory or as text or file in an external medium. In reading and writing processes, these mentally represented meaning or knowledge structures may differ, since the "inner structures" may stem from a (diffuse) inner store ("Fundus") which is subject to typical memory distortions like forgetting, distortion, or unconscious development, whereas external structures are not subject to unconscious, non-logical influences (1997, p. 55). Thus, despite the fact that she acknowledges differences between "internal" and "external representation", the underlying idea is of a "transport" of data, or knowledge, or representations via the "flow of information" from the world into the mind and vice versa. In other words, the model works if one

[19] Molitor-Lübbert does not give a definition of the notion of information she refers to. It seems to be a conceptual mixture of semantic information and Shannon information, taking "meaning" from the former and "transferability" from the latter concept. An overview of notions of information and their (often not so explicit and clear-cut) use with regard to cognition can be found in Lyre (2002).

accepts a (naïve) realist epistemology along with the idea that the world is represented in the mind in a structurally equivalent way (granting some distortions due to failure of wetware).

Here, writing research touches upon the old, yet unsettled debate on the role of representation in the relation between mind and world, which I will suspend for now and pick up in the second part of the thesis. For now, I will introduce Ortner's perspective on the role of the "text so far" for the writing process. Like Molitor-Lübbert's approach, Ortner considers the role of the "text written so far" – the artifact produced – In the process of writing, but does so in more depth.

3.4.4 Trying to Redefine the Role of the Written Product

With regard to the tangible nature of writing, Ortner argues that linguistic expressions are – more than other conscious actions – particularly well-suited to stabilize: when we speak and write, we capture, record, stabilize, tighten, and make tangible the inner as well as outer world (Ortner, 2000, p. 128). In this sense, language and writing are – in many cases – means of giving substance to fleeting impressions, to what is vaguely present in the background or in the foreground, but barely graspable. He refers to writing as *materiality in the flesh of language* ("Materialität im Fleisch der Sprache", Ortner, 2000, p. 130). In the materializing process of writing, linguistic expression becomes graspable as *objectivations*, which offer orientation for human beings' actions by providing distance, permanence, and editability.[20] As such, *objectivations* in language allow for thinking in a qualitatively different way, creating a part of the world as a workpiece to be processed further.[21]

Ortner's idea of the actual process of writing is that language offers small reusable units which are arranged according to calculation-like rules or abstract patterns. The metaphor he uses is that of pixels which are arranged to form a line or picture. Characteristics of *objectivations* are (p. 131):

- They are material or immaterial products in a production process.
- In language, they organize content and structure of strings of signs ("Zeichenketten"). Drawing from Gestaltpsychology, Ortner describes *objectivations* as figures before a (relatively unstructured) background and as figures which are unfolded to Gestalts like verbal chains, texts, or utterances. The engine for these processes is the search for equilibrium between *objectivations*.

[20] In the context of Ortner's research, the concept of objectivation serves to justify why self-reports of professional writers may be used as data for writing research: they provide the traces from which writing strategies may be reconstructed.

[21] If we replace *objectivation* with representation, the reader more familiar with Cognitive Science may be reminded of Clark and Chalmer's extended cognition hypothesis; Clark (2006) also writes about the materiality of the "ultimate artifact" language. I will elaborate on this in chapter 7.2.3.

- *Objectivations*, as objects of controlled (or controllable) behavior, can be manipulated in processes.
- The role of language in *objectivation* is materialization, stabilization, and socialization of *objetivations*, providing a basis for potential further processing. As such, language is a medium for balance between different *objectivations* and a medium for the production of a *social final version* ("soziale Endversion", p. 132).

I may do Ortner's thinking injustice, but in his idea of the process he is himself caught in the trap of the representationalism he so strongly criticizes: "objectivation of a piece of the world in a linguistic version" transports the assumption that language is there to represent the world in the sense of translation. Although he points out that the piece of the world being created is an *individual* version ("individuelle *Welt(-ausschnitts)version*", p. 130), the idea of a symbol coding entities in the world, i.e. the idea of language symbolically *representing* entities in the world, is not abandoned. Like Molitor-Lübbert, Ortner assumes that symbols of the "inner world" are coding for objects in the outer world. This perspective is qualified by the idea that propositional knowledge "refers to" other kinds of knowledge and the idea that the world represented in the text is an individual version. Conceptually, writing boils down to symbol manipulation, as he characterizes writing as "propositional work" (p. 5), as an act which interweaves and connects propositions ("das Schreiben als propositonsverwebende- und verknüpfende Tätigkeit", p. 5).

However, Ortner's approach differs from the cognitivist approach in two aspects: First, in his focus on the material nature of language, particularly the written product, and its effects on thinking: instead of mental representations, there can be inner or outer *objectivations*, which in turn may allow for qualitatively different ways of thinking. Second, he holds that writing is not always motivated by a problem to be solved, but may as well be rooted in a striving for coherence between *objectivations*, in aiming for a state of equilibrium.

3.5 Discussion

The cognitive process theory of writing in its successive versions centers on the "sub-processes" of writing, while remaining at best vague with regard to the question how a writing process is orchestrated. In this sense, there is no place for the writer, which, from a didactic point of view, begs the question of how informative such a theory can be for practitioners in process-oriented writing didactics who are dealing with whole writers and their individual writing processes.

The “classical” model of writing as a cognitive process by Hayes and Flower as well as its successors is fit to solve “closed”, well-defined problems. However, writing tasks tend to be highly “ill-defined”. Many activities, especially in the early phases of a typical academic writing project, like a seminar paper, are more akin to finding and defining “the problem” rather than solving a given problem by calling the relevant mental processes. Moreover, in the current approach problems will be solved on the basis of propositional knowledge. I argued that in this approach the process of writing is “knowledge neutral” in the sense that the process operates on propositions, but structures and processes are independent and do not have an impact on each other. Propositions of different fields of knowledge may be de- and re-contextualized in the same process of writing, inferences may be made on the basis of basic propositions, which may yield new propositional knowledge structures, but nothing qualitatively new. Thus, if writing is to be the epistemic-heuristic and even creative process that, for example, Molitor-Lübbert and Ortner claim, the atomistic concept of propositional knowledge as well as seeing the role of knowledge in the writing process merely as resource or, if not “well-organized”, hindrance, the role of knowledge in academic writing processes must be reconsidered. Furthermore, I argued that the position of the “rhetorical problem” as something which is “added” to the writing process is collateral damage caused by the cognitivist approach with its concept of knowledge, as used by Hayes and Flower. Instead, it should be at the center of any cognitive theory of the writing process. Understanding writing as problem solving neglects the fact that writing, especially when working on an academic text, is not an end in itself. As Ortner points out, writing can also be rooted in intrinsically motivated attempts of striving for coherence/ a state of equilibrium. Academic writing is usually *about* something of importance to the writer, at least in the world s/he shares with a particular discourse community.

On a more abstract level, this still prevalent cognitivist approach in writing research describes cognitive processes as modules which eventually sum up to the “whole individual”, controlled by a monitor or central executive or ominous homunculus which organizes the single modules in running their cognitive processes in order to come up with plans and decisions for action. The researcher’s focus on the single module creates a perspective which “naturally” renders goals, motivations, and the like external events, which potentially disturb the otherwise smoothly running cognitive process.[22] In this vein, knowledge (if “disorganized”), rhetorical problem, and written speech are also viewed as “constraints” potentially hindering the writing process. In seeking to provide a solution to the theoretical problems posed above, Ortner suggests widening the concept of knowledge by assuming propositional knowledge to refer to other types of knowledge; in contrast, Wrobel draws

[22] I have merely spelled out this criticism for the writing research presented above, in cognitive cognitivist approach has been debated at least since the 1970ies (e.g. Varela, 1990).

on speech act theory, framing speech acts as linguistic action (*Sprachhandlungen*) and considers the context of the writing process; finally, Molitor-Lübbert and Ortner seriously include the "text written so far" into the theoretical account of the writing process. However, with the partial exception of Ortner, none of them depart from the idea that writing is problem solving by operating on propositional knowledge. I hope to have convinced the reader at this point that doing so is, indeed, a good idea.

Writers of all levels of expertise usually do not experience academic writing as a routine process "running smoothly". To pick up on Wrobel's comparison above, maybe we should not attempt to picture the process of writing as well-plannable as a trip to Rome. A more adequate image may be an expedition into unchartered territories, where opportunistic planning and charting complement each other as we try to plan for the expected and improvise with the unexpected, using the equipment at hand. A first step towards accounting for such a "messy" process is to develop a different view concerning the "constraints" posed by knowledge, the rhetorical problem, and written speech. They suddenly rise from an "added constraint" to the core of the writing process, addressing knowledge ("*what* I want to say"), the writer's relation to the academic community ("to *whom* will I say what in a way which will have the *desired effect*"), and last but not least the writer's own position in discourse ("*I*").

An alternative theoretical account of academic writing as a cognitive process thus

1. needs to develop a different account of the role of knowledge in the writing process and
2. needs to place the "rhetorical problem" at the center rather than at the periphery of the writing process.

I agree with Ortner that the effects of *objectivation* in general and its effect on thinking in particular need to be considered. Thus,

3. the role of the environment, particularly the artifact produced ("text written so far"), and, with it,
4. the very nature of writing as a cognitive process, which is widely understood to be "written speech",

need to be reconsidered as an inherent part of a theoretical account of writing.

After the central position of the cognitive process as symbol manipulation has become vacant, I propose to follow what successful practice in process-oriented writing didactics teaches:

5. consider "the whole writer".

Conceptualizing cognitive processes (almost) exclusively as internal has led to – loosely speaking – the necessity to model a whole (very much bounded) world within the individual. In my attempt to understand academic writing as a cognitive process, I propose to take a broader perspective and consider the writer in his/her interaction with the environment(s). Considering the environment, it is possible to focus on its physical, social, and cultural, and – although not considered in this context – virtual aspects. It is not by accident that figure 6 places what has been referred to as "constraints" at the center of the writing process, cutting across writer and environment. In considering the role of knowledge, the nature of writing, and the rhetorical problem, I do not want to the reader to infer that they are independent of each other; rather, I am using them as categories under which I will proceed to discuss the interaction processes between writer and environment.

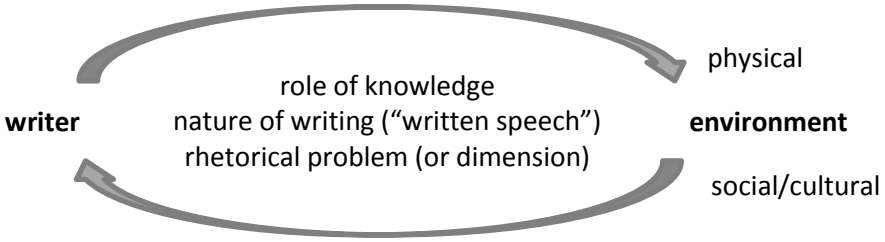

Figure 6: Perspective on writing as a cognitive process (for explanation see text).

The arrows mark a possible impact of writer and environment on each other, in an ongoing process. Thus, the writer must be seen not as static, carrying out cognitive procedures, but as a developing individual affected by and affecting his/her world. Figure 6 should be understood as a framework for the discussion in the next chapters. I should state again that my interest is in the development of the academic writer, starting with the transition phase from school to tertiary education.

In theorizing about writing processes, at least two temporal domains play a role, either explicitly or implicitly. While Hayes & Flower (1980) dismiss the idea of a phase model, Gould (1980) and Wrobel (1995) relate to them in the sense that they propose a process at macro-level, which represents the progression of the overall writing project, whereas the process at micro-level refers to writing-as-it-is-happening. A writing project can span a short period of time, like writing an email or letter, as in Wrobel's research, or a longer period, like writing an academic publication or a thesis. If writing is considered a cognitive process, this encompasses at least two temporal domains: the act of writing in "real time" as observable behavior, or "writing-as-it-is-happening", and the cognitive processes in organizing the academic writing project from research question (or assignment) to finalization, i.e. all actions leading to the final text. It may span, e.g., in case of a thesis, considerable periods of time and

encompass intermediate products (texts of various genres, diagrams, tables, drawings, etc.) and other observable behaviors.

With regard to the development of the academic writer, changes may be expected at both levels. In the following chapter I will therefore focus on the cognitive developmental dimension of academic writing.

4. A Cognitive Developmental Perspective on Writing

The phenomenon of interest of this thesis is the development of the novice student into an academic writer. There is wide-spread agreement that writing and thus academic writing is subject to several years of development. The Gregg & Steinberg volume "Cognitive Processes in Writing" (1980) contained not only the first empirically grounded model of writing as a cognitive process, but also the first developmental model, developed by Bereiter (1980), which remains widely received. It can be seen as a precursor to the still predominant cognitive developmental model, proposed by Bereiter & Scardamalia (1987). Kellogg (2008) suggested an additional developmental stage to their model. An indicator for these model's prevailing dominance is the fact that the respective publications or key passages from them have recently been translated to German in order to be more readily available for writing tutor education (in Dreyfürst & Sennewald, 2014). In this chapter I will introduce these models and discuss their interrelationships, putative developmental "mechanism", and the number of developmental stages assumed. Finally, I will discuss the models against the background of the "constraints" of knowledge, written speech (rather: the nature of writing), and the rhetorical problem (or dimension); I will then reconsider the recursivity of the writing process and argue once more that a cognitive developmental account of becoming an academic writer should consider more than an isolated cognitive process.

4.1 Bereiter's First Model of Development in Writing

In his paper "Development in Writing", Bereiter (1980) suggests that it is useful to talk about writing development in its own right, despite the probability that it may reflect other kinds of development.

Based on a literature review, he identifies five characteristics which differentiate written from spoken English and provides a description of the corresponding developmental task to be mastered (for details see table 2). While the first four steps described refer to the development of school children, the last can already be understood as touching academic writing.

Characteristics of Written English	Challenge
Written English is more compact, shows higher elaboration and specificity of subjects, less local variation, and a different usage and distribution of linguistic devices.	differentiation of written and spoken English as distinct subsystems
Written English is tied to different modalities than spoken English (exceptions granted, e.g., writing a dialogue for a play).	ability to switch between both modalities
Written English has to follow conventions regarding spelling, punctuation, etc., which are learned in school.	mastery of conventions of writing
Writing may both demand and foster a different mode of thinking. Since writers are not directly in a discursive situation where they get feedback, they do not know their readers, their contexts, or their state of knowledge. Rather than referencing shared experiences, writing demands explicit references and building logical arguments ("propositions linked together by logical entailment").	explicit, objective, and context-free propositional language
Writing can be learning like a craft since written English can be shaped and reshaped more deliberately, which also allows for products which are difficult to achieve in spoken language, like novels, poems, or scholarly work.	proficiency in various genres and literary style

Table 2: Characteristics of written English and corresponding challenges to be mastered by the learner. The challenges can be understood as developmental tasks (summarized after Bereiter, 1980).

Bereiter (1980) proposes a model of hierarchic skill integration, where all "skill systems" of automatized skills in the different domains process, product, and reader are integrated in order to achieve a higher functional skill. As this new skill system becomes automatized, a higher functional skill can be achieved at each stage. Figure 7 provides a visualization of the model. The first stage, *associative writing*, consists of writing down what comes to mind without ordering it. It is the most basic skill system to yield intelligible text. It builds upon the "mechanical" (sensomotorical) ability to write and what Bereiter (1980, p. 83) refers to as "ideational fluency", the ability to produce associations in a controlled manner. Flower & Hayes (1980) refer to this kind of writing as "writer-based prose", i.e. writing which suits the writer in representing ideas in the order they occurred rather than reader-oriented. The challenge experienced by the writer is primarily what to write. If the topic assigned (or found) is interesting, this results in better ideational fluency, which in turn leads to a better-developed and coherent text. In this sense, writing is perceived as data-driven (as opposed to concept-driven)[23]. When there are no more new ideas, the writer will stop, regardless of coherence or completeness of the text.

[23] Bereiter himself does not elaborate on the difference, a way this distinction may potentially be understood as a precursor of Bereiter & Scardamalia (1987) cognitive developmental theory: the concept behind data-driven writing may be similar to *knowledge-telling writing*, whereas concept-driven writing involves a plan and may be more akin to *knowledge-transforming writing*. In the next subchapter, both writing strategies will be introduced in detail and context.

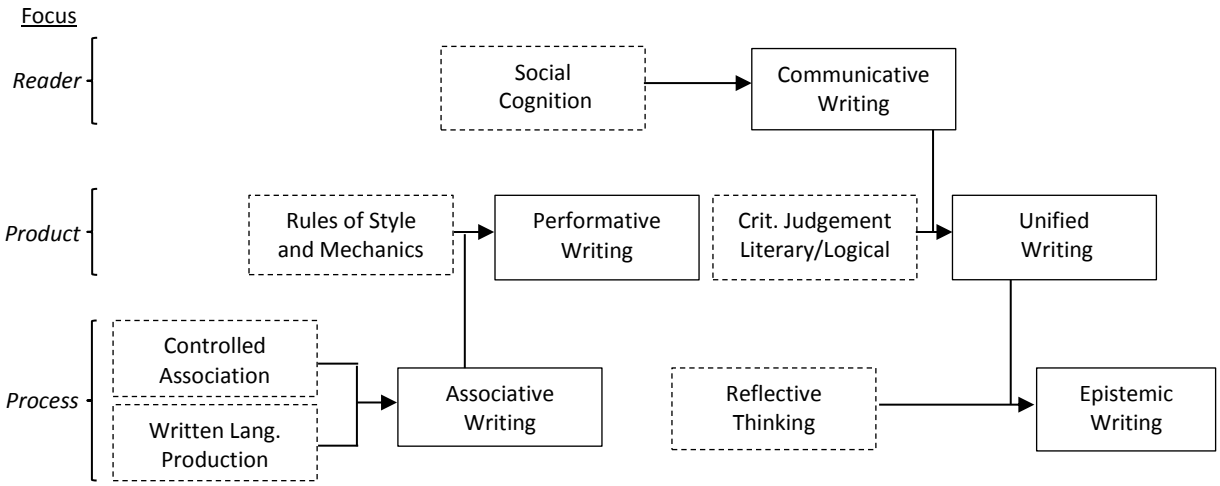

Fig. 7: A model of skill systems integration in writing development (following Bereiter, 1980, p. 84)

The next skill system in Bereiter's hierarchy (1980, pp. 82-88) is *performative writing*. It builds upon *associative writing* and integrates it with rules of style and mechanics of writing, i.e. with spelling, punctuation or more demanding conventions, like varying length and complexity of sentences and making clear, non-ambiguous references, or avoiding particular expressions. The challenge experienced by the writer is not to be thrown off what to write by these conventional demands. *Communicative writing* integrates *performative writing* with social cognition and is aimed at having an effect on a potential reader. The challenge is taking the point of view of a hypothetical reader. This provides the basis for *unified writing*, which integrates *communicative writing*, the ability to consider others' perspectives in writing and thus the ability to evaluate ones' own text by being able to read it critically. This feedback-loop enables the writer to shape the text according to his/her own standards, which is the basis for developing ones' own style. Bereiter (1980, p. 87) marks this point as crucial, because "writing becomes a productive craft and not merely an instrumental skill". The final stage is *epistemic writing*, which integrates *unified writing* with the ability to think reflectively. Bereiter relies on Olson (1977) in stating that "[w]riting, because of its amenability to storage, review, and revision, makes possible a kind of extended and involved thought that is almost impossible without writing" (p. 88) and thus allows the writer to discover that the writing-reading feedback-loop acquired in the stage of Unified Writing does not only improve the text, but also understanding. This way, a writing process can become "a personal search for meaning" (p. 88):

> *Epistemic writing represents the culmination of writing development, in that writing comes to be no longer merely a product of thought but becomes an integral part of thought. It*

> *becomes part of what Vygotsky has called the "extracortical organization of complex mental functions [quoted in Luria, 1973, p. 31]." As a result, the various skill systems that have been integrated to produce mature writing competence may now be enriched by the cognitive consequences of writing.* (Bereiter ,1980, p. 88)

As a developmental step, *epistemic writing* qualitatively differs from the previous developmental steps, since it changes the individual's cognition in the way that the very act of writing is integrated into a cognitive process – it becomes a tool for thinking in a qualitatively different way.

Bereiter's first stage model, based empirical studies of school students, is per se not a cognitive model; however, Bereiter (1980) maintains that writing development cannot be understood without one and defines what a full cognitive model of writing would have to account for.

> *"A complete processing model would have to deal with all three of these aspects – with the cognitive moves that make up writing and their organization; with levels of processing, from the highly conscious and intentional to the unconscious and automatic; and with how processing capacity is deployed to these various functions in such a way as to enable writing to go on."* (Bereiter, 1980, p. 78)

Clearly, Bereiter saw himself at the beginning of his research, and together with Marlene Scardamalia he later proposed the cognitive developmental model, which still shapes the way we are viewing writing development.

4.2 From Knowledge-Telling to Knowledge-Transforming

The research that Bereiter & Scardamalia (1987) summarize in the book "The Psychology of Written Composition" can, in a sense, be perceived as a closing in on his initial hypothesis that, from a certain developmental stage onward, writing allows for a support of thinking in a qualitatively different way. They propose that learning to write involves reconstructing the language production system in a way which allows for functioning not only interactively, like in a conversation, but autonomously. This must be explained in more detail: A conversation is interactive not only in the sense that two people exchange and negotiate ideas, they also continuously support each other by providing cues. They indicate to each other whether they have understood, whether to stop, proceed, elaborate, change the topic, and they raise questions and support the other in recalling memories. This support is also present in asymmetrical conversations, as between direction-giver and -follower, accuser and accused, etc. In written composition these supports are suddenly gone.

Written composition thus demands learning

1. how to generate text without a respondent,
2. to actively search for contents,
3. to plan a whole text,
4. and, finally, to evaluate one's own text.

Whereas in the 1980 model writing was discussed as a skill, Bereiter & Scardamalia (1987) have adopted the predominant view of the time (see, e.g., Berkenkotter, 1982) that writing is essentially problem solving. They thus situate their research in the cognitive science of the time and make a point of characterizing writing tasks as ill-defined problems.

> *The mental activities of writing considered in our research are the same kinds of higher mental processes that figure in cognitive research on all aspects of human intelligence. They include goal setting, planning, memory search, problem solving, evaluation, and diagnosis. … Cognitive science has been gradually working its way from well-defined to ill-defined problems, from tasks that drive from limited knowledge to tasks that draw on large bodies of knowledge, and from tasks that are easily constrained experimentally to ones that are more susceptible to intentions of the participants. On all of these counts, writing lies far out on the yet to be reached end of the continuum.* (Bereiter & Scardamalia, 1987, p. xiii)

The starting point of Bereiter & Scardamalia (1987, pp. 4-5) is the observation that writing is based on linguistic competences shared by all humans, yet it is often seen as difficult to acquire and will be acquired to highly varying degrees of expertise by different individuals. This is mirrored in the literature, which either treats writing as a natural consequence of spoken language development, i.e. as *natural*, or as an ability mastered only with effort, i.e. as *problematic*. This begs the question of whether there is one cognitive process, with a few parameters set differently, or whether expert writing follows a quantitatively different model (Bereiter & Scardamalia, 1987, p. xiv). Based on their research, they propose two cognitive models of writing, i.e. the more "natural" *knowledge-telling writing*, which relies much on spoken language competence, and *knowledge-transforming writing*, which builds upon the former and additionally relies on deliberate control of the cognitive processes needed for the composition of texts.

4.2.1 The Cognitive Model of Knowledge Telling

Bereiter and Scardamalia (1987, pp. 6-7) assume that writing is rooted in discourse and that learning to compose a text involves overcoming the lack of cues present in conversations. To use their own words, "the knowledge-telling model is a model of how production of discourse can go on, using only these sources of cues for content retrieval – topic, discourse schema, and text already produced" (p. 7). The topic is usually determined by an assignment in school, which according to them is part of "ordinary living" and thus provides an environment in which writing is almost inevitably acquired (p.

8). Put simply, the "developmental task" for reaching the stage of knowledge-telling writing is to become independent from oral interaction and to be able to rely on memory for producing a text. To reach a point in development where writing matches the proficiency of the writer's oral language abilities takes about six years. The quote of a 12-year old on text composition illustrates the composition strategy at the stage of *knowledge telling* best (p. 9):

> *I have a whole bunch of ideas and write down until my supply of ideas is exhausted. Then I might try to think of more ideas up to the point when you can't get any more ideas that are worth putting down on paper and then I would end it.*

The focus of this kind of writing strategy is on what the writer has to say, which is why it is also referred to as egocentric or "writer-based prose" (Flower, 1979). Another interesting observation is that the fact that a student writes something down does not have a sustained effect on his/her view on the topic: Bereiter and Scardamalia report on a study which involved identifying student writers' main points from a text which was either their own paraphrased text, an "upgraded" text sharpening the student's statement, or a "downgraded" text, which elevated a minor point to main point status. Interestingly, there was "evidence of considerable development between grades 5 and 11 in the extent to which students seemed to have a firm grip on what their main points where. When presented with a single main-point statement, the younger students tended to accept it as valid, no matter which version it was, and when presented with all three versions at once they had trouble deciding and tended to judge on the basis of details" (Bereiter & Scardamalia, 1987, pp. 354-355). In other words, at this early stage, the act of writing does not seem to "feed back" on the student's understanding.

Figure 8 visualizes the knowledge-telling process, which begins with the mental representation of an assignment as a starting point. It makes use of content and discourse knowledge at various points in the process (see arrows). At first, topic and genre identifiers are extracted from the assignment, which prime associated concepts through a process of spreading activation. This process is taken to work automatically, so provided the initial cues extracted from the assignment were chosen appropriately and the writer has stored the necessary knowledge in memory, monitoring or planning for coherence are not required for content-knowledge retrieval. The retrieval of discourse knowledge is taken to work analogously.

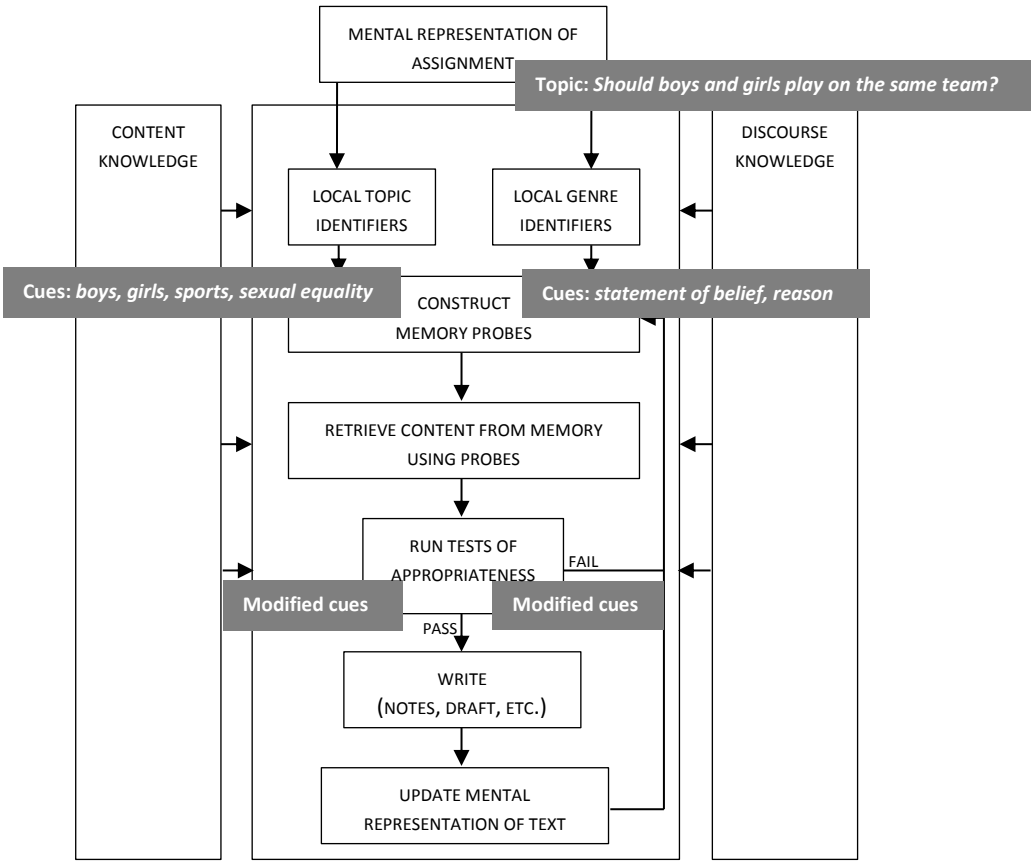

Figure 8: Structure of the knowledge telling model, after Bereiter and Scardamalia (1987, 8). The additional grey boxes integrate the example of a topic and possible cues given in the original text.

Items of content are retrieved, tested for appropriateness, and, if passed, written down as notes or text. Then the next cycle of content generation begins.

A definite strength of this model is that, given a suitable and motivating topic, it manages to explain how novice writers can produce coherent text. By making use of the knowledge and cues available, the writer can immediately begin to produce text and will do so until s/he runs out of new ideas without engaging in planning and goal-setting which exceeds language production in a conversation. Differences in quality of text can be accounted for by individual differences in content and/or discourse (genre) knowledge or explained by variations in language abilities. The latter are not part of the model. Bereiter & Scardamalia's (1987, p. 10) conclude that "it should be little wonder if such an approach to writing were to be common among elementary school students and to be retained into university and career." For practice, the model provides an explanation as to why it is a good investment for teachers to invest in their assignments in order to make their expectations clear and explicate the steps necessary to meet those expectations: a 'good' assignment will yield better

results. Furthermore, one may infer that the discourse or genre knowledge the writer draws on implicitly may be greatly influenced by reading practice.

4.2.2 The Cognitive Model of Knowledge Transforming

While *knowledge telling* amounts to 'writing down whatone has in mind' about a particular topic, *knowledge-transformig* writing may feed back on the writer's knowledge so that the process of writing may play a role in the development of the author's thoughts. Writing becomes a process "in which the thoughts come into existence through the composing process itself, beginning as inchoate entities ('driblets') and gradually, by dint of much rethinking and restating, taking the form of fully developed thoughts" (Bereiter & Scardamalia, 1987, p. 10). Part of the knowledge transforming model (fig. 9) involves the interaction between a content problem space and a rhetorical problem space, specified in the Dual Problem Space Model, which visualizes the relation between both problem spaces (Bereiter & Scardamalia, 1986, p. 303).

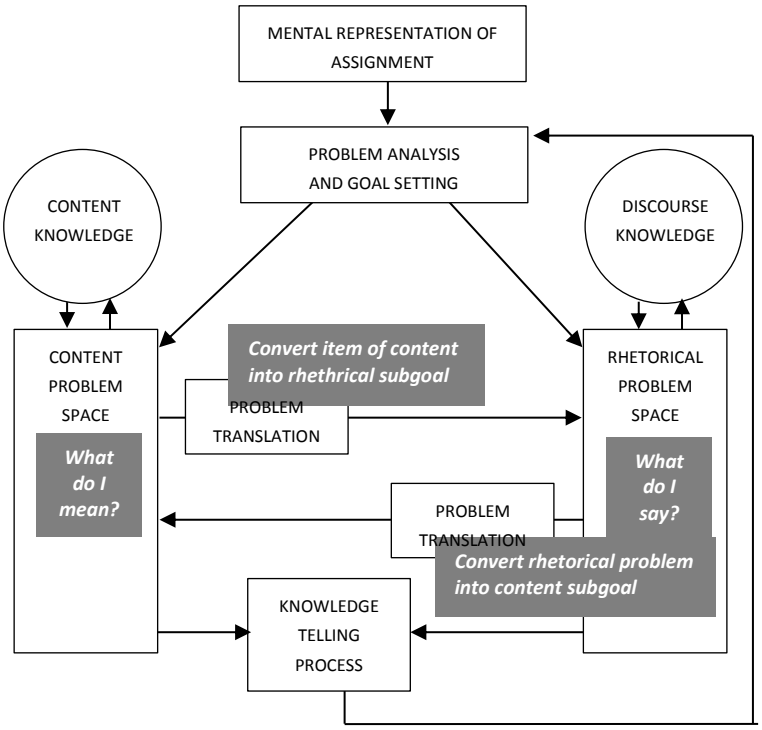

Figure 9: Structure of the knowledge transforming model, following Bereiter and Scardamalia (1987, p. 12). The grey boxes contain comments given in the Dual Problem Space Model (p. 303).

The problem space consists of states of knowledge and operations (e.g., inference), which can transform one state of knowledge into another (Hayes and Flower refer to the strategy of knowledge transformation following Newell, 1980, which differentiates between a content and a rhetorical problem space). Each problem space generates sub-goals which are fulfilled in the other space. More specifically: In content problem space, beliefs of the writer can be changed through operations like inference or hypothesis building. Rhetorical problem space represents the rhetorical situation (the text and the goals connected with that text). It deals with the relation between contents and possible reactions of the reader. Operations change text, goals, or relationship between text and goals. Knowledge transformation happens in content space, if there is an interaction between rhetorical and content space. This interaction is referred to as "reflective processes in written composition". Both components realize the process of knowledge reproduction (see Bereiter & Scardamalia, 1986, p. 12).

4.2.3 The Relation between Knowledge Telling and Knowledge Transforming

The characteristic difference between the knowledge-telling and knowledge-transforming strategy is that knowledge-transforming writing involves planning incorporating strategic goals and sub-goals (plus other components of problem-solving strategies). "The knowledge-telling model implies that knowledge of text structures plays an active role in text production, but not in the deliberate planning of the text's overall structure. It is therefore consistent with the model that immature writers should show an absence of implicit references to discourse structure in their composing protocols but should nevertheless have some representation of structural features of their texts" (Bereiter & Scardamalia, 1987, p. 354). It is important to note that knowledge-telling as knowledge-reproducing writing is not abandoned but embedded in the knowledge-transforming strategy: "the knowledge transforming model is not simply an elaboration of the knowledge-telling model. Rather, it is a different kind of model – essentially a problem solving model as opposed to a task-execution model – which incorporates the simpler model as a sub-routine" (Bereiter & Scardamalia, 1987, p. 341), i.e. knowledge-telling and knowledge-transforming are two steps in one developmental process, where one builds upon and later incorporates the other.

A text itself does not allow one to infer how it was produced (i.e., which strategy the writer used), a text written in "knowledge-telling mode" may yield a suboptimal but still acceptable result (Bereiter & Scardamalia, 1987, p. 183). A study using thinking-aloud protocols showed that a difference between in writers can be found with regard to the proportion of what has been 'thought aloud' to be found in the text: In knowledge-telling writing, thinking-aloud protocol and text may be almost identical, whereas in knowledge-transforming writing statements which can be found in protocol as well as text differ (Bereiter & Scardamalia, 1987, p. 21).

Interesting are the differing implications for knowledge: “from the perspective of the knowledge telling model, knowledge is something one already has and that remains intact; writing is a matter of conveying a selection of this knowledge to someone else”, whereas knowledge transforming – here Bereiter and Scardamalia cite an aphorism by C. Day Lewis – is writing to change one’s knowledge: “We do not write in order to be understood; we write in order to understand” (Bereiter & Scardamalia, 1987, p. 22).

Kellogg (2008) points out that writers at the knowledge-telling stage struggle with the literal meaning of the text, whereas at the knowledge-transforming stage writers build a representation of what the text means. Writers at this stage plan and revise more, because they can perceive whether there is a difference between the text produced and what they meant to say. He also points to research showing that the act of writing becomes a means of actively forming representations of knowledge in long-term memory. This is the reason why Bereiter & Scardamalia (1987) refer to knowledge-transforming writing as reproducing knowledge: it becomes a tool for learning (memorizing) and understanding. A quote by Otto Kruse illustrates this: “Many things I will not understand until I try to write them down. Many things I believe to have understood until I try to write them down” (Kruse, presentation at Vienna University, rough translation by me)[24].

[24] *„Vieles versteht man nicht, solange man nicht versucht hat es zu schreiben. Vieles glaubt man verstanden zu haben, bis man versucht hat es zu schreiben.“*

4.3 A Third Developmental Stage: Knowledge Crafting

Building on the work of Bereiter & Scardamalia (1987), whose research focused on the writing development of high school and college students, Kellogg (2008) proposes a third stage in the development of the professional writer, which he refers to as knowledge crafting. It is characterized by the progression to professional expertise, which is reached by journalists, editors, or academics.

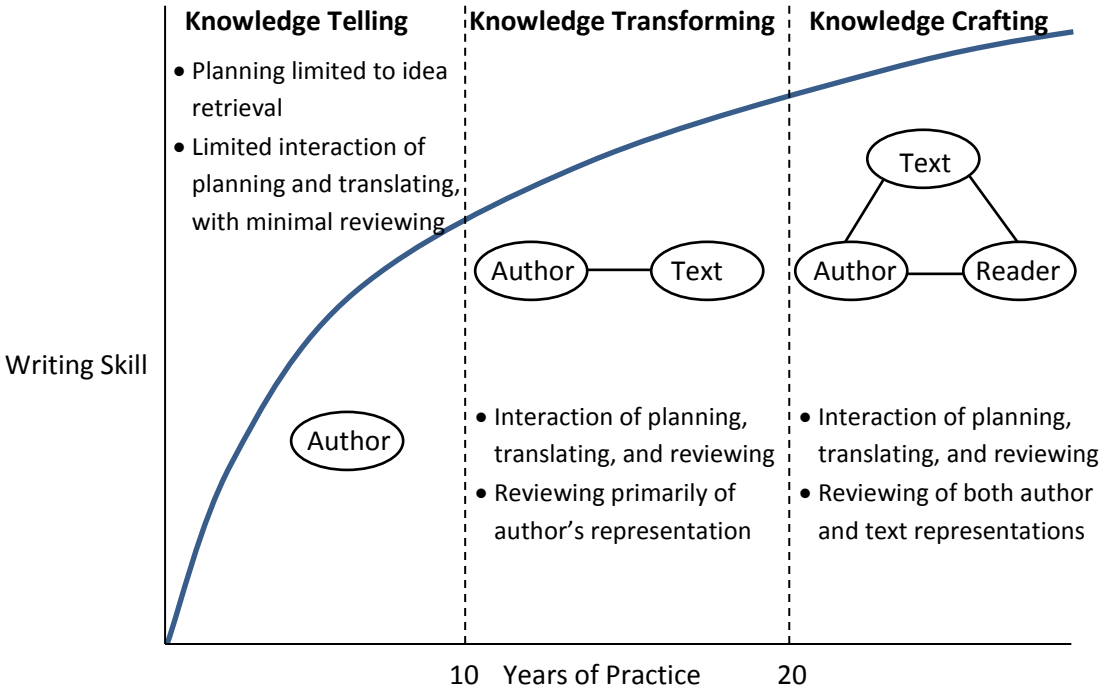

Figure 10: Macro-stages in the cognitive development of writing skill (following Kellogg, 2008)

At this level, writing "involves modeling not just the reader's view of the writer's message but also the reader's representation of the text itself" (Kellogg, 2008, p. 7). This stage describes the professional writer, who does not only know whether the text says what s/he thinks, but who also builds a representation of the potential reader and tailors the text towards a particular audience. Figure 10 gives a summary of the stages in the cognitive development of writing skill. In the context of academic writing, this is of particular interest since, at the level of a Master's degree, this is the level of writing which is demanded of students.

Kellogg argues that, analogous to becoming an expert chess player, "learning to become an accomplished writer is parallel to becoming an expert in other complex domains" (p. 2) and involves at least 10.000 hours of practice or ten years. A view of writing through the lense of expertise research can already be found in Flower & Hayes (1981). By age 14-16, writers will have mastered

knowledge telling. To reach the stage of knowledge transforming will demand another 10 years. Kellogg suspects that it takes several years to acquire the domain-specific rhetorical skills needed in order to be able to craft knowledge for a specific audience, thus he expects this stage not to be reached until after college (Kellogg, 2008, p. 11). Transferred to the German-speaking university system, this would mean that we cannot expect fully fledged academic writing competences at Bachelor level – and maybe not even at Master level, if writing is not practiced enough.

Kellogg's view of the challenges involved in writing is strongly shaped by the role of "limited attention and storage capabilities" he ascribes to writing processes: "working memory limitations in holding and manipulation representations of how the reader interprets the text, while simultaneously managing the author and text representations, is a fundamental break on the writing skill of writers throughout childhood, adolescence, and young adulthood" (Kellogg, 2008, p. 8). The memory systems are so relevant, because Kellogg assumes that each stage of writing development involves representing and manipulating an additional domain: At the knowledge-telling stage, the writer needs to be able to represent the knowledge s/he wants to write about; at the knowledge-transforming stage s/he needs to be able to represent the text in content as well as in rhetorical content space and thus needs to be able to reflect on whether the text says what s/he wanted to convey; and at knowledge-crafting stage the writer additionally needs to be able to build a representation of the audience in order to be able to predict how the potential reader will understand the text. Thus, in Kellog's view any increase in writing competencies rather heavily relies of an expansion of working memory, which is to exert "executive attentional control" (p. 11) over the coordination of three representations. He allocates this function in the MONITOR of Hayes & Flower's (1980) first cognitive model and suggests "that the availability of executive attention ought to be a major constraint on the development of writing skill" (Kellogg, 2008, p. 13).

Bereiter & Scardamalia's (1987) as well as Kellogg's (2008) models rest on cognitivist assumptions as much as the cognitive process models presented in the previous chapter. I do not want to repeat the criticisms here, but instead focus on the differences, relations, and implications of the models with regard to understanding the 'developmental tasks' of the writer.

4.4 Relations and Differences among Cognitive Developmental Models

4.4.1 How Do the Different Models Relate?

Bereiter's first developmental model (Bereiter, 1980) proceeds from the differentiation of written and spoken English via the mastery of writing conventions to the ability to produce explicit, objective,

and context-free language and, finally, to proficiency and literary style. The development of the writer proceeds through five stages, from associative writing, via performative, communicative, and unified writing, to epistemic writing. At least the two first stages are not far from the kind of approach Bereiter & Scardamalia (1987, p. 56) criticized by citing the 1974 manifesto of the CCCC (Conference on College Composition and Communication): "Implicit in conventional school approaches has been the assumption that mastering written composition is a matter of incorporating new rules into an intact language production system – rules unique to the written medium, such as spelling and punctuation; rules of syntax and lexis related to the dialect properties of written language; and finally rules of form and content related to genres of written composition". However, Bereiter & Scardamalia (1987) do not comment on the relation between Bereiter's (1980) and their own model, despite the fact that there is a clear continuity with regard to the focus on qualitative changes which take place in writing. Bereiter's first model of writing development (the "1980 model") had five stages, the second only two and in later work (Bereiter & Scardamalia, 1987) there is no comment on how they are related; however, the description of associative writing is very similar to that of knowledge-telling writing. With regard to knowledge-transforming writing the picture is not as clear: The highest developmental stage in the "1980 model" is epistemic writing, but as a corresponding stage in the "1987 model" the description of unified writing matches knowledge-transforming writing best, since it is described as the ability to read one's own text critically and therefore using writing for *understanding*, which opens the opportunity of using writing as a productive craft.

4.4.2 Developmental Mechanism

A quite fundamental difference between the models of Bereiter (1980) and Bereiter & Scardamalia (1987) may be found on the level of "developmental mechanism": While the "1987 model" proposes stages of development, but does not explicitly discuss a "mechanism" on the level of the cognitive systems, the "1980 model" may work via skill integration. Despite the fact that Bereiter cites Vygotsky only via Luria, his model may have been inspired by Vygotsky's interfunctional interpretation of higher mental functions: Vygotsky (2012 (1934), p. 177) proposed that mental development depends on a change in the *relation* and connections between mental functions, not in a change of the function alone. Vygotsky did not think of functions as static, their "internal" development in turn is to be determined be the developing relation between them.[25] The crucial point is that he understood development not in terms of the development of single mental functions,

[25] It is important to note that Vygotsky's cognitive functions differ from the mental modules assumed in cognitivism in the sense that mental modules work as "stand-alone" cognitive units. They may receive input from other modules and deliver output, but their internal processes are not influenced by other modules.

but as the evolution of a whole network, the *interfunctional system*.[26] In this sense, Bereiter's hierarchy of skills being successively integrated in order to form the basis for the next developmental level could be understood in a Vygostkyan sense as changing relations between underlying mental functions, which in turn may cause a change in these functions as well, eventually allowing for mastering the developmental level of *epistemic writing*. While the "Vygotsky-connection" is speculative, what should be noted nonetheless is that Bereiter in 1980 did not frame writing as *problem solving*. While many traits of Bereiter's first approach to writing development are to be found in the later work with Marlene Scardamalia, problem solving and, with it, the concept of propositional knowledge became a focus only then. It can be assumed that the notion of development was in line with the ideas of the time and building on Piaget's work, which will be discussed in some detail in the next chapter.[27]

4.4.3 Two or Three Stages?

While Bereiter and Scardamalia's research focusses on school students, the issues and symptoms discussed may appear familiar to the university lecturer. Interestingly – and this is the reason why it is worth going into detail concerning the development of early writing – all these issues come up again when learning academic writing. The difference to school is that at the university in the Humboldian tradition there is no didactic tradition of fostering writing. It is implicitly assumed that students have already mastered these developmental steps and therefore only need to acquire the "dialect" of their discipline – which is assumed to be acquired through being immersed in the discipline itself. However, in a sense students have to undergo – again – learning in all four domains introduced above:

1. *how to generate text without a respondent*

   It is important to note that novice academic writers have lost familiar respondents, i.e. their school teachers whom they might have known for years. They had been immersed in a school community where they could rely on others' experiences like "he just wants to read word by word what is in the book". As novices at university students do not know their new respondents, there is little personal relationship between students and university teachers and they are not part of their respective academic community yet. Thus, despite the fact that they (most probably) have acquired the ability to generate a text without a respondent, they cannot build

[26] In his thinking, this changed the functional composition of (holistic) consciousness, which he thought of as the real subject of mental development (Vygotsky, 2012 (1934), p. 178). However, I will not open Pandora's Box here by entering into a debate on consciousness.

[27] The developmental "mechanism" is not explicitly discussed in either publication. Bereiter & Scardamalia (1987) cite Piaget and Pascual-Leone, who tried to integrate Piaget's model with the information-processing approach, an approach that is no longer received today. I agree with Marchand (2012) that it is epistemologically incoherent, but a comprehensible discussion of the heterogeneous developmental theories building on Piaget is not within the scope of this thesis.

upon academic language, are not familiar with the genres, etc. and thus lack the grounds to appropriately address their text to an academic audience of their discipline.

2. *to actively search for contents*

   While Bereiter and Scardamalia meant memory recall, the university student needs to learn recherché techniques, about the leading figures in his/her field, and has to acquire the knowledge and position necessary to evaluate sources.

3. *to plan a whole text*

   This is not just a matter of knowledge about structure and genre. As texts grow longer and more complex, additional competencies are necessary (and are addressed in process-oriented writing didactics): planning of the writing process 'as a project', allocating enough time for working on the text, experience in when, where, and how they can work.

4. *to evaluate one's own text*

   In order to read one's own text critically and revise it, one needs to have knowledge and competencies listed in points 1-3 and needs to be able to apply them with some distance in order to read as if the text was not ones' own, and only then can one then develop it further, being the author again. Revising demands acting like a member of the respective academic tribe who has particular expectations at this particular level of socialization into the discipline.

Incorporating Kellogg's knowledge-crafting stage would require the introduction of "*the representation of the reader's understanding of the text*" as a fifth demand. However, one could also perceive this as developing the ability "*how to generate text without a respondent*" further. Kellogg (2008) does not propose a cognitive process which would account for a qualitatively different way of writing; the empirical evidence he presents comes mainly from memory research: Kellogg attributes many of the problems that writers experience to limitations of working memory. An implicit idea behind this is that it will grow, i.e. expand to be able to simultaneously hold more information with experience: At first, it can only hold what the author wants to say, then expectations toward the text, and finally a representation of how a potential reader will understand the text. However, the concept of working memory is more or less analogous to the working memory of a computer, which has a certain storage capacity, which is fixed. Even if we were to argue that biological memory is bound to work differently and thus to be more flexible than a computer (while at the same time keeping up the computer analogy?), I seriously doubt that a psychologist could come up with an experiment which could measure all these "contents" simultaneously in order to show that they are actively held in working memory at the same time. Furthermore, it should be noted that Bereiter and Scardamalia describe *knowledge-transforming writing* in terms of a transformation between content and *rhetorical* space and also consider the rhetorical dimension of writing. While they studied school students' writing for school (but not, say, journal or letter writing),

Kellogg's proposed third stage regards professional writing. I find it more reasonable to assume that the differences in the models reflect differences in research design and expectations towards the writer, which reflect institutional (or professional) demands, rather than to assume that "pre-professional writers" do not consider the recipient of a text. Kellogg's assumption may be owed to the cognitivist preoccupation as representation as prerequisite for action. In terms of the developmental model, it is a least unclear whether the third stage as proposed by Kellogg is needed in terms of describing a qualitative step in writing development.

Having said this, Kellogg's description of knowledge crafting is widely accepted; after all, it does capture teachers' observations on as well as expectations towards student texts. Thus, despite the criticism regarding the cognitivist assumptions underlying the stages proposed by Bereiter & Scardamalia and Kellogg, as a developmental framework the three-stage model proposed by Kellogg offers a useful description of expectations towards writers in different phases of their development. However, we should bear in mind that there may be yet another candidate for a stage in writing development, Bereiter's (1980) initial fifth stage in writing development, *epistemic writing*.

4.5 Discussion

I will now look at the developmental theories introduced above through the perspective sketched in figure 6, where knowledge, written speech (the nature of writing), and the rhetorical dimension are placed as central aspects under which the interaction between writer and his/her environment can be considered. In order to provide context to the previous chapter, I will briefly discuss the model's differences under these aspects and then pick up on the issue of recursivity and its consequence: that writing should be considered on two temporal levels, i.e. *writing-as-it-is-happening* and the writing process at project level. A developmental perspective is bound to have an impact on both.

4.5.1 Written Speech

The models introduced see writing as "written speech". Bereiter & Scardamalia (1987) and Kellogg (2008) assume such a skill as basis for their model and the development from *knowledge-telling* to *knowledge-transforming writing* can be interpreted as building a second process on top of this ability. More explicit is Bereiter's 1980 model, where the first stage of writing development, *associative writing*, is based on "written language production". Picking up on the "Vygostskyan connection" inferred above, there is a fundamental difference in understanding the role of written speech between Bereiter's 1980 model and the others: In his first model, the cognitive function "written speech" is constituent part of a network, which may cause changes in the basic function. In the later models, "written speech" is conceptually a mental module which may receive input from

other models, but those cannot change its internal cognitive processes. If “written speech” is to mediate the interaction between writer and environment, it may be considered in terms of developmental change as well; as change in cognitive function itself, as change in the role of the cognitive function, or both.

4.5.2 Rhetorical Dimension

Regarding the rhetorical dimension of writing, one can observe that the younger the model, the later the rhetorical dimension is expected to be mastered by the writer: In his first model, Bereiter (1980) placed *communicative writing* as third of five stages. In the second model, it becomes central in the second (and last) stage of *knowledge transforming*, where content space and rhetorical problem space are equally important for the writing process. Finally, Kellogg (2008) adds *knowledge crafting*, claiming that only then will the writer be able to represent the reader’s potential representation of the text. If I understand writing not merely as internal cognitive process, but as a means of interaction with the environment, the shift in perspective implied in figure 6 will ask for considering the rhetorical dimension (from implicit assumptions on the reader’s – teacher’s – expectation to explicit knowledge of an audience) at every developmental stage. After all, writing is “always discursive” (Kruse, 1999).

4.5.3 Knowledge

From the names given to the developmental stages, one can infer that knowledge is a central issue in both, Bereiter & Scardamalia's (1987) model and Kellogg’s (2008) extension of it. However, the underlying cognitivist assumptions are the same as Hayes’ and collaborators’, with all their implications. The difference to Hayes’ and collaborators’ models is that Bereiter and Scardamalia introduce the idea of repeated transformations of knowledge between knowledge space and rhetorical space as the writer works on the text. In the face of the considerations about problem solving in an overall problem space, this means they are explicitly naming two sub-problem spaces, while not naming others. This changes neither the underlying atomistic concept of propositional knowledge nor the idea that writing is problem solving. Bereiter and Scardamalia were probably well-aware of this when they concluded that the model can account for knowledge re-production and understanding (since inference is within the scope), but did *not* claim that *knowledge transforming* is equivalent to *epistemic writing*. Bereiter initially describes *epistemic writing* as producing more than a “verbal artifact”, where writing becomes an “integral part of thought” in a “personal search for meaning” (1980, p. 88). However, with regard to his initial model he does not discuss the concept of knowledge underlying this view, whether knowledge would be affected by this process, nor the consequences for understanding the role of knowledge in writing. In the later publication the

concept of *epistemic writing* occurs merely once (Bereiter & Scardamalia, 1987, p. 85), in the context of executive control in internal feedback and planning.

In addition to the ostensive focus on the role of planning on the writing process, the cognitive developmental models can be understood as focusing on the rhetorical dimension of writing, founded on a notion of writing as "written speech". The field (explicitly or implicitly) agrees on the relation between thought and language that writing means translating (possibly non-linguistic) concepts (which constitute thought) into language, together with the assumption that with regard to the aspect of verbalization the medium speech is not so fundamentally different from writing. With the exception of Bereiter's initial claim (1980) that *epistemic writing* has in turn an impact on thought, this view on the nature of writing does not change with the development of the writer. Furthermore, like the cognitive process models, the developmental models are "knowledge neutral" in the sense that knowledge is a resource to the writing process. At different stages in writing development, the process knowledge is subjected to change, but the basic propositions stay untouched. In this sense, I suggest that *writing research has a blind spot with regard to the role of knowledge in academic writing*. This certainly has to do with the cognitivist paradigm but may also be due to the fact that writing research is focused on a "general competency" in the sense that the "content" of writing is blended out. If we want to understand *epistemic writing* as a tool for the "personal search for meaning", as Bereiter (1980) termed it, the intentional dimension needs to be part of a developmental account of writing. Thus, instead of keeping the "static" view on the nature of writing and the role of knowledge in the development of the writer, I suggest that we should include those in theorizing the changes occurring in writing processes as the academic writer develops in the interaction with his/her environment.

Temporal Levels Resulting from the Recursivity of the Writing Process

Above I argued that writing processes should be considered at least at two temporal levels, the level of "writing-as-it-is-happening" and the "writing process at project level". Bereiter and Scardamalia as well as Kellogg do not differentiate these levels. The cognitive process models Bereiter & Scardamalia (1987) propose for *knowledge-telling* and *knowledge-transforming writing* refer to *writing-as-it-is-happening*, the next level of the model is the developmental level. Kellogg follows Hayes in assuming 10,000 hours of practice between two developmental levels (2008, p. 2). Implicitly, however, processes regarding the project do play a key role, at least with regard to larger writing projects as they are common in academic writing: at the *knowledge transforming* stage, the writer is expected to be able to represent the text in 'content space' as well as in 'rhetorical content space'. If we abandon the idea the writing entails the representation of the whole problem space, what is demanded of the writer is to engage in directing the writing project. The same argument holds for the *knowledge-*

crafting writing, which assumes that the problem space must incorporate a representation of the audience in order to be able to predict how the potential reader will understand the text. In academic writing, this reader will be from the academic community, which in turn will be better understood as the writing project progresses – after all, the publication of the academic text is an act of participation in this community.

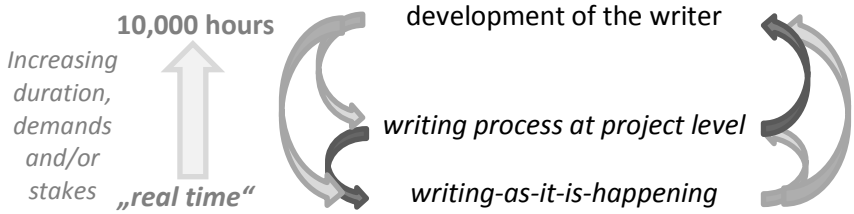

Fig. 11: Interacting levels and temporal scales involved in academic writing projects. The arrows denote the potential impact one level may have on the other, darker arrows stand for putatively stronger impact. The ascending arrow at the left indicates that phenomena observed at each level largely differ in duration, actual writing projects may also differ in demands and stakes involved.

Therefore, I propose to consider three levels instead of two in theorizing the cognitive developmental dimension of writing (see figure 11). Processes at each level potentially impact each other. The writing project has a central role in driving change (indicated by the dark arrows indicating a potentially stronger impact). First of all, the assignment is the starting point in Bereiter & Scardamalia's (1987) cognitive process models on both developmental levels. This is plausible insofar as novice students rarely engage in academic writing activities without one, so we may safely assume that it has a "driving role" in the development of the academic writer. Secondly, as the student progresses, academic writing assignments or projects change (from summary to review, maybe essay, pro-seminar paper, seminar paper to BA-, MA-, PhD thesis and beyond) and with them also change the demands (e.g., length, complexity, maybe writing in a foreign language, expectations towards innovation) and, certainly in the case of theses or research papers, the stakes involved.

The Whole Writer – Not Just a Cognitive Process

One may argue that the *writing process at project level* is addressed by planning, as in Hayes' and collaborators' models as well as in the developmental models: Where planning does not refer to sentence level, for example when it comes to structure, the project level is addressed implicitly. However, the models do not differentiate the scope of the planning activities and they do not address other competencies that novice academic writers struggle with. At project level, writers have to much more than planning text and in contrast to the cognitive and developmental models?, process-oriented writing didactics address these points. They have to learn how to organize

themselves in the sense that they need to develop ways of dealing with the scope of their project and integrate it into their daily lives. For example, Joan Bolker's (1998) *Writing your dissertation in fifteen minutes a day* carries a piece of advice for staying on the writing project already in the title. Wolfsberger (2009) addresses planning of the writing project in the sense of project planning and fitting it into "the rest" of the writer's life several times and devotes a whole chapter to it. Skinner's (1997) advice to always write at the same time of day in the same place is even geared towards conditioning 'the body' to be ready for writing. In practice, the infamous writers' block is an important issue and fortunately most of the time there is simply a *writing problem*. This is one of the reasons why it would be more advisable to talk about *writing* blocks (Hjortshoj, 2001), and practitioners have devised didactic formats to deal with students' anxieties in the context of writing (Wynne, Guo, & Wang, 2014). The point I want to make is that becoming an academic writer does not only incorporate the competences needed to plan and produce increasingly demanding texts meeting certain criteria, addressing a specific audience, and making the argument one wants to make, but also to organizing one's life in such a way as to find the time and peace needed for writing as well as regulating one's motivation and anxieties, and the ability to use different strategies for getting out of a dead end regarding either of the issues addressed. In short, a cognitive developmental account of writing should not only regard externally motivated short and low stakes writing assignments under laboratory conditions, but have explanatory value for writing *in the wild* with potentially high personal stakes involved. Including the *writing process at project level* provides a place for addressing the issues mentioned as *part* of the writing process instead of leaving them out as external factors.

Having said this, despite the fact this whole chapter is on writing development, it has not been considered whether it is appropriate to refer to the increase of writing competence in terms of development and developmental stages rather than in terms of learning. Writing, even more so academic writing, is obviously culturally determined. I propose to take a step back and consider whether, and if so in which sense, we can talk about academic writing in terms of development.

5. Academic Writing *Development*?

Developmental models in psychology usually describe development as proceeding in a succession of well-defined stages. The underlying idea is that of a natural order of events leading to bodily changes, including the nervous system (in child development usually understood as maturation). In contrast to this, learning is understood as triggered by the physical, social, and cultural environment. Bereiter & Scardamalia (1987) mainly studied high school students, where maturation is certainly an issue, but Kellogg's *knowledege-crafting writing* (2008) concerns adults. An alternative to maturation is institution-led development. Pohl (2007, pp. 87-90) argues against this by pointing out that the strength of a developmental model lies in excluding external factors, which then offers including such factors (didactical, social, etc.) in a controlled manner. He lists the potential determinants as found at German universities:

- *Instruction*: introduction to bibliographical work and referencing by tutors[28] and maybe private reading of guidelines
- *Communication*: institutional feedback on a seminar paper (receiving credits and grade, maybe a report)
- *Reception*: reading experiences
- *Production*: text production and resulting writing experiences

Based on this, Pohl argues that the German university system actually represents the ideal case for studying writing development without institutional interference: Classically, there is no writing instruction (beyond the tutorials mentioned) and feedback is often limited to receiving the grade. I heartily agree with Pohl that there is a lack of explicit institutional writing support given to students at German-language universities, but I disagree with him in interpreting this as an absence of external interferences. Even beyond assignment and teaching traditions, the university will impose more or less subtle pressures, structures, norms, and values on students, an effect captured by the expression *hidden curriculum*.

Thus, it is actually an open issue in which sense becoming an academic writer can be understood as a developmental process. The alternative would be to think of (academic) writing in terms of learning, so an obvious first step is to differentiate between development, which is usually conceptualized as proceeding in stages, and learning, which is usually conceptualized as proceeding in an additive manner, and look at potential relations between the two and the role of the environment in this. I will base my considerations on the "grand theories" (Marchand, 2012) of Piaget and Vygotsky, which

[28] In the German university system, tutors are peer students who support the university teacher in the context of a course; this should not be confounded with the Oxford tutoring system.

at first sight may have little to do with writing, let alone academic writing, because they stem from research on children. However, I will focus on the "mechanisms" and principles of development, not on the cognitive competencies a particular stage may explain. They will therefore provide a basis for discussing the question of whether and, if so, in which sense it is viable to speak of developmental stages with regard to academic writing.

Furthermore, it is an open question whether it is possible to "isolate" the development of academic writing competencies from other competences. Bereiter (1980) assumed that writing development may reflect other developmental phenomena and the cognitive functions represented in his skills integration model, like *social cognition* and *reflective thinking*, point in this direction. Pohl (2007, p. 71) lists some factors with may influence the development of academic writing by supporting and, sometimes, maybe by irritating it:

- *Enculturation into the university and academia*: transition into new forms of learning and routines, communication with teachers, etc.
- *Academic socialization*: acquisition of norms and values, constellations of problems and questions, etc.
- *Cognitive acquisition of academic concepts for analysis and cognition*: knowledge of concepts like hypothesis, concept, correlation, etc.; knowledge of methods.
- *Ongoing accumulation of knowledge in the discipline*: subject matter, facts, and perceptions.
- *Academic writing development in a narrow sense*: knowledge of genres, discourse, competence regarding text structures, argumentation, and idiomatic phrasing.

Much writing research, especially when undertaken with methodologies from linguistics, focusses on the last point. While the reader may not be able to tell from the text whether it has been written following a knowledge-telling or a knowledge-transforming strategy, in academic writing development it is possible to find, compare, and categorize linguistic phenomena in students' texts and show that these follow a particular sequence.

Whether this sequence is subject to cognitive development cannot be decided on the basis of the text.[29] Despite this, when it comes to a diagnosis of development, it is well worth to consider products of writing. In order to integrate this complementary perspective, I will report on two longitudinal linguistic studies which traced the development of students' texts. What they cannot determine is the question whether academic writing, as young adults become academic writers embedded in higher education institutions, can be considered not "merely" in terms of learning.

[29] As mentioned earlier, from the text alone it is not possible to determine whether the writer engaged in *knowledge telling* or *knowledge transforming writing* (Bereiter & Scardamalia, 1987, p. 183).

Therefore, we should clarify the sense in which we refer to development and learning, how they are related, and which role the environment plays in this. I will discuss this in more conceptual terms on the basis of the developmental theories of Vygotsky and Piaget and then in the context of the way learning is conceptualized in part of the higher education literature. Furthermore, as Pohl's (2007, p. 506) own observations show, the stages cannot be separated accurately from other developments undergone by the individual, which Pohl refers to as "subjective theories".

In brief, in this chapter I will argue that it does make sense to talk about *development* of academic writing in the sense that a sequence of developmental steps can be observed, but that these stages reflect a balance between the writer's cognitive capacities and expectations of the environment. Furthermore, the expectations towards students' academic writing (or the texts produced) do not end at writing capabilities in a narrow sense, but involve the development of the 'self' (as used by Kegan, 1982).

5.1 A Complementary Perspective: A Focus on Students' Texts

The cognitive developmental theories introduced above focus on what is "going on" inside the mind of the writer. While Bereiter and Scardamalia state that a text will not necessary reveal whether it has been written using a knowledge-telling or knowledge-transforming strategy, in everyday academic practice student texts do give an impression of where the students stands – otherwise they would not be used as a basis for assessment. Despite the predominant focus in this thesis being on the writing *process*, it should be noted that looking at the development of students' academic writing *products* is the complementary perspective which will allow a diagnosis of whether development has taken place or not. Feilke & Steinhoff (2003, p. 119) propose two conceptual foci for understanding the development of academic text competence: habitus and problem solving. A focus on the adaptation of habitus would understand the learner as being socialized into an initially new environment with new norms and values, which the learner needs to actively acquire. Alternatively, they propose, the learner can be understood as experiencing and reflecting on language, thereby discovering new possibilities of linguistic action. They are building structure by solving problems ('domain-typical communicative problems') and thereby changing their own concept of language in empirically identifiable phases in a structured way. Feilke and Steinhoff argue in favor of the latter. They argue that looking at writing development in terms of habituation will not allow distinguishing imitation from a development of conceptual structures. They understand habituation as a process of approximation which can be captured merely in quantitative terms. The rationale behind this is expressed by Pohl (2007, p. 529), who points out that the ontogenesis of academic writing may by no means be equated with general academic enculturation and disciplinary socialization, despite them

being necessary concomitants.[30] I do not see the necessity for such a strict divide and throughout this chapter I develop the argument why. However, this does not diminish the value of the two models for the development of students' text I will introduce now. An important conceptual basis for both is provided by Ehlich's theory of a "common academic language" (in German, "Allgemeine Wissenschaftssprache" and "Wissenschaftliche Alltagssprache" are used synonymously). In a nutshell, the idea is that between common or everyday language and educational language ("Bildungssprache") on the one hand, and disciplinary terminologies ("Fachsprachen") on the other, it is possible to characterize a realm of linguistic expressions which are typical for academic language but not discipline-specific. An analogous example in English would be expressions which will typically be provided by phrase banks[31]. The concept provides a level of comparison of linguistic features in a given student's texts from various disciplines writing in one discipline as well as the same student's texts written for different disciplines, the focus being not on the cognitive processes of writing itself but on the comparison of texts written by students in the beginning, during, and at the end of their university studies.

5.1.1 From Non-Typical to Domain-Typical Use of Language

Based on a corpus analysis of students papers from linguistics, history, and comparative literature in different phases of their studies, Steinhoff derived a developmental model describing four stages of language use: transposition, imitation, transformation, and contextual fitting (2007, p. 422). In the initial phase of *transposition*, students try to solve problems in academic writing by using means and text procedures not typical for academic writing. They may draw on phrases typical for journalistic and popular science writing, like "scientists assume" ("die Wissenschaftler gehen davon aus") or "everyone is talking about / the concept … is on everyone's lips" ("Der Begriff … ist in aller Munde"). On the level of structure, Steinhoff found phenomena typical for school essay writing, like the voicing of critique only at the end of the text, often introduced with a Phrase like "in my opinion" ("meiner Meinung nach") or a reflection of the process of text production. He also found idiomatic expressions typical for spoken language, which are not accepted in German academic language, because they do not impose the degree of distance to the reader expected from academic texts.[32] In a second phase, this is followed by a first attempt to copy academic language, therefore Steinhoff termed the phase

[30] Rough translation from Pohl (2007, p. 529), with one alteration: as said before, in German "wissenschaftlich" refers to all disciplines, including humanities and arts, therefore I translated "wissenschaftlich" here as "disciplinary". The original quote reads as follows: Die Ontogenese wissenschaftlichen Schreibens darf zwar keinesfalls mit der allgemeinen akademischen und wissenschaftlichen Sozialisation gleichgesetzt werden. Beide bilden aber für das wissenschaftliche Schreiben notwendige Begleiterscheinungen."

[31] E.g., http://www.phrasebank.manchester.ac.uk/

[32] Expressions like "unter die Lupe nehmen" (at a close glance), "nur die halbe Wahrheit" (half the truth), or "auf der Strecke bleiben" (getting lost along the way) are not accepted in German academic language, but their equivalents may be suitable for academic writing in English.

"*imitation* phase". In German academic language, which compared to English relies heavily on nominalization, an excessive use of this phenomenon can be found. Students tend to use overly complex expressions, construct very long and complex sentences, and/or exaggerate in trying to mimic elaborate German academic language. All this indicates that students sense that these linguistic means are characteristic of German academic texts, but they do not yet control the repertoire. The result is often an exaggeration of these means, leading to texts which may be very difficult to understand to the point where they are almost devoid of meaning. In the *transformation* phase, the third phase of the model, an understanding of typical surface structures and functional specificity of expressions develops. Paradoxically, this is regularly accompanied by a false use of phrases ("Formulierungsbrüche")[33]. Steinhoff also observed an overuse of domain-typical means: writers cling to particular forms which they perceive to be typically "academic". This indicates that writers realize the functional specificity of common academic language. As an example, they realize the use of an expression like "the author claims" ("behaupten") as a means of indicating a critical stance. The last phase Steinhoff (2007, p. 424) termed *contextual fitting*. It marks the ability to use typical academic language in a context-sensitive way which follows the domain-typical common sense. Student writers control the linguistic repertoire of academic writing and use it consciously and adequately. Their use of language becomes richer and more variable, for example they use a greater variety of verbs in order to indicate, describe, and classify other authors' statements and actions as well as their own. They also comply with conventions concerning the use of passive constructions or the use of "I", which Steinhoff interprets as a sign that they acquire the habitus of the discipline. To give an example to illustrate this development regarding intertextuality from intersubjectivity towards originality: first, learners passively reproduce domain knowledge, until they begin to reflect upon what they read and are finally able to critically analyze and judge the use of the first person singular. While novice students often use the "narrator – I", they gradually learn to use the "author – I" or "researcher – I", both of which can be used in academic texts.

In his analysis, Steinhoff shows that student writers acquire academic text competence with every paper and with every semester. In addition to analyzing his corpus, Steinhoff asked academics to judge student texts. The judgements not only matched these results, but the judges partially referred explicitly to the same textual phenomena that Steinhoff found in his quantitative analysis of the data. Additionally, he asked the experts to judge the student texts in comparison to texts from academia. The latter were rated to be "more scientific" than the student texts, even those displaying contextual fitting.

[33] "Formulierungsbrüche", "Überblick auf…geben", "m.E. nach", "soll über…eingegangen werden", or "mit Anlehnung an".

5.1.2 From Object-Oriented to Argumentative Writing

While Steinhoff choses a quantitative approach, Pohl's (2007) *studies of the ontogenesis of academic writing* ("Studien zur Ontogenese wissenschaftlichen Schreibens") can be seen as complementary in the sense that he based his work on several qualitative analyses of the texts of only three students. In Pohl's view, in text production there is a need for close interaction of cognitive complexity and linguistic complexity (Pohl, 2007, pp. 64-65).

He bases the stages of his model on Weinrich's analysis of two seminal scientific[34] writings from the two very distant fields of molecular biology and art history. Weinrich (1995 as cited in Pohl, 2007) identifies a sequence of parts of text, which he identifies as serving different "truths": The first step provides an overview of the status quo of research in the area, yielding a *reference truth* ("Referenzwahrheit"), the second describes the research results and how they have been obtained, providing *protocol truth* ("Protokollwahrheit"). In a third step, the first two are "interlaced" in a discussion of the findings against the background to a *dialogic truth* ("Dialogwahrheit"). Finally, the outlook towards potential further research yields an *orientation truth* ("Orientierungswahrheit"). While it is arguable whether it is useful to use the term "truth" in this particular context, Pohl uses these four steps as a framework to highlight a change in focus that academic writers go through during their ontogenesis, starting with Weinrich's second step of *protocol truth*. Pohl (2007, p. 488) names the stages in his model o*bject-focused writing* ("Gegenstandsfokussiertes Schreiben"), *discourse-focused writing* ("Diskursfokussiertes Schreiben"), and a*rgumentation-focused writing* ("Argumentationsfokussiertes Schreiben") and discusses the changes in student writing with regard to four different foci.

The first perspective taken in the analysis he refers to as "the phenomenology[35] of the ontogenesis of academic writing" (p. 489). At this level, he analyses the use of idiomatic expressions, common academic language, lexica density, and syntactic complexity as well as meta-communication regarding announcements regarding the organization of the text. The results in many respects match those of Steinhoff (2007a) and since specifics are not relevant in this context, I will not go into detail and stay on a conceptual level. Pohl analyses ontogenesis as reduction of 'not yet distinct linguistic-textual competencies' ("Ontogenese als Rückgang noch nicht ausgeprägter sprachlich-textuteller Kompetenzen", p. 498) regarding, for example, intertextuality and planning texts. The resulting limitations in expression may also contribute to observations made with regard to a *shifting of focus*, an analysis which I will present in more detail, because the stages of Pohl's model are derived from it.

[34] In the sense of the German "Wissenschaft" which also includes research in the arts and social sciences.
[35] I must confess that I do not understand the use of the term *phenomenology* with regard to the results of an analysis of student papers. I can only assume Pohl means what could be termed the temporal level of "writing-as-it-is-happening", a level where the writer experiences the struggle for the next words and sentence.

At this level, he interlaces Weinrich's analysis of texts with his developmental levels for student writing. He argues that developmental progress is often characterized not so much by more sophisticated or more complex *solutions* to problems but by a more complex *representation* of problems (roughly translated from Pohl, 2007, p. 492). Thus, while task environment and assignment may be identical, writers may conceptualize the task at hand in a different way at different developmental stages, which may then allow for a more complex solution. Part of the ontogenesis of the academic writer then is owed to changing *reconceptualizations* of a given writing assignment. With regard to a shift in focus, the three developmental phases are characterized as follows:

1. *Object-focused writing* is characterized by a style which centers on the "pure", seemingly segregated and given scientific object, which I will refer to as phenomenon. The role of literature is that of the medium granting access to the object of investigation; as literature, it is in a way "invisible" or transparent. At this stage, authors' texts realize a "*protocol truth*", which is characterized by introductions solely focused on the phenomenon, a lack of argument and discussion. Quotes from the literature serve as substitute for text rather than proof of (lacking) argument. It seems as if writers write primarily for themselves. *If* the author takes an evaluative stance at all, it comes as an appendix.
2. *Discourse-focused writing*, the former medium becomes the object of examination: this changes the perspective on the phenomenon from a "given scientific object" to an object constituted by discourse and thus to be seen in the context of disciplinary discourse. This is accompanied by a "pluralization" of the phenomenon. Authors at this stage are focused on a "reference truth" in the sense that argumentative structures of the text serve a representation of different positions. Pohl refers to this as *communicative-epistemic*, as ensuring understanding. Again, the author's evaluation will come as an appendix.
3. *Argumentation-focused writing* is characterized by another shift of focus towards the way positions are argued as well as addressing a reader to be convinced by arguments or, in terms of Weinrich, *dialogic truth*. Scientific approaches, methods, and categories are now re-conceptualized as competing objects which may be criticized and improved. The reader is guided in his/her understanding of the literature towards a conclusion which is derived on the basis of the arguments in the main text.

What I see in this analysis is a description of students' changing stance with regard to the knowledge of their discipline as well as with regard to the legitimacy of their own actions. As such it is in contradiction to Pohl's own supposition that the ontogenesis of writing should not be equated with general academic and disciplinary socialization. It shows that it may be possible to employ methods from linguistics to describe features of texts as isolated phenomena, but when it comes to the

observation of how the author's intention is reflected in the text, it becomes inseparable from the way the same person perceives his/her position in academia as well as his/her relation to disciplinary knowledge. The target of Pohl's fourth analysis, which he admits to being highly speculative (p. 506), actually supports this point: He proposes to look at the ontogenesis of student texts as successive replacement of subjective theories of what is academic. For this he borrows the term "subjective theories" from Groeben (1988, as cited in Pohl, 2007). Analogously to his model of text development, he describes the development of subjective theories as progressing from an idea of science/academia as being substantiated by objects, via discourse, to argumentation.

Developmental level	**1st: object**	**2nd: discourse**	**3rd: argumentation**
Concept of truth	Protocol truth	Protocol truth, reference truth	Protocol truth, reference truth, dialogic truth, (orientation truth)
Anticipated reader	No (specific) reader	Understanding reader	Reader to be convinced
Subjective theory?	Hellenistic?	Scholastic?	Modern?

Table 3: Tendencies in the ontogenesis of academic writing (translation of Pohl, 2007, p. 508)

The "subjective theories", which he terms hellenistic (describing and listing of structures and categories), scholastic (presentation of authoritative positions in the discourse), and modern (contributing an argument), correspond with particular ideas of truth and reader (see table 3).

5.1.3 From an Isolated to an Integrated View of Academic Writing Development

As my focus is on the "cognitive process side" rather than the "product side," I am not interested in presenting a concise overview of the research of academic writing conducted on text; however, I do want to point to the value that each perspective has for the other. Both studies show that developmental levels can not only be identified with regard to the cognitive strategies chosen, but also regarding phenomena like lexicon, intertextuality, etc. With regard to those, both systematically observe phenomena which match the regular complaint of teachers that 'students cannot write anymore', e.g. overuse of terminology, high repetition or false use of phrases, and frame them as symptoms of development. These findings are of high practical relevance, because when communicated to university teachers they help raise an understanding that these indicate student development rather than ignorance or a lack of prior education. Furthermore, they fit with the commonplace in psychology that a new level of development is often preceded with a phase of regression, a breakdown of behavior that was previously stable.

Pohl himself is indecisive about his analysis of a shift in "subjective theories" and points out that it may as well be writing competence (in a narrow sense) which is responsible for a text appearing as if the author were following a particular subjective theory (Pohl, 2007, p. 506). I agree with Pohl that a

focus on the writing product alone is not sufficient to substantiate his analysis. However, his "speculations" may be an indicator that the development of academic writing happens in conjunction with a change in what he terms "subjective theories". With regard to one of the three students he studied so closely, he found that the developmental effects he observed in her texts varied with the experience the subject had with discipline, discourse, and maybe even a particular school or paradigm (Pohl, 2007, pp. 510-512). This strongly points to another factor, which we should consider in conjunction with and not isolated from becoming an academic writer: the socialization into the discipline. Steinhoff refers to Fleck (1935, p. 135), who characterizes the academic thinking collective as a "hierarchy of stages of initiation" ("Eingeweihtseins"): the former pupil step by step turns into a researching student. Some have great difficulties, while others can more readily take on this role, but even those need much time as well as a sufficient number of reading and writing experiences. Thus, despite the fact that the explicit goal was to study *only* writing competencies, both come to conclusions which point towards other phenomena.

As Pohl (2007, p. 506) admits, with the methods at hand he cannot address the observations made – it is quite reasonable that researching the development of student texts and the development of their use of common academic language will yield just that. The question arises whether the attempt to study academic writing *in a narrow sense* can provide the categories and a framework which is sufficient for a viable understanding of all relevant aspects of the phenomenon. In other words – excuse the commonplace – we should beware of mistaking the concepts and categories we use in order to frame and study a concept with particular theories and methods for the phenomenon itself: Just because our interest is in academic writing and writing is seen as a cognitive process, which will yield text, this does not mean that the cognitive and developmental processes involved in writing an academic text will obey the categories defined based on observation of (linguistic) behavior or on introspection. Or, in less sophisticated terms: Just because I can draw a box which corresponds to a behavior observed or an introspection which was verbalized, this does not mean that there will be a 1:1 correspondence to underlying cognitive processes.

Furthermore, the "boxes" chosen are culturally determined. In his book *Naming the Mind* Danziger (1997) shows how deeply foundational concepts of psychology are rooted in culture.

> *The objects of science are usually taken to refer to some distinct aspect of a reality that is thought to exist independently of the science whose objects they are. When we claim that psychological science adds to our knowledge of attitudes, motives, personalities and so on, we assume that psychological reality divides up along the lines indicated by this received network of categories. A sensation is not an attitude and a motive is not a memory, though of course there may be relationships between them. Similarly, psychological theory commonly builds hypotheses about the structure of attitudes or the laws of learning, but does not*

> *question that 'attitude' and 'learning' describe distinct kinds that each require their own theoretical constructs. In other words, psychological theory operates on the basis of some pre-understanding of that which it is a theory of.* (Danziger, 1997, p. 5)

As Leiber (1999) remarks, the book could have been written in the fifties, since the categories Danziger discusses do not refer to the concepts and categories introduced later, particularly many of which were introduced with the rise of cognitive science. However, the argument generalizes: We build on basic distinctions and categories because of conventions and tend to accept them without question.

The other side of the coin is that it is legitimate to question and possibly re-determine the categories we use for observing a phenomenon: the assumption that the processes involved in writing an academic text can be neatly separated from (and understood independent of) understanding that the writer is – or is socialized towards – creating new knowledge within a highly specialized community, which in turn bases the validity of this knowledge on peer-review of texts following its norms, may just not be sufficient for yielding a viable understanding of what is going on when we write and develop as academic writers. One aspect of this process is a change in "subjective theories" regarding the understanding of academic work and a theoretical approach to *academic* writing development should be able to account for that. I therefore propose to let go of the idea that it is possible to understand academic writing development – or better: the development of the academic writer – as an isolated competence and consider a more holistic approach which understands development as changing ways of interacting with the environment, which incorporates changing the view of the world as well as of the 'self'. This demands conceptual clarity concerning what can be understood as development in the context of higher education, especially with regard to becoming an academic writer.

5.2 Development Happens in Interaction with the Environment

There seems to be consensus in writing research that it is appropriate to talk about writing *development*. Despite this, I want to go back to the roots of developmental theories in psychology in order to discuss the roles of the environment and learning. This will provide the basis to conceptually frame the sense in which it may be appropriate to talk about stages of writing development and the development of the writer in the next chapter.

5.2.1 Differentiating Development and Learning

The words "development" and "learning" are often used without an explanation of the underlying concept, for example, learning may be understood as association, storage and retrieval, inference,

adaptation, insight, or internalization (Roemmer-Nossek, 2012). There is less variability with regard to understanding development as biological process of maturation, but here the question of the impact of nature and (or) nurture has an impact on where the line is drawn between development and learning. An overview useful to this day comes from Vygotsky (1963, 1978), who notes four ways to conceptualize the relation between development and learning (the fourth one representing his view): seeing development as independent of learning, seeing learning as development, or as two processes conditioning each other with a primacy of development and vice versa. The first option is the idea that development and learning are independent of each other: Development is the biological process of maturation which determines what can be learned. As such, it is a premise for learning at a particular level, whereas learning in turn does not have an influence on development. As an example, Vygotsky refers to Jean Piaget's stage model of child development: the biological process of maturation provides the basis for the child to learn what it could not have understood before. The models presented above do not refer to the relation between learning and development explicitly, although Bereiter & Scardamalia (1987) do refer to Piaget's work serval times. The second option can be seen as the opposite approach, since learning and development are understood to be the same: both processes take place in parallel, so a stage in development corresponds with learning. This view, which he traces back to William James, is rooted in seeing learning as habit formation, which is based on the acquisition of conditioned reflexes. This view of development is accumulative, rather than proceeding in stages. The third approach is more complex, since it assumes that development and Learning condition each other: in the dualistic view as proposed by Kurt Koffka, development is understood to be as independent of learning, while at the same time learning is understood as being identical with development. So the process of maturation (in the sense of biological development, for example of the nervous system) and learning, which is itself a developmental process, are conditioning each other. Thus, it is assumed that development takes place through the interaction of two processes of a different nature, where "the process of maturation prepares for and makes possible a given process of learning; the process of learning as it were stimulates and to some extent advances the process of maturation" (Vygotsky, 1963, p. 24). Vygotsky (1978, pp. 84-90) rejects all three approaches and instead, as a fourth option, proposes his idea of development as driven by the interaction with the environment. Central to his approach is the concept of the *zone of proximal development*.

5.2.2 Vygotsky's Zone of Proximal Development

Vygotsky sees learning and development as interrelated. Whereas other approaches try to determine a child's mental development based on what a child can do alone and unaided, he is interested in the currently ongoing developments. Thus, Vygotsky is interested not only in determining the *actual developmental level*, which is the result of a completed developmental cycle, but even more so in

ongoing maturational processes, the current developmental cycle the child has not completed yet. As an indicator, he takes what a child can do with the assistance of others, but not yet alone. Therefore, the zone of proximal development "is the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86), which allows for the prediction of the next actual developmental level. In this context, Vygotsky reassesses the role of imitation as not purely "mechanical", but as allowing the child to do what it would not be capable of doing without the assistance of others. As "human learning presupposes a specific social nature and a process by which children grow into the intellectual life of those around them" (Vygotsky, 1978, p. 88), learning is distinct from development, yet triggers developmental processes, so development lags behind learning processes, resulting in *zones of proximal development*. The environment plays a central role as the mastering a developmental task is marked by the child being able to do independently what it previously has only been able to do with advanced peers or adults in a shared environment. He refers to this process as the *internalization* of knowledge and abilities (p. 91).[36] With this view, Vygotsky highlights the importance of the environment – the social and cultural dimension as well as the role of artifacts – as initiating and scaffolding change.

5.2.3 Primacy of Development or Learning?

Piaget never met Vygotsky, who died in 1938, but commented on several criticisms Vygotsky (2012) voiced in "Thought and Language" (originally published in Russian in 1934), writing that they "could have come to an understanding on a number of issues" (Piaget, 1962, p. 241). In his direct comment Piaget does not refer to his understanding of the relation between learning and development, but a hint may be derived from his comments on the relation between spontaneous and non-spontaneous concept construction in school children. Vygotsky believes that new concepts are learned through adult intervention, while Piaget sees two construction processes at work, a spontaneous one and the non-spontaneous (didactic) one. A result of two processes at work is that they may interact to accelerate development or impede each other, because there is a mismatch. In a more general context, however, Vygotsky admits to there being a contribution of spontaneity to development (p. 251-252).

In a subsequent publication, Piaget explicitly discusses his view on the role of development and learning: To him, development is a spontaneous process, concerning the development of the body (a continuation of embryogenesis), the nervous system, and mental functions. As opposed to this,

[36] The concept of *mediated activity* plays a central role here; I will discuss it in the context of embodied and situated cognition in chapter 7.1.

learning is provoked by situations or adults (like a teacher) and thus a limited process, regarding a single event, problem, or structure. Four main factors are responsible for the development of cognitive structures: *maturation* (understood as continuation of embryogenesis), *experience* of the effects of the physical environment on "the structures of intelligence", *social transmission* (he names linguistic transmission and education as examples), and *equilibration*, the active process of self-regulation, where a transformation in one direction is compensated by a transformation in the other direction. Therefore, development is not simply the sum of learning experiences (Piaget, 1964). A closer look reveals that Piaget's reservations towards a the role of learning in development was driven by his critical stance towards behaviorism: "I think that the stimulus-response schema, why I won't say its false, is in any case entirely incapable of explaining cognitive learning" (Piaget, 1964), a view Vygotsky shared (John-Steiner & Souberman, 1978, p. 122). In his view on development, learning (if understood as the mechanism of association) does play a role in the sense that it serves as a function in the overall process of development. He proposed that if learning was to be thought of in terms of a stimulus-response schema, it would have to be written in a circular form. Furthermore, instead of starting with the stimulus, it would have to be thought from the response-side, rather than the stimulus, since the organism (its cognitive structures) determines what can be perceived as a stimulus – in this sense the structure (possible response) determines the stimulus, not vice versa (Piaget, 1964). In order to understand this, a closer look at Piaget's concept of adaptation is necessary. Piaget did not promote it as a learning mechanism, but, as I will show later, it did inspire ideas of learning, inter alia, in the context of higher education.

5.2.4 Piaget's Concept of Adaptation

Piaget criticizes biologists of his time for seeing epistemic processes as a result of stimulus-response-associations without an inner organization paired with a view of the environment as having no influence on the genetic system, which determines reflex- and instinct-driven behavior. In this way of thinking, the only connection between genetic and epistemic processes of the organism is selection. As opposed to this, Piaget, who wanted to understand the development of human knowledge, holds that every epistemic act implicates an organization (Piaget, 1974, p. 2). As such, he sees cognitive mechanisms, on the one hand, as a continuation of the organic regulations they emerge from, and, on the other hand, as differentiated organs of these regulations in the interaction with the world (Piaget, 1974, p. 355).

Piaget distinguishes between three major epistemic categories: inherited behavior like reflexes and instincts, perception, and acquired behavior. Acquired behaviors fall into two categories: logical-mathematical and exogenous aspects, the latter meaning empirical learning and experimental behaviors (1974, pp. 2-3). Logical-mathematical epistemic processes are rooted in sensomotoric

schemes, as abstract they are only seen in highest levels of human thinking. Sensomotoric schemes are situated between inherited organization and perception, enriching perception through organizing it. This is what Piaget refers to as cognitive *assimilation*, suggesting that no epistemic process, despite being based on perception, faithfully represents reality, because every act of perception implies assimilation to, or integration into, earlier structures, which may remain unchanged or be modified in this process in a continuous way. This factor of assimilation allows recognition of what is being perceived and, since any epistemic process occurs with regard to meaning, provides it with meaning. Piaget points out that association (as in classical conditioning, which he gives as an example), is merely part of the larger process of assimilation (1974, pp. 4-6).

Piaget understands epistemic processes not as representing reality, but as effecting reality by – seemingly or really – changing it in such a way as to fit the functions of the transformational systems behavior is bound to. Only in behavior, perception becomes meaningful (1974, p. 6-7). In his view, these transformational systems are logical-mathematical, with operators eventually rooted in sensomotoric schemas (1974, p. 7). These, in turn, are bound to the anatomical forms of morphogenesis; thus, from a biological point of view, it must be ruled out that the organization of behavior schemes is independent of any endogenous factor (p. 10). Cognition of an object is its incorporation into a behavior schema (p. 8). While some are inherited, most are built and differentiated through *accommodation*. Accommodation is the modification – active reshaping – of assimilation schemata.

Piaget (pp. 179-180) distinguishes two levels of adaptation, an individual level and a hereditary level, or between the adaptation of the organism and intelligence. He also distinguishes between assimilation cycles and assimilation schemes. The former are used if the elements assimilated are matter or energy, for example in digestion, while the latter are functional. Both are characterized by the fact that the environment is assimilated to a form determined by the organism, so in this sense a generalization of the term assimilation to the behavioral level is by no means metaphorical. Thinking and higher cognitive functions are simply another (special) case of the organism adapting to its environment (p. 184). Assimilation and accommodation must considered under the aspect of equilibration or self-regulation, which he takes to be a fundamental factor in development. He understands the term in the sense cybernetics use it: as an active compensation, where a transformation in one direction is compensated by a transformation in the other direction (Piaget, 1964). Not only basic but also “higher” acquired behavior must involve processes’ auto-regulation (and thus feedback) – otherwise trial-and-error learning could not occur (Piaget, 1974, pp. 11-12). Ultimately, these considerations are based on the assumption that auto-regulative processes are “defending” the organism against an aggressive environment – aggressive in the sense that it creates

entropy as opposed to living organisms, which create information. In this context, the role of developing cognitive and/or behavioral schemes through regulations is the same as all other auto-regulative mechanisms on all levels: to increase information as a balance against (destructive) entropy in order to maintain the bodies' autonomy (Piaget, 1974, pp. 13-14). Equilibrating- or self-regulating factors are neither inheritable, because they adapt to external conditions, nor externally acquired, because they are internal regulations (Piaget, 1974, p. 37). Thus, in a wider sense, Piaget studies how the regulatory mechanisms for behavior and organic (to genetic) regulatory mechanisms are related. On the level of the development of human knowledge, he studies the interaction of behavior (experience and social transmission) and organic (maturation) mechanisms.

In a nutshell, Piaget (1974, pp. 174-176) thinks of the organism as an open, self-regulating, organized system, which continually interacts with and adapts to its environment in order to maintain itself. The process of adaptation, consisting of assimilation and accommodation, is essentially an equilibration process. It occurs when the environment changes, which happens continuously and more or less slowly. Unless they destroy this organization, new elements will be assimilated into the cycle by a transformation of elements of the system – this persisting modification is referred to as accommodation. Assimilation and accommodation are the two poles of adaptation, as one cannot exist without the other. This process view is central to Piaget's thinking: Organic life is based on continuous autoregulation processes. On all levels of development and organization, equilibration dynamics balance endogenous and exogenous "disturbances" or influences; the central idea is that of mutual influences through interaction, with maturation as the "driving force" for development.

5.2.5 A Complementary Perspective on Piaget and Vygotsky

Vygotsky died in 1938, well before the Macy conferences of the mid-1940ies to 50ies, so he was not familiar with cybernetics. However, in the 1930ies Vygotsky and Piaget held very similar views regarding child development, which may even be seen as complementing each other (Shayer, 2003). While initially there was a focus on the differences between their work, rendering Piaget as focusing of the solitary individual and Vygotsky on the social subject, in a second phase of reception the focus was on resemblances (as reviewed by Lourenço, 2012, pp. 282-284): Both take a developmental perspective to be essential for understanding psychological phenomena, i.e. an experimental approach must be complemented by a developmental approach. Development is not seen as accumulative, but as proceeding in stages (Piaget) or levels (Vygotsky) which provide the basis for developing towards the next stage/level. These changes are seen as qualitative and transformational in nature, there is no return to a previous stage. The "mechanism" of development is described in terms of distinct but interdependent processes, assimilation/accommodation in the case of Piaget and internalization/externalization in the case of Vygotsky. Lourenço (2012) refers to this as

dialectical approach. In this context the role of the environment is noteworthy: Vygotsky describes how memory becomes increasingly *mediated* (an example being a knot in the handkerchief as mnemonic aid), Piaget considers the role of *exogenous knowledge* originating in *observables*. Both highlight the importance of social interaction for the ontogenesis of the individual (here also lies a difference between their approaches which I will discuss below) and the primacy of action as opposed to a primacy of perception serving a faithful representation of the world. In their focus on inner processes, both are aware that differences between externalized knowledge (a child's answer to a question) and the underlying cognitive structure may frequently be found and consider this in their methodologies.

The fundamental difference between Piaget's and Vygotsky's thinking may lie not so much in their respective observations and concepts, but in their concept of knowledge or rather its epistemological status and in the role ascribed to artifacts. Piaget was interested in the development of knowledge, but in context of the concept of adaptation, knowledge cannot be a faithful representation of reality, but must be constructed. In order to know an object, it must be acted upon. This kind of interaction is called operation, it is "the essence of knowledge; it is interiorized action which modifies the object of knowledge" (Piaget, 1964). There are two types of experience (or aspects to the same experience): First, physical interactions with objects allow for drawing knowledge from the objects themselves through abstraction, exemplified by Piaget in weighing objects and discovering the differences. Secondly, knowledge is not only drawn from the objects but from the actions upon the objects. This second type of experience Piaget refers to as logical-mathematical experience. This was in 1964, and later he introduced a third level in order to account for reflecting abstraction or logical-mathematical experience, the child's *coordination* of actions upon objects. This leads to what Piaget referred to as *necessary knowledge* (Lourenço, 2012). To him, the experience of physical reality is the basic factor in the development of cognitive structures, and these structures are taken to be universal in the sense that everyone will develop the *same* knowledge. Furthermore, to him "logic is not a derivative of language", but "more profound" (Piaget, 1964). In other words, Piaget's conception of knowledge is rooted in the idea of truth and he seeks an explanation of how truth can be attained through construction of knowledge , whereas Vygostky did not seem to care much about this point, as Piaget himself remarked (Piaget, 1962). This may have been the reason that Piaget saw the importance of interaction with objects for development, but did not consider their cultural nature to be as central as Vygostky did: by doing so, a cognitive development cannot be considered to be culturally independent.

In the context of becoming an academic writer, we obviously have to consider that academic writing is culturally determined, not only in a broad sense by (the not very specific denomination) Western

cultures and societies, but by academic disciplines. Each has its own very specific discourses (Russell, 2002). Furthermore, the phenomenon we are interested in concerns late adolescence or adulthood, so the obvious question is, why bother with theories based on the study of child development. I agree with Shayer (2003) that in the 1930ies both developmental theories are complementary. Both focus on the individual's interaction with the environment, but are complementary with regard to the "primary trigger" or "driving force" for development: for Piaget it is maturation, the continuation of embryogenesis in interaction with the environment, leading to structures which enable learning; for Vygotsky the social situation triggers learning, which leads to development; and both see the importance of the "opposite" driving force as well. Indeed, both see development as an ongoing process of reaching successive stages or levels of cognitive structures which enable the individual to interact with the environment in a way previously not possible. As discussed above, with the development of his genetic epistemology, Piaget later developed the cybernetics-inspired concept of adaptation, which will be relevant in the next chapter, but the compatibility with Vygotsky's approach remains.

5.3 Reconsidering Academic Writing Development

5.3.1 Developmental Stages

Today there is a consensus that with regard to the particular concept of stages as a "bundle" of cognitive abilities progressing together in leaps, Piaget's theory was wrong. As Thelen and Smith remark, they may have fitted on a large scale, but "dramatically failed to capture the complexity and messiness of cognitive development in detail" with regard to "(1) an impoverished beginning state, (2) global discontinuities in cognition across stages, and (3) monolithic cognitive growths" (1994, pp. 21-22). Thelen and Smith review empirical evidence showing that (1) infants are not incompetent, but already have perceptual and conceptual skills, that (2) precursors to "higher cognitive abilities" like abstract numerical thought can be found early, and that (3) variability in individuals indicates that "stages" of development are domain-specific rather than unified (p. 22). Furthermore, Piaget (1964) saw embryogenesis completed at adulthood, so in his theoretical framework there would be no developmental stages after child development.

Still, Piaget's genetic epistemology offers a way of understanding the ontogenesis of the individual as intricate interplay between nature and nurture rather than as the "unfolding" of a genetic blueprint or learning from experiences in an additive manner. If we let go of the "particular stage packages" described, his consideration of the "order" of development remain as important. In his concept, developmental stages are not "hard-wired", but come with a "sequential probability", as Piaget

(1964) termed it: The “next level” only becomes probable when the previous has been reached, because the (cognitive) structures developed provide the basis for the development for assimilating the environment in a qualitatively different way. Thus, if there are, say, three developmental levels, developing to the third level is improbable when the organism has reached level one, but level two will provide the structures which will make it probable. Trial-and-error learning, i.e. assimilation and accommodation, are now taking place in a new environment: Because of the new assimilation schemes the environment is acted upon and perceived in a novel way, thus not only the organism changes, but the environment as the organism experiences it as well.

There has been debate about whether the stages are necessary for the theory. As Feldman argues, in contrast to some of his co-workers, Piaget himself never abandoned the concept of stages. His idea was that a stage forms “a coherent, interconnected, functional working system that provides the rules and procedures, principles and capabilities, constraints and possibilities for the mind at that stage” (Feldman, 2004, pp. 177-178), each stage integrating and transforming the previous one. At first sight, this is not so different from Vygotsky’s idea of a network of mental functions as an interfunctional system (Vygotsky, 2012 (1934), p. 177). The difference may be rooted in epistemological “demands”: Because of his realist position, Piaget’s theory needs a “functional working system” which is the *same* for each individual – which in turn asks for a description of this “sameness” in terms of universal structures and processes –, whereas Vygotsky does not seek to explain truth in his theoretical approach.

Despite this, we speak of a person as developing and with regard to writing it can be assumed that the development of the writer has no “endpoint” as long as there are new challenges. The question therefore is whether we should consider academic writing development to proceed in stages at all and, if so, in which way.

5.3.2 A “Vygotskysation” of Piaget (or vice versa)

Since Piaget and Vygotsky published their theories, there have been great advances in genetics and neuroscience. Despite this, their approaches have not lost their topicality. Going into findings in epigenetics and neural mechanisms of learning is beyond the scope of this thesis, but we should take into consideration that at least in adult development the likely option is not *either-or*, but *hen-and-egg*: physical changes in our body (including the nervous system) potentially change the way we assimilate our environment and if the environment changes we will potentially accommodate to this, which will have an impact which genes are being expressed – in short, trying to disentangle development and learning with regard to underlying mechanism becomes pointless. The question arising is not whether this will take place throughout life, but rather which factors to consider with regard to the interaction between organism and environment. Thus, the question is not whether

maturation *or* the environment can be "trigger" or driving force for development. As pointed out above, for Piaget it was primarily maturation (embryogenesis), for Vygostky primarily social interaction.

A point Piaget did not seem to consider as central is that in physically interacting with their environment, children in Western cultures rarely interact with "raw nature", but within and with artifacts – human-made structures. Even if children were completely isolated[37] in these early interactions, many of these could also be studied as social transmission mediated by artifacts representing a hidden curriculum cast in toys, from the first rattle over building blocks, marbles, etc. to various types of games. The effect at work here may be similar to what Rogoff (2003) observed for developmental models of children and the role of schooling in Western cultures: Despite the fact that we even name developmental stages with reference to our institutions, we speak for example of pre-schoolers or elementary school children, we tend to neglect the educational institutions' role in the development.

> *Instead of assuming that age transitions are inherent to children's biological maturation, independent of circumstances, it is reasonable to ask how children in a particular community become responsible enough to take care of themselves in ways expected and supported in that community. The impressive changes that come with biological maturation are accompanied by powerful changes in communitywide expectations and opportunities for children's participation in the activities valued in the community. For example, in middle-class communities, the role of a particular cultural institution – formal schooling – is so central that its contributions to children's developmental transitions are often overlooked.* (Rogoff, 2003, p. 171)

In other words, in trying to understand development there is the tendency to focus on the individual when trying to identify the steps all "normal" subjects will make, while underestimating or even ignoring the "normalizing" effects of the (to a certain degree) standardized environments like institutions and artifacts offer. At least with regard to adult learning, I propose to think of development and learning in terms of Piaget's concept of adaptation, but in a "Vygotskyan way", i.e. with a focus on the structures provided in and by the environment and without the cognitive structures necessarily having to be identical. For example, in the case of schools we can view the curriculum as having culturally developed in a way complementary to Piaget's description of the development of the individual: it represents an equilibrium between "cultural developmental expectations" or goals towards the individual and attainable development of cognitive capacities of the large majority of individuals going through the institution, embodied in structures which scaffold

[37] The younger children are, the less likely it is for them to be unattended. Recently, there have been more and more studies concentrating on scaffolding provided by caregivers, see for example the study by Csibra & Gergely (2009), showing how parents may "teach" infants by directing their attention using ostensive signals (prosody or gaze).

those individuals' development towards the goals. This view implies an understanding of developmental stages as the result of a "negotiation" between cultural[38] expectation towards the individual and the maturational (ultimately evolutionary) constraints on the development of the cognitive system, stability of physical and social structures in the environment provided: adaptation works both ways.

5.3.3 A Constructive Developmental Theory of the Self

There is yet another dichotomy which is at best implicitly covered in the context of the developmental theories introduced: Vygotsky as well as Piaget are concerned with the development of the individual's knowledge (which in Piaget's case is not so much *individual* after all, since he claims that the cognitive structures will be the same). What may loosely be termed "personality development" is thus not considered explicitly. Implicitly, the theory, especially the concept of adaptation, does offer a framework for thinking about it. Based on Piaget's work, particularly his concept of adaptation as meaning-making, Robert Kegan developed a constructive-developmental theory of the self, starting from understanding "human being as an activity" (Kegan, 1982, p. 8).

> *… it is not that a person makes meaning, as much as that the activity of being a person is the activity of meaning making. There is thus no feeling, no experience, no thought, no perception, independent of a meaning-making context in which it becomes a feeling, an experience, a thought, a perception, because we are the meaning-making context. … Human being is the composing of meaning, including, of course, the occasional inability to compose meaning, which we often experience as the loss of our own composure.* (Kegan, 1982, p. 11)

According to Kegan, two perspectives can be taken on this meaning making. The organism's relation to the world, which will lead to a personal construction of the world through prediction, finding regularities, rules, and relations, has been widely acknowledged in the works of Piaget, Kohlberg, and others.[39] This meaning-making of the world is an epistemological activity, while the other perspective, despite being equally important, has been widely neglected. Kegan refers to it as the experience of the dynamically maintained "self": "what is at stake in preserving any given balance is the ultimate question of whether the "self" shall continue to *be*, a naturally *onto*logical matter." (p. 12). In other words, learning and development always involve both, epistemological and personal development: I cannot relate, i.e. start to see the world in a different way, without changing myself. Just like the physical environment can be seen as an interaction partner for the body in development of sensomotory integration, the "self" will not develop in a vacuum, but in the engagement with the

[38] I am aware that, when it comes to human social organization, a clear-cut boundary between "biological" and "cultural" is difficult. I want to point out that I use the term culture in the *very* general (and in the context of cultural studies probably naïve) sense of 'those aspects of being human which are usually not described in terms of biological evolution': usage and creation of artifacts, physical and social structures, organizations, and the like. Thanks to Sabine Dengscherz for suggesting this clarification.

[39] In cognitive science the topic is currently subject to intense debate under the notions of *predictive coding* or *predictive processing* (see, e.g., Clark, 2016)

social environment. In this sense, Kegan understands the activity of *meaning* not only as survival activity necessary for maintaining life, or a physical activity, seeing or grasping something in a more narrow sense of cognition, but also as a social activity: it requires being recognized by another. Thus, meaning-making and survival of the organism, bodily experience, and social experience cannot be separated (pp. 16-19).

Kegan (1982, pp. 25-27.) draws on Piaget's genetic epistemology and his work on physical meaning-making in the first few years of life for evidence, when he highlights the importance of the subject-object balance as "the deep structure in meaning-evolution" (p. 31): the individual is subject to his/her perceptions, which in turn are the basis for the organization of the world, i.e. s/he is embedded in his/her perceptions. The newborn is not able to distinguish between stimuli from inside his/her own body and those coming from outside. S/he is embedded in an undifferentiated world. Development means to differentiate, to develop a perspective on one's own perceptions. By going through a process of *de-centration* followed by a *re-centration*, the subject-object balance changes and results in a transformed subjectivity (and newly constructed world): e.g., as the child moves from *being* a reflex to *having* a reflex, a new object emerges from the former subject. In this sense, as we develop, we "emerge from our embeddedness" (p. 31). Taking the transition into Piaget's era of concrete operational thought as an example, re-balancing from *being* perception to *having* a perception allows perceptions to become the object of attention. This fundamentally changes how an individual can relate to the world: by being able to move between different perceptions, s/he can start constructing categories, which in turn make (perception of) the world less fluid and more stable (p. 32).

A common notion of development is to see it as a sequence of internalization. At first sight, this does not seem to be consistent with the notion of development as a process of differentiation. Kegan argues that it is intrinsically related to adaptation: "In fact, something cannot be internalized until we emerge from our embeddedness in it, for it is our embeddedness, our subjectivity that leads us to project it onto the world in our constitution of reality" (p. 31). In this sense, physical meaning-making, as conceptualized by Piaget, "is the beginning of a history of transformations, each of which is a better guarantee to the world of its distinct integrity, a history of successive emergence from it (differentiation) in order to relate to it (integration)" (p. 31). Thus, what Kegan proposes is a further development of Piaget's genetic epistemology by including the development of the "self" and complementing the concept of adaptation with a cyclic process of differentiation (emergence from embeddedness) and reintegration (relating to the world or internalization). With this addition, it becomes possible to conceptualize Piaget's stages of cognitive development as equilibrium stages. Kegan refers to this process of "evolutionary movement" (p. 39) not as an additional process, but

rather as an implication of Piaget's work when looking at adaptation processes from the perspective of changes in subject-object balance over time.

Thus, we have two processes here: An adaptation process, i.e. an ongoing striving for equilibrium between a developing self and a changing world, and an *evolutionary movement*, i.e. "evolution as meaning-constitutive activity" of ongoing differentiation and integration driving the development of the self (Kegan 1982, p. 77). The difference between the former and the latter is that to the observer behavioral consequences (the completion of a cycle) may become visible on a different timescale. Whether we are talking about two different but interacting underlying processes, or whether we are talking about one process with different levels of observation is not explicitly discussed by Kegan. However, by stating that Piaget's developmental stages can be understood as equilibria reached during the progressing "evolutionary movement", I interpret Kegan's view as taking a different level of observation on the same process. In any case, the resulting dynamics can be observed in a narrower timeframe (a cycle of adaptation leading to a behavior observed) or a wider timeframe (a cycle of differentiation/integration leading to a change of self which allows for the individual to relate to the world in a different way). To Kegan, the latter constitutes personal development:

> *…this conversation is not one of continuous augmentation, but is marked by periods of dynamic stability of balance followed by periods of instability and qualitatively new balance. These periods of dynamic balance amount to a kind of evolutionary truce: further assimilation and accommodation will go on in the context of the established relationship struck between the organism and the world. The guiding principle of such a truce – the point that is always at issue and is renegotiated in the transition to each new balance – is what, from the point of view of the organism, is composed as "object" and what is "subject". The question always is: To what extent does the organism differentiate itself from (and so relate itself to) the world? … this evolutionary motion is the prior (or grounding) phenomenon in personality; that this process or activity, this adaptive conversation, is the very source of, and the unifying context for, thought and feeling; that this motion is observable, researchable, intersubjectively ascertainable* (Kegan, 1982, p. 44)

It is important to note that in this view, personal development and knowledge acquisition (rather a development of knowing) are part of one single process: meaning-making. We learn, but we also experience the activity of learning, which makes meaning-making an activity which is epistemological and ontological at the same time: "it is about knowing *and* being, about theory-making *and* investments and commitments of the self" (p. 45).

With regard to educational systems, the focus here being on higher education, we may ask what kind of interaction between individual and environment is being fostered in the institution: is the curriculum structured in a way which creates great pressure for accommodation in the sense that a particular outcome is expected (like giving the proper definition in an exam) or does it offer opportunities for adaptation with some degrees of freedom in meaning making? A curriculum which

does not include a sufficient amount of opportunities for practicing this will fail to provide an adequate environment for the development of academics. It will not come as a surprise that I see academic writing assignments as a paradigmatic example of posing a challenge which will, on the one hand, drive the individual to accommodate to the environment in the sense that formalities, genre, topic, etc. may be prescribed (and need to be internalized), while at the same time demanding the student to assimilate due to the need of developing his/her own perspective on the topic and finding a line of argument, which demands constant decision making – and thus causes the need to emerge from embeddedness.

5.4 Development as *Becoming* an Academic Writer

The aim of this chapter was to prepare the ground for considering academic writing in terms of development, in particular with regard to two questions:

1. What should we focus on when we study *academic* writing development and
2. how we can conceptualize *development*?

With regard to the first question, it can be said that the focus on the text product and the *writing process narrow* has the same consequence as the classical cognitivist models, which perceive the cognitive processes of writing as independent "boxes": it does not allow for capturing the *academic* dimension of academic writing. However, academic writing is not an end in itself, it is intentional and situated in a social and physical environment and this leads to phenomena in academic writing which cannot be explained if the focus is on the text and/or the "inner cognitive process" alone. I suggest that the environment provided by higher education institutions as well as academic communities will have an impact on how students conceptualize 'what they are doing' and the nature of academic work (be it research in the arts or sciences) when they are writing; and as they are socialized into academia this is bound to change. This may be reflected in Pohl's (2007) speculation (as he termed it) that changing "subjective theories" of the nature of research may be involved, but he used theories and methods which do not allow for a further exploration of this issue. However, in the next chapter I will introduce findings from higher education research which will allow for addressing students' relation to knowledge and their epistemological beliefs. Thus, with regard to Bereiter's (1980) comment that 'writing development' may well reflect other areas of development I clearly support this idea and propose that it may at least partially be captured under not notion of epistemological development.

Before proceeding with any further considerations, it was important to clarify the question in which way it is appropriate to talk about academic writing *development*. Supporting evidence, which is complementary to the cognitive process models "naturally" focusing on 'mental processes', studies of students' text do allow for an identification of stages regarding common academic language, intertextuality, etc. in students' texts. However, the fact that most students will eventually be able to produce a text which meets the demands of the environment does not preclude the option that the phenomenon could be better conceptualized in terms of learning. I argued a view on development based on the developmental theories of Piaget and Vygotsky, showing that they are not so much contradictory, but complementary, by suggesting that *adaptation* may be driven by the environment as well as the developing individual. At least in adult development, the question of a primacy of learning over development or vice versa addresses two sides of the same coin: there is no development without learning and no learning without development. We may understand stages, phases or levels of development as equilibrium not only between individual and environment, but also between collective experience of what can be expected of most individuals at a particular stage and more or less explicitly institutionalized cultural expectations; this is conceptually captured by Vygotsky's *zone of proximal development*. For school children, these expectations are clear and structures like the curriculum and institutionalized teacher education provide stability (and sometimes reluctance to organizational adaptation). However, – as shown in the introduction of this thesis – in higher education expectations towards academic reading and writing are usually part of the hidden curriculum.

Both, Piaget's and Vygotsky's theory, focus on the development of knowledge. I introduced the work of Kegan to argue that as the individual's knowledge about the world changes, the individual's view onto the world and the ways s/he will be able to act within and interact with the world changes. This amounts to a change of the individual or, as Kegan terms it, of the 'self': the adaptation to the environment is not only about knowing, but also always a *becoming*. The consequence of this view is that development of academic writing can be viewed as a process of adaptation which will develop the individual's knowledge and abilities in interaction with the environment in a way which incorporates the development of the whole individual. On the side of the individual, cognitive development is thus not about adding or "upgrading" an independent module 'in the mind' to the next "correct" structure, but about personal development: about *becoming an academic writer*. The environment will implicitly or explicitly impose its expectations; and the more explicit and maybe even institutionalized they are, i.e. the more stable the structures the growing individual is interacting with, the more likely it is that they will be describable in terms of a stage, level, or phase. Growth does not occur in one shot, but requires many cycles of adaptation, therefore reaching what in a reliably structured environment can be labelled a stage of development will raise the probability

of reaching the next stage.

In the following chapter I will argue that in the context of *academic* writing an important part of this *becoming* can be captured in terms of beliefs about the nature and status of the disciplinary knowledge encountered.

6. Becoming an Academic Writer Involves Developing One's Personal Epistemology

Students enter the university with a notion of knowledge which has been shaped by their prior experiences in school as well as the way society views knowledge. This usually involves a notion of academic knowledge as being true and "guaranteed" by authority. As they enter university, this is challenged and the student is driven to adopt a view that knowledge is tentative: his/her ideas about the nature of knowledge change as his/her position develops towards a more sophisticated personal epistemology (e.g., Perry, 1970; Hofer & Pintrich, 2002; Bendixen & Rule, 2004).

In this chapter I argue that there is a strong relation between becoming an academic writer and the epistemological development demanded in academic socialization, particularly in writing-intense disciplines. Currently, research regarding the two fields is separate, but I will show that on both sides, i.e. personal epistemology and academic writing research, connections can be found. I propose that the concept(s) of personal epistemology significantly adds to understanding the challenges students have to tackle as they become academic writers. In order to give the reader an idea of what is meant with "epistemological development", I will introduce the "Perry scheme", which initiated this research field, then give an overview of different approaches, and discuss the approaches which are relevant in the context of this thesis in more depth. While not labelled as such, issues relating to the writer's personal epistemology and its development do play a role in academic writing research and practice, for example in Pohl's suggestion of 'subjective theories' (Pohl, 2007), or in Elbow's notion of *voice* (1981). I propose that considering the epistemological development as part of becoming an academic writer offers a theoretical basis for understanding some phenomena in student texts which play a role for practitioners of process-oriented writing didactics.

6.1 Concepts of and Approaches to Personal Epistemology

6.1.1 The Perry Scheme

The term *epistemological development* was introduced by William Perry, who worked as a student counsellor and published his work on a longitudinal study "Forms of Ethical and Intellectual Development in the College Years – A Scheme" in 1970 (Perry, 1970), based on student interviews collected over a period of 20 years in the context of documenting undergraduate experience at Harvard and Ratcliffe. Perry had observed that students differed dramatically in the way they responded to different ideas concerning truth and value in the pluralistic environment of the university and eventually systematized his observations into a model which describes a series of

challenges, which each student has to find an individual way to respond to. The model suggests a main line of development of nine stages, *positions* as Perry termed them, which describe how the student conceptualizes knowledge and authority as well as his/her role.

The positions trace how most students view and approach mastering the uncertainties and inconsistencies of the pluralistic university environment as they are confronted with contradicting authorities, be it persons or 'in the literature.' The main line of development goes from an idea of Truth (capital "T" intended to denote an idea of "absolute truth"), which is guaranteed by an authority via the realization that there may be competing truth (as Truth is not yet known), a period of seeing truth as relative and contextual, to developing commitment, where responsibility is taken in the face of relativism and which eventually becomes a way of being. The pace of development may differ and only some of the students will reach the final position 9 and fully develop commitment(s). Perry grouped the nine positions into three major phases of epistemological development, the *modifying of dualism* (positions 1-3), the *realizing of relativism* (positions 4-6), and the *evolving of commitments* (positions 7-9). The developmental trajectory in *dualism* moves from an absolute notion of knowledge, which is bound to authority, to the realization that there may be more than one answer to a question, bound to the belief that the "truth" will be found. As the students move through the positions of *relativism*, they initially may take an "anything goes" attitude to deal with an pluralistic environment which is characterized by many "opinions", which in turn may have different underlying epistemologies, while eventually realizing that the need some kind of "safe ground to operate from", which can only be built by commitment. Making a first commitment, experiencing the implications of this and eventually realizing commitment as part of their identities, which are affirmed by their environment, marks the last developmental trajectory, *evolving of commitments*. Table 4 describes this main line of the scheme with all nine positions (an explanation of positions' names is not given) described in more detail (following Perry, 1970, p. 10): The first column indicates the name of the respective position, the second gives a description of it.

An alternative way to group them is proposed by Moore (2002; fourth column), who differentiates between *dualism* (positions 1-2), *multiplicity* (positions 2-4), *contextual relativism* (position 5), and *commitment* (positions 6-9). Moore's version is not only commonly used in the literature (see, e.g., Perkins, 2008; Labbas, 2013), it also relates to more recent research building on Perry, which will be introduced in this chapter (see table 8, summing up the developmental models of this subchapter). The most "prominent" positions, in the sense that they are most easily recognized and have sparked most follow-up research, are the first five, which are thought to develop within the (in the US American system) typical four years of college education (Chandler, Hallett, & Sokol, 2002).

	Perry's Scheme of Epistemological Development *main line of development*	*Phases grouped*	
		Perry	*Moore*
Position 1 ***Basic Duality***	The student sees the world in polar terms of we-right-good vs. other-wrong-bad. Right Answers for everything exist in the Absolute, known to Authority whose role is to mediate (teach) them. Knowledge and goodness are perceived as quantitative accretions of discrete rightness to be collected by hard work and obedience.	The modifying of dualism	Dualism
Position 2 ***Multiplicity Pre-Legitimate***	The student perceives diversity of opinion, and uncertainty, and accounts for them as unwarranted confusion in poorly qualified Authority "so we can learn to find The Answer for ourselves.		
Position 3 ***Multiplicity Subordinate***	The student respects diversity and uncertainty as legitimate but still *temporary* in areas where Authority "hasn't found The Answer yet." He supposes Authority grades him in these areas on "good expression" but remains as puzzled as to standards.		Multiplicity
Position 4 ***Multiplicity Correlate or Relativism Subordinate***	(a) The student perceives legitimate uncertainty (and therefore diversity of opinion) to be extensive and raises it to the status of an unstructured epistemological realm of its own in which "anyone has a right to his own opinion," a realm which his sets over Authority's realm where right-wrong still prevails, or (b) the student discovers qualitative contextual relativistic reasoning as a special case of "what They want" within Authority's realm.	The Realizing of Relaitivism	
Position 5 ***Relativism Correlate, Competing or Diffuse***	The student perceives all knowledge and values (including authority's) as contextual and relativistic and subordinates dualistic right-wrong functions to the status of a special case, in context.		Contextual relativism
Position 6 ***Commitment Forseen***	The student apprehends the necessity of orienting himself in a relativistic world through some form of personal Commitment (as distinct from unquestioned or unconsidered commitment to simple belief in certainty).		Commitment within relativism
Position 7 ***Initial Commitment***	The student makes an initial Commitment in some area.	The evolving of commitments	
Position 8 ***Orientation and Implications of Commitment***	The student experiences the implications of Commitment and explores the subjective and stylistic issues of responsibility.		
Position 9 ***Developing Commitment(s)***	The student experiences the affirmation of identity among multiple responsibilities and realizes Commitment as an ongoing, unfolding activity through which he expresses his life style.		

Table 4: The main line of Perry's scheme of epistemological development, see text for further explanation (following Perry, 1968, p. 10).

6.1.2 Deflections of Development

While a main line of development could be identified, not all students developed through all stages described, at last not during the time they were studied: Perry found that some students may delay

or deflect growth by adopting strategies he termed *temporizing*, *retreat*, or *escape* (Perry, 1968, p. 198): A *temporizing* student may procrastinate in the same position for a full academic year, maybe even admitting to 'not being ready yet'. This will either result in taking up growth again or in drifting into *escape*, which will be explained below. While *temporizing* may happen at any time, *retreat* will (relatively rarely) happen while the student is involved in *modifying of dualism*. Perry comments that a *regression* to position 2 or 3 would well-describe the phenomenon, except for the "dramatic energy" (p. 204) involved: "it appears to require fight" (p. 205). The reason for a student reacting with *retreat* is interpreted to be partially intrinsic, because of the dualist division of the world into we-good vs. they-bad, and partially due to the need to defend against the challenges posed by a pluralistic environment. The variants of *retreat* he identified (Perry, 1970, pp. 204-211) are:

- *Reaction*: high anxiety, complaint, resentment against multiplicity.
- *Dedicated reactionar*y: rightness, hate of otherness, no overt anxiety; has all the answers.
- *Negativism*: passive resistance against the Authority, but no "cause" of one's own.
- *Dogmatic rebel*: identity in "cause" with no contingent judgement. "Cause" determined by whatever Authority does to be against.

The two more common variants of *escape* Perry categorized are *dissociation in multiplicity* and *encapsulation in relativism*, which I will briefly describe; less common are *encapsulation in multiplicity* and *dissociation in relativism*. In dissociation, the "sense of active participation as an agent in the growths of one's identity is abandoned. Its final destiny lies in the depersonalized looseness of Multiplicity" (Perry, 1968, p. 212). Students in this state of *escape* do not seek intellectual challenge in favor of adopting an "anything goes" attitude. *Encapsulation in relativism* is characterized by the student encapsulating in activity, being particularly obedient and/or working hard, but "sealed off from the implications of deeper values" (p. 213). The student might resort to cynicism, using relativism to defeat all value statements, except for the self-affirmation as a nihilist finding identity in performance. As Perry points out (p. 212), the alienation of *escape* may not be permanent, but precede adoption of a position of commitment; it therefore comes as a surprise that Perry did not see it as a form of regression as well, albeit a less "rebellious" one.

Perry saw his work as grounded in Piaget's theory of development (1970, pp. 228-230), after all it is based on Piaget's concepts of assimilation schema and adaptation as introduced previously in this thesis. Analogous to the period of formal operations, the scheme of epistemological development recapitulates a movement from naïve egocentrism towards a more differentiated awareness of the environment, tracing assimilations and accommodations involved in the student's assumptions on knowledge and value. With regard to the phases described by Piaget, Perry would place his scheme as a follow-up phase, referring to young adolescents starting at age 15, calling it the "period of

responsibility" which constituted a "shift is away from spatial-cognitive restructuring to emotional and aesthetic assessments" towards a "personal style of equilibrium" (Perry, 1970, p. 230).

Perry's work sparked follow-up research as well as criticism, so I will briefly provide an orientation to the field of *personal epistemology.*

6.1.4 Personal Epistemology – An Orientation

Perry's scheme has been developed further as well as criticized. What unites all approaches it that they are based on the assumption that epistemological development means that "an individual's thinking about epistemological issues not only changes over time, but that it develops towards a more sophisticated perspective or stance toward knowledge and knowing" (Pintrich, 2002, p. 400).

In the field a variety of labels is used: epistemological thinking, epistemic cognition, epistemological beliefs, epistemological theories, ways of knowing, epistemological reflection, and epistemological resources and repertoires; Hofer suggests to use the term *personal epistemology* as an umbrella (Hofer, 2002, p. 3). This also includes approaches which do not necessarily aim at identifying defined developmental stages, and I will use it as a general term and refer to epistemological development only if a Piagetian understanding of development is meant.

In order to define a least common denominator for all these approaches, Pintrich (2002, p. 390) suggests that "personal epistemology would include cognitions and beliefs about the certainty of knowledge (objectivist vs. relativist vs. multiplist views), the simplicity of knowledge (simple, concrete vs. complex, contingent, context-dependent), the source of knowledge (external authorities vs. personal voice), and justifications for knowing (criteria for making knowledge claims, use of evidence, use of reasoning)." Different aspects may be weighed as more or less important by different approaches, but on the whole there is widespread agreement that the ones named above define a person's view on the nature of knowledge and knowing. Some models link these views to beliefs about the nature of learning (and teaching) and/or intelligence (innate abilities), disciplines (domain specificity of beliefs), or the self and motivational beliefs (Bendixen & Rule, 2004). Richardson (2013) sees two main approaches to researching epistemological cognition, qualitative research methods and the operationalization in questionnaires using scales, models Pintrich (2002) refers to as *cognitive models* and *developmental models*. The aim here is not to give a complete overview[40], but to present research with an implicit or explicit link to the development of the

[40] There are a number of reviews and integrative papers with a large review section (see, e.g., Hofer & Pintrich, 1997; Greene, Azevedo, & Torney-Purta, 2008; Bendixen & Rule, 2004; and Richardson, 2013). While the majority of researchers focus on tertiary education (which is also the focus here), there is also research on the personal epistemology of children and adolescents (school age) as well as people between 40 and 60 (for a discussion, see Chandler, Hallett, & Sokol, 2002), which is not considered here.

academic writer and which may “strike a chord” with researchers and practitioners in the field of academic writing.

6.1.5 Developmental Models

According to Pintrich (2002), *developmental models* conceptualize epistemological development as a unitary structure changing over time. The changes can be described as development in phases, stages, levels, or positions toward a more sophisticated stance or perspective regarding knowledge and knowing, leading to an assumed final state or endpoint. Accordingly, epistemological thinking was initially thought of as domain-general, which is reflected in research designs: Tasks address academic, social, and personal contexts and require little disciplinary knowledge. Thus, interviews may rely on very general questions. Development is usually conceptualized in a Piagetian sense as striving for equilibrium as the individual aims for coherence between his/her knowledge and experience in a meaning-making process. Perry’s model, although still considered to be valid (Moore, 2002; Chandler, Hallett, & Sokol, 2002), has also been criticized, e.g., for being domain-independent or for being mainly based on students belonging to a white male elite.

More than One Way of Knowing

Belenky, Clinchy, Goldberger, & Tarule (1986) studied a very heterogeneous group of women with regard to age, ethnicity, and social class as well as personal context (young mothers), and educational institutions, ranging from community colleges to so-called invisible colleges. While initially their study did not particularly focus on epistemological development, it turned out that the subjects’ personal epistemology was central to their perception of self and world. However, some of the perspectives found (based on interviews and written accounts) did not fit the Perry scheme. Table 5 gives an overview of the positions described, including a reference to Perry’s scheme.
As Clinchy (2002) points out, Perry’s description of the positions focuses on the nature of knowledge and truth, whereas they came to stress the relation to knowledge and truth as well as the women’s conceptions of themselves as knowers.

Position	Description	Reference to Perry
Silence *(later renamed Silenced)*	Position of *not knowing* (while potentially being intellectually engaged, but overwhelmed) Feeling incapable of articulating thoughts and feelings, unable to 'take in' and comprehend (usually described by those who have moved beyond it). Failure to develop, not a step in "normal" development.	none
Received Knowledge *(later renamed Received Knowing)*	Belief that for every question there is a single correct answer. There is no room for ambiguity, but right/wrong, true/false, good/bad etc. *Truth is external and lies in the hands of authorities.* Receptive to *knowledge as something which is stored and reproduced*, but not to be used and questioned.	Position 1: Dualism
Subjectivism	Subjectivists "just know", *knowledge is immediate*, not based on words or inferences. They can only deal with knowledge they can relate to and feel; *truth is personal* and individual (springs from heart or gut) and everyone has the right to one's opinion. Values are no subject to reflection. Suspicion towards information from authorities.	Position 2: Multiplicity Pre-Legitimate
Procedural Knowing	Knowledge neither consists of facts stored "as they are" nor stored direct experience, but is a process which requires work. There may be different answers, but some may be more valid than others. Two gross approaches are taken: **Separate knowers** seek *mastery and control* by taking a critical approach, looking for what is wrong, while **connected knowers** *active(ly) surrender* by taking an accepting approach, seeking what is right or understanding by taking on the other perspective. Both are "objective" (as opposed to subjectivism).	Position 4: Multiplicity Correlate or Relativism Subordinate *with regard to critical thinking (separate knowers)*
Constructed Knowing	*Complexity and ambiguity are assumed and sustained, right answers a special case.* Learning and thinking are described as a circular proceeding out of confusion, as weaving together strands of rational and emotive thought and integration of objective and subjective knowing.	Position 5: Relativism Correlate, Competing or Diffuse

Table 5: The positions, a brief description, and a reference to Perry's position as described by Clinchy (2002).

The positions *dualism* / *received knowledge* and *relativism*/*constructed knowing* are not fundamentally different, whereas *procedural knowing* opens up a new perspective on the way students may relate to knowledge: Belenky et al. (1986) found that there appear to be two contrary approaches to dealing with knowledge in a way which is not subjectivist (in this sense, the strategies are labelled as objective) and accordingly labelled the subjects as *separate* and *connected knowers*. *Separate knowers* put themselves at a distance, they are interested in the validity of an argument, the nature of their agency is described as mastery and control. In contrast to this, the agency of

connected knowers is described as active surrender in an attempt to understand and engage in reasoning with the other (for a detailed description see table 6).Research building on *Women's Ways of Knowing* indicated that, despite the fact that a gender *bias* was found, the two modes are *not gender exclusive* (Galotti, Clinchy, Ainsworth, Lavin, & Mansfield, 1999). They referred to separate and connected knowers as learning types, but since there appears to be little evidence for learning *types* (Pashler, McDaniel, Rohrer, & Bjork, 2008) as opposed to *learning preferences* or *strategies,* I prefer to use the term *strategy*.[41] Furthermore, it should be noted that there are ideal types and one individual student never exhibits *all* aspects of a mode (Clinchy, 2002).

Aspect	Connected Knowing	Separate Knowing
The name of the game:	"Believing Game" looking for what is right; accepting	"Doubting game" looking for what is wrong; critical
Goals:	Emphasis on meaning: to understand and be understood	Emphasis on validity: to convince and be convinced, to justify, test, refine
Relationship between the knowers:	Supportive: reasoning *with* the other	Challenging, adversarial: reasoning *against* the other
The knower's relation to the known:	Personal. Attachment & intimacy: "stepping in"	Impersonal. Detachment and distance: "stepping back"
Nature of agency:	Active surrender	Mastery and control
Nature of discourse:	Narrative	Argument
The role of emotion:	Feelings illuminate thought	Feelings cloud thought
Procedure for achieving (approximating) "objectivity":	Adopting the perspective of the particular other; empathy	Adopting a neutral perspective, "from no position in particular"; adhering to rules for avoiding bias
Basis of authority:	Personal experience (own or vicarious)	Mastery of relevant knowledge and methodology
Strengths:	Holistic, inclusive	Narrowing, discriminating
Vulnerabilities:	Absence of conviction; loss of identity, autonomy, and power. Danger of always being the listener	Absence of conviction; alienation and absence of care and intimacy. Danger of never listening

Table 6: Characteristics of separate and connected knowing (following Clinchy, 2002)

In the context of academic writing, it is particularly interesting that Clinchy's (2002) explanation of the two strategies employed in *procedural knowing* draws on writing researcher Peter Elbow's (1973) distinction of *doubting* and *believing game*. These are grounded in his observation that in writing

[41] Furthermore, the use of *strategy* instead of *type* does not automatically imply that personal epistemology is a fixed personal trait which is context-independent (an issue which is under debate), but leaves open the possibility that an individual may act in a context-specific way and employ the strategy of acting as a separate knower in one situation or domain and as a connected knower in another. This fits with Clinchy (2002) later referring to separate and connected *knowing* (rather than *knowers*).

essays students often play either the *doubting game*, which involves a weeding out of the self in the search for truth, or the *believing game*, where they adopt the perspective of the other, because it demonstrates a direct link between phenomena often found in student text and personal epistemology.

Model of Epistemological Reflection

Baxter Magolda developed her Model of Epistomological Reflection (Baxter Magolda, 1992) in a longitudinal study involving annual interviews with 51 women and 50 men, who in the beginning were at traditional college age, which were analyzed using grounded theory methodology; after 10 years the number of participants had dropped to 39.

She makes her own guiding assumptions explicit:

1. Epistemic assumptions and the structures they constitute are socially constructed in a meaning-making process in which initial epistemic assumptions, dissonances we experience, and the context play a role.
2. An individual's personal epistemology is context-bound, since it is grounded in epistemic assumptions and particular experiences.

In her analysis Baxter Magolda looked not only at the subjects' conceptions of knowledge and knowing, but also at the roles they ascribed to teachers, peers, the role of evaluation (or assessment), and themselves as students. She found different patterns in relating to the different role and actions taken, which were gender-related, but not gender-exclusive. She suggests that they may be understood as possible social constructions students use as they develop from a dependence on authority in the phase of *absolute knowing* to self-authorship. Table 7 gives an overview of the phases, the first column giving the phase or position, the second a description of the conceptualization of knowledge, expectations towards roles, and gender-related patterns, and the third the time and percentage of students being categorized in that phase/position.

Position	Description	Year of studying: %
Absolute Knowing	*Knowledge is certain, authorities know the Truth.* Role of students: obtaining knowledge from teachers Role of teachers: communicate knowledge effectively und making sure it is understood Role of peers: sharing material, explaining Role of evaluation: testing acquisition of knowledge Gender-related patterns in knowledge acquisition (*not* gender exclusive): • *Receiving pattern* (more women): listening and recording information; *asking* peers • *Mastery pattern* (more men): active involvement in maintaining attention and remembering of information; *debating* with and *quizzing* peers	First year: 68% Second: 46%

Transitional Knowing	*If different interpretations are offered, knowledge is uncertain (e.g., in humanities and social sciences). There are areas of certain knowledge (e.g., maths and sciences).* Role of students: understanding (rather than acquisition) Role of teachers: aid understanding and application of knowledge Role of peers: aid exploration of different interpretations Role of evaluation: testing understanding Gender-related patterns (*not* gender-exclusive): • *Interpersonal pattern* (more women): sorting out opinions by connecting to others and the subject; greater enjoyment of uncertain than certain areas and employment of personal judgement; focus on sharing views • *Impersonal pattern* (more men): distance to others and subjects in learning; interested in others' views and discussion for being challenged to think; resolving of uncertainty via logic; focus on defending one's view	First: 32% Second: 53% Third: 83% Forth: 80%
Independent Knowing	*Knowledge is uncertain; truth is individual.* Role of students: thinking for themselves Role of teachers: promoting independent thinking and avoid judging students' opinions Role of peers: exchange to expand possibilities Gender-related patterns (*not* gender exclusive): • *Interindividual pattern* (more women): difficulties to establish one's voice alongside those of others; quick to see how others are right and change views accordingly • *Individual pattern* (more men): perfection of own voices	Forth: 16% 1st after college: 57%
Contextual Knowing	*Beginning making good judgements based on relevant information and criteria about multiple perspectives. Realization of responsibility for decisions; decisions rely on external formulas.* Integration of relational and impersonal patterns: Previously gender-related patterns merge as individuals watch others make judgements and use the complementary pattern to augment their previously preferred pattern. Proceeds through phases: Letting go of external formulas and search for internal authorities. Transition usually triggered by experience of either crisis (professional or private) or positive consequences of acting on one's needs. Leading to the foundation: an individual belief system as foundation for self-authorship *Self-authorship: Contextual knowing as the integration of the epistemic assumption that knowledge is contextual, the intellectual process of determining what to believe, and the integral role of the self in the knowledge construction process.*	Forth: 2% Post-College Years

Table 7: A summary of Baxter Magolda's Model of Epistemological Reflection.

Baxter Magolda found a progression of epistemological positions in four phases from *absolute knowing*, via *transitional* and *independent knowing* to *contextual knowing* that at its core is similar to the findings of Perry and Belenky, Clinchy, Goldberger, & Tarule. However, with regard to the first three positions she found a gender-related developmental trajectory: students who were categorized as following the *receiving pattern* in *absolute knowing* would also be categorized following the *interpersonal pattern* in *transitional knowing* and the *interindividual pattern* in *independent knowing* and vice versa before they merge in *contextual knowing*. *Contextual knowing* is described as a process of "developing their internal voices" (p. 99) with the 'developmental goal' of gaining self-authorship. In the overall process, "the gender related patterns used in earlier ways of knowing mediated the transition to authoring one's own views" (Baxter Magolda, 2002, p. 95), particularly in *independent knowing*, where students following the *interindividual pattern* experience difficulties in finding their voice. Below, I argue that these findings are relevant for academic writing with regard to the concept of voice or stance as used in academic writing research.

Baxter Magolda also looked at the expectations of students towards the roles teachers, their peers, the goal and form of assessment, and themselves. While these may not perfectly apply to the German-language university, her findings still provide a source for reflection for teachers in higher education who may be puzzled by their students' expectations and attitudes towards studying. While it is well established that great variation can be found among students (Perry, 1970), Baxter Magolda provides figures which, despite the fact that they are bound to be culture specific, give an impression of the variability in which students' epistemological development proceeds: In their first year, 68% of the students could be categorized holding a position of *active knowing.* At the end of college, only 16%, but a year after college 57% of the students had developed epistemological assumptions which would lead to a categorization of holding a position of *contextual knowing*. Based on the interviews, she attributes this shift to the fact that in work and graduate school contexts, subjects "were expected to function independently" and expected to come up with decisions, which "offered the first substantive opportunity for self-authorship" (p. 95). She also reports that many initially mistook the new context as "total freedom", not realizing the need for rationale or stance taken behind a decision, which triggered a development she describes within the position.

I will discuss the finding of these models in the context of concepts and findings from academic writing, which I will present in the following sub-chapters. While my interest lies in the developmental models it should be noted that they are criticized, particularly by proponents of cognitive models who object to the idea of developmental stages. They show that the stages, especially in the very detailed version Perry proposed, may not be as unified. I will introduce this

approach to researching personal epistemology in general and Schommer's cognitive model in particular. Furthermore, the role of the discipline (or more generally: domain of knowledge) has not been discussed. These points will be treated in the following two subchapters.

6.2.6 Cognitive Models

Cognitive models of epistemological thinking assume a number of components or dimensions, which may express themselves as well as change rather independently. Epistemological thinking may be conceptualized also as domain-specific. Basic assumptions of the models and research design go hand-in-hand: Research is often conducted taking into account different school subject areas (like mathematics). Quantitative analysis yields, often independent, components, and thus the degree of sophistication of epistemological thinking can vary according to dimension (Pintrich, 2002).

The probably most widely cited survey was developed by Schommer (1990), who asked for the effect of students' beliefs about the nature of knowledge on comprehension. Starting with a critique of Perry and his "followers'" research assuming that personal epistemology is unidimensional and develops in a fixed progression of stages, she proposes that it is more plausible that personal epistemology is a system of beliefs. The Epistemological Beliefs Inventory Schommer devised consists of 63 items, which are answered on a five-point scale from 1 (strongly disagree) to 5 (strongly agree), covering the five dimensions (scales in brackets):

1. *omniscient authority* (depend on authority; don't criticize authority),
2. *certainty of knowledge* (avoid ambiguity; knowledge is certain),
3. *structure/simplicity of knowledge* (seek single answers; avoid integration),
4. *control/innateness of learning* (success is unrelated to hard work; ability to learn is innate; can't learn how to learn),
5. *speed of learning* (learning is quick; learn at first time; concentrated effort is a waste of time).

She found that students' epistemological development did not proceed in the clear-cut stages Perry proposed and thus refers to an individual's set of beliefs as an epistemological belief system rather than a person's 'overall' stage of epistemological development.

Schommer's research is geared towards the relation of personal epistemology to comprehension, which is why control and speed of knowledge acquisition are relevant factors. As Hofer (2002, p. 11) points out, "[b]eliefs about the nature of knowledge and knowing are presumed across the models, yet issues of whether beliefs about learning and intelligence should be included remain a dispute." What is particularly interesting with regard to academic writing is the method Schommer used to validate the effects of epistemological belief as predictor for learning and comprehension: she

provided excerpts from two texts from different disciplines (psychology and nutrition) without conclusion. One conclusion required an integration of theories presented, the other positioning oneself regarding controversial findings, and the subjects were asked to write the concluding paragraph. For both domains, Schommer's analysis yielded that the more students believed in quick, all-or-none learning, the more likely it was that they came to oversimplified conclusions. The more they believed in certain knowledge, the more absolute their conclusions were. Schommer controlled for prior knowledge (number of classes taken on the subject) and understanding ("mastery" as measured with a multiple-choice test) and found that the more classes a student had taken on the subject, the more tentative answers became. In other words, Schommer found correlations between epistemological beliefs and phenomena often found in students' texts[42].

6.2.7 Is Personal Epistemology General or Specific?

An open issue in quantitative cognitive research on personal epistemology is the question whether an individual's personal epistemology is general and thus akin to a personality trait or whether it is context dependent, i.e. whether it is discipline-specific and/or culturally determined. With regard to academic writing, this is a relevant question, because it opens another dimension in which expectations towards students' texts can be understood.

Whereas Schommer interpreted her results as indicating domain generality (Schommer, 1990, 1993, Paulsen & Wells, 1998), using Schommer's questionnaire, obtained systematically different results from students of the six domains humanities, social sciences, natural sciences, education, business, and engineering. Students in the hard sciences scored higher on *certainty of knowledge* than those of soft subjects, students from applied disciplines scored higher on *certainty of knowledge*, *simplicity of knowledge*, and *quick learning* than those of pure subjects. While this regarded different students in different disciplines, further research into this showed that students' epistemological beliefs initially tend to be the same in different domains, but become domain-specific within their academic specialization. Furthermore, qualitative differences in beliefs about the nature of knowledge and learning have been found between "Western" students and students in China, Hong Kong, South Africa, or the South Pacific, who had not been exposed to Western educational systems (Richardson, 2013). Thus, epistemological beliefs can be understood as initially being domain-independent and becoming domain- (or discipline-) specific in academic socialization (Muis, Bendixen, & Haerle, 2006).

[42] Schommer's approach sparked much research using her questionnaire (e.g., Paulsen & Wells, 1998) or revised versions (e.g., by Qian & Alvermann, 1995); see review, e.g., by Richardson (2013). The aim here is not to provide another review, but to present research of personal epistemology with a link to academic writing.

While it is often criticized that developmental approaches see personal epistemology as domain-general, Perry saw students "always as more complex than any theory" and "even suggested that students could be in several different positions at the same time with respect to different subjects and experiences" (Knefelkamp, 1999, p. xii). Likewise, Baxter Magolda understands personal epistemology as contextual and bound to the individual's reality and thus not as domain-general (Baxter Magolda, 2001); furthermore, Clinchy (2002, p. 85) remarks that "we need to examine development within rather across domains." It is thus safe to assume that there is now widespread agreement in the field that personal epistemology is domain-specific, at least with regard to academic discipline and thus the context of academic writing.[43]

6.2.8 Discussion

The difference in approaches shows that Personal Epistemology as a research field is rather heterogeneous: "Currently there is neither a unified model of epistemological understanding to guide research, nor a single model that clearly articulates the relationship between personal epistemology and how epistemological beliefs change and develop" (Bendixen & Rule, 2004).

Table 8 gives an overview of the positions identified by Perry, Belenky et al. and Baxter Magolda, respectively. The picture which emerges shows that later research expanded and refocused Perry's original scheme with regard to gender-related patterns along with an identification of less fine-grained stages. Belenky's positions almost reflect the Perry Scheme up to position 5 and Perry's positions as grouped by Moore (2002) roughly coincide with Baxter Magolda's stages of epistemological reflection. Since Baxter Magolda's research revealed different strategies of knowing in each phase (the gender-related patterns), I use her model as I continue.

In contrast to the developmental models, while still assuming a progression from less to more sophisticated epistemological thinking, cognitive models focus on the belief system at a given point in time. Factor analysis indicated that different epistemological beliefs of an individual would not necessarily belong to the same level. The differences in findings of both approaches (using cognitive and developmental models) may at least in part be due to the approaches used: Perry's qualitative research was based on counselling sessions, which after all have the function of supporting student's sense-making, a setting bound to create a bias towards attempting to create coherence. This involves a reflection, reinterpretation, and integration of past experiences, which is most probably reflected in the findings. The same may be true for the interview techniques used by Belenky and colleagues as well as Baxter Magolda, a collateral effect (certainly not damage) may have been to engage participants in meaning-making.

[43] For a further discussion, see Hofer (2006).

In contrast to this, quantitative approaches are less, but also more narrow: while Schommer criticizes Perry's model for being unidimensional (1990), it should be noted that the factors identified in her work are 'unidimensional' in themselves, whereas the positions Perry describes are complex, each subsuming many dimensions. This is not surprising, since factor analysis by definition singles out independent dimensions (factors), which in turn are represented as a continuum. Only a longitudinal study would allow for identifying whether there are systematic qualitative leaps. Furthermore, Schommer's questionnaire defines epistemological development in negative terms, as giving up naïve beliefs, since it measures the extent to which students hold the less sophisticated poles of the dimensions identified at a point in time, which imposes a conceptual limitation in studying the adoption of more sophisticated beliefs (Richardson, 2013).

<table>
<tr><th rowspan="2">Perry Scheme of Epistemological Development

main line of development</th><th colspan="2">Grouped to phases</th><th rowspan="2">Belenky, Clinchy, Goldberger & Tarule

Women's Ways of Knowing
Gender-related patterns (not gender-exclusive)
- women-related
- men-related</th><th rowspan="2">Baxter Magolda

Model of Epistemological Reflection</th></tr>
<tr><th>Perry</th><th>Perry following Moore</th></tr>
<tr><td colspan="3"></td><td>Silence(d)</td><td></td></tr>
<tr><td>Basic Duality</td><td rowspan="2">The modifying of dualism</td><td rowspan="2">Dualism</td><td>Received Knowing</td><td rowspan="11">Absolute Knowing
• receiving pattern
• mastery pattern

Transitional Knowing
• interpersonal pt.
• impersonal pattern

Independent Knowing
• interindividual pt.
• individual pattern

Contextual Knowing (Post-College Years)
integration of patterns and development of self-authorship</td></tr>
<tr><td>Multiplicity Pre-Legitimate</td><td>Subjectivism</td></tr>
<tr><td>Multiplicity Subordinate</td><td rowspan="3">Multiplicity</td><td rowspan="2"></td></tr>
<tr><td>Multiplicity Correlate or Relativism Subordinate</td><td rowspan="4">The Realizing of Relativism</td><td>Procedural Knowing
• separate knowers
• connected knowers</td></tr>
<tr><td>Relativism Correlate, Competing or Diffuse</td><td>Contextual relativism</td><td>Constructed Knowing</td></tr>
<tr><td>Commitment Forseen</td><td rowspan="4">Commitment within relativism</td><td rowspan="4"></td></tr>
<tr><td>Initial Commitment</td><td rowspan="3">The evolving of commitments</td></tr>
<tr><td>Orientation and Implications of Commitment</td></tr>
<tr><td>Developing Commitment(s)</td></tr>
</table>

Table 8: Positions (phases, stages) of epistemological development as described in the dominant models, including gender-related patterns.

In contrast to the quantitative approach, Perry's focus was on qualitative steps in development as well as strategies adopted in avoiding potential pains involved. In light of the previous chapter's argument on the role of environmental structures for a description of phases or positions, despite the description of the 9 stage-like positions Perry's scheme is best understood as an attempt to capture the dynamics of three major *transitions* and the issues playing a role, whereas the advantage of Schommer's work, and of the cognitive approach in general, is the possibility to reveal a correlation between epistemological beliefs (however narrow the construct) at a particular point in time and other factors, like student performance, at a particular point in time.

However, all lines of research on epistemological development show a progression from a concept of knowledge as unambiguous truth, which is guaranteed by authorities, towards the realization that knowledge is complex and context-dependent. Perry's and Baxter Magolda's highest positions also involve a taking of responsibility for decisions. Still, neither the developmental nor the cognitive approach explicitly consider the role of the environment and thus the structures the individual is interacting with, nor do they consider the role of the subjects' activities, i.e. what the subject is actually *doing*. However, implicit links can be found to academic writing research and practice: In her description of *separate* and *connected knowers*, Clinchy (2002) draws on writing researcher Peter Elbow's (1973) description of the *doubting game* and the *believing game* as writing strategies, and Schommer (1990) used the performance of students in writing conclusions to measure the correlation between student learning and their epistemological beliefs. The use of the terms *voice* and *self-authorship* by Baxter Magolda (1992; 2002) may be coincidence, but if so it is one which offers a "natural" interface to writing research. I will elaborate on this in the following sub-chapter, where I argue for a role of epistemological development in becoming an academic writer.

6.3 Personal Epistemology in Academic Writing

Both, epistemological and academic writing development, occur in tertiary education and are central to becoming an academic. Ironically, the two related fields of research can be viewed as having complementary blind spots. On the one hand, the still predominant model of writing development by Bereiter and Scardamalia with the addition of Kellogg (Bereiter & Scardamalia, 1987; Kellogg, 2008) terms the phases *knowledge telling*, *knowledge transforming*, and *knowledge crafting*, i.e. in terms of what is happening with "knowledge" during the writing process. As I have argued in chapter 3, despite this, the cognitivist model they propose is "knowledge-neutral": their propositional concept of knowledge does not (and cannot) play a role for the writing process itself. On the other hand, while correlations between student performance and position have been identified – (Schommer

(1990) showed a correlation between students' epistemic beliefs and comprehension and Baxter Magolda (1992) found that patterns of interaction sought with peers change with epistemological development) – most research on personal epistemology focusses on the construct of knowledge, rather than on what students *do*, as they develop their epistemology.

Essentially, the point I am going to argue now is simple: As the novice student becomes an academic writer, his/her relation to knowledge, his/her concept of what it means to know, and his/her self-perception as 'knower' changes in a quite fundamental way from a *knowledge-recipient* to a *knowledge-producer*. In terms of epistemological development, this entails making judgements and committing oneself to the decisions made based on one's position. If there is one "learning activity" which forces the student to find and reveal his/her concrete position with regard to a *particular* topic or question, and which involves constant decision making on various levels, it is academic writing. Thus, while academic writing is certainly not the only knowledge-producing activity students engage in, it is ubiquitous and demands as well as fosters epistemological development. Furthermore, I propose that personal epistemology research significantly adds to an understanding of what it means to become an academic writer, because it offers a framework for understanding many of the "pains" students experience in the face of the empty page which can be fully captured neither by a linguistic approach, nor by the current model of writing development.

I should insert a disclaimer here: I do not argue that academic writing is the only activity which demands and fosters epistemological development; clearly, working on a research project, interpreting data, discussion in class, nightlong discussions with fellow students, work in interdisciplinary teams, etc. do as well. Furthermore, disciplinary epistemologies change and some may confront students with a challenge of their concepts of knowledge earlier than others. Having said that, I will now discuss findings and concepts from academic writing research which may gain from (and add to) an understanding of becoming an academic writer as involving the development of one's personal epistemology.

6.3.1 Personal Epistemology View on Development of Student Texts

In the previous chapter, Pohl's (2007) work on the ontogenesis of academic writing was introduced. I will briefly repeat Pohl's characterization of the three stages of student writing (texts), *object-focused*, *discourse-focused*, and *argumentation-oriented writing,* and suggest how they may relate to the positions *absolute, transitional, independent,* and *contextual knowing of* Baxter Magolda's Model of Epistemological Reflection as described above in table 7.

In chapter 5 I introduced Pohl's work on the development of student texts. His initial stage of *object-focused writing* centers on the "pure" scientific object. Literature is not perceived as a particular

view, but treated as if it was providing direct access to the 'phenomenon'. Students' texts realize a "protocol truth", which is characterized by introductions solely focusing on the phenomenon, a lack of argument, and discussion. At this stage an opinion is rarely found but, if so, comes as an appendix (Pohl, 2007, pp. 494-495). It makes sense that students holding a position of *absolute knowing* would be expected to produce texts with features as Pohl describes: *if knowledge is certain* and *authorities* (teachers and literature) *know the Truth*, it is sufficient to faithfully record it. And since the student does not perceive himself/herself as an authority, it does not come as a surprise that there is no perceived need to see the 'authoritative literature' as a particular perspective or to take a stance. Based on Baxter Magolda's description of the gender-related patterns, I speculate that at this stage there might be differences in student activities, but not necessarily in student texts. However, one can see how the male-related *mastery pattern*, which is characterized as more active and involves (verbal) debate, will support adopting discursive features in texts more readily (see also figure 12).

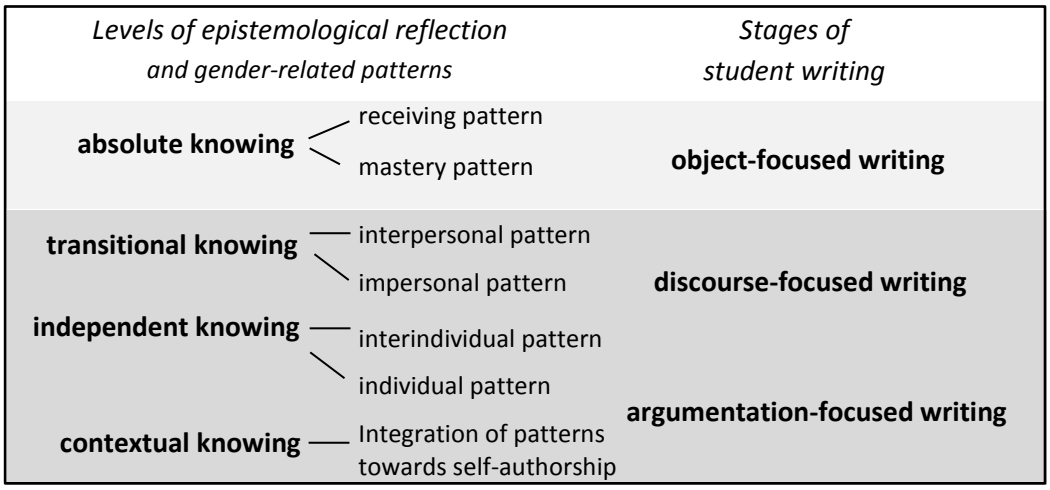

Figure 12: Mapping of Baxter Magolda's (1992) levels of epistemological reflection and Pohl's (2007)stages of student writing based on text analysis.

Discourse-focused writing does no longer center on the "pure" scientific object, but on the object as constituted by discourse. Students' texts realize a "reference truth" in the sense that argumentative structures of the text serve a representation of different positions. Pohl refers to this as *communicative-epistemic* ("kommunikativ-epistemisch"), as ensuring understanding. The author's opinion comes as an appendix to the text (Pohl, 2007, pp. 495-496). Pohl's corpus analysis was based on three students, two studying German and Catholic Theology, one German and English, all to become school teachers (pp. 218-220)

The position of *transitional knowing* describes *knowledge as uncertain, if different interpretations are offered* (typically in the humanities and social sciences), while there are still *areas of certain*

knowledge (typically in maths and sciences). From texts, especially if students overtly follow academic conventions of referencing, it will not be visible how they judge the certainty of knowledge. However, Pohl's description of this phase as ensuring understanding fits well with Baxter Magolda describing the perceived roles of students and peers as seeking and aiding understanding and exploration of different interpretations. The male-related *impersonal pattern* with its focus on defending one's view and the tendency to resolve uncertainty using logic may help students in meeting expectations towards their argumentation structures.
However, also a text of a writer following the women-related *interindividual pattern* described for *independent knowing* may be categorized as *discourse-focused*, because they experience difficulties to establish their voice alongside others.

Pohl's final stage, *argumentation-focused writing*, entails a shift from realizing that there are multiple positions towards realizing how positions are argued and how the reader is addressed in order to be convinced. Students' texts realize a "dialogic truth" in which approaches, methods, and categories are re-conceptualized from given to competing objects which may be criticized and improved. The author now provides a conclusion, which is drawn based on the arguments in the main text (Pohl, 2007, pp. 496497).
The corresponding position in epistemological development is not as clear in this case. In *independent knowing* students perceive *knowledge as uncertain* and *truth as individual*, and students' roles as thinking for themselves and exchanging in order to expand possibilities. This would place it somewhere between *discourse*- and *argumentation-focused writing*. The text of a writer following the male-related *individual pattern*, which is described as the perfection of one's voice, may be categorized as *argumentation-focused*. In this case, 'independent knowers' following the male-related pattern would produce text which, according to Pohl's developmental stages, would be perceived as more advanced while the epistemological position is quite fitting.

There may also be a correspondence between Pohl's *argumentation-focused writing* and early *contextual knowing,* which is described as *beginning to make good judgements based on relevant information and criteria about multiple perspectives*, an attitude towards knowledge which is clearly helpful in writing arguments and drawing conclusions. This demands the integration of male- and woman-related patterns. *Self-authorship* is realized with the integration of the epistemic assumption that knowledge is contextual, the intellectual process of determining what to believe, and the integral role of the self in the knowledge-construction process.

In his analysis of ontogenesis as a 'reduction of not yet distinct linguistic-textual competencies', Pohl characterizes the development found in student texts as 'unfolding or widening of the focus of

attention' ("Entfaltung oder Ausweitung des Aufmerkamskeitsfokus") and proposes that the observations made can also be attributed to a lack of linguistic-textual competences, which constrain the author (2007, p. 498). In this view, the key to mastering academic writing lies in a progression of mastering 'academic common language' (Konrad Ehlich's concept of "wissenschaftliche Alltagssprache" introduced above). On the other hand, in a separate analysis of his data, Pohl suggests that *object-*, *discourse-*, and *argumentation-focused writing* may correspond to students having a Hellenistic, scholastic, or a modern view on research ("Wissenschaft"), i.e. different subjective theories. In a sense, he proposes that students' understanding of academia is developing, an implicit 'philosophy of science' which is not far off from my proposal to view the development of one's personal epistemology as a dimension of becoming an academic writer.

6.3.2 Voice and Stance

In Baxter Magolda's Model of Epistemological Reflection, *independent knowing* is characterized by 'establishing one's voice', an expression which according to Tardy (2012, p. 34) is "a term that most writers have heard or used", at least in US-American college education with its compulsory composition courses. Process-oriented writing didactics hold that "writing can be learned" like a craft. Particularly in academic writing, there are clear expectations towards a text in terms of norms and expectations of the audience. At the same time, writing is highly individual with regard to how a person organizes the writing process, but also with regard to the product of writing. Rohman (1965), who is mainly known for introducing the phase of *pre-writing*, and who is otherwise rather cognitivist in his thinking about the writing process, calls it an *act of self-actualization*. As such, in writing *voice* is a central notion, though not a unified one. By some, it is perceived to be a 'robust' theoretical concept, a 'slippery' one by others (Guinda & Hyland, 2012). There are diverse views on *voice*, but if much of writing didactics addresses the *craft*-like nature of writing, *voice* addresses the *personal* dimension of the product.

ELBOW'S CONCEPT OF VOICE

Originally, the term *voice* was promoted by Peter Elbow based on his experiences in a course on autobiographic writing. He sees voice as an individual aspect in writing which is recognized by the reader: „My view is that there is always a *personal* dimension to any text. When I'm reading, I tend to look for some sense of contact with the person who actually wrote" (Elbow, 2000, p. 146). Elbow's interest in the writer's voice originated in the observation that he found passages in students' texts which could not be considered "good writing", but which would "*register strongly*". Despite the fact that they sounded awkward, Elbow reports that they "struck me, they captured my attention, they *got through"* (Elbow, 2000, 146) until "…gradually a new and mysterious kind of standard began to emerge" (Elbow, 1981, p. 283). He reports that students often responded to his marking the strong

passages with exploring their feelings or thoughts more deeply. Others came up with new ideas or remembered things they had not been thinking about for years. “Students begin to like writing more, to write about things that are more important to them, and thus to feel a greater connection between their writing and themselves. I think this process leads not just to learning, but to growths and development” (p. 284).

Elbow distinguishes voice, no voice and real voice (Elbow, 1981, pp. 298-300):

- Writing with *no voice* lacks sound, rhythm, energy, and individuality. It sounds wooden, because people stop in mid-sentence to wonder what they are going to say or which words to use. This kind of writing is most common.
- Writing with *voice* has that fluency, rhythm, and liveliness. Some frequent and confident writers manage to get voice into their writing.
- *Real voice* resonates, but it does not necessarily mean fluency, but captures the reader’s attention and understanding – “the words go deep” (p. 299).

“The distinction between voice and real voice helps us understand the tricky relationship between verbal fluency and verbal power. Sometimes they go together but sometimes they are opposed” (Elbow, 1981, p. 298). Elbow admits to there being no objective characteristics for distinguishing *voice* and *real voice*, yet he perceives it as “a matter of hearing resonance rather than being able to point to things on the page” (p. 299). In other words, it refers to “a dimension of the text that is rhetorically powerful but hard to focus on: the implied and unspoken meanings that are carried in the text but that are different from the clear and overt meanings of the words“ (Elbow, 1999).

In this sense, voice (including real voice) is a highly subjective notion and one would see why it divides the academic writing community into advocates and those who avoid it for “its imprecise meaning and its often literary and aesthetic overtones” (Tardy, 2012, p. 34).

Elbow frames writing as an ability which needs to develop and through which the writer’s self develops. Clearly, in the context of academic writing, expression and perception of *voice* takes different forms than in autobiographical writing, but if we keep in mind that academics usually identify with their work and that academic writing is a central means of self-promotion, Elbows assumption that “any *kind* of writing can have a real voice or lack it- any style, tone, mood, or syntax” (Elbow, 1981, p. 300) is plausible. He points out that “even though real voice brings excellent writing when it is fully developed and under control, it often leads to terrible writing when it is only just emerging and not yet under control” (p. 301). As the writer is moving from a functioning to a more sophisticated mode, the quality of writing may drop quite dramatically – at this point teachers often despair, because ‘students can’t write anymore’. Elbow relates to Piaget in stating that “genuine

restructuring requires destructuring. I think I see this happening in writing: many students don't seem to get past certain level of adequate writing without going through a stage with lots of deteriorated writing" (Elbow, 1981, p. 301). This view gets empirical support from Steinhoff's (2007a) model of students' academic text developing from a non-typical towards a domain-typical use of language, which was introduced in the beginning of the previous chapter: symptoms of destructuring can clearly be found in the phases *imitation* and *transformation*. Elbow links this 'development of skills' to the development of the self in the presence of external expectations: "Your most fluent and skillful voice is usually your *acceptable voice* - the voice you develop as you work out an acceptable self" (Elbow, 1981, p. 301). An important point is that while authenticity is an important aspect of voice and Elbow sees in writing development also a development of the self, *voice* is not identical with the author (Tardy, 2012, p. 36).

More recently, Elbow distinguishes between *sincerity* and *resonance* as two kinds of voice, which are both linked to the individual. The former is understood as a particular voice bound to a style useful in particular contexts, whereas the latter is more akin to the original concept of voice as 'the self in the text' (Elbow, 2007). If we want to characterize *voice* in academic writing, it is probably more akin to *sincerity*.

Other Voices on Voice and Stance

While Elbow takes an individualist perspective on voice, the social perspective looks at voice as not only dependent on the author and his/her linguistic choices taken, but as also determined by its social context, with the inclusion of a view of genre as social: "From a *social perspective* … voice relates to *self-representation* and *authorial presence* but always taking into account the social worlds for and out of which a text is produced" (Tardy, 2012, p. 39). Ivanič suggest a *discoursal self* which is social and constructed in the discourse characteristics of the text. These characteristics explicitly or implicitly, on the side of the writer willingly or unconsciously, reflect values, beliefs, and power relations of the social context in which the text is produced. The *discoursal self* is not identical with the author and not merely a projection of the audience; it can be thought of as a role available in a given social context and in writing realized within a genre. Thus, the social context can be thought of as providing *possibilities for selfhood*. For example, in writing a traditional research paper, the academic writer realizes his/her discoursal self within the constraints imposed by genre and expectations of the potential audience in relation to the academic discourse chosen and the particular contributions discussed (Ivanič, 1998; see also Hyland, 2008). An important consequence is that while Elbow's original concept of voice allows for texts without a voice, from a social perspective, a text will always have a voice. Consequently, Prior (2001) suggests viewing *voice as dialogic*, since it allows to unite both the social and the individual perspective. This allows for a

consideration of both, the notion of voice as unique and authentic as well as the notion of, as Ivanič would term it, *discoursal self* in a social context (including genre). This allows for an understanding of voice as a co-construction in the interaction between author and *reader*. As Dressen-Hammouda (2014) phrases it, "voice helps to create a co-constructed, shared sociocognitive space that allows readers and writers to situate one another." To varying extents "most of those who have written on voice occasionally acknowledge all of these dimensions in their work" (Tardy, 2012, p. 35). It depends on the aspect and consequences of voice they focus on.

Tardy (2012) reports on a study by Jeffery (2010) on master students' perceptions of voice and found that they identified voice with ownership, authority, or opinion, i.e. from an individualist perspective, but also as revealing their attitudes and views and committing to a position. He comments that "the relationship between *commitment* and voice referred to here … is not unrelated to stance" (2012, p. 37). Stance is subsumed in the broader phenomenon *voice* and conveys "different kinds of feelings and assessments" (Hyland, 2008). The term thus relates to opinion on/meaning ascribed/feelings towards the 'content' of a text and the linguistic means taken to convey these in the text. Hyland characterizes stance as a commitment to the evidence (*evidentiality)*, an attitude towards the content (*affect*), and the self-projection of the writer into the text (*presence*).

Stance can be seen as denoting the 'more local' phenomenon as position taken in the particular text with regard to particular content and concrete linguistic choices, whereas *voice* is "almost always presented as a prolonged and effortful enterprise" (Guinda & Hyland, 2012) and as such the concept is closer to the writer's identity and development.

From a linguistic perspective, both stance and voice are characterized by the author's use of "tools" like hedges and boosters, attitude markers, and self-mention. In this sense, both relate to style (Tardy, 2012, p. 37). Ivanič & Champs (2001), based on an earlier study with 9-year-olds, suggest that the writers' sense of agency in knowledge-making – his/her epistemological stance – is reflected in syntactic and semantic choices: "We suggest that there is a continuum from the view that knowledge is objective and universally true to the view that knowledge is subjective and situated in local experience. We are proposing that different positions on this continuum are associated with different linguistic features" (p. 16). Features which possibly carry a view that knowledge is objective and true are:

- Present tense verbs to express "universal truths"
- Categorial verbs (verbs not modalized to express tentativeness or uncertainty)
- "State" verbs presenting indisputable "facts" (e.g., "be", "have", "appear")
- A lack of verbs referring to the processes of research, thinking, and writing.
- A lack of references to researchers and theorists as the human agents of these processes.

While this list is at proposal-stage and does not explore other epistemological positions, it demonstrates the potential of narrowing down epistemological positions from students' writing. Thus, voice and stance provide a conceptual bridge between the linguistic level (the means employed in a text produced at a given point in time) and the psychological level regarding an individual's personal epistemology. I will use voice for the more enduring phenomenon with a developmental dimension, whereas I use stance as subsumed by voice to refer to the position the author willingly or unwillingly reveals in a particular text with regard to particular content.

So we can conclude that there is an intimate connection between personal epistemology and a writer's voice. At the same time, conventions in academic writing may demand a depersonalized style. They may differ between disciplines and communities, so it is necessary to look at the role of the discipline in academic writing.

6.4 The Role of the Discipline

6.4.1 Writing as if No-one Was There

Personal epistemology focuses on the individual student, yet epistemological development is context-specific and in tertiary education the disciplines and their respective epistemologies are bound to play a fundamentally important role. However, especially to the novice, they may be disguised by conventions in academic writing.

A paradigmatic example is the "taboo on I": The most obvious linguistic means to willingly express one's *voice* and stance is self-reference. It therefore comes as no surprise that the use of the first person pronoun "I" poses considerable difficulty for novice academic writers. While mastering 'academic style' is often treated as a matter of linguistic proficiency, Girgensohn (2008) argues that the "taboo on I", which is still prevalent in many academic written discourses, may play an important role. She describes how students experience academic writing as detached and depersonalized, as being forced to write as if it was not them who are writing ("Schreiben als spreche man nicht selbst"). They perceive a prohibition to use the first person and only gradually learn its differentiated use. Based on a study on how academic writers in different disciplines with varying cultures, Steinhoff (2007b) was able to develop a more differentiated view on the use of "I." He identifies three types, i.e. the "narrator – I", the "author – I", and the "researcher – I", and shows that if there is a prohibition on "I" it relates to narration. The "author-I," which guides the reader through a line of argument, and the "researcher-I", which promotes one's own contribution, are accepted across disciplines (to varying degrees). In his study of the development of student texts, Steinhoff (2007a)

was able to show that novice academic writers often use the "narrator – I" und then gradually learn to use the "author – I" or "researcher – I", both of which can be used in academic texts.

Academic writing (particularly in German) is notorious for nominalizations and passive constructions. Ivanič & Champs (2001) list some features which they identify with positivist writing traditions, which prevail particularly in the sciences:

- No use of first person references
- Verbs to do with the process of research, thinking, and writing, but mainly in the passive
- Few references to people as the agents of these processes
- Reference to published works as objects rather than their writers

If compared to the list they suggested as indicating author epistemological beliefs, it becomes clear that those features in texts, while admitting that there is a (depersonalized) process of research, at least *partly* transport the implicit epistemological stance that the knowledge conveyed in the text is universally true and as if the knowledge came about without human agency. Thus, ironically, while novice academic writers become members of a new community, having to change the way they relate to 'the world' and thus their 'self', the language they use (to varying degrees) denies human agency in this process.

6.4.2 The Illusion of Tansparency

Russell (2002) casts a historical view on the development of academic writing and shows how these positivist traditions grew out of a 19th century ideology that "good academic writing must … be an objective rendering of reality" (p. 11) in order to convey truth in conjunction with the "naïve view of language as transparent recorder of thought" (p. 10). Russell traces an expansion of the functions of writing from 'writing as transcription' to serve speech to the highly specialized disciplinary discourses of modern academia. A differentiation of disciplinary rhetoric in the respective forums allowed for researchers not to "step outside their respective symbolic universes" (p. 11). This way the respective discourses could develop specific rhetorical characteristics, which make communication within the community easier and thus more efficient – with the side-effect that the discourse is not understood outside the community. A central point Russell makes is that the members of the respective community do not perceive these rhetorical structures as rhetorical, they are *transparent*. This way language can be perceived (and is) as the 'recording means for ideas and truth'. The result is a "naïve, mechanical conception of writing" (p. 12) as a generic competence, which omits the contextual, rhetorical nature of writing.

6.4.3 Genre as Social Action in the Discipline

Consequently, Russell advocates a view of *academic writing in the discipline*:

> *As a social activity, writing is inevitably embedded in and conditioned by a community. By its very nature it is local, context specific, dependent on a community for its existence and meaning. Literacy is thus a function of the specific community in which certain kinds of reading and writing activities take place* (Russell, 2002, p. 12).

In other words, socialization into academia is highly discipline specific, Carter suggests and understanding academic writing as '*ways of knowing, doing, and writing in the disciplines*' (Carter, 2007). With regard to academic writing, the phenomenon we are looking at is genre. However, as means and product of socialization, the common view of genre as a static set of properties which describe and classify 'type of texts' is not sufficient. Instead, genre is defined by the rhetorical situation and motives, and therefore understood as social action, which offers a standardized (but not static) way of responding to recurring situations (Miller, 1984). What recurs is "not a material situation (a real, objective, factual event)" (Miller, 1984, p. 157), but "typical joint rhetorical actions available at a given point in history and culture" (p. 158). In the process of students' socialization into the discipline, "genres serve as key to understanding how to participate in the actions of a community" (Miller, 1984, p. 165). In this sense, *genre is social action*.

I briefly want to refer to earlier criticism (see chapter 3) that the prevailing cognitivist models of writing as a cognitive process by Hayes and colleagues regard the need of a specific rhetoric for a text as an add-on. In the light of the view just presented, it is obvious that cognitive process models implement the naïve assumption of transparency revelaed by Russell (2002): the "rhetorical problem" in writing would amount to organizing otherwise context-free knowledge in the planning-phase and then 'applying' a genre like a format. Understood as a socially situated practice, *there is no rhetorical problem* as an addition to the cognitive process of writing; rhetoric is at the core of academic writing, as writing is a means of participation in that community.

If we view texts not as faithfully storing true knowledge but as belonging to community-bound genres using specific rhetoric, conventions like an omission of agents, use of passive constructions and the like cannot be viewed as 'linguistic surface features' which neatly "dress" knowledge one way or the other. Just like the novice academic writer potentially reveals a position of absolute knowing, genres should be perceived as "transporting" hidden epistemological assumptions. Bazerman's (1994) theory of genre systems, which is based on the concept of genre as social action, suggests that genres within institutions should not be viewed as isolated, since interactions within a community are organized by many genres. If one wants to understand the ways disciplinary epistemologies diffuse in a community, looking at one genre will not be sufficient.[44]

[44] I do not want to start an inquiry into sociology of science, but in my experience the positivist style of science papers is more than complemented by ongoing 'lab talk' about which group is doing what and how, who went

As Russell (2010) argues, the view of genres as social actions is “deeply compatible with Vygotsky’s view of mediated action”, since the phenomenology Miller draws on and Vygotsky’s cultural historical activity theory share fundamental assumption on the nature of learning. I will pick up this thread later in chapter 7 in the context of current theoretical developments in cognitive science.

6.4.4 Implications for Practice

In the US-American system, with its tradition of (initially remedial) composition courses, disciplinary faculty do not feel responsible for teaching writing in the discipline, because they perceive writing as generic and their discipline as domain specific knowledge (Russell, 2002, pp. 55-56). In the German-language university, which sees itself in a Humboldian tradition, writing is understood as disciplinary, but there is also a perception that academic writing is a matter of talent – despite generations of professors complaining that ‘students cannot write anymore’ (see Pohl, 2007, pp. 24-26). There is the prevailing tradition of the seminar paper as a genre (or, rather, at least as many genres as there are disciplines), but the practices around this genre(s) have changed from being embedded in a discourse among a relatively small group of students studying and researching with a professor for a year to lonesome writing at the end of the semester (Kruse 2005; 2012). A consequence is that in both systems students may not receive the support that they need, especially in the face of the pressure of attaining their degrees more quickly, which dramatically increased with the recent higher education reforms.

The current rise of process-oriented writing didactics, especially in Germany, but also in Austria, can be perceived as a reaction to this. However, understanding academic writing as learned *in the discipline* creates apparent an obvious contradiction (Russell, 2013). As practitioners usually offer centralized services in institutions (writing centers and the like), the structures implicitly transport a generic view on writing and so does the education of practitioners. At the same time, the experience of working with students from different disciplines demands the recognition of disciplinary rhetorics and disciplinary epistemologies in order to support students in developing an “acceptable voice” (Elbow, 1981, p. 301). Practitioners have to develop a feeling for these, as well as for the student’s personal epistemology, but currently the issue of neither disciplinary nor of personal epistemologies is being addressed, making this a field for development for research, practice, and education of practitioners.

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to work where, who is referencing whom or not and why, etc. Thus, the young researcher is very much aware that knowledge is not emerging mysteriously, but made by peers. However, the *novice* academic writer is not yet part of this community.

6.5 Discussion

Becoming an academic writer means, among other things, developing a position while facing uncertainty by departing from a secure positon of absolute knowing (which may have already started in school) in order to develop from a knowledge-recipient to a knowledge-producer. This involves a development of the self (in Kegan's sense), while – depending on the discipline to a greater or lesser degree – being expected to write as if neither the writer and researcher producing the text, nor other writers/researchers referred to, were present. In a text, the writer's position becomes audible as *voice,* as recognizable features regarding an author, which subsumes *stance*, as the particular position in a particular text.

6.5.1 A Role for Knowledge in Academic Writing

There is a parallel between writing research and process-oriented writing didactics with regard to the question of domain specificity: both fields approach academic writing generically, while acknowledging disciplinary differences and individuality of the writer. Similarly to personal epistemology being contextual, academic writing is viewed as being learned in the discipline (Russell, 2002; Carter, 2007). Both processes, epistemological development and becoming an academic writer, occur in the same population at the same time; both must be mastered in order to reach the institutionalized personal goal of 'becoming an academic'. While methods of studying them may have developed separately, one focusing on beliefs and perceptions, the other on processes and actions, they are intertwined "in the wild".

However, considering the epistemological dimension offers an additional perspective on student writing which goes beyond considering students' texts in purely linguistic terms and holds considerable explanatory value. First and foremost, considering the student's personal epistemology as s/he is becoming an academic writer allows for a consideration of the role of knowledge for the writing process on a meta-level by offering a construct which allows for considering discipline specificity and individuality, while still being generic enough for "theoretical handling".

6.5.2 Understanding Phenomena in Student Writing

Considering students' positions with regard to knowledge and knowing in the writing process may explain some phenomena frequently found in students' texts. Gender-related patterns found in personal epistemology research may help understand different strategies or difficulties experienced in academic writing, and, finally, the reasons for 'non-development' as found in personal epistemology research potentially explain student behavior and attitudes towards academic writing assignments or measures in process-oriented writing didactics.

PHENOMENA IN STUDENT TEXTS

The alignment of some typical 'flaws' in student writing with a putative epistemological position offers a potential explanation for some phenomena at the boundary between structure and 'knowledge'.[45]

Especially novice students sometimes experience insecurity in understanding plagiarism. Some are overly afraid to commit plagiarism without noticing, others may convincingly claim they did not mean to do "anything wrong" in the face of clear plagiarism. This could be explained by a position of *absolute knowing:* the closer a text copies the authorities' words, the closer it stays to Truth. At the same time, if there was the *one* Truth, it would be independent from a person, so why give a reference?[46]

A position of *absolute knowing* could explain student papers which list a series of facts and summaries without providing a line of argument – even in the face of obvious contradictions between facts, findings, concepts, theories and the like. Based on Bean (2011), Lahm (2016, p. 33) mentions three text patterns often found:

- *"And-then*-texts*"* simply provide a chain of information, typically in the order of reading the source literature.
- *"All-about*-texts*"* have encyclopedic character in providing a collection of facts, but lack argumentation, since there is no research question.
- *"Data-dump*-texts*"* contain data, quotes and chunks of information, but lack a structure the reader can follow.

Those text patterns may be interpreted as handed in prematurely, a result of the novice writer simply starting the writing process too late, but they may well represent the view that academic writing means 'representing absolute knowledge' rather than arguing a position.

Absolute knowing or *transitional knowing* could also explain the absence of discussion and conclusion or the phenomenon that an opinion, if voiced at all, comes "stand alone" and is not based

[45] They are located more on a structural and 'content'-level, not merely linguistic issues, which may be a reason why writing research seems not to be focusing on them. However, they do play a role in assessment practice, via being addressed in scoring rubrics for writing or in diagnosis tools.

[46] The surprising results of the following studies in the effects of plagiarism software on plagiarism may be interpreted in this vein: Youmans (2011) told 50% of the students in two classes that their papers were to be checked by plagiarism software, expecting that the warning would result in fewer cases of plagiarism. This was *not* the case. In a second study, involving students writing two papers, the warning did have the expected effect on the first paper (those knowing they were to be checked plagiarized less), *but not on the second paper*: Those who had plagiarized before, did so again. This kind of behavior could only be explained by an absence of consequences (which was not the case) or a position of absolute knowledge.

on the main text (see Pohl, 2007): Students may feel that if authorities have not found the Truth yet, they are not authorized or responsible to make a choice.

A position of *transitional knowing* and maybe even more so *independent knowing* could explain why so many students do not discuss the choices they made in choosing literature, concepts, methods, or theories and why they do not mention contradicting ones. As *transitional knowers* they may not feel authorized, as *independent knowers* they may assume a relativist attitude of 'anything goes.'

Gender-Related Patterns

Above, I have mapped the phases and gender-related patterns identified in Baxter Magolda's Model of Epistemological Reflection and Pohl's stages of student writing (see figure 12). In the phase of *transitional knowing*, they help understand why students may engage in either the doubting or the believing game and why some students rely on "inacceptable" narration, while others have fewer problems in complying with the argumentative demands of academic writing. In *independent knowing*, if the male-related pattern is applied to writing, they may yield results which may be perceived as more advanced. Taken together, academic writing, at least in a positivist tradition, can be characterized as more accommodating towards male-related-patterns of epistemological beliefs. Addressing these patterns or strategies in counselling and workshops for students as well as university teachers may be useful to trigger reflection and possibly foster the epistemological development of the individual by supporting writing following the opposite strategy.

Phenomena of Not-Growing

Beside the main line of development, Perry (1970) found that some students delay or deflect development by temporizing, retreat, or escape. At this point, I can only speculate that these states of "non-development" may play a role in attitudes towards academic writing and possibly the experience of writing problems, but I suggest that this is worth exploring.

Belenky et al. described the phenomenon of *silence*, which they do not see as the initial stage of epistemological development, but as a failure to develop (Clinchy, 2002, p. 65). An interesting question with regard to academic writing is in how far it may be useful to regard a lack of linguistic ability as *silence.* This 'other' *silence* would not be rooted in poverty and abuse, but in a very literal sense describe the situation many novice writers experience when the language of instruction and writing is not their first language and/or if they are the first in their family to obtain a university degree. It may be fruitful to explore whether methods nurturing development (as described, e.g., by Belenky, 1996) could be applied to this group. Obviously, a silenced writer will not produce a text to be analyzed. However, there is an extensive body of research on academic writers who do not write in their first language (L1), so-called L2-writers. As Dressen-Hammouda (2014) argues, language

teaching is often geared towards standards and norms, while disadvantages which L2-writers face in blind manuscript review seem to stem from the way they (do not) display an accepted disciplinary voice in their publications. She proposes that this group should be supported in reflecting socially and institutionally uses as part of their academic socialization. It is beyond the scope of this thesis to explore the role of voice (and possible selves in several languages) in L2-writing further, but their (not so) special case sheds additional light of the relation between text and writer.

6.5.3 First Probes towards Empirical Evidence

My mapping of the developmental phases from the two fields and considerations regarding voice in academic writing as having a linguistic *and* epistemological dimension is conceptually grounded. Since an empirical grounding is beyond the scope of this theoretical thesis, I can only share some clues.

The trigger for the theoretical considerations above came from counselling: reflecting 'what the student has to say', the status of knowledge in the respective discipline, and the students' role led to an "aha-experience" after which the previous insecurity of 'how to write', for example how to use hedges and boosters, had vanished.

Much of process-oriented writing didactics can be viewed as employing a wealth of methods to support students in aiding a reflection of perceptions and eliciting their stance; Elbow's (1973) *freewriting* may be the most prominent example. Overtly, they may address solving tasks in a particular phase of the writing process, like finding a topic or pinning down a research question, but covertly they can be viewed as supporting the development of the student's individual voice by aiding 'discovering what he/she has to say,' to paraphrase the title of Skinner's famous essay (1997). Others highlight the discursive nature of academia by providing (online-) environments which foster discourse and exploring 'possible selves' by role-taking (e.g., Hewings, 2012).

An "empirical hint" that writing problems may sometimes be about knowledge and knowing comes from the Writing Assistants Project we started at the University of Vienna in 2015, which we based on the Writing Fellows concept developed by Dreyfürst, Liebetanz, & Voigt (2016). A full description of our implementation and the results of the evaluation of the summer semester 2016 can be found in Roemmer-Nossek, et al. (forthcoming): Part of the program, which is almost exclusively implemented in writing-intense BA-courses early in the curriculum, is a compulsory single counselling session for all participating students (238) of about 50 minutes. The analysis of the protocols of the summer semester 2015 yielded that between 17 and 36% of the students in the participating courses used this session to get, as we termed it, a "crash course on research" (*Wissenschaft*) (Ammann,

Kuntschner, Rismondo, & Roemmer-Nossek, 2015)[47]. Based on this, we included the option to rate the statement "The Writing Assistants supported me in understanding academic research (*Wissenschaft*)" on a five-point Likert scale in the online-questionnaire (Limesurvey) utilized for evaluation. On average 20% of the students from three faculties affirmed this statement.

Clearly, at this point there is no robust empirical support for the link between *voice* in writing and *voice* in epistemological development; however, it is encouraging that Ivanič & Champs (2001) are thinking along these lines as well. Frano P. Rismondo, Erika Unterpertinger and I have begun to address this issue empirically. In a crude first exploration, BA-students in the beginning of their academic writing socialization filled in Schommer's (1990) Epistemological Beliefs Questionnaire. Their texts, book reviews, are currently being rated (double-blind) with regard to linguistic means and an underlying epistemological position is inferred. If we find a correlation, we will start developing means to infer a conceptually grounded educated guess on students' epistemological position from their written work as well as didactic means for reflecting the nature of knowledge and knowing. This would open an additional way for process-oriented writing didactics to address problems that students experience in writing: beyond offering phrases from common academic language and a reflection on the use of pronouns, a reflection on personal epistemology may prove useful for mastering challenges which are currently understood and addressed primarily on a linguistic level.

6.5.4 In a Nutshell

Becoming an academic writer involves changing positions with regard to the status of knowledge, the process of knowing, and assuming responsibility for decisions; in short, the development of one's personal epistemology. Practically, this view offers a way of addressing student problems in developing their position in knowing and voice in writing on a conceptual level which is still generic enough for writing didactics, while not negating disciplinary epistemologies. Theoretically, this view does not work with a "static" propositional concept of knowledge, which is merely a resource (and thus neutral) to the writing process, but places it in the center of what it means to become an academic writer.

The concept of *voice* provides a bridge between the concept of position as used in personal epistemology research and *voice* or *stance* as used in writing research. Academic writing means to develop what Elbow terms an *acceptable voice*, which needs to comply with conventions of disciplinary genres. In North American genre theory, genre is perceived as social action. This view puts rhetoric at the core of the writing process.

[47] 6 courses were slightly > 20%, 17% came from the only participating seminar on MA-level, 36% from a course where teaching methods may have played a role.

6.6 An Intermediate Status Quo

Before going on to the next chapter, I want to recapitulate the alternative view on academic writing developed so far. Based on the criticism of the classical models of writing as a cognitive process by Hayes and collaborators, I claimed that an alternative theoretical account of academic writing as a cognitive process:

1. Needs to develop a different account of the role of knowledge in the writing process.
2. Needs to place the "rhetorical problem" central to rather than at the periphery of the writing process.
3. Needs to consider the role of the environment, particularly the artifact produced ("text written so far") and with it
4. the very nature of writing as a cognitive process, which is widely understood to be "written speech."
5. Needs to consider "the whole writer".

To start with the last point, in the previous two chapters I developed a notion of development which draws on Piaget's concepts, particularly adaptation, on Vygotsky's cultural historical activity theory, and Kegan's concept of development of 'self.' Based on these I argued that it does make sense to talk about *development* of academic writing in the sense that a sequence of developmental steps can be observed, but that these stages reflect a balance between the writer's cognitive capacities and expectations of the environment. Furthermore, expectations towards academic writing development do not end at writing capabilities in a narrow sense, but involve development of the 'self'. Bereiter (1980) assumes that writing development may reflect other developmental phenomena. I would go a step further and argue that specifically the development of the *academic* writer cannot be understood separately from the writers' epistemological development, since this is part of the development of his/her acceptable *voice*. This way, knowledge cannot be viewed as a mere resource to writing, indeed the writer's beliefs towards knowledge and knowing shape the academic writing process on all levels – they are at the core. What is an *acceptable* voice is also shaped by the "accepting side", the academic community the novice grows into. Here, the conceptualization of genre as social action provides a framework for understanding that participation in academic communities is rhetorical at its core. Thus, viewing academic writing development as the "upgrade of a mental module" is not sufficient, as it is about changing oneself as one is changing the views of and modes of interaction with the 'world' in an ongoing adaptive process; in this sense, I refer to writing development in higher education as *becoming an academic writer*.

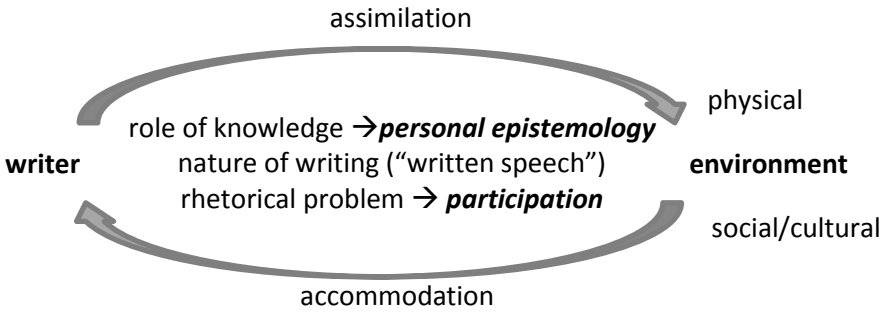

Figure13: Perspective on becoming an academic writer.

Thus, claims 1, 2 and 5 have been argued already. As indicated in figure 13, knowledge does play a role for the academic writing process, because it is influenced by the writer's personal epistemology and the "rhetorical problem" has disappeared in favor of the that the writer is participating in a community. What is still open is the discussion of the role of the environment, including the artifact produced ("text written so far"), and a criticism of the view of writing as "written speech". In order to address these points, a different approach to understanding writing as a cognitive process is necessary. Above, I have criticized the cognitivist concept of cognition but have not offered an alternative so far. The next chapter will provide just that.

7. Cognitive Processes are Embodied and Situated – The "Four E's" in a Nutshell

Classical cognitive science or cognitivism was grounded in the view that mind and body are separate (in philosophical terms *substance dualism*) and the idea that a mechanism can be independent of its physical implementation (*functionalism*) (Nunez & Freeman, 1999, p. xii). This allowed for an understanding of the mind as information-processing device no matter whether implemented in hardware (a computer, abstractly speaking: a Turing machine) or *wetware* (the brain). This results in seeing the mind and body as separate. However, the following account by the neurologist Frank R. Wilson gives an insight into the problem arising from wanting to differentiate between mind and body by describing the difficulty of determining what the hand is.

> *From the perspective of classical surface anatomy, the hand extends from the wrist to the fingertip. But under the skin this boundary is just an abstraction, a pencil line drawn by map-makers, giving no clue as to what the hand is or how it actually works.*
> *On both sides of the wrist, under a thin layer of skin and connective tissue, pale white, cordlike tendons and nerves pass from the hand into the forearm. Are the tendons above the wrist – this is, in the forearm – part of the hand? After all, we are able to hammer nails or use a pencil only because of the pull of the tendons and muscles near the elbow. From the perspective of biomechanical anatomy, the hand is an integral part of the entire arm, in effect a specialized termination of a cranelike structure suspended from the neck and the upper chest. Should we agree that we define the hand in biomechanical terms, we invite further complexities of definition. …muscles could be permanently paralyzed by cutting a thin white cord that somehow activates the muscle. … Are the nerves controlling the muscles and tendons that cause the hand to move also part of the hand?*
> *… Should those parts of the brain that regulate handfunction be considered part of the hand? The perspective of physiological or functional anatomy suggests that the answer is yes. We need to go no further than this to realize that a precise definition of the hand may be beyond us. Although we understand what is meant conventionally by the simple anatomic term, we can no longer say with certainty where the hand itself, or its control or influence, begins or ends in the body.* (Wilson, 1999, pp. 8-9)

Wilson is not suspected of questioning cognitivism, his account is a consideration relevant to the doctor seeking a cure for the patient not being able to use his hands in particular contexts, like a pianist not being able to play anymore. While the philosopher immediately frames this example in terms of the mind-body problem, in this context I simply want to invite the reader to consider the complexities involved in volitional action: What if we think of the hand as being part of a musician improvising a jazz-standard on the guitar together with a band?

The cognitive sciences have started asking such questions about cognition "in the wild" (to use the title of Hutchins' 1995) book) and in doing so are currently in the process of developing a different

understanding of cognition[48]. This involves a reconsideration of the role of action, perception, and cognition, the role of the body, the role of the environment and interaction with it, in its physical as well as social and cultural dimension and with regard to the boundaries of cognition. In short, the field is going through a paradigm shift, abandoning cognitivism (or clinging to it in form of a *Neo-Cognitivism*, as Nunez & Freeman, 1999, p. xiii critically remark) towards understanding cognition as embodied and situated. Rather than a coherent new paradigm, to date there is a collection of approaches united by the realization that, in order to understand (human) cognition, the role of the body and interaction with the environment must be taken into account. There are a number of labels for them, all of which refute – to a greater or lesser degree – classical cognitive science or cognitivism: embodied, situated, embedded, distributed, dynamical, extended, enactive, social, and cultural cognition, the dividing lines are not always being clearly cut. They should thus not be understood as distinctive approaches and/or covering different phenomena, but rather as representing the "wild growth" of emerging foci, theories, and approaches of an interdisciplinary field of research in the state of transition. Recently, there have been several approaches to sorting out and relating these developments (e.g., by Clark, 2001; Wilson, 2002; Fingerhut, Hufendiek, & Wild, 2013a; Walter, 2014).

I will follow the categorization of Fingerhut, Hufendiek, & Wild (2013a), who refer to them as "the four E's" – embodied cognition, embedded cognition, extended cognition, and enactivism – and refer to *embodied cognition* in two ways: in a broad sense they understand it as uniting the 4E's as an "umbrella term", while *embodied cognition narrow* puts a strong focus on the role of the body and its specific contribution to cognition (Fingerhut, Hufendiek, & Wild, 2013a, p. 78). To disentangle both, Robbins and Aydede (2009) propose using *situated cognition* instead. Since one term stresses the role of the body, the other the role of and interaction with the environment, I will use *embodied and situated cognition* as 'umbrella-term'. With regard to human cognition, environment denotes not only the physical, but also the social and cultural context of an organism.

I should say that the terms embodied, embedded, and also extended cognition are not selective – an embodied cognitive system is also embedded in its environment and sometimes it will not be possible to sharply delineate whether a phenomenon counts as example for embedded or extended cognition. For many of the concepts discussed, one may argue whether this "belongs to" embodied, embedded, or extended cognition, but since my aim here is to introduce the concepts in order to be

[48] The new approaches in cognitive science are rooted in phenomenology and American pragmatism. Varela, Thompson, & Rosch (1991) founded much of their work on phenomenology, particularly on Merleau-Ponty (see chapter 2), Engel, Maye, Kurthen, & König (2013) trace current developments back to pragmatism. A concise overview of ideas regarding embodiment in philosophy is provided by Fingerhut et al. (2013b, pp. 19-43).

able to refer to them later, I will use the categorization of Fingerhut, Hufendiek and Wild (2013a) and treat embodied and embedded in one subchapter.

I will now introduce the "E's" with regard to their central concepts as a basis for the following chapter, where I will discuss the relation and theoretical consequences of these approaches for understanding human cognition in general and academic writing in particular.[49] I will introduce them in three tranches, embodied and embedded cognition will be introduced together in the first, because I see them as complementary views, then extended cognition, as a different perspective on the boundaries of cognition. Chapter 7.3 takes a "detour" over anthropological thinking on writing as a technology, as it has been discussed by proponents of enactivism. Finally I will introduce central concepts of enactivism, the approach which can be considered to be opposing cognitivism most, I will consider the consequences of understanding writing as a case of extended cognition.

7.1 Embodied and Embedded Cognition

The most obvious consequence of an *embodied cognition* (narrow), which focusses on the properties of a cognitive system, is considering the *body* not as a container, but as embodied knowledge. For simulated cognitive systems, this meant moving from computer simulations to robotics (or combining both). Together with new system architectures as well as an "influx" of anthropological thinking into cognitive science, the new approach led to questioning some basic assumptions regarding the very aim of human cognition. I will briefly introduce the central concepts of embodied and embedded cognition, which I understand to be complementary perspectives.

7.1.1 Physical Properties of the Body and its Environment Matter

In the field of robotics, one way to realize embodied cognition is to focus on studying the effect of materials on behavior. For example, Pfeifer & Bongard (2007, pp. 124-125) showed that using the "right" materials, like including rubber elements in a robot's arm in analogy to the properties of the human muscle-tendon system, may dramatically reduce the need for electronic control. Another well-known example are passive-dynamic walkers, "headless skeletons" without an architecture which is so well-balanced that they may walk with a little push or down a slope.[50] They illustrate an important consequence of *embodied cognition narrow* particularly well: the passive-dynamic walker can be understood as *embodying the knowledge* necessary for walking, very much like organisms lacking a nervous systems can be seen as embodying evolutionary knowledge about their particular

[49] The reader familiar with those ideas may simply skip the chapter.

[50] Rather than reading about them, I recommend searching "passive dynamic walker" on youtube, e.g Collin 's Passive Dynamic Robot (w. Y.).

environment.[51] According to Fingerhut et al. (Fingerhut, Hufendiek, & Wild, 2013, pp. 81-83), this form of embodied-mind hypothesis suggests a weak form of multiple realizability of cognitive states, while emphasizing a strict dependency of specific cognitive states on the bodily traits of the subjects; in other words, there is still some compatibility with functionalism (and thus cognitivism).

Still, in this view the body's role is much more than that of a container for the mind: Whatever can be regulated in the interaction between the body with its physical properties and architecture and the environment does not need central control. This demands a re-thinking of what is "cognitive" in the classical sense and opens up room for questioning where or whether we should draw boundaries between the cognitive system, its body, and the world. Under a cognitivist perspective, this divide is clear: one thing – a control device (the "mind part") – controls another thing, a shell with input and output devices (the "body part"); in contrast, embodied cognition demands that a cognitive system must be able to act in its environment intentionally (must have a purpose und be able to maintain goals) in "real-time" and in a robust way (Brooks, 1991). At the same time, the idea that this must necessarily involve (1) sensing, then (2) operating on a representation of the world to come up with a decision how to act, and (3) carrying out the action calculated was dispensed with and replaced by a biologically motivated understanding of cognition: Cognition is there to aid action in space and time. Depending on the purpose and goals of the robot, this can be realized in different ways. I will introduce some examples in order to illustrate some important points and implications of this line of thinking.

7.1.2 A Challenge to Central Control and the Role of Representation

A seminal example for such a system is the *subsumption architecture* Brooks (1986) suggests, which builds on the idea of the reflex arc as implementing a loop between the organism and the environment. One "loop" or *layer* could be thought of as a system producing a particular behavior, which in the context of the robot is a subsystem; for example, it can produce the behavior "*wander along whatever is right of you*" (e.g., a wall). A second layer may implement the behavior "*inhibit wandering if there is no floor in front of you and turn"* in order to avoid stairs, a third one *„ if there is something blocking the way inhibit wandering and turn"*, etc. The idea is that these layers are independent of each other and cannot communicate in the sense that the pass information among each other. But they are connected in the sense that they can either inhibit or call each other's activity, they are ordering and *subsuming* each other's activity, and more layers can be added

[51] As Thelen & Smith (1994) have demonstrated with their dynamic systems approach, considering physical properties is not only important in engineering, it allows for a qualitatively different understanding of developmental phenomena, in their case how human infants learn to walk.

without having to rethink the whole architecture. There are fundamental differences between this kind of system and a classical one: there is no central instance computing a decision and there is no representation, instead the world is used as "its own best model" (Brooks, 1991).

Brooks was not the first to question whether cognition is there to faithfully represent the world, I will come back to this issue in the context of introducing enactivism, but he was perceived as being particularly radical in postulating that we do not need representation *at all*. As Clark (1997, pp. 22-23) remarks, this may amount to throwing out the baby with the bath, since a) the brain does obviously integrate sensory inputs and b) uses *motor emulation,* which can be seen as kind of inner model of proprioception, as " virtual feedback" in order to guide action. Furthermore, we are able to recognize repeating patterns in our environment and we are able to repeat actions. Thus, in short, it is safe to assume that there is some sort of relation between structures and patterns which make up cognitive systems and structures and patterns in their environment, which emerges and changes in interaction.[52]

7.1.3 Cognitive Systems are Scaffolded by their Niche

There is a second point, which is important: Brook's robots do not need a representation in the sense of a world model, because they are built to function in their particular environment with regard to their "goals"; in biological terms, they occupy a *niche*. The robots are situated in the sense that they sense and act upon particular structures in "the world", which form their environment. Vice versa, the environment can be understood as offering behavioral constraints. In contrast to the notion of constraint as hindering, as found with Hayes & Flower (1980), in this view constraints are necessary "interaction partners" for the cognitive system: As much as they may not foster some interactions, they enable, structure, and coordinate others, which could not take place without them. They provide *scaffolding* (Clark, 1997, pp. 22-23) and thus allow for behavior which the observer will interpret as coherent despite the absence of a central planner in the examples given. So *Scaffolding* refers to external support, which includes structures like tools and also the support of others. It "denotes a broad class of physical, cognitive, and social augmentations" and in this sense can be understood as implementing a *zone of proximal development* (Clark, 1997, p. 194).

Another way to conceptualize cognition as embedded is Gibson's ecological theory of perception (Fingerhut, Hufendiek, & Wild, 2013, pp. 76-78), which can also be labelled "anti-representationalist". In contrast to the approaches above, for Gibson (1979) not action, but

[52] This theme will pop up again in this thesis. The question of the nature of representation and its relation to 'the world' is one of the big questions in cognitive science, since an answer always has epistemological implications – here meant in the philosophical sense.

perception is primary. He proposes that information does not have to represented and processed, instead it is in the environment, which offers *affordances*. These are information which the organism can directly "pick up" from the environment, because they are suited to the organism's perceptual systems and vice versa: "The chemical make–up texture and overall shape of the surfaces off which the light reflects determine the characteristics of the light. Since surfaces are interfaces of substances with the air in the room, the nature of the surfaces is, in turn, determined by the substances that make them up. This set of facts is what allows the light that converges at any point to carry information about the substances in the environment. It also allows animals whose heads occupy the point to learn about their environment by sampling the light" (Gibson, 1979, p. 107). These are opportunities for behavior which are relative to the animals which perceive them. In this sense, light *is* information about the perceiver as well as the relation between perceiver and environment (e.g., the height of a perceiver plays a role for the horizon across objects); proprioception and exteroception imply one another. Gibson, and in his wake Turvey, Shaw, and Macy, reject the classical distinction between percepts and concept, in this sense *affordances* are invariances. While in neuroinformatics *invariances* would be learned by a system as the physical properties of an object which still allow for recognition, if light, position, velocity or other parameters change (a kind of implementation of object permanence), *affordances* are based on animals' ability to discriminate substances, surfaces, places, objects, and events. The latter are ecological terms, i.e. substance is not matter, a surface the interface between substance and medium (e.g., air), a place is not a point, etc. (Turvey & Shaw, 1999, pp. 96-97). In this sense, there is no meaningless physical environment, but what a substance and surface *is* and what it *means* are inseparable, because these properties are relative to the animal (p. 97).

Now, one can ask whether there is a conceptual need for "truly existing" (i.e. independent of the properties of a cognitive system) affordances which, as is often the case, is decidable on epistemological grounds. For Chemero (2009) they are an essential building block for his account of a *radical embodied cognitive science*, because they provide the foundation for his version of entity realism (as argued in chapter 9). If one already understands the introduction of the "ecological terms" (substance, surface, etc.) as a "transformation" in as much as the organism sensory organs have evolved to be sensitive to particular events, one is willing to accept a constructivist position. It all boils down to the ontological nature of *invariances*: Gibson maintained that "[i]nvariance comes from reality, not the other way round" (Gibson, 1972, p. 239). In terms of Piaget's concept of development, adaptation would be limited to accommodation, to a "proper learning". Not surprisingly, Piaget therefore has a very different understanding of invariances as ongoing processes of construction and reconstruction, which implies that invariances always relate to development

(Piaget, 1974, p. 356)[53]. Furthermore, Gibson's view demands that any ecological theory of perception must be built entirely from the side of the environment (Varela et al., 1991, 204), which implies taking quite a different route from the developments in cognitive science sketched above. Instead of direct perception, Varela, Thompson, and Rosch (1991) propose to see perception as based on sensorimotor enactment – their *enactivism* will be introduced later in this chapter.

Having said this, Gibson's concept of *affordance* can be described as "strong". Understood in a "weak" sense, like Gallagher's (2013) concept of *social affordances.*[54] In the weak version, it provides a concept which is very useful, because it allows for conveniently referring those aspects of the environment an organism is interacting with and adapting to as a category.

7.1.4 Offloading Cognitive Load

Embedded cognition refers to the hypothesis that certain features of our environment support cognitive processes without being part of them, for example by arranging tools in a particular way which supports our workflow in the workshop or traffic signs to support the flow of traffic (Fingerhut et al., 2013a, pp. 73-74). Embedded cognitive systems are not only *scaffolded* in their actions, we use our environment and alter it in order to reduce the cognitive work remaining to be done.
Consider, for example, playing Tetris: a cognitivist would expect a player to represent the rules, types of blocks and the current situation of the field, in order to solve the problem of where to put the next block by mental rotation, before deciding to act. As Kirsh & Maglio (1994) could show, real players simply turn the block until it fits into an open slot. So instead of building up a representation, players use the environment itself and thereby reduce the "cognitive work" of the task and are able to play much faster. Kirsh & Maglio (1994) refer to these as *epistemic actions*[55], i.e. actions which alter the environment in a way that reduces *cognitive load*. Although different spatial tasks seem to lend themselves particularly well to this kind of *offloading of cognitive load* (Kirsh, 1995), it is not limited to them. Finger counting can be understood as an epistemic action involving the body. Allowing children the use of fingers in the early stages of mathematics learning, which is usually understood as an abstract task, leads to better learning results (Bender & Beller, 2011).

7.1.5 Cognition is Cultural

Using the fingers for counting and basic calculations illustrates how solving an abstract task is grounded in the physical interaction with the world. As Wilson explains, "[w]hen the purpose of the

[53] "In einer nicht statischen, sondern lebendigen Wirklichkeit bedeutet Invarianz aber nichts anderes als ununterbrochene Rekonstruktions- und Konstruktionsprozesse, so dass sich sogar die funktionellen Invarianten immer auf eine Entwicklung beziehen." (Piaget, 1974, p. 356)

[54] Used analogously to strong and weak AI or strong and weak emergence.
[55] As opposed to *pragmatic actions*, which alter the world (e.g., by planting a tree).

activity is no longer directly linked to the situation, it also need not be directly linked to spatial problems; physical tokens, and even their spatial relationships, can be used to represent abstract, nonspatial domains of thought. The history of mathematics attests to the power behind this decoupling strategy" (Wilson, 2002).

Figure 14 shows seven examples of using the body for counting. One can easily imagine that counting system E, which knows 27 locations for 27 numbers, is powerful at quickly referring to one of those 27 numbers, but poor at supporting even simple calculations.

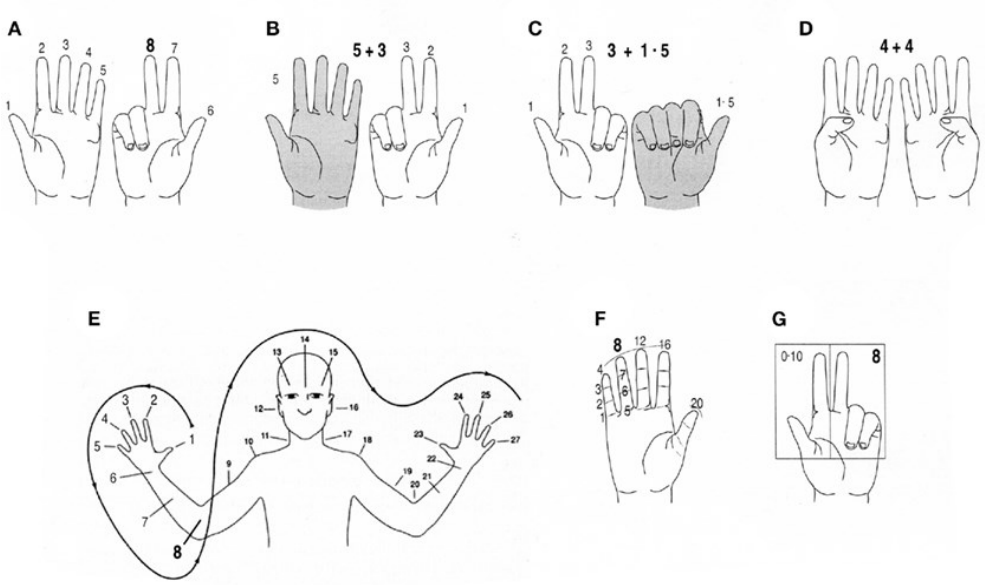

Figure 14: Different cultures use the body for counting in different ways, supporting thinking in a decimal system (A & G), a system with base five (B & C), base 20 (F), or other (D & E) (Bender & Beller, 2011).

Thus, finger counting is a telling example, not only for the "grounding function" of the body in interaction with the world, but also for the cultural nature of human cognition, because it also illustrates that as soon as there is "a way of doing things", it is a *cultural* way of doing it, which acts as a constraint in development.

The close relationship of these concepts to the developmental theories of Piaget and Vygotsky (see chapter 5), as well as to Gibson's theory, is no coincidence, as "they were probably among the very first to notice the true intimacy of internal and external factors in determining cognitive success and change" (Clark, 1997, p. 34).

The cultural dimension is inseparable from the social dimension. Vygotsky's (1978, p. 56) description of the development of pointing illustrates the point. Initially, pointing is the infant's movement towards an object beyond reach, an unsuccessful attempt to grasp. If the caretaker interprets this

behavior as pointing and hands the object to the child, this is a key moment. The effect of the child's behavior is not on the object itself, but *on the other person*, which changes the nature of this interaction in a fundamental way. As Vygotsky puts it, "the primary meaning of that unsuccessful grasping movement is established by others" (p. 56), it becomes a gesture not towards the object, but for others. When the child eventually links its behavior to the situation as a whole, grasping towards the object becomes a movement aimed at another person: the grasping movement becomes a means of establishing relations, it becomes pointing. This is only possible if the situation is *recognized by other*.

7.1.6 Cognitive Systems Engage in Niche Creation

Humans exist not only in their ecological, but also in cultural niches, and we certainly change our environment in more fundamental ways than the robots described above. We create and co-create temporary or permanent niches, which in turn provide scaffolding to development, a notion which Sterelny (2003) refers to as *cumulative downstream epistemic engineering*. Important parts of this thinking are illustrated by the metaphor of the *ratchet effect* (Tomasello, 2002; originally published in English in 1999), which illustrates the role artifacts play the interaction between cultural evolution

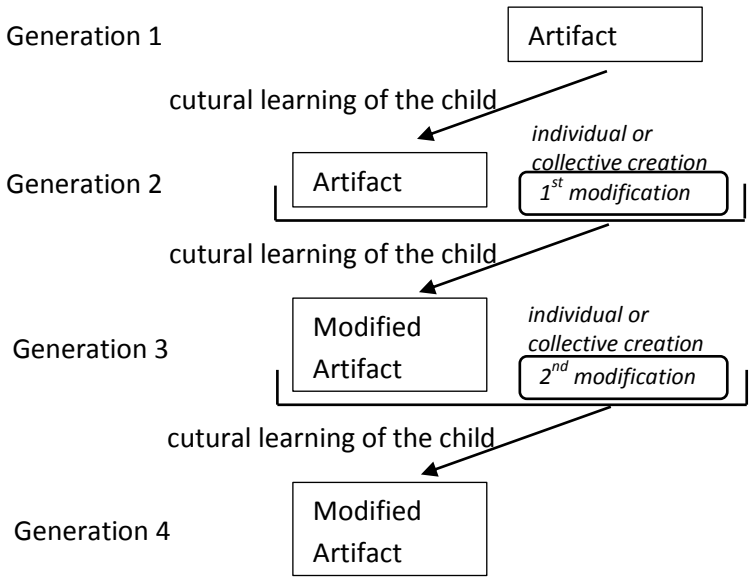

Figure 15: The ratchet effect (Tomasello, 2002, p. 51)

and human ontogenesis (see figure 15). With each generation, artifacts serve as an environment for cultural learning of the child, but each generation may also modify artifacts, which will then provide a different environment for the next generation.[56]

We should bear in mind that human environments are only partly ecological (in the biological sense). The cultural space we co-create this way serves as an additional inheritance mechanism via artifacts, rituals, institutions, social norms, narratives, etc. This also sheds an interesting light on how we conceptualize human nature. It is quite popular to say that we are "stone age people" living in a far-too complex world, because cultural evolution proceeds faster than biological evolution. Sterelny opposes this by arguing that one important characteristic of humans is a great developmental plasticity allowing for adaptation to as well as affecting very different environments: "As hominids remade their own worlds, they indirectly remade themselves" (Sterelny, 2003, p. 173).

7.1.7 Embodied and Embedded Cognition in a Nutshell

Embodied and situated cognition can be understood as reconsidering the nature of (human) cognition and questioning some fundamental assumptions of cognitivism. I will quickly recapitulate the relevant points:

- The "locus" of cognition is questioned, as knowledge is no longer understood as propositional structures "stored" somewhere, but as embodied in physical structures, including the brain. (The point is illustrated by robotic models which lack central control, but are able to produce behavior which is understood as "cognitive" by exploiting physical properties of materials and architectures.) Behavior emerges in interaction of the cognitive system with the environment, the "unit of interest" for understanding cognition is no longer central control (the brain), but the whole cognitive system (depending on the research focus: in its embeddedness).
- The aim of cognition is questioned. Instead of a representation of the world, the ability to act robustly and in time is the goal, which changes the focus towards a primacy of action.
- Cognition is inherently social and cultural.
- The properties of the environment in supporting action (scaffolding), the utilization of environment for cognition (offloading cognitive load), and the (co-)creation of the environment become central topics.

[56] The aim of Tomasello's research on apes and children is to determine which specific cognitive abilities make us human. In the ratchet effect, he sees two mechanisms at work, innovation and imitation, claiming that one of the major differences between human and non-human primates is that humans imitate rather than emulate behavior, which allows for cultural learning. However, covering the corresponding controversy is beyond the scope of this thesis.

This subchapter focused on basic concepts and could only give a glimpse of the wealth of research taking place. One aspect I covered only implicitly still needs mentioning: the shift from the question of how cognitive systems represent the world towards the focus on the interaction of the cognitive system with its environment leads to an understanding of cognition as a process, not in the "classical" sense of a machine running a program, but to an understanding that cognition is best understood as a developmental process.

Viewing cognition as embodied and embedded begs the question of the boundary of cognition: how clear cut is the boundary between the cognitive system and the niche it creates?

7.2 Extended Cognition

Embodied and embedded challenges the identification of mind with the brain and looks at the whole cognitive system (be it organism or robot-model) and the role of the environment. But can the boundary between them always be drawn at the skin (or hull)? There is a gradient between structured public space, e.g., through rules and traffic signs, my workshop where things are in reach, choosing and adjusting my bike to suit my body and usage (e.g., downhill race vs. transporting a child to kindergarten), and a prosthesis with regard to how "close to the skin" and how personal the 'embedding structures' are. Again, the boundaries of cognition are questioned. In order to explain and discuss the conceptual grounds, groundbreaking empirical and theoretical work in this area has come from Ed Hutchins (1995) with a focus on the role of structures in cooperation. I will mainly draw on the work of Andy Clark, who claims that language is an artifact allowing for extended cognition.

7.2.1 The Extended Mind Hypothesis

Consider again the hand belonging to the guitarist playing in a band: Without a guitar, the guitarist can neither become a guitarist, nor ever act as one, and without practice in time the ability to perform will deteriorate. Likewise, there are many other things humans can do in interaction with artifacts, but not without. This led Andy Clark and David Chalmers (1998) to propose the *extended mind hypothesis*[57]. The basic idea is that we should reconsider the notion of a cognitive system as to include those parts of the environment which are critical for the type of behavior under investigation (or, in terms of Clark and Chalmers, the problem to be solved):

[57] Philosophically speaking, they term their position *active externalism*, because the external features play an active (and thus causal) role in the cognitive process (Clark & Chalmers, 1998, p. 3).

> *…the human organism is linked with an external entity … creating a coupled system that can be seen as a cognitive system in its own right. All the components in the system play an active causal role, and they jointly govern behavior in the same sort of way that cognition usually does. If we remove the external component the system's behavioral competence will drop, just as it would if we removed part of its brain.* (Clark & Chalmers, 1998, pp. 8-9)

For the guitarist, this would imply considering the instrument as part of the cognitive system as long as the process of playing is going on; organism and artifact are temporarily *coupling* to become a cognitive system.

7.2.2 The Parity Principle

While the example above treats organism and artifact as *complementary* elements of one system, Clark & Chalmers (1998) suggest another way of coupling, to which they refer as *parity principle*. Consider the musician playing from score vs. from memory or, as they do, Inga and Otto both going to the Museum of Modern Art at 53rd street. Inga accesses her memory, Otto, who has Alzheimer, from the notebook he carries everywhere. According to Clark and Chalmers, there is no difference between the two cases, since both memories are portable and relatively reliable (though Otto's is more easily prone to externally caused decoupling), since "[w]hat really counts is that the information is easily available when the subject needs it, and this constraint is satisfied equally in the two cases" (p. 9). The difference between Inga and Otto (or a neural implant for memory), Clark and Chalmers grant, are differences in the phenomenology associated with information retrieval, while maintaining that in both cases the information has the status of a belief (which in turn is understood to require consciousness. They advocate a sparseness of explanation: in the examples (calculation on paper, notebook) the assumption of an internal representation is *additional* and can be omitted without losing an explanation.

Clark and Chalmers assume that the human brain is adapted to engaging in external coupling in the ways described. They understand language as "a central means by which cognitive processes are extended into the world. Think of … a philosopher who thinks best by writing, developing her ideas as she goes" (p. 5).

Clark and Chalmers are actually advocating two versions of extended cognition, one built on complementarity and the other built on the parity principle. The first one simply involves drawing the boundary between cognitive system and its environment elsewhere, otherwise it is a continuation of the line of reasoning introduced regarding embodied and embedded cognition. As Clark termed in a defense of the extended mind hypothesis, the mind is "organism-centered, but not organism-bound" (Clark, 2007, p. 192).

At this point, I should confess that I turned the order of the argument around: Clark and Chalmers start with the parity principle and then extend to the complementary case, but the latter does not build on the former. While it is beyond the point of (and not necessary for) this thesis to discuss the parity principle in all its dimensions[58], I do want to point out that the example of Inga and Otto suggests a "functionalism 2.0": the goal of cognition in this example is problem solving and as long as the result is the same the cognitive processes are seen as equivalent. The way they use the term information fits the concept of propositional knowledge, including the assumption of equivalence between information in and outside the mind – with a slight shift of what counts as the "core of cognition" towards a "basic package of cognitive resources" (both p. 5). If one considers this in the context of the key concepts of embodied and embedded cognition sketched above - and in the first chapters of Clark's own book "Being there" (Clark, 1997) – one cannot help but see that there is an important contradiction in Clark's thinking: If I take the physical properties of the artifacts cognitive systems to interact with matter, an argument he develops in "Being there" over several chapters, then the parity principle does not work, because it relies on a disembodied notion of information which is still compatible with cognitivism. The point that Clark, despite being an advocate of embodied cognitive science, has not given up representationalism as well as his parity principle have also been criticized elsewhere (e.g., Chemero, 2009, p. 186; Thompson & Stapleton, 2009, p. 27; Gallagher, 2013, argues for a liberal interpretation).

The examples given by Clark work best when there is little room for interpretation, like in examples involving mathematics (with or without the aid of fingers or pen and paper), the game Tetris, or, as in the Inga and Otto-example, finding a single fact to solve a clearly defined problem. If the written notes in the notebook are replaced by a musical score, anyone who learned to play an instrument (at least in classical Western musical education) will realize that a simple "the representation is inside or outside" does not work. Even for the professional musician, it makes a difference if one is seeing the score for the first time, whether one has been practicing and developed one's interpretation, or whether one knows the piece 'by heart'. In other words there is much more involved in the 'cognitive process' than simply accessing 'the information' in the score internally or externally at a point in time. Trying to understand *cognition-as-it-is-happening* without considering the developmental dynamics involved necessarily ends in discussing how a static system in a static world deals with a chunk of 'information'. The examples studied (in experiments or thought experiments), as the one given by Clark and Chalmers, usually involve dealing with *one* element, which draws the subject's attention (which in turn is often equated with consciousness, at least in neuroscience; Clark and Chalmers without further discussion assume it must "accompany" a belief) and demands a clearly

[58] A discussion of the parity principle can be found in Adams & Aizawa (2001), it has been further discussed by (Hutto & Myin, 2013).

defined *re*action. In other words, the problem space is still well-defined, it is just thought of incorporating more than the brain. More interesting ("ill-"or even barely defined) cognitive processes, those demanding adaptation in the facing of uncertainty can only be captured by a developmental view, moreover by a view which sees the *creation* of the "problem space" (to stay in the same diction here) as part of the process; I will return to elaborate on this point in the context of the next chapter.

7.2.4 Extended Cognition in a Nutshell

The Extended Mind hypothesis reminds us that many human activities are artifact-mediated and claims that as long as a cognitive system engages in a stable coupling with an artifact it becomes part of the cognitive system. Clark and Chalmers describe two principles for coupling, the complementarity principle and the parity principle. In the complementarity version, viewing cognition as extended to cognitive science offers a new perspective on investigating the materiality aspect of academic writing. However, in the parity principle version it can be seen as an attempt to bring represenationalism back into embodied cognition "through the back door". This becomes particularly apparent in the way it is used with regard to language.

7.3 Writing – Artfact or Technology

Before I will focus on Clark's theoretical claims and implications regarding language – under the conditions of the following disclaimer: it is neither my goal to fully discuss all aspects and consequences of viewing language as an artifact, nor is it within the scope of this thesis to develop anything near an alternative theory of language. However, if one can debate whether language is an artifact, for writing it is out of the question. Earlier I criticized the cognitivist understanding of writing as "written speech" and with the extended cognition hypothesis, cognitive science has the concepts at hand to reconsider the nature of writing. I will sketch the some basic ideas, but only as far as I need them to contextualize academic *writing*.

7.3.1 Language, the "Ultimate Artifact"?

Clark & Chalmers (1998) do not explicitly discuss the link between their use of the term information[59], as used in the Inga and Otto-example, and their considerations regarding *language as a central means to extend cognitive processes into the world*. Unfortunately, it remains unclear what they mean with "language".

Since Saussure, linguistics differentiate between *langage*, *langue*, and *parole* (Crystal, 1991, p. 193 and p. 250): *Langue* means a particular language as in use, like English, German, or American Sign

[59] Which is unfortunate, since cognitive science are operating with more than one theory of information (Lyre, 2002).

Language, whereas *langage* refers the human ability to speak 'as such', which is the notion of language cognitive scientists are usually interested in. *Parole* is *speech* (performance), the act of speaking by an individual and only this can be directly observed (not in the Gibsonian sense, in the sense of data). *Langue* and *parole* are intertwined in the sense the there is no *langue* without *parole*, and *parole* can only be understood in context of *langue*, which is a social product. They both have a social and individual dimension, whereas *langage* is a *theoretical* concept. This is how far I want to draw on this basic linguistic distinction in order to make the following point: From an embodied and situated cognition point of view, using this differentiation would be highly useful in order to distinguish what we are talking about. What we can interact with is *parole*, speech, thus only this qualifies as an artifact. Its acquisition, the ability to interact with others mediated by these kinds of artifacts, including the ability to produce them, is scaffolded by an environment which can be experienced in terms of physical and social structures and their regularities. It can also be observed and a particular structural regularities can be described and referred to as *langue* and "fed back" into the environment by explicit teaching (within institutions) or by directing attention[60]. The concept of *langage* offers yet another level of description and is based on the observation of the structures described, with or without a consideration of the artifact level.
So when I said it remains unclear what Clark and Chalmers mean with language, I do not know whether and when they are talking about *langage*, *langue*, or *parole*. In computationalism, that does not matter, but if I seriously consider the materiality of cognitive system and artifact, the distinction must be made. In his book "Being There" (Clark, 1997), Clark terms language "the ultimate artifact" (which is the topic of chapter 10) and uses the expression "public language" (p. 193). We can only infer that he does not mean *langue*, since as a philosopher of cognitive science he is interested in the role of language for human cognition, but *langage*. However, this is a theoretical concept, whereas the notion of language as an artifact would be covered by the term *parole*, speech.

Vygotsky, who is often cited by Clark as having worked on the role of *language* as a tool for scaffolding, was specifically referring to *speech*. Accordingly, the correct translation of his well-known work "Thought and Language" (Vygotsky, 2012) from Russian would have been "Thought and Speech", as Kozulin (2012) remarks in his introduction to the new edition. Vygotsky highlighted the role of speech, first provided in a social situation by a caretaker, later as internalized *egocentric speech,* found in preschoolers, and finally as *inner speech* of school children.

> *[E]gocentric speech appeared when a child tries to comprehend the situation, to find a solution, or to plan a nascent activity. The older children behaved differently: they scrutinized*

[60] Csibra & Gergely (2009) refer to this informal "subliminal" teaching method of caretakers to direct infants' attention by use of ostensive signals as "natural pedagogy".

> *the problem, thought (which was indicated by long pauses), and then found a solution. When asked what he was thinking about, the child answered more in a line with the "thinking aloud" of a preschooler.* (Vygotsky, 2012, p. 32).

Clark's (1997, pp. 198-204) understanding of language is that of an external resource, but one that does not require "the installation of a different *kind* of computational device … the same old process of pattern completion in high-dimensional representational spaces" (Clark, 1997, p. 199) will do[61]. The external resource "representation" allows basic sensorimotor skills to divide the problem into a series of sub-problems which can be solved; intermediate results can be stored, and so eventually the whole problem can be solved. In this sense, language does not transfigure the brain. It does not require qualitatively different computations, it is the *external resource* language which *complements* the brain's representations and computations. The role of *inner speech* would be that of ensuring control by staying on or shifting focus. To explain this idea, Clark draws on Kirsh & Maglio's (1994) study of Tetris players. They found that expert players were not only very fast in pattern completion, but also reported higher-level concerns (like "don't cluster blocks in the center") and suggested that these indirectly play a role by shifting the focus of attention and thus modulating the lower-level pattern completion. Clark concludes: "The most obvious benefit of the *linguistic encoding of thoughts and ideas* is, of course, that such encoding formats our ideas into compact and easily *transmitted signals* that enable other human beings to *refine them, to critique them, and to exploit them*" (p. 204, italics by me).

However, in terms of an embodied cognition only *parole* offers an artifact which allows for interaction. However, in a later article Clark also refers to "words and sentences", suggesting that the "form part of the process of thinking, and they do so not merely in virtue of their contents but also in virtue of their materiality: their physical existence as encountered and perceptible items, as sounds in the air or as words on the printed page" (Clark, 2006, p. 370). In other words, to him the spoken or written form of a word or sentence is the same: their materiality does not matter – thus conceptually they are *not* treated as an artifact. Only this way the external and the internal representation can be equivalent – whether Inga's remembering and Otto's looking up and reading in the notebook may be seen as the same cognitive act can be questioned. Furthermore, what is the "content" of an artifact? Thus, the very classical idea that the brain represents the world (albeit one made of artifacts) has come in through the back door. Only there is a division of labor into "basic cognitive processes" operating on internalized representations and "supported" by the body and environment taking some cognitive load as well, resulting in the ability to *transmit* thoughts, because the artifacts produced, words and sentences, are able to "carry" contents. Thus, in contrast to Fodor's *language*

[61] Clark (2016) develops this notion of extended cognition relying on basic cognitive processes further with regard to predictive coding.

of thought (Fodor, 1975) Clark's theory assumes no translation to be taking place, but a direct transmission of the representations in various formats.

This view, the parity principle in particular, explains why Clark (2006, p. 370), as did Saussure (see Ong 2002, p. 17), equates speech and writing. However, if the physical properties of an artifact impose constraints, i.e. invite particular interactions and do not foster others, then looking at the properties of verbal and written artifacts is of high interest for academic writing. I thus hold that the idea of viewing our cognition as extended remains interesting – in the complementarity-version.

An approach based on this could be to focus only on "parole in action", looking at it as *verbal behavior* – to use the title of B.F. Sinner's book (Skinner, 1957). A re-discussion of *Verbal Behavior* against the background of the current debate in cognitive science is certainly pending. A notion which seems underexplored in theorizing the nature of language is that in speaking the production of the *behavior* "speech", speech-perception (in interaction, at least for learning), and the *production* of the *linguistic artifact* originate in *one act*.[62] In contrast, if I build a chair, the process of artifact construction and its use are segregated temporally, probably spatially as well, and very different in terms of behavior produced. In this sense, Skinner focused on 'using the chair', Clark on the 'the role of the chair in use', but the complementarity of both perspectives was not explored as Skinner's approach was dismissed with the rise of cognitivism.

However, theorizing language is not within the scope of this thesis. Speech is an event, speaking a behavior which produces an artifact which is as short-lived as the event, while writing is behavior yielding a (more or less) durable artifact. Since my topic is *writing* I will focus on the *materiality of the written artifact* and its role for understanding writing as a cognitive developmental process. The goal of the next subchapters is to explore the artifact-nature of writing further with regard to its impact on cognition.

7.3.2 Writing as Technology

In the previous chapter (7.3.1) I discussed the Extended Mind Hypothesis and criticized Clark for claiming language to be the "ultimate artifact", but by treating language and speech as well as speech and writing as equivalent actually neglecting the artifact-nature of speech and writing. Viewing writing as a case of extended cognition in the complementarity principle version at the very least offers a different perspective. A compatible theory which does not equate speech and writing, but views it as a technology, is coming anthropology. The putative role of this technology on human cognition (and culture) has been discussed by Goody, Ong, Harris, and, more recently, Menary. I will

[62] This characteristic is shared with making music or dancing, and it would be interesting to study how it extends to rituals.

briefly introduce the theory, mainly following an account Steward (2010) offers from an enactivist point of view, and then discuss it in the two following subchapters.

In his book "The Domestication of the Savage Mind", Goody (1977) traces the development of writing and develops a theory of the impact writing as technical innovation had on the development of Greek philosophy. Central to this approach is the understanding of writing as a technology which is part of and plays a role in structuring social relations.
The earliest known form of writing was invented 3000 BC in Mesopotamia and used for identifying ownership by attaching clay tablets to objects. Later, signs were invented to represent the objects as well. Thus the earliest known records of writing are not narratives, but *lists* of persons, objects, and events. Initially, the aim of writing was not to provide a "record of thought", but a tool which enabled new operations, like the administration of stocked goods, which would not have been possible based on spoken language alone (Photography 1 shows a replica of a clay table). In more abstract terms, Goody argues that writing is a technology which was invented for structuring social (economic) relations, while at the same time being embedded in them. By using this technology, social relations were altered and could develop, which in turn drove the development of the technology *writing*. Thus the common intuition that writing was invented to represent – in the sense of providing a record of – spoken language, a "written speech", is misleading.

Referring to Goody, Steward (2010) sketches the further development of writing as follows: Writing was used to produce lists, which could be grouped into three types, retrospective, prospective, and lexical lists. Retrospective lists can be divided into *chronicles* (ordered by events) and *annals* (orders by date). They allow for documentation and thus the emergence of a "history". Prospective lists serve planning purposes, thus scaffolding cognition in a powerful way. Later *lexical lists* gained particular importance, especially in Sumer and Egypt. They were typically linked to teaching purposes and thus to institutionalized education, which illustrates how an initially "administrative technology" spread to be developed and to develop other spheres of social organization, in this case educational institutions. The use of lists had an impact on cognition, either directly or, via social organization, indirectly, because lists aid memory and planning. Also, they need to be intelligible by different readers, which in turn will influence language to become less ambiguous. The longer and more complex lists became, the more important became their organization: the need to categorize as well as to organize them emerged. Since first writing systems were pictographic or hieroglyphic, an organization based on visual properties of the sign was not feasible. Other options were an organization based on categories (e.g., plants, animals, etc.), on form, or on the initial sound of the entity depicted. Eventually, the initial sound determined the grouping of pictograms on the list. This, in turn, laid the path for a development of writing systems from pictographic, via syllabic, and

consonantic to the invention of the alphabet by the Greeks. Only then, after several thousand years of evolution, could writing be identified with the phonemes of spoken language and be understood as “written speech”.

Photograph 1: Replica of a clay tablet of around 3000 B.C.: administrative text for showing amounts of different crop needed for production of bread and beer (Photo by me, permission to print by courtesy of Heinz Nixdorf Museums Forum (http://www.hnf.de).

Coming back to the differentiation between “savage” and “domesticated mind”, Steward (2010) follows Goody’s hypothesis that the latter owes the domestication largely to writing: While it is assumed that humans living in the Neolithic had an atemporal or cyclic world view governed by myths and rites, chronicles and annals scaffold the perception of time in terms of a linear succession of events – a history. The juxtaposition of “savage” vs. “domesticated” mind goes back to Levi-Strauss referring to Neolithic vs. contemporary humans. Goody (1977, pp. 2-7) criticizes this dualistic view of the superior ‘we’ as opposed to the primitive ‘they’, which he sees in much of anthropology and, in an extenuated version, at the root of Levi-Strauss’ theory.

> *If we think of changes in communication as being critical, and if we see them as multiple rather than single in character, them the old dichotomy between primitive (or ‘prior’) and advanced disappears, not only for ‘thought’ but for social organization as well.* (Goody, 1977, p. 10)

Instead, he argues for a developmental view, which “points to the role of changes in the mode of communication in the development of cognitive structures and processes” in relation to “what historians of culture perceive as ‘the growths of knowledge’. While this has to do with ‘content’, it also presupposes certain processes which are related … to the modes of communication by which

man interacts with man and, more especially, transmits his culture, his learned behavior, from generation to generation" (Goody, 1977, p. 36).

7.3.3 Literacy Alters Cognition

The intuition that writing was invented to phonetically transcribe, to "record" speech or thinking is a misconception. However, Steward's reception of Goody gives an account which makes apparent how this misconception came about: The invention of the alphabet with a comparably small number of letters does not only provide a system which is more easily acquired than thousands of pictograms or other signs memorized by professional scribes, it effectively allows for a phonetic transcription of spoken language. This allowed writing to expand its influence from an initially narrow range of social systems to virtually all domains of language, for example history, philosophy and mathematics. Steward emphasizes "it is exactly at the very moment when written language comes closest to spoken language that the originality and the specificity of its contribution to cognition becomes most apparent" (Stewards, 2010, p. 25).

As already stated above, the alphabet, which lends itself to phonetically transcribe spoken language quite easily, may not have led to the first written stories, but it made it "cheaper" to record them in a technology acquired more easily and thus with growing availability. Through alphabetic literacy, a different kind of discourse becomes possible, which fostered rationality, skepticism, and logic.

> *Culture, after all, is a series of communicative acts, and differences in the mode of communication are often as important as differences in the mode of production, for they involve developments in the storing, analysis, and creation of human knowledge, as well as relationships between the individuals involved.* (Goody, 1977, p. 37).

Steward (2010) points out that the narrative dimension of writing enables the comparison of different versions of a story in a detailed, and emotionally more detached way, than two versions recited by a narrator: "writing is structurally individual and private, both during reading and writing itself; it is thus an instrument which induces critical distance, which dissipates collective emotion and promotes what is called 'objectivity'" (p. 25). Writing is visible, specialized, and durable, as opposed to fleeting speech, which makes following – and thus examining and critiquing – a line of arguments possible in an unprecedented way. Writing can be copied faithfully and spread, which may support the spread of shared understandings and beliefs. Taken together, "alphabetic writing" thus enables readers to follow and dissect thought processes and puts pressure on writers' arguments to be clear (i.e. precise and logical), the trademark of Western philosophy. This "style of thought is literally inconceivable without writing… [it] is the condition of possibility for the constitution of mathematical and logical idealities" (Steward, 2010, p. 26). Of course, Rome wasn't built in a day. The cultural and technological effects of writing on social relations and individual did not occur at once, but

developed over time. Causalities are circular and complex, until "[a]t the culmination of this process, writing appears as an integral and essential part of a major cultural mutation" (Steward, 2010, p. 25).

Thus, despite the useful potential of writing to preserve speech over time and space, it did not *originate* to provide a record of thinking or speech. Writing could only develop the potential to support abstract thought through the development of a technology which initially served administration towards an alphabet close to phonetic transcription in combination with the spreading of the technology to various domains of life. This transformed the nature of cognitive processes "in a manner that leads to a partial dissolution of the boundaries erected by psychologists and linguists between abilities and performance" (Goody, 1977, p. 18).

7.3.4 Writing as Thinking

The work of Ong (2002) traces how deeply literacy changes culture as compared to orality. It changes the perception of speech quite drastically: "Writing… is a particularly pre-emptive and imperialist activity that tends to assimilate other things to itself … Though words are grounded in oral speech, writing tyrannically locks them into a visual field forever" (Ong, 2002, p. 12). In other words, a literate person cannot perceive speech as "purely" oral language anymore. This has an impact on memory, since it plays a different role in an oral culture than in a literate one (p. 19). Ong highlights the visual and technological dimension of writing and follows Olson in arguing that it enables 'autonomous' discourse, which cannot be challenged, because it has been detached from the author, which could be challenged; a book cannot.

A similar suggestion comes from Harris (1989), who heavily criticizes Goody for promoting a "very ethnocentric view" and of romanticizing the Greeks as inventors of the phonetic alphabet (albeit in an earlier version of his theory) and Ong's position that writing restructures thought as "almost clichés". Instead, he promotes his notion of 'autoglottic space', which I will briefly introduce: A necessary prerequisite for 'autoglottic space' is valid unsponsored language, i.e. language which is separated from the speaker. Writing allows for this kind of decontextualization, which prises "open a conceptual gap between sentence and utterance … Utterances are automatically sponsored by those who utter them, even if they merely repeat what has been said before. Sentences by contrast, have no sponsors, they are autoglottic abstractions. The Aristotelian syllogism like the Buddhist *panchakarani*, presupposes writing" (Harris, 1989, p. 104).

As Menary (2007) summarizes Harris' proposal from an "integrational linguist" point of view as an alternative view to and critiques of seeing "writing is essentially western or that literacy improves our memory capacity" (p. 622). However, this seems to be beating a straw puppet. Except for the term itself and the fixation on the syllogism, Harris' 'autoglottic space' is very much in line with Goody's

theory, at least in the version of 1977: Both see writing as enabling a way of thinking which was previously much more difficult (maybe impossible) and both highlight the role of the social (political; Harris) or, more generally, communicative process (Goody) in which these 'thinking practices' are embedded. Thus, while I see difference in details, but not on the conceptual level relevant in this context, I have included Harris, because Menary (2007) draws on his approach in the paper "Writing as Thinking". The latter is interesting in this context, because he combines the anthropological understanding of writing as a technology altering social processes and individual cognition with Clark & Chalmers' (1998) extended mind hypothesis (see chapter 7.2.1). In his theoretical approach, the products of the writing process are meaningful vehicles (which Menary identifies with contentful and representational), "created and manipulated by an agent as a bodily act" (p. 622). To Menary, the crucial point of this view is that sentences are not thought of as abstractions, but as material vehicles manipulated by an embodied agent. In this view, they may also be understood as memory-enabling, since they allow for off-loading cognitive load. Menary concludes that this "explanation of writing allows us to throw off the internalist hold on cognitive explanations and a more coherent account of cognition is forthcoming that connects up neural, bodily and social dimensions of cognition. When we couple this with Harris' view of writing as enabling abstract/theoretical thinking, it is a powerful account of how we think by writing" (p. 631).

Menary's thinking is perfectly in line with Clark and Chalmer's extended mind hypothesis. At first sight, the anthropological "top-down" view on language as technology embedded in a literate society altering communication (and thus social organization) and thereby individual cognition and the extended cognition "bottom-up" view seem to meet and complement each other in the concept of the written artifact or vehicle as meaningful (i.e. contentful and representational) vehicle. However, if we replace "vehicle" by "sign", we immediately see that Menary, just like Clark and Chalmers, suggests representationalism in the embodied version (see chapter 7.2.3). While it is not the goal of this thesis to develop a theory of language, I still want to point out that there is a gap between the anthropological holistic view of language and the prevalent (comparably atomistic) view in cognitive science, which effectively sees the "language artifact" realized at word and sentence level and language as a sentence production system.

With regard to understanding *writing as thinking*, it is relevant to realize this gap, because it poses the question of how we conceptualize the phenomenon of academic writing: Do we see writing as the production of one sentence after another until a text is finished, as an interweaving of propositions, as Ortner (2000) termed it, *or* do we understand writing as an interaction with the environment which will a) produce an artifact (text) embedded in a discourse composed of sentences and b) change the writer's 'self' and her relation to the environment? After all, a text can still tell the

same story after every sentence has been altered (a factor exploited by my Latin teacher, who "rewrote" *De Bello Gallico* in order to spoil exam preparation by memorizing the translation).

The question, then, is what "binds" the sentences in an academic writing project. From a cognitivist point of view, the answer is simple: the problem to be solved as represented in problem space. However, as I have argued, the process of academic writing involves the creation of the problem. Therefore, in the representationalist extended cognition version, where meaning is situated on sentence level and the representation may be distributed over internal and external representations (artifacts), the question emerges as to how the problem is created and how the cognitive systems determines that it has been solved. If we want to understand *writing as thinking* in the sense of enabling the development of abstract thought, this demands not merely an embodied cognitive system manipulating external vehicles "carrying" meaning, but a meaning- or sense-making writer. While texts are undoubtedly made up of words and sentences, writing as a sense-making process is best understood with regard to the whole writing project – not only from a writing research, but also from a cognitive science perspective.

7.3.5 Some Insights on Nature of Writing in a Nutshell

The aim of this subchapter was to reconsider the nature of writing. In the context of the extended mind hypothesis, language is understood as an artifact. I criticized that in the "parity-principle-version" this view amounts to an embodied version of representationalism, which only works because the same time the materiality of the artifact, i.e. the consequences of its physical extension in time and space is disregarded: there is no differentiation between speech and writing. This criticism extends to Menary's proposal of understanding writing as thinking by conceptually merging Clark and Chalmer's *extended mind hypothesis* and Harris' *autoglottic space*.

In the "complementarity version", the view of language as an artifact and that of writing as a technology shared by Goody, Ong, and Harris are compatible. The account given by Goody provides a deeper understanding of the co-evolution of writing as a technology which altered and is altering social organization and communication processes as well as the cognition of individual agents: literacy alters culture and cognition in profound ways and enables abstract thought. Thus, the understanding of writing as a "record of thoughts" or "written speech" of cognitivist theories is misleading. Instead, writing can be understood as enabling an individual cognitive developmental process as well as a co-evolution of human cognition, culture, and technology.

If we understand writing as a cognitive developmental process, then the writer as "sense-maker" should find a place in the theory. The conceptual basis of enactivism necessary to develop such an account will be introduced in the next part of this chapter.

7.4 Enactive Cognition

The term *enactivism* was introduced by Varela, Thompson, and Rosch (1991) and taken up and developed further by Thompson, De Jaeger, Di Paolo, Froese, Stuart, and others[63]. In opposition to representational theories of mind, *enactivism* maintains that organisms do not passively perceive and represent the world, but actively create it in interaction with the world: they *enact* their world.

Cognitive systems are understood as *autonomous* or *autopoietic systems* which share the "goal" of all biological processes, which is self-maintenance. Two basic assumptions are necessary:

1. cognition depends on the *structural coupling* between organism and environment and
2. cognition arises in the interaction with the world, in this sense cognition and perception are *embodied actions*.

In order to understand this, it is necessary to introduce the core concepts with which the theory operates, like autonomous system, structural coupling, operational closure.

7.4.1 Autonomous system

The concept of *autonomy* has its roots in Maturana & Varela's (1987; published in English in 1980) concept of *autopoietic systems* which are self-sustaining and self-reproducing. Thus, in my description I will first rely on their work and then add from the more recent literature.

Any system[64] is characterized by having a boundary. It is spatial and temporal, but may also be described in terms of or other traits which constitute "in" and "out". As such, it can be observed in terms of its structure, internal processes, and its behavior and terms of the rules governing its structure and behavior. The 'components' of the system are interacting or even interdependent, it is interconnected. Based on this definition for non-living systems, Maturana & Varela (1987, p. 51) develop their theory of *living systems*, which are autopoietic and, more generally, autonomous systems. They differ from other systems by producing the components which constitute them. Take the cell as an example (see figure 16): Its boundary is defined by the cell membrane, which stops diffusion and allows for a medium inside the cell, in turn allowing for autocataclytic reactions. Among these are also those processes which build the molecules making up the membrane; in other words, the cell is reproducing itself in an ongoing process of self-maintenance.

[63] In my account I stay with the works which frame themselves as an continuation and expansion of the initial framework proposed by Varela et al. (1991) with the goal to convey the central concepts of the theory. For this reason, I am including neither O'Regan and Noe's *weak enactivism* (Fingerhut et al., 2013b), nor Hutto & Myin's (2013) "Radicalizing Enactivism" .

[64] Their understanding of system is rooted in general systems theory, ideas of the cybernetics movement, and theory of complex dynamical systems.

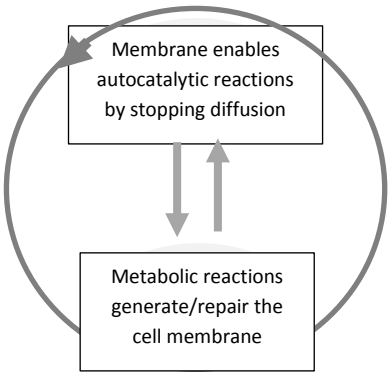

Figure 16: Example of an operational closure in the cell: the cell membrane (grey outer circle) provides a boundary protecting the cell's internal medium. The metabolic reactions in this medium maintain the membrane in an ongoing process.

7.4.2 Operational Closure

Every process in this system presupposes another process within the system, forming a "loop", which constitutes *operational closure*. As the border between processes outside and the network of processes inside the system is produced, in this case in form of the membrane, the system constitutes its unity and identity. In order to describe the network, Maturana & Varela (1987, p. 54) differentiate between *organization* and *structure*. Organization refers to the relations between the elements of the system which characterize it as members of a particular class, whereas *structure* refers to those elements and relations which realize it specifically. Thus, the system realizes and specifies itself and as long as this structural change is going on the organization is maintained, ontogenesis of the system continues.

7.4.3 Structural Couplings

The network of ongoing processes needs energy to maintain its organization against decay. This needs to come from outside the system, so while being *operationally closed*, autopoietic systems are *energetically open*. So interactions with the environment – i.e. *embodied and situated* interactions- arise from the need to maintain the system; in this sense being and doing of an autopoietic unit are inseparable (Maturana & Varela, 1987, p.56). If the interactions are recursive and thus rather stable, they are called *structural couplings* (1987, p. 85). From the "point of view" of the system, while internally it is "striving" for equilibrium, a perturbation takes place and the system perturbs its medium (including other autopoietic systems). *Structural couplings* are never complete in the sense that they reach "perfection" (or equilibrium), but are under constant structural change.

7.4.4 Sense-making

This tension has a crucial consequence: the continuation of autopoiesis – *survival* – is the norm under which each interaction with the environment has an intrinsic value: the encountered is either "good" or "bad" for survival. This implies that there is no cognitive act without a value, which means that cognition and emotion are one. An autopoietic system has a perspective (*a position*) in a world where every event has a value. Its world is meaningful, because as the autonomous system engages in structural coupling the organization of the system determines relevance and significance of the value of the encounters, the living system *makes sense* (Varela et al., 1991, p. 147).

This sense- or meaning-making process is shaped by the living systems' adaptivity in interaction with its history of structural couplings. Obviously, even if their organization was identical at some point in time, no two systems will ever have the exact same history of structural couplings. Therefore, the values ascribed to interactions will differ, which will have an impact on future structural coupling sought or avoided; in short, their respective sense-making processes will be different. It is a process of *self-individuation* (Di Paolo & Thompson, 2014). In the process of *self-individuation*, a living system actively creates or *brings forth* its world through its interaction with it, it *enacts* it.

7.4.5 Precariousness, Viability, and Adaptivity

Di Paolo & Thompson (2014) argue that in order to make operational closure "non-trivial", the theory needs to be expanded by the concept of *precariousness*, which means that the operationally closed network will run down in the absence of "enabling relations" between processes. Only those processes are precarious which cannot exist in absence of the network. They claim that this causes an internal tendency towards internal imbalance[65], which, in order to be sustained, needs energy, matter and relations with the outside world. However, in a network made up of mutually dependent but different processes, the aspect of *precariousness* is intrinsic and simply one side of the "coin" of *operational closure*. If one process in the network is dependent on another, this other is "enabling". If it is not, there is no dependence, thus it is not part of the network. In this sense, precariousness is an inherent trait of operational closure: thus, autopoiesis can be framed as 'producing structure against ongoing decay'.

The other side of the coin is that, despite their precariousness, autopoietic systems must be of a certain *robustness* (Froese & Di Paolo, 2011), i.e. they must be able to sustain their organization

[65] At first sight, this claim is in opposition to Maturana and Varela and also Piaget. However, biological systems usually contain two antagonistic mechanisms, be it the citric acid cycle (as known from school biology textbooks) or the interplay of excitatory and inhibitory networks in the brain, which make sure that the respective functions remain in a "corridor" between harmful extremes. If one understands 'keeping the balance' as keeping the system in the "corridor" of optimal functioning, striving for equilibrium can either amount to an up- or a down-regulation of the system observed.

against a range of perturbations. This notion is captured by the term *viability.* "We can then define these ranges of non-fatal events as the system's *viability* set, which is assumed to be of finite measure, bounded, and possibly time-varying" (Froese & Di Paolo, 2011, p. 8). Put simply, in order to stay within this viability set (or range) by monitoring perturbations and shaping its trajectory, living systems need to be *adaptive*. A basic form is the internal regulation of metabolic processes, but adaptivity can also involve the regulation of the system's environment, be it following a gradient in seeking nutrition or in cooking a three-course dinner. Adaptive regulation is not to be understood as conformance, but as an activity generated by the autonomous system. In this sense, Froese & Di Paolo (2011) argue that adaptive autonomy is a basic form of life and sense-making a basic form of living.

If the autonomous system's adaptive behavior and sense-making are in the service of keeping the system within the viability range, then it follows that *meaning* is related to that and this individual. It brings forth its own world (Maturana & Varela, 1987, p. 185).

7.4.6 From Cell to Socio-Cognitive Interaction

Maturana and Varela rolled out their concept of autopoiesis (more generally, autonomy) starting with biochemical processes in the cell, which in turn can engage in structural coupling not only with the 'non-living' environment, but also with other living systems, like the slime mold. As Froese & Di Paolo (2011) point out, there is a 'cognitive' or *ontological gap* if we want to scale up from single cell organisms to humans. The first step towards scaling up is looking at the structural coupling of two or more autonomous systems or adaptive agents, i.e. autonomous systems which are able to adjust their coupling relationship with the environment. The environment may also be constituted of other agents, which may invite coupling. Thus, agents can be part of a multi-agent system, which is constituted by agents in a shared environment coordinating their activities in an inter-individual interaction process. From the perspective of one agent, the other(s) can provide *interactive scaffolding* (Froese & Di Paolo, 2009). However, the agent's values are still self-related.

Froese & Di Paolo (2011, pp. 17-19) suggest that in order for social cognition to become possible, the autonomous system must perceive another autonomous system as *another system capable of goal-directed behavior*. Self-related values rooted in maintenance of the metabolism do not provide a sufficient basis; values related to the *other* and thus underdetermined by "metabolic values" are necessary. These require the activity of a partially decoupled system, which is able to make a self-other distinction, like the immune-system or the nervous system. The latter governs sensorimotor interactions, thus it is (also) essential for social interactions; and since its dynamics are relatively decoupled from metabolism and not strictly confined to self-normativity, its values can be about something else. This kind of 'aboutness' requires that the agent (or autonomous system) is *cognitive.*

Based on work of Barandiaran and Moreno, they argue that a system counts as cognitive, if it is able to preserve a dynamical network of autonomous sensorimotor structures in an adaptive manner, for example habits, "which encompass partial aspects of the nervous system, physiological and structural systems of the body, and patterns of behavior and processes in the environment" (Froese & Di Paolo, 2011, p. 18). This opens up almost limitless possibilities for behaviors.

Such agents can, in a general sense, engage in what De Jaegher & Di Paolo (2007) term *participatory sense-making*. This kind of sense-making is rooted in movements, including utterances (so here there is an anchor-point for theorizing about language which could start on the *parole*-level) which are mutually coordinated in *social coupling* and which affect individual sense-making in ways not possible for a single individual.

Social cognition is seen as a special case of participatory sense-making, because it requires recognition *of* the other. As Froese & Di Paolo (2011, p. 22) argue, it also requires the recognition *by* the other: For social interaction to take place, there must be an invitation and it must be accepted by the other autonomous system. For example, the act of giving can only be completed with the other's act of receiving. Based on these considerations they propose the concept of *socio-cognitive interaction*:

> *Socio-cognitive interaction is co-regulated sensorimotor coupling between at least two cognitive agents, whereby the regulation of each agent is aimed at aspects of the mutual coupling such that:*
>
> 1. *A new autonomous organization emerges from the interaction process spanning at least two internal and a shared relational domain of dynamics, and*
> 2. *The cognitive agency of at least two of the individuals is not destroyed in the process (though their scope can be augmented or reduced). And*
> 3. *A cognitive agent's regulation of sensorimotor coupling is complemented by the coordinated regulation of at least one other cognitive agent.*
>
> (Froese & Di Paolo, 2011, p. 23)

I will come back to this point shortly in the discussion (chapter 7.5.2).

Varela (1990) once defined intelligence as the "ability to enter into a shared world." The conceptual basis developed in enactivism gives a first idea of how self-individuation and sociality can be realized.

7.4.7 Enactive Cognition in a Nutshell

I now briefly summarize the most relevant points made in this subchapter. Enactivism offers an understanding of cognition which fundamentally differs from cognitivism in almost any aspect; therefore I will juxtapose the two in doing so:

- Cognitivism starts from the premise that cognition is information processing, enactivism from the concept of *autopoiesis*. Cognition is a process grounded in the process of living and understood as *sense-making*.

- Cognitivism seeks universals of cognition, in enactivism they are as many processes of *self-individuation* as there are *autonomous systems*.
- Cognitivist systems develop by proceeding through a series of stages which in turn "implement" different cognitive mechanisms. Enactive systems *enact* themselves in interaction with their environment. These *structural couplings* are never perfect, thus this process is always *adaptive* (developing).
- Cognitivism treats emotions as an "add-on" to cognition, in enactivism cognition and emotion are one process, since there every interaction is *valued* as serving or hindering survival – thus the *world brought fourth* is *meaningful*.
- Cognitivist systems operate on mental representations, they receive input – solve a problem based their representation of the world – generate an output; there is Truth in an objective world. Enactive systems "know" *viability*, they are self-maintaining and enact a world.
- Social Cognition in cognitivism works via some representation of the other (theory of mind), enactive systems engage in *participatory sense-making*, under certain conditions they may recognize the other and engage in *socio-cognitive interaction*.
- Cognitivist systems store, retrieve, and operate on propositional knowledge, enactive systems *bring forth meaning* through recurring patterns of interaction. They do not *have* knowledge (as in content), but – adapting Maturana's "to live is to know" – enact a *process of knowing* which is *embodied*.

Enactivism "provides a view of cognitive capacities as inextricably linked to histories that are *lived*" (Varela et al., 1991). Obviously, in this theory there are no representations in the classical sense, there is simply no need for a 1:1 relation between anything outside in an objective world and inside the boundary of the living system. This has been widely and deeply discussed in the literature on (more or less radical) constructivism (see, for example, Schmidt, 1994; or Roth, 1996). If I understand the "world" of a cognitive system as enacted in the interactions with the environment, then this process of knowing is always context-dependent and individual, it is "the very essence of *creative* cognition" (Varela et al., 1991, p. 148).

7.5 Discussion

In this chapter I introduced some central developments and concepts from contemporary cognitive science. All of them departed from the cognitivist framework which the still accepted *cognitive process theory of writing* is based on.

7.5.1 Embodied and Embedded Cognitivism?

The research and concepts presented under embodied and embedded cognition show that there is a shift in focus from the idea that cognition research is exclusively identified with looking at central control (located in the brain or a mind 'as unit') towards a focus on the materiality of the body and the role of the "periphery" as well as the role of the environment in scaffolding behavior. This has led to a notion of cognition as inherently socially and culturally situated, and quite a few researchers question the old assumption that the aim of cognition is to represent the world. Thus, where cognitivism did not invite to question a naïve realism, these ideas do. However, one can study the interactions between, say, the material properties and architecture of a robot moving in a particular environment, without ever questioning a cognitivist concept of cognition, and still be accepted for doing "embodied robotics". In this sense, I see embodied and embedded cognition as "epistemologically neutral".

7.5.2 Enactive Extended Cognition

The extended mind hypothesis with its parity principle is not "epistemologically neutral"; instead, it can be seen as an attempt to save represenationalism. However, together with Clark's framing language as the "ultimate artifact", at the very least it does pose relevant questions with regard to the materiality of language. Thus, the rethinking of the boundary of cognition it offers, especially in conjunction with the less cognitivist "complementary" version of extended cognition, is intriguing. However, the view anthropologists offer in framing writing as a cultural technology and particularly the Goody's theory, offer better grounds for understanding its effects on cognition within a framework of a cultural and cognitive co-evolution.

Whether an artifact-extended cognitive system in the complementary version temporarily constitutes a cognitive system in its own right may be questioned. From an enactivist point of view, at a first glance one could dismiss the idea by arguing that the artifact which the autonomous system is coupling with is not part of the network of processes establishing the organization of the system and thus violates operational closure. However, the role of artifact-mediated interaction in human development was interesting enough for Piaget, and particularly for Vygotsky, to take a prominent role in their theories of child development. I would therefore like to reframe the question: How can an enactivist theory of cognition theorize artifact-mediated interaction in cognition (and thus development)?

Thompson & Stapleton (2009) follow De Preester in suggesting that we should distinguish between the body *incorporating* and *extending* environmental processes. Artifacts which *extend* the body are usually understood as tools like pens, scissors, computers, etc., whereas prostheses would be an example for artifacts *incorporated* by the body. They argue that the latter have a phenomenologically

different status: Since, phenomenologically speaking, the body-as-subject is transparent in the sense that in interaction it is not recognized as part of the environment, they take transparency as a constraint for *incorporation. "For anything external to the body's boundary to count as part of the cognitive system it must function transparently in the body's sense making interactions with the environment"* (Thompson & Stapleton, 2009). This kind of transparency is often reported for prosthetic limbs, and clothing would be a less exceptional example. While they do not see biological attachment as a requirement for experiencing this "non-experience" of transparency, they do hold that "some kind of intimate coupling with the body's autonomous dynamics is necessary". In reference to Maravita and colleagues' work on the effect of tool use on the body schema[66], they suggest that the incorporation of the artifact could be observed on a neurophysiological level. In addition to the *transparency constraint*, the artifact must be subject to active regulation, that is, "the *body has to be capable of leading the dance*" (Thompson & Stapleton, 2009).

Framing this suggestion in the context of my argument above, Thompson and Stapleton do suggest that the incorporation into the brain's body schema plus the phenomenological account of transparency amount to the artifact becoming a part of the living system, i.e. they do not see it as violating operational closure. With regard to writing, the coupling of pen and hand can be understood as a case of extended cognition also from an enactivist perspective as long as the tool becomes transparent/is incorporated into the body schema. I am sympathetic with this view, but I do not think this is the whole story.

Artifacts are human-made, thus they are cultural, and culture can only emerge in the coupling of autonomous agents capable of making a self-other distinction and thus of *socio-cognitive interaction*. We can think of them as "materialized intentions" (I would not insist on the expression) in the sense that an autonomous agent capable of socio-cognitive interaction, instead of perceiving another, perceives *something-made-by-another-system-capable-of-goal-directed-behavior*. The "mechanism" of an "enactive extended cognition" would then be a combination of two: the *incorporation* into the body schema, which Thompson and Stapleton describe in combination with the *structural coupling* analogously to the coupling involved in *socio-cognitive interaction*, only that the other autonomous agent in this case is substituted by an artifact. It replaces the recognition by another by *another's "materialized intention"*, and lends itself to complete an act; here, the term *affordances* comes in handy (although not in the Gibsonian "strong" sense, but in the "weak" ecological sense; see 7.1.3).The difference in this kind of sense-making is that in absence of the other, the autonomous agent has the lead, whereas in agent-agent interaction this may be a matter of explicit or implicit

[66] There is a wealth of work on the effect of all sorts of manipulations (e.g., the rubber-hand illusion) and tool use on the body schema and peripersonal space. See, e.g., Maravita & Iriki (2004) or Baccarini & Maravita (2013).

negotiation. The neurophysiological body schema is the "locus of intersection" between the internal processes involved in self-maintenance constituting *operational closure* and the network of autonomous sensorimotor structures engaging in what could be termed *interactional closure*. Thus, I propose to add a third constraint: *the autonomous system must be able to engage in socio-cognitive interaction*.

The development of such an ability, which involves cultural artifacts for specific interactions, may not occur without a history of self-individuation involving socio-cognitive interaction led by a more experienced other and mediated by artifacts. I strongly suspect that in order to develop it needs the scaffolding of *triadic interactions,* i.e. interactions between a novice individual (whose development is in focus in that context), an experienced individual who in its interaction serves as a scaffold for the other in the particular task, and an artifact mediating the task.[67]

Thus, from an enactivist point of view, I propose that we can also talk about extended cognition if these constraints are satisfied:

1. From a phenomenological perspective, the 'extending artifact' must be transparent.
2. The autonomous system must lead the interaction.
3. The autonomous system must be able to engage in socio-cognitive interaction.
4. The artifact (e.g., tool) involved is recognized as "materialized intention" and offers the affordances which allow it to substitute *another-system-capable-of-goal-directed behavior.*

I suggest that a prerequisite for extended cognition involving artifacts is socio-cognitive interaction and that triadic interactions provide the scaffolding for the development of such a behavior. I should note that I do not maintain that every single case of extended cognition needs a phase of triadic interaction, but that the individual must be capable of engaging in socio-cognitive interaction. So I propose a second way in which extended cognition may be realized: Thompson and Stapleton's propose that the artifact must be incorporated into the body schema. I suggest that interaction with an artifact building on the capability of socio-cognitive interaction, which is based on the recognition of the other and defined by mutual sense-making in a shared domain, based on shared values, leading to meaning which may not be made alone, qualifies as second way to realize extended cognition. To answer the question in how far this second way of realizing extended cognition must also subsume the first is beyond the scope of this thesis. As I will argue in the next chapter, writing as a cognitive developmental process realizes both.

[67] Here, the work of the group around Reddy on infants is very interesting, but beyond the focus of this thesis, see Reddy (2008).

7.5.3 Enactivism as Developmental Theory

In enactivism cognition (and life) cannot be separated from development, so an obvious question is how it relates to the grand developmental theories of Piaget and Vygotsky. I provide a brief contextualization, but going into more depth is not necessary in this context.

The suggestion just made regarding the scaffolding role of triadic interactions is very much in line with Vygotsky's account of development. Furthermore, this enactivist version of extended cognition offers an understanding of internalization which does not end up relying on representations.

Piaget's genetic epistemology, which shares some of the roots with enactivist thinking in cybernetics and biology, may be closer to enactivism with regard to the role of the body in considering maturation as an important aspect of development. The concept of adaptation places assimilation and accommodation in the service of self-regulation in maintaining equilibrium, a view which in enactivism is mirrored in the role of adaptivity in structural coupling and internal processes. Thus, in many aspects the theories are compatible.
The most fundamental difference between Piaget's theory and enactivism can certainly be found with regard to epistemological assumptions: where Piaget took to realism, resulting in the assumption that internal cognitive structures developed in each stage must be the same across individuals, enactivism takes to constructivism, understanding development as self-individuation – a theme Kegan worked on as development of the 'self' based on Piaget's theory.

Piaget's concept of adaptation is very similar to the concept of structural coupling as used by enactivism (and biological constructivism), but it differs in one crucial point. Enactivism knows the concept of adaptivity, as for example used by Froese & Di Paolo (2011), and it becomes quite clear that adaptivity changes the nature of structural couplings and the relation of the processes constituting operational closure. Adaptation, with its focus on the dynamics constituted by the interplay between assimilation and accommodation, offers a more differentiated concept for looking at the dynamics of structural couplings in a developmental perspective. Thompson & Stapleton (2009) hold that in order to incorporate an artifact into the neurophysiological body schema, the body must have the lead in structural coupling. With regard to Piaget's concept of adaptation, the open question is what this "in the lead" conceptually means. Are we talking about "unperturbed assimilation" or a fine-balanced equilibrium between assimilation and accommodation? What the introduction of Piaget's distinction of the two directions of adaptation has to offer is to potentially distinguish between different ways of structural coupling over the course of a developmental process where the lead of the body will have to be "claimed" several times. E.g., when we think about handwriting, it is a long way from being able to grasp a pen, producing the first traces, drawing, and mastering all the demands of hand writing (drawing the letters, making them fit the lines, separating

the words, etc.), until finally we may be able to experience “our thoughts flowing onto the paper” in freewriting.

When taking the observer perspective, the appropriate metaphor for development is thus not a straight ladder leading to a fixed landing, as implicit in Piaget’s developmental stages, but a spiral, as suggested by Vygotsky.

7.5.4 Status Quo of “the Checklist”

With regard to the “checklist” of points to be clarified in the course of this thesis, we are now here: Based on the concepts involved with embodied and embedded cognition, we have begun to consider the environment and the role physicality or materiality in general and that of artifacts in particular, including the text (N^{o} 3: *reconsidering the role of the environment*).

The understanding of writing as a “record of thoughts” or “written speech” of cognitivist theories was questioned and *the nature of writing* (N^{o} 4) reconsidered. Understanding writing as a case of extended cognition in the “complementarity-version” is compatible with the anthropological view of writing as a technology which altered and is altering social organization and communication processes as well as the cognition of individual agents.

Finally, the ground was prepared to consider the writer in the writing process: Enactivism offers an understanding of the *cognitive process* as a process of sense-making, self-individuating, and inherently developmental. With these concepts at hand, it is time to reconsider academic writing as a cognitive developmental process.

8. Reframing Academic Writing

Equipped with the concepts of the last chapter, I will now develop an account of academic writing as a cognitive developmental process of self-individuation and, where possible, discuss it in the context of findings in writing research. I will discuss the consequences of an embodied, embedded and extended view on writing, before I suggest an anthropological perspective on the nature of writing and eventually propose an enactivist perspective on academic writing and the writer.

8.1 The First 3 E's: Writing as Embodied, Embedded, and Extended Cognition

8.1.1 The Visceral Dimension of Writing

The role of the body in the writing process in the sense of an embodied and situated cognitive science is underexplored. However, in writing about writing it has been reflected upon in various ways, especially in connection with literary writing.

Conditioning the Body

The behaviorist approach to the role of the body in writing comes from B.F. Skinner (1981). In his famous talk advising students "How to discover what you have to say", with regard to the body he suggested to self-condition the readiness to write by writing every day, regardless of the quantity, without expecting quality in the beginning, and always at the same time of day. The place should be exclusively reserved for writing. Besides discouraging the use of drugs expanding consciousness, he urged his listeners to get enough rest before writing and to use comfortable clothing and furniture. This way, Skinner suggests, a powerful circadian rhythm develops which will reliably evoke verbal behavior at the time conditioned.

Roles for the Body in the Writing Process

A very different approach to the embodied dimension of writing comes from Lisa Clughen (2014) in her argument for an 'embodied writing support', which is grounded in feminist literature on the body. In her review referring to the works of Wilson, Grosz, Jaggar, Blackman and others, she argues that the mind-body dualism in Western cultures with its view that knowledge is located in the (rational) mind has led to Othering the body: The body, which is often associated with the female, is considered an obstacle to reason, the antagonist to the mind, which must be tamed or even stay invisible. Coming from a very different direction than embodied and situated cognitive science, corporeal feminism comes to the conclusion that there is "body intelligence" and that the body is "an active relational force, the source and communicator of embodied knowledges of the world in and of

itself" (Clughen, 2014). Given the very different terminologies as well as theoretical and methodological backgrounds, I do not dare claim that both fields come to the *same* conclusion, but there are certainly strong parallels in the rejection of the mind-body dualism, the idea that knowledge does not only reside "in the head", and the central role of emotions. Clughen holds that "[f]ar from an obstruction to writing, the body … can beget writing in various ways, the primary being, perhaps, the way in which it offers a fundamental engagement with the world not always accessible during thinking."

Clughen (2014) collected accounts of the way (mainly) literary writers experience the body in writing and identifies two dominant ways: firstly, writers emphasize a mind-body unity, often reflecting that the body has a role in thinking and, secondly, they view the body as a route to "unconscious" engagement with the world. The accounts show that many literary writers experience their bodies as pivotal to rather than hindering the writing process. This is often accompanied by strong emotions or even physical sickness, others may "feel" characters as they invent them.

Walking is attributed a central role as stimulant for the writing process by many writers as eminent as Plato, Rousseau, Dickens, Kierkegaard, Woolf, Thoreau, and DeQuincy, who perceive the act of walking as creating new perspectives, which foster new ideas and the production of knowledge. Another role ascribed to the body is its role in "escape" from rational thought with the aim to tap into "unconsciousness" (which is not used as a technical term here) and/or reaching a state where writing almost happens by itself, involving an "averted gaze". Furthermore, Clughen (2014) points to the role of speech for writing and writing pedagogy, as recognized by Zoellner, Elbow, and others: Students, who may have problems expressing what they want to say in writing, are usually able to say it orally when asked, a phenomenon also referred to as *visceral blurt*.

Based on the evidence collected, Clughen (2014) proposes that writing didactics should consider the body rather than focus on writing exclusively as a skill, particularly when stakes are high and emotions like alienation, panic, fear or resistance prevail. Initial practical consequences she suggests are the creation of a comfortable, safe environment, using dialogical settings for working on writing, and working with the "averted gaze" by diverting the 'blocked' writer's focus away from the assignment, for example by moving to another part of the room to work on an aspect, while leaving the paper out of sight.

Room for the Body

The advice given by Skinner has found its way into process-oriented writing didactics. Students are invited to reflect where and when they can write. However, while explicitly addressing the body, implicitly the approach fosters a dualist view: the message is to create conditions so the cognitive

process is not disrupted. The role granted to the body in this approach is that of a container, which does not play a qualitative role for the writing process itself.

Clughen's observations mainly rest on the experience of literary writers which may not transfer to academic writing in all aspects. However, the didactic implications she proposes are for an academic writing context and offer potential for phenomenological work: it would be interesting to invite (becoming) academic writers to reflect on their bodily experiences involved in writing. I should note that the emotions of alienation and resistance, which Clughen mentions as occurring in counselling students, fit very well with the phenomena *escape* and *retreat* observed by Perry with regard to epistemological development (see chapter 6.1.1). I see this as a further cue that the development of students' personal epistemology and their becoming academic writers cannot be separated.

To sum up, considering the role of the 'whole body' for writing, for academic writing in particular, has so far been an exception rather than the rule. The picture changes slightly when one considers the role of the writing tool for writing. In the following two subchapters, I will first revert to the concepts introduced in the previous chapter to theorize why writing with the hand is experienced as more immediate by many and then look at some differences between handwriting and typing.

8.1.2 Writing as Extended Cognition "Narrow" – The Importance of the Tool

WRITING WITH THE HAND

Trainers for academic writing often recommend writing by hand, when clients have a writing problem[68], it is promoted as more immediate than typing. There may be a more fundamental reason why many writers experience handwriting as more immediate and personal. Gibson (1979) in his theory of drawing and its development in the child proposed that both drawing and writing develop from a "fundamental graphic act" (p.275):

> *Of all hand-held tools that have been invented, the sort that makes traces on a surface is especially noteworthy – the stylus, brush, pen, pencil, crayon, marker. The movement of the tool over the surface is both felt and seen. The muscle-joint-skin kinesthesis is emphasized by orthodox sensory psychology. But these are transient awarenesses. The seeing of a progressive record of the movement of the tool is lasting. There is a track or trail of the movement, like the afterimage of a firebrand whirled in the darkness, except that it is permanent – a stroke, a stripe, or a streak, in short a trace.* (Gibson, 1979, p. 275)

In other words, the intriguing property of a writing or drawing tool is that it turns movement into a permanent trace. It allows for leaving a visible effect on the world.[69]

[68] The term "writer's block" has made it into the everyday language of people writing regularly. However, not every temporary inability to write is a writer's block, despite the fact that a writer may experience that his/her writing 'is somehow blocked'. What a professional would diagnose as a writer's block – rather writ*ing* block – is fortunately a relatively rare condition (for an in-depth discussion, see Hjortshoj, 2001).

[69] Gibson (1979, p. 275) maintains that it is these permanent traces the child is interested in and it will start producing them as soon as it can hold an appropriate tool at approximately 16 months of age (with the

In light of the considerations above I would not interpret this as the child "learning invariances as they are", as Gibson does; as argued above, I opt for the view that invariances are constructed by the cognitive system in "exploiting" regularities in the environment. What makes Gibson's considerations interesting is that despite his focus on perception, in his own example the action *precedes* it. The fascination the child experiences may lie in the experience of leaving a visible trace in the environment allowing for structural coupling. Furthermore, others can perceive this trace, too; it may become subject to triadic interactions. Long before a child starts to learn handwriting, s/he spends several years practicing "trace production". In an enactivist understanding of extended cognition, this is not merely a "training of perceptive skills" or sensorimotor fine skills, but the beginning of a history of structural couplings between the body and an artifact which at some (probably rather early) point becomes directed toward the world, i.e. intentional. With this, we can expect the pen to become phenomenologically transparent to the child, to become incorporated into the body scheme and influence the perception of peripersonal space. Thus, pen-mediated interaction with the world is deeply familiar and this may be the reason why even much later in ontogenesis returning to the pen as the tool of choice for developing ideas may provide a feeling of intimacy and security.

Looking at process-oriented writing didactics, this immediate "embodied narrow" level is partially addressed by trainers inviting reflection of media and tools used in the process. For many students, using freewriting as a technique also means writing with the hand for the first time after years of using a computer, and it seems like there is at least one in every group for whom this comes as a revelation.

WRITING BY HAND VS. WORD-PROCESSOR

Obviously, typing is a different act from handwriting and a computer affords other interactions – and this is bound to have an effect on the text produced. The computer mouse is a similar case as the pen: Bassolino, Serino, Ubaldi, & Làdavas (2010) have shown that the frequent use of a computer mouse extends the representation (as used in neuroscience sense of receptive field) of peripersonal space. But can the keyboard become subject to incorporation to a degree the pen does?
The choice of tool is not just a matter of mastery, although a lack of speed in handwriting may lower performance in handwritten exams (Connelly, Dockrell, & Barnett, 2005), it may even influence the text at the level of style, as a study by Mogey and Hartley (2013) indicates: they found a tendency of typed mock examination essays (questions where provided in advance) not only to be slightly longer,

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probability of leaving traces in mud or food being a more messy precursor) and that the features of these traces are invariants. The terms which are used to refer to them are, of course, unknown to the child. To name a few, a trace or line can be *straight* or *curved*, have an *angle* and *apex* (of a jerk or zig zag), *closure* can occur when a line touches its beginning, lines can be *connected* or in *parallel*, etc. In Gibson's theory, the act of practicing drawing invariants, the child practices its perception of the information it is "picking up" via its visual system, a view I criticized in chapter 7.1.3.

but also to be rated higher with regard to seven of eight readability scores, when compared to handwritten essays. However, what is considered to be appropriate readability in the respective discipline with regard to lexical density and style may vary – in other words, academics may have judged the style "too simple". A text written with pen on paper will invite different strategies for developing the text and for revision than a text typed with the aid of a word processor. From the latter, one may expect not only a "better" appearance, but also an increase in readability, as correction, revisions on a structural level are supported by the software's functions (Goldberg, Russell, & Cook, 2003).

In the study by Mogey and Hartley (2013), questions were known in advance, so "pure writing" could be studied. It would be interesting to carry out a similar study under the conditions of a real exam with novel questions and a judgement not only of readability, but also depth or argument. Since for ethical reasons such a study is out of the question, I can only suspect that results would differ. In light of the gender-related patterns found with regard to students' personal epistemologies, it is interesting that among those 13 (of 37) who chose to write per hand only two were male students. If women are more likely to play the "believing game", to use the words of Belenky et al. (1986) and the pen as tool is more likely to be incorporated into the body schema in the sense Thompson & Stapleton (2009) suggest, the question whether there is a correlation between tool preference and gender-related pattern in epistemological belief can be addressed empirically. My hypothesis would be that writers in "believing mode", either seeking to understand the ideas of others or developing their own ideas, may have a tendency towards more "intimate" pen use, whereas writers in "doubting mode" may prefer the more impersonal computer. However, this may only apply to current generations. Which tool is experienced as more intimate and which as more impersonal is likely to be a snapshot.

Context does not only matter with regard to content or the stakes involved, but probably also with regard to the technological infrastructure students grow into. After reviewing studies between the late 1970ies to the mid 1990ies, Kellogg (1996) concluded that handwritten and typed text at this time did not differ reliably with regard to quality. This was before the ubiquitous presence of social media, and one may suspect, as e.g. Mogey and Hartley (2013) do, that the informal style in communication via these channels may have an impact on other genres.

Writing from an Embodied Extended "Narrow" Perspective

In this section I have only touched upon the wealth of research done in the area of handwriting vs. writing on the computer in order to make the following points: The choice of tools matters for the writing process. However, the relation between tool and process cannot be seen as static, but must be considered in context of the "technological landscape" of the writer, the writing task, and the

personal relation to the writing tool. Understanding writing as a case of extending cognition by coupling with and incorporating the writing tool "pen" (or at least parts of the computer, like the mouse) into the body schema is a first step toward reconsidering the nature of writing (see fig. 17). If the tool (artifact) or writer changes, the cognitive process is going to change as well.

Figure 17: Perspective on writing as extended cognition: Coupling between writer and writing tool.

8.1.3 Academic Writing as Embedded Cognition

Process Oriented Writing Didactics as Scaffolding

Academic writers and their writing processes are highly individual, furthermore different writing projects may pose different difficulties. Process-oriented writing didactics as an established methodology provide a "generalized case". From an embodied embedded point of view, it provides scaffolding and induces reflection of the individual writer by targeting various levels and aspects of academic writing processes. Here are some examples:

- By giving the impulse to start filling the blank page, practitioners socially mediate interaction with the artifacts involved.
- Any type of product may be used for offloading cognitive load, if the writer uses it as a scaffold later.
- Inviting experimentation with visualizations, drawings, clustering, mind maps, and the like exploiting the spatial dimension, the novice writer is literally guided in "mapping the territory".
- The "five phases of a writing project" (see table 1) give an orientation and allow for getting a grasp of the steps involved in an academic writing project. It is also used for planning and thus provides a scaffold in a temporal dimension.
- Suggesting the use of "intermediate genres" like journaling or writing about one's research question to a relative (the "letter to my aunt") provide the familiarity of "non-academic" social environments.
- Various techniques for giving constructive feedback and especially peer-feedback do not only guide the writer to focus on higher concerns, like content and structure, before

addressing lower (or later) order concerns, like style and grammar, they also serve as a social scaffold in providing "training" in switching relations towards one's text.

These examples from writing didactics show that process-oriented writing didactics – like didactics in general – can be viewed as providing scaffolding for becoming an academic writer.

THE NOVICE ACADEMIC WRITER'S NICHE

From a cognitivist perspective, writing development involves an ongoing expansion of memory capacity: Writers are simultaneously dealing with "handwriting, spelling, punctuation, word choice, syntax, textual connections, purpose, organization, clarity, rhythm, euphony, the possible reactions of various possible readers, and so on. To pay conscious attention to all of these would overload the information-processing capacity of the most towering intellects" (Scardamalia cited in Bereiter, 1980, p. 80).[70] This is in line with Kellogg's (1996) understanding that the development of writing competencies relies heavily on an expansion of working memory. Understanding academic writing as embedded in an environment which provides physical and social scaffolding can offer an alternative to (conceptually) putting more and more load onto working memory. Instead, we may try to understand how becoming an academic writer involves offloading cognitive load into the environment and engaging in actively structuring this environment so that it provides the scaffold needed.

An important aspect of the academic writer's niche is the discipline. However, initially *writing assignments* may be the only scaffold experienced since the novice academic writer finds himself/herself in a situation where s/he is expected to write for an academic community which s/he does not interact with (is not yet part of the world). Genre provides an important perceivable structure; however, perceivable does not mean *perceived*: Novice academic writers are not yet familiar with the genres relevant in their respective discipline, which is why it is important to explicitly discuss them. Herein also lies the reason why explicit and detailed assignments are so important and why investing in their clarity and the "right" level of challenge has effects on the quality of texts produced (Lahm, 2016, p. 57).

Different writers will need different scaffolding. Realizing when and where one writes best and approximating these conditions by going to a coffee house or setting up the desk, allocating time for writing, setting up the computer, working with a word processor, installing the reference

[70] Thus, here information processing is identified with conscious processing (and later in that passage automatization with a reduction of the information to be processed at a time) without further discussion. It is beyond the scope of this thesis to enter into a debate on the relation of information processing and consciousness, but I do want to point to the observation that linking the concept of information with the experience of novelty in cognitivism will lead to conceptual incoherence.

management program suiting one's working processes, and so on are all tasks the novice academic writer is (more often implicitly) confronted with. Practitioners in writing support foster reflection of these issues and it is part of the novice writer's 'developmental task' to master them in a way which fits his/her individual needs. Thus, becoming an academic writer means engaging in *niche creation*.

8.1.4 A First Approach: Writing as Embodied, Extended and Embedded

The cognitivist approach considers the cognitive process as *writing-as-it-is happening*, but considers the *writing process at project level* at best implicitly through planning. Development is understood as a series of stages involving different cognitive processes for writing.

Viewing academic writing in this embodied, embedded, and extended framework allows for an analysis of the challenges the novice academic writer faces beyond *writing-as-it-is-happening* and "solving the problem" of planning and writing a text. Since the expectations towards students are institutionalized and follow (often implicit) standards, we can refer to them as "developmental task", which for the novice academic writer is threefold:

1. Writing in the new "academic language" about a new subject,
2. Carry out a writing project, which, be it only of the number of words expected, exceeds previous projects in terms of scope[71],
3. and understanding the role of him/herself and written products within the discipline and organization as well as the expectations regarding developing a position.

As such, writing spans three temporal domains, *writing-as-it-is-happening*, *writing at project level*, and, since there is no action without adaptation, the *development of the writer* in an environment using artifacts.

Figure 18 provides a visualization of (some) relevant couplings the novice academic *writer* engages in as described in this chapter. A stable coupling can be expected between writer and writing tool (unless the writer is changing it) as already depicted in figure 16, which allows for extending cognition toward the paper for producing a text. The text is also part of the *environment*, which expands between the physical or material and the social domain, where artifacts (like a text) are both in the sense that they may be material (it is possible to interact with it) and social (it belongs to a genre and needs to be written in a social context).

[71] Except for a lage writing project at the end of secondary school, in Austria the recently introduced "V*orwissenschaftliche Arbeit"*, in Germany the "*Facharbeit"*. While initial courses may assign writing a summary, review, or argumentative essay, the genre which is commonly considered to be the first academic writing task is still the proseminar-paper, a shorter version of the seminar-paper.

In chapter 3 I argued that a substantial challenge posed by academic writing is to engage in directing the writing project. The coupling between writer, writing tool, and text is embedded in a physical environment which may be utilized for offloading cognitive load. An important aspect of academic writing (learning a craft in general) is that organizing one's working environment belongs to this craft. The novice academic writer must engage in '*niche construction*', s/he must actively structure the material environment to fit individual needs. This is in turn embedded in the social structures provided, rendering the university teacher and writing assignments the main 'social scaffolding' for the novice writer (for the sake of simplicity, neither the organization of the university, nor the community of students is included).

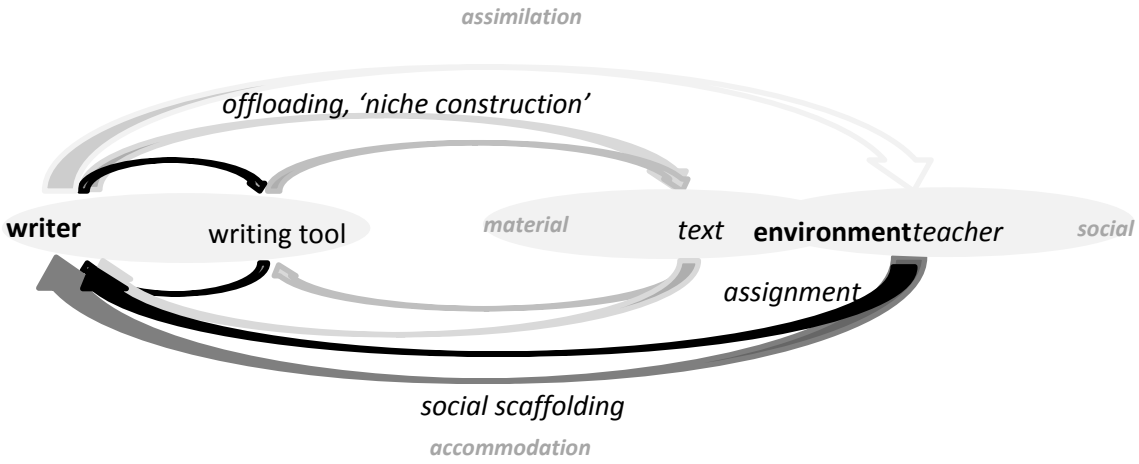

Figure 18: Perspective on writing as an embodied, extended, and embedded cognitive process as the *novice* academic writer interacts with the environment (for explanation, see text).

These "coupling cycles" must be thought of as rather static, if there is a rather inflexible cognitive system, like a robot, in a stable environment. However, humans are highly adaptive, so they should be thought of in terms of adaptation in the "vygotskyanized Piagetian sense" suggested in chapter 5, as an ongoing dynamic between assimilation and accommodation. The couplings may be observed as happening on different temporal scales, but they are not independent of each other as they may provide stability (scaffolding) for each other: if one breaks down and has to change as another changes, as the environment changes or the writer develops. Thus, all of these relations are subject to dynamic change – interaction is always adaptation. The darker an arrow is, the more it determines what it is pointing towards.

The writing tool – writer coupling is depicted darkest in both directions, since this we can understand as a stable coupling case of extended cognition, as Clark and Chalmers frame it, as well as in the sense of *incorporation* as enactivism does. From an enactive point of view we see extended cognition

realized in two ways: The coupling between hand and writing tool realizes a coupling between cognitive system and artifact in which the tool is becoming phenomenologically transparent by being incorporated into the body schema in the sense that (Thompson & Stapleton, 2009), whereas the coupling writer – text as written so far can be understood in the sense of the writer engaging with the text as substitute for another in socio-cognitive interaction (as argued in chapter 7.5.3). The criterion of transparency applies when the writer is using writing for generating ideas, as a thinking tool (as in *freewriting*) and not focusing the text as such. (For various ways of coupling with the text, see the next subchapter.)

It is important to note that in this view development is not a separate process in the sense that the developmental stage determines the nature of the cognitive processes which can be "run"; instead, each action is both cognition and developmental, they are inseparable.

Applying the Initial Framework

In a cognitivist view, there is one world to be represented by all cognitive systems residing in it. An embodied embedded view on cognition cannot ignore that, despite the fact that at university students and university teachers may share the same space, their *environments* differ quite dramatically. While the teacher as an expert academic writer is part of the faculty and embedded in an academic community, the novice struggles for orientation, is confronted with expectations different from the familiar school environment and understanding of roles. The university teacher is a major point of contact, "substituting" the community the novice is to grow into. Since student-teacher interaction at university is much less personal than at school, institutional expectations are often only vaguely understood and the assignment takes an even more important role in (more or less) defining writing at project level, providing structure and thus scaffolding to the student's actions.

An embodied and embedded perspective allows for considering the role of the body in the writing process, be it as the "tamed body" which should not disturb the writing process by more basic needs or as constituent of writing itself, as Clughen suggests.

The cognitivist understanding of the writing process offers an explanation for phases of the writing process in terms of *pre-writing*, *writing*, and *re-writing*, where *prewriting* is usually understood as thinking and/or planning before writing. It is one process for all kinds of writing and a cognitive universal. In an embodied embedded perspective, the *particular* environment and particular writing project, including conditions of work, tools available, and other structures, influence the writing process. They are relevant to understand the writing process, because they do not hinder otherwise "free" cognition, but pose *constraints* which are not arbitrary by invite particular kinds of interaction.

With this in mind, the role of the text in the writing process can be understood in a different way. While “text written so far” is part of the different visualizations of the model Hayes and collaborators proposed (Hayes & Flower, 1980; Hayes, 1996; Hayes, 2012 as introduced in chapter 3), the text is not part of the cognitive process. In Molitor-Lübbert’s (1997) cyclic model (see chapter 3.4.3), the text does play a central role, but only in the evaluation-part of the cycle as a result to be checked against the plan in order to determine whether ‘the problem’ has been solved. Thus, in neither of the cognitivist theories is the text a *constituent* of the process, thinking of it as “thoughts recorded so far” which must be matched against the ‘plan for problem solving’ does not appreciate the fact that it acts as a constraint to the future writing process. From an embodied embedded perspective, the text is an indispensable part of the writing process. Thinking of the relation writer – text in terms of the *ratchet effect* (Tomasello, 2002) or *cumulative downstream epistemic engineering*, as Sterelny (2003) terms it (see chapter 7.1.5), appreciates the fact that the text, once it has been started, acts as a scaffolding structure: what has been written provides part of the environment for and poses a constraint on what will be written next.

While cognitivist models need a representation of ‘the problem’ to be solved, I have argued that much of the task in academic writing is not solving, but *creating* and *defining* the ‘problem’ (see chapter 3.3.3). The more “local” and iterative idea of embedded and adaptive processes suggested lends itself to this kind of task much more readily and yields a better understanding of what academic *writing at project level* means: it is not about creating a plan and then executing it; instead, it means a process of creating the problem and dealing with it, but not linearly.

What do we gain by this view? Reframing writing as a cognitive process this way has several advantages:

- A cognitive theory of the writing process which is not exclusively going on ‘in the head’ of the writer, with reading as an input and sentences as an output, offers a framework which includes processes of interaction with the physical and social environment, which may mutually influence each other.
- Understanding cognition as embedded and extended offers a theoretical basis for considering the role of artifacts in the writing process, be it tools for writing, the “main” text, or intermediate products.
- The view presented offers a framework for analyzing how process-oriented writing didactics address the various levels and domains of interaction between cognitive system and its environment.

- By thinking of coupling in terms of adaptation, the model does not render writing a static process; instead, it is seen as inherently developmental. The embodied and embedded perspective on writing processes perfectly lends itself to being studied empirically. Currently, comparably little is known about how writers are supported by and/or structure their environments, which artifacts are used when and in which role. Researching in this area can foster an understanding of writing processes *in the wild* and aid the development of new didactic methods.

However, one can still argue that the model can be simply built around a writer and that the process "running" inside may well follow a cognitivist model in the tradition of Hayes and Flower (1980). It is exactly in this sense that I see embodied and embedded cognition as "epistemically neutral" (see chapter 7.4.3): they offer a focus on particular aspects relevant to cognition, the role of the body and the environment, which may have consequences for the "inside" of the cognitive system, but they may also be understood as an extension of classical views rather than an alternative.

However, if we take the considerations regarding the nature of writing into account, it becomes clear that understanding writing as a technology which co-developed with human cognition to transcend many dimensions of social and cultural life, it becomes apparent that the cognitivist understanding of writing as "speaking using a different format" ("written speech") simply

The other important issue which is still open with regard to "the checklist" is a consideration of the writer as developing 'self'. For the latter I will apply the enactivist framework of thinking sketched in the previous chapter.

8.2 Academic Writing as a Cognitive Developmental Process

The previous subchapter cast a view on the embodied, embedded, and extended nature of academic writing. This chapter is building on this, but the primary focus is on the specific contributions of an enactive view to understanding writing as a cognitive developmental process.

8.2.1 Three Modes of Writing

There is more than one way to interact with the text, and Peter Elbow (2000, pp. 154-155) reflects on this point with regard to the relation between writing and speech, claiming that there are three relations: *writing is indelible, speech is ephemeral*, the opposite perspective being that *speech is indelible, writing is ephemeral*, and finally *writing is like speech.*

As a published product, the written text remains, in this sense *writing is inedible, speech is ephemeral*. “Once we get it on paper it takes on a life on its own, separate from the writer” (Elbow, 2000, p. 150). As he points out, the underlying concept of writing is that thinking takes places first and writing means producing a record of (finished) thought. In a classical view, the task of the writer is to include the contextual cues in the text, which are present in spoken language. This shapes the writer’s attitude towards the text: “*getting it right* feels like an inherent demand in the medium itself of writing” (Elbow, 2000, p. 151).

“Translated” to the enactivist framework presented, what Elbow observes is that there is more than one way to distribute the roles in interaction: In the first case, writing the text serves as a substitute for direct interaction with others. In the second case, we are looking at the role of the text (and various intermediate text products) in individual sense-making, where the substitution of ‘the other’ by a text may cause an acceleration of self-individuation. In the final example, the text is seen as a product which is to serve as a substitute of the author in the interaction with the academic community. The felt pressure of “getting it right” represents the shared values and institutional expectations the individual needs to comply with.

The second perspective is counter-intuitive at first glance: *speech is indelible, writing is ephemeral* seems to be denying the durability of the written artifact. However, once something has been said (and heard, I should add), it cannot be taken back. In this sense, speech is the artifact which produces a durable effect. “Precisely because speech is nothing but temporary crowdings in air molecules, we can never revise it” (Elbow, 2000, p. 152). In contrast to this, writing usually takes place in solitude and does not have to be published in any sense, therefore it is “the ideal medium for *getting it wrong*” (Elbow, 2000, p. 153), because there can be revision and rewriting. Thus *ephemeral writing* is “a *way* of making up our minds” (Elbow, 2000, p. 154), exploiting chaos and incoherence as opposed to writing after planning, as e.g. Flower and Hayes propose. Instead of thinking before writing, he promotes writing as a thinking tool, because writing supports what unaided thinking lacks:

> *When we just think in our heads, the cycle of language is incomplete; we are prey to obsession. The thoughts, sentences, images, or feelings that play in our heads continue to play round and round. But when we write down those thoughts or feelings, the sterile circle is often broken: they have a place on paper now; they evolve into another thought or even fade away. Writing is a way to get what is inside one’s head outside, on paper, so there’s room for more.* (Elbow, 2000, p. 154)

Elbow refers to this line of reasoning as a “somatic perspective” (p. 154) and points to the paradox that the durable artifact can be easily changed. It may serve as “a prosthesis for the mind” (p. 156).

> *For the mind is a structure of meaning and so too is a piece of writing. The mind, as a structure of meaning, can grow and develop through stages and so too can a piece of writing. Thus writing*

> *provides us with two organisms for thinking instead of just one, two containers instead of just one; the thoughts can go back and forth, richen and grow. We think of writing as deriving meaning from the mind that produces it, but when all goes well the mind derives meaning from the text it produces. (Organization, or meaning, or negative entropy, can flow in two directions.)* (Elbow, 2000, p. 156)

Whether the evolving text can be called an organism, whether organization, or meaning, or negative entropy, can actually *flow* anywhere, including across the boundary between "mind" and "world", is questionable, to say the least. Leaving this aside, his description can pass as a description of academic writing as extended cognition.

In the last case, *writing is like speech,* the text serves to substitute a particular community to be addressed[72]. Elbow elaborates on this with regard to issues of style, but acting *as if* one was speaking to a particular community can constitute a scaffold also relating to the (imagined) community.

In the context of figure 17, it becomes apparent that the three cases Elbow refers to constitute a different way of coupling between writer and text as well as the way the embedding social dimension is perceived. If understood as modes of writing or strategies, the first can be understood as playing the *doubting game* towards one's own text, the second the *believing game* in the production of ideas, and the third as "interaction game" with the academic community. As Baxter Magolda argues (see chapter 6.1.3), in order to achieve *self-authorship*, which characterizes *contextual knowing*, the highest stage of epistemological development of in her model, the two patterns of *doubting* and *believing game*[73] must be united.

Framed in the context of Elbows observations, in the context of writing "uniting the patterns" in self-authorship does not mean that there will necessarily be a synthesis of both; rather, becoming an academic writer (among other things) means to become able to *choose* among those different modes. Thus, becoming an academic writer involves actively engaging in coupling with the text and eventually also the academic community.

Thompson & Stapleton (2009) argue that for enactive extended cognition the body must take the lead in coupling in order to incorporate an artifact. With regard to extended cognition understood as coupling to achieve interactional closure in artifact-mediated socio-cognitive interaction, in the case of academic writing the writer must be able to actively determine the mode of coupling with the text in order to be able to engage in writing as a cognitive developmental process.

[72] Elbow links this to practical advice with regard to readability of the text.

[73] To be correct and complete, the corresponding patterns in Baxter-Magolda's model are named differently with each stage, so the writer either proceeds through the series of receiving – interpersonal – inter-individual patterns or through the mastery – impersonal – individual pattern. *Believing* vs. *doubting game* are the terms Belenky, Clinchy, Goldberger, & Tarule (1986) refer to based on Elbow (1973), because of the writing context.

8.2.2 Development of Academic Writing

On this basis, I want to return to the model of Bereiter and Scardamalia (1987) with the extension of Kellogg (2008) as introduced in chapter 4 and 4.3 in particular. In addition to Bereiter and Scardamalia's *knowledge-telling* and *knowledge-transforming* writing, Kellogg proposes *knowledge-crafting writing* as a third developmental stage. This latter stage describes the professional writer (and thus also the academic writer), who does not only know if the text says what s/he thinks (i.e. can use writing for understanding), but who also builds a representation of the potential reader and tailors the text towards a particular audience.

As I argued earlier, stage models of this type can be useful not so much for understanding developmental processes, but as an expression of expectations, environmental pressures, and values arising in and governing socio-cognitive interaction (see chapter 5.3.2).

NOT WORKING MEMORY, BUT THE MODES OF INTERACTION ARE GROWING

As the writer develops, the cognitivist approach assumes that working memory is to represent more and more in the course of writing development (see chapter 4.3). Instead, I propose looking at the "stages" as successively and adaptively engaging in qualitatively new interactions with a physical/material as well as social environment and taking different roles in doing so, eventually building coupling upon coupling, where each new "dimension" will not leave the existing coupling unchanged and will involve the off-loading of cognitive load and active creation of the writer's niche.[74]

To illustrate the point: An infant or small child will be able to hold a pen (its affordances inviting a particular kind of interaction) and engage in what psychologists would call object play[75], providing the "basis" for learning writing in school as stable coupling between writer and artifact in interaction with the paper (see chapter 8.1.2). While in Kellogg's developmental model, it would be another 20 years until a reader is represented, in the view represented here there is already a reader impersonating cultural norms and expectations, i.e. the school teacher, and the children, embedded in the institution, struggle to get letters, words, and eventually sentences "right" for this teacher. Initially, homework is a "one way street": it derives its meaning from the social interaction with the teacher as well as the ubiquitous presence of writing as a cultural technology, until children learn to express their ideas in a text. As Donovan (2001) has shown, first texts will amount to association chains and children only eventually learn to organize them by first staying on the topic and then structuring them further by dealing with different topics. Thus, it is a long way until "full" knowledge-

[74] This is very much in line with by Vygotsky's interfunctional interpretation of higher mental functions, see chapter 4.2.2.

[75] Play is another topic which is beyond the scope of this thesis, although an exploration of the play-like aspects of writing would be interesting. A characterization and classification of play can be found in Smith (2010), chapter 1, chapter 7 (p. 124) focusses on object play.

telling writing is mastered. Thus, in contrast to Kellogg's understanding of development in the enactivist understanding of writing as proposed here, *author*, *text* (as complying to norms given in the assignment), and *reader* (the teacher) are always there.

Kellogg's thinking starts from the assumption that writing is "written speech", thus there is first the thoughts to be expressed by the author, who in *knowledge-transforming writing* has to learn to "press" them into a particular format (genre in the classical sense), and finally address this text complying with a genre, *crafting* his/her ideas to suit a particular audience. From an enactive perspective, the cognitivist view is "reversing causality". Writing development *starts* with, i.e. is initiated by, the social (cultural) environment. The culture has institutionalized particular expectations impersonated by a teacher, who very much determines the social environment and immediately poses demands, and the writer, building on the ability to use a pen, is driven to accommodate to the environmental "pressures" exerted by the social environment.

If we theorize writing development further within the developmental framework suggested in chapter 5, the development towards *knowledge-telling writing* can be understood as the writer starting to assimilate the environment in an attempt of striving for equilibrium. In this sense, the ability to experience writing as "written speech" is the result of a long developmental process embedded in cultural expectations.

A relevant dimension of change in writing development is the relation to knowledge (see chapter 4.2.3): Writers who have just learned to write in *knowledge-telling* mode do not differentiate between their opinion and „external knowledge". Writing the text is subjective, but when the text is read it is part of 'the world'. Once they can write in *knowledge-transforming* mode, written text can be understood to express an opinion (be subjective) or objective knowledge to be faithfully reproduced – also in writing, which is the reason that it may be used for learning. In both cases, there is a dissociation in the process of adaptation: *knowledge-telling writing* is "assimilative" in the sense that it is "writer-based prose" (to use the term of Hayes and Flower), which does not consider the environment (accommodating), whereas *knowledge-transforming writing* is "accommodating" in the sense that it is used for understanding (learning) "objective knowledge"; other than that there is only opinion.

In this vein, the development of the academic writer can be understood as ongoing change in interaction with the environment, where adaptation may initially be driven by pressures to accommodate, until the writer internalizes the scaffolding and starts assimilating the environment. If we want to characterize writing as a tool at each stage, *knowledge-telling writing* is the ability to use a technology for saying something, *knowledge-transforming writing* is a cognitive tool utilizing

this technology for learning and demonstrating the proper knowledge of something, but both are dissociated. Academic writing demands that both can be chosen as strategies in different contexts. If we want to call this *knowledge-crafting writing*, the concept from an enactivist point of view differs from Kellogg's in significant ways:

From an enactivist point of view, any type writing is always rooted in socio-cognitive interaction, thus it is very unlikely that the writer will be "representing the reader", i.e. recognize the other in the interaction, only when the stage of *knowledge-crafting writing* is reached. Instead, knowledge-crafting writing involves the ability to address a specific audience and, with regard to academic writing, the ability to engage in artifact-mediated socio-cognitive interaction with one's own text in various ways: in playing the doubting and believing game in text production as well as in text revision in a way which is appropriate to the context of the writing project.

This process does not only involve the "text written so far", but also intermediate products, which serve as a scaffolding, and also the choice of time and place for writing, the writing tool and medium, arranging for getting feedback, complying to formats and other demands, etc. Thus, beyond writing in a "narrow" sense, becoming an academic writer also means to "steer" the writing process through the different constraints posed by various aspects of the environment.

8.2.3 Extended Socio-Cognitive Interaction as "Participatory World-Making"

Academic writing is not an end in itself; it is a *means* to enact the world. The text is the artifact which allows for engaging in a discourse *about* something: it is intentional. When I write I do not experience text production; when I search for a way to say something, it is directed toward the world in an attempt of *sense-making*. In this sense, not only the writing tool, but also the text becomes transparent in a process of writing as thinking. And in this way we can understand writing as extended socio-cognitive interaction, thus extended cognition "works" also in an enactivist framework.

Sense-making through academic writing builds on socio-cognitive interaction. Thus, even if the place of *the other* in interaction is taken by an artifact (or several), the artifacts involved derive their meaning from a history of initially tool-mediated triadic interaction. In this sense, at its core, (academic) writing is not about interweaving propositions stored in long-term memory, and it is not about problem solving, but about acting in a social context. If in academic writing we are striving for coherence in the text, the ostensive aim from a phenomenological point of view may be a logical argument (and I am not questioning the importance in the context of discourse), the underlying need may be one for interactional closure with regard to the (extended) sense-making process. Writing as sense-making does not take place in interaction with "raw nature", but embedded in and with a

social environment with shared values. North-American genre theory understands genre as social action and the enactivist view can be understood as further supporting this view. What we call genre acts as scaffolding and as such it is not static, but developing with the community. As argued before (see chapter 6.3.3), the rhetoric of a particular academic discipline is not an add-on introduced after the "logical work" of interweaving propositions has been completed, but emerges from the values resulting from extended socio-cognitive interaction. In this sense, academic writing is always discursive – not merely because the text in academic writing is directed towards a particular audience, but because it is a process of "participatory world-making".

The expression "participatory world-making" is meant to denote the obvious: academic writing cannot be understood in terms of incorporation, embeddedness, and extended socio-cognitive interaction involving various artifacts alone; it also involves the *creation* of artifacts. The products of writing become part of a shared world. As such, they mediate interaction with the academic community (as indicated by the adaptive "coupling cycle" between text an academic community in figure 18).

8.2.4 Becoming an Academic Writer as Self-Individuation

From an enactvist point of view, autonomous systems bring forth their word, they enact it. This process is self-individuating in the sense that the history of past interactions puts a constraint on and thus co-determines future interactions. Thus, every organism is unique and has a unique position in the world. However, social organisms, particularly humans, are able to engage in mutual sense-making by socio-cognitive coupling across a shared domain. The ability to engage in a ratchet-effect like interaction with a text builds on this ability, which allows for an "enactive version" of extended cognition (see chapter 7.5.2). Sense-making involving coupling with one's own text and other artifacts can be understood as engaging in scaffolded and artifact-mediated "sense-making with oneself", which can be expected to intensify the self-individuation.

If one is to describe this with regard to academic writing, in addition to learning to structure one's environment, becoming an academic writer involves the development of *personal epistemology* and of an *acceptable voice* (see chapter 6). The pluralistic environment of the university drives the novice academic writer to develop his/her writing and with it his/her epistemological position. *Knowledge-transforming writing* provided the security of "taking in" objective knowledge. If the idea of absolute knowledge must be abandoned, the alternative is "opinion". In a complementary fashion, if writing, instead of a personal opinion, suddenly expects the writer to argue a position, it may be an unsettling experience, if knowledge as the basis for this position has just given way. As old writing strategies are suddenly questioned, the novice academic writer has to adapt to the new environmental expectations of being a *knowledge producer* with an *acceptable voice* in an academic community.

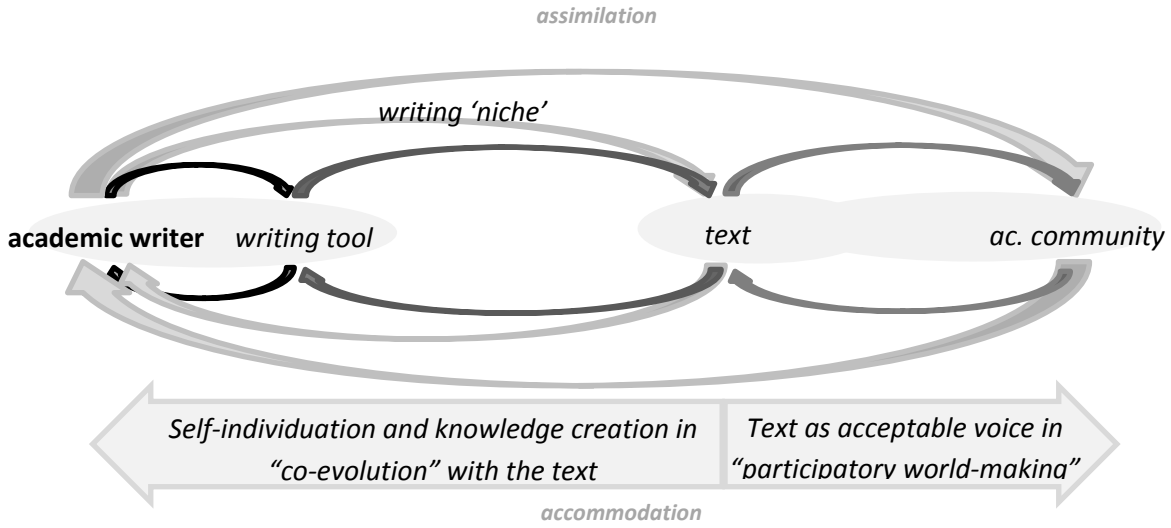

Figure 19: Perspective on writing cognitive developmental process as the academic writer interacts with the environment (for explanation, see text).

Moving from being a receiver and re-producer of (true) knowledge to a self-perception of being a producer of (relative, discipline-specific) knowledge means realizing and actively taking on one's role in this process. In this sense, the academic writer (as Thompson and Stapleton put it) becomes able to "take the lead in the dance" in the interaction (in figure 18, this is indicated by the "assimilating" part of the coupling cycles taking on a fuller color as compared with figure 18; moreover, the "half-cycle" including assignment as scaffolding in fig. 18 is not present in fig. 19). Kegan refers to this kind of "getting on top" as *the emergence from embeddedness* as the individual engages in enacting its world: "In fact, something cannot be internalized until we emerge from our embeddedness in it, for it is our embeddedness, our subjectivity that leads us to project it onto the world in our constitution of reality" (Kegan, 1982, p. 31).

8.2.5 …Within an Academic Community

To contrast this with a cognitivist understanding of cognition: cognitivism seeks cognitive universals, and cognitive processes are operations on representations of one world. Thus, cognitivism is a realist position, whereas enactivism is deeply rooted in the biological constructivism of Maturana & Varela (1987). It understands cognition as *sense-making* based on individual experience, and as every organism is different and has a different history of interaction with the world, the world it lives in and enacts is unique. There is no need for a faithful representation of an objective world (which is continuously changing anyway, be it only because the organism changes), just for *viability* allowing survival. On this primary biological level, autonomous systems are entirely self-related.

However, the academic writer develops into a discipline or, as to include inter- or trans-disciplinary research, an academic community. It is characterized by shared values and many of these can be

described in terms of a disciplinary epistemology and social conventions. In other words, while the novice academic writer develops his personal epistemology and voice, the community s/he grows into determines not only the phenomenon explored and created, but also what is *acceptable* in doing so. Thus, knowledge is determined by the way of knowing in the academic community, which in turn is developed in the discourse of the individual writers engaging in participatory world-making.

8.2.7 There is No Endpoint to the Development of the Academic Writer

The enactivist account of academic writing presented here also gives an insight into why writing remains difficult. While the cognitive process theory of writing includes clear halting conditions for cognitive processes described and the highest stage of classical developmental models may be taken as an end point to development, the picture drawn here is more complex: The cognitive developmental process described sees the individual embodied writer in the physical environment, handling a cultural technology, being scaffolded by artifacts and other structures in order to engage with the artifact text as co-evolving artifact in self-individuation, so that the product can become part of a participatory world-making process in the community which the writer has grown into.

In other words, there are many adaptive processes taking place simultaneously, and a change in one may have stabilizing or destabilizing effects on others. Since neither the environment nor the academic writer can be expected to remain static, development cannot be expected to stop.

Likewise, it is difficult to find the point to end a writing project. There are always aspects one has not mentioned yet, connections to concepts and theories one could elaborate on, theoretical trails to follow, literature which could be relevant being published just now, or, most dangerous, new ideas. In order to find the time and space to follow up these new ideas, it is time to end the private engagement with this text, briefly summarize the relevant findings and implications in the following short chapter and share it.

8.3 Final Status Quo: Ticking Off the Checklist

8.3.1 The Role of Knowledge in the Writing Process

The cognitivist theories criticized in chapters 3 and 4 understand knowledge as a *resource* to the writing process. Unless it is “disorganized” and acts as a constraint (understood as hindrance), it has no influence on the writing process. In contrast to this, the synthesis of findings from studies on the development of students’ text (as introduced in chapter 5) and the field of personal epistemology (chapter 6) shows that the personal epistemology of the academic writer and specific characteristics of students’ texts coincide. Furthermore, different ways of positioning oneself towards the text

following the gender-related (but not exclusive) patterns of doubting or believing game may have an impact on how "advanced" a text will be rated by a teacher. Thus, writing processes are not neutral with regard to the writer's position towards the 'knowledge' in the text; it has an impact on structure, line of argument, and even phrases.

Embodied and situated cognition, particularly enactivism (chapter 7), furthermore challenges the cognitivist propositional notion of knowledge by taking a constructivist position. If cognitive systems are understood as bringing forth a world by enacting it and if this is a process of self-individuation, a notion of objective knowledge in the sense of absolute truth has no place in this. However, in socio-cognitive interaction sense-making takes place in a shared domain in a shared process. Thus, despite being not representational in the classical sense, it is intentional, it is about something in the world. Academic writing can be understood as artifact-mediated socio-cognitive interaction, but since it also yields an artifact as product of this process, it can be understood as engaging in *participatory-world-making*, which makes the academic writer a *knowledge producer*. In this sense, academic writing and knowledge ("what is written about") are *inseparable*. The writer's beliefs towards knowledge and knowing as well as the shared domain shape the academic writing process on all levels – thus knowledge is not a resource, it is at the core of the writing process.

The framework presented here helps understanding the role of the discipline, which is not merely "feeding" the student with particular (propositional) knowledge and providing him/her with guidelines on how to cast that into a particular rhetoric, but as a shared domain in which a "participatory meaning-making" mediated by artifacts (texts) takes place. Furthermore, before it takes on this role in interaction with members of the community, the interaction can be understood as co-developing with the author in a "ratchet-effect"-like manner (see chapter 7.1.6).

8.3.2 Placing the "Rhetorical Problem" in the Center of the Writing Process

Academic writing as artifact-mediated socio-cognitive interaction builds on socio-cognitive interaction, which needs as well as constitutes a shared domain, which in turn needs and constitutes shared values, which shape the interaction (see chapters 7 and 8). In other words, the cognitivist problem of a rhetorical problem shaping propositional knowledge so as to fit to a particular rhetorical context does not exist. There is no problem, since from an enactive perspective causality runs in the other direction: socio-cognitive interaction provides the domain in which (domain-specific) knowledge can emerge. However, as Russell (2002) has shown, in the case of disciplinary specialization and the concurrent specialization of rhetorics, the latter have become "transparent" in the sense that they are no longer perceived as disciplinary (i.e. domain-specific) discourses. The question is thus not how knowledge can be fit to a particular discourse and its rhetoric, but whether

and how ‘knowledge’ can transfer to another domain and, if so, how similar this ‘transferred knowledge’ is to the source domain.

8.3.3 The Role of the Environment, Including Artifacts

An embodied and situated cognitive science and particularly enactivism (as introduced in chapter 7) understand cognition in terms of the interaction with the environment. This includes the physical, social, and cultural dimension of the environment and with regard to the cultural nature of human cognition particularly addresses the role of artifacts. Concepts like embeddedness, scaffolding, or off-loading of cognitive load allow for an analysis of how academic writers organize their writing processes and how process-oriented writing didactics support writers in doing so or aid reflection in supporting the development of being able to do so (see chapter 7.1.7). This allows for analysis of the structures and processes a writer is embedded in, the constraints they impose (as scaffold or hindrance), the artifacts involved, and the nature of interaction with them as writer and environment (which also incorporates the institutional expectations imposed) at a given point in time, and how they change over time, from the first writing assignment received by the novice student who is still in the transition phase from school to university to the dissertation and beyond. Developmental dynamics range from accommodating to the environment (including explicit expectations) to “taking control” in the adaptive interactions by creating a balance between assimilation and accommodation in adaptation, by learning to regulate them towards being more “assimilative” or “accommodative.”

In this, the environment is not a constraint understood as hindrance, development means to emerge from (or get “on top of”) the structures which may initially impose the need for development externally through a change in institutional setting, leading to different expectations, by assignments, etc. This represents the Vygotskyan approach; based on the conclusion from chapter 5, it is clear that in this framework development can also be triggered by the writer’s development, which leads to interaction with the environment in a novel way. I have focused on academic writing, but in principle this framework can be used for studying writing (or reading) from the first moment a pen is held.

8.3.4 The Nature of Writing as Technology Altering Cognition

The cognitivist view of writing as “written speech” in conjunction with the idea that writing means translating propositional through into language (as criticized in chapter 3) was abandoned in favor of the view of writing as a technology which co-evolved with culture and has an impact on human cognition on the individual level (chapter 7.3). While the importance of the affordances of the alphabet as phonetic transcription replacing a disproportionate number of pictograms is under debate, Goody’s (1977) theoretical account nonetheless makes clear that it was not the invention of writing as such, but the spreading of an administrative technology over seemingly all domains of human culture which could only after several thousand years of co-development lead to the

misconception that writing is a tool for providing a "record of thought". Whereas in Clark's account no distinction is drawn between speech-as-artifact and writing-as-artifact, in Goody's theory the artifact nature of writing is clear, thus his account is in line with embodied and extended cognition (or rather vice versa).

8.3.5 Considering "the Whole Writer": Academic Writing as Self-Individuation

In enactivism, the developmental trajectory of an individual is not that of passing through a succession of cognitive processes constituting stages, but self-individuation (see chapter 7.4.4): the history of past interactions with the environment determines the cognitive systems and thus future interactions. In this view, cognition and development are inseparable. Going through a demanding academic writing project does not only yield a product, it changes the writer and thus his/her position towards and in the environment. This is captured in Elbow's notion of voice as well as in the notion of epistemological position. This also solves a problem never even mentioned by Hayes and collaborators (and "outsourced" to a *monitor* or *central executive*): how does the writer make decisions regarding the text? In an enactivist view, this is clear: decisions are continuously made based on values which are at the heart of every cognitive act, either regarding the maintenance of operational closure, regarding self-related values not directly based on metabolism, or values established in socio-cognitive interaction in a shared domain. Therefore, from an enactivist perspective, writing is not a cognitive system running the cognitive process "writing". Academic writing is a means for the whole writer to interact with a very specific community from a position and developing a position as well as his/her voice.

8.4 Implications for Future Research and Practice

Understanding academic writing as a cognitive developmental process from the enactive perspective suggested in this thesis has implications for writing research, but also for cognitive science as well as for practice.

8.4.1 Implications for the Debate in Cognitive Science

As argued above, concepts from current cognitive science(s) can foster an understanding of academic writing as cognitive and developmental process. However, this is not a one-way street: writing, particularly academic writing, is a field offering a wealth of research as well as field-tested didactics. Academic writing is a very complex phenomenon of a scope and practical dimension which is usually not studied in cognitive science and it has proven to be a good "case" for thinking through some theories.

This thesis has given a motive to reconsider Clark's proposal to understand language as the "ultimate artifact". Whereas within the philosophical context, the way Clark uses "language" is not met with objection, thinking through (academic) writing allowed for a different perspective and has led me to realize that Clark, while being a strong proponent of embodied cognition, actually ignores the artifact nature of speech by a) not differentiating between speech, the living language made up of speech acts, and language as a theoretical construct, as linguists since Saussure do, and b) not differentiating between the artifact nature of speech and that of writing. Only in this way can Clark and Chalmers' hypothesis of extended cognition in the parity-principle-version be said to "work", and the obvious implication is to take this theoretical consideration back to the philosophical debate in cognitive science. Furthermore, it is time to reconsider Skinner's Verbal Behavior in the current context.

The second "collateral insight" led to the proposal of a second way of thinking about extended cognition in an enactivism: Stepleton and Thompson propose that for an enactive extended cognition the artifact must become phenomenologically transparent and incorporated into the body schema. With regard to writing, this may explain why handwriting is experienced by many as more immediate or personal and why it is often used in idea-generating writing. In addition to this, I propose a second way to realize extended cognition, which builds upon socio-cognitive interaction. The idea is that an artifact as "materialized intention" takes the place of the other as a substitute. The affordances of the artifact invite particular interactions and only in the interaction of both, individual and artifact, can interactive closure be realized. As in the other case, the obvious implication is to take this proposal back to the theoretical debate.

Bereiter and Scardamalia once stated: "A theory of writing that could explain writing in all its fullness could pretty much send all other psychological theories packing" (1987, p. xiv). What I have proposed is still far away from that, but I saw the wisdom in this statement when I realized that during the work on this thesis I sooner or later found myself confronted with the "big questions" in cognitive science. A few I have addressed in this thesis (like the nature of human cognition), others I have avoided (like the question of consciousness) or opted out after discussing them to the point needed in this context (like the question of language), since they would have expanded the scope of this thesis to the point of losing its focus on writing.

8.4.2 Implications for Writing Research and Practice

In the context of writing research, my thesis can be understood as providing the theoretical ground for broadening research methods so as to include the environment (with its expectations towards the writer) into an observation, the dynamics of interaction with artifacts and others on various time scales.

The proposal that the development of the academic writer cannot be understood separately from his/her epistemological development provides the ground for numerous research projects. The first step is obviously a study with the goal to find empirical evidence.

Writing is not the only knowledge-producing activity in academia and not the only way to foster epistemological development, but it is certainly one that plays a role in all disciplines. The importance in this may correlate with the writing-intenseness of the respective discipline and I suggest that it will be worthwhile to further explore the relation between academic writing (including the artifacts produced), methods, and discipline.

The enactive perspective on writing as a cognitive developmental process offers an explanation for why university teachers often have such great difficulties in understanding why a fair share of their students does not meet their expectations with regard to academic writing and why these students have difficulties in understanding what their teacher expect.

The kind of research proposed could inform practice and aid a further development of process-oriented writing didactics. A practical implication is that writing didactics need to consider the epistemological dimension, be it that basic knowledge in philosophy of science and epistemology as well as knowledge regarding student epistemological development should become part of writing trainers' education or that a methodology should be developed which supports student epistemological development in the context of academic writing. A first step for process-oriented writing didactics could be to make students more aware of the expectations they face in this regard.

The grass does not grow faster if you pull it – development will always take its time. However, disseminating knowledge of academic writing and epistemological development may support university teachers in understanding the phenomena they are confronted with and act accordingly. Teachers should level their expectations towards students, but not the requirements of their assignments and genres. The obvious (and far from new) suggestion to university teachers is that especially students new to academic writing benefit from clear and explicit assignments. Investing in this kind of assignments means investing in a better reading experience when having to grade the papers handed in.

A pending question is that of the epistemological development of peer-tutors. In how far does it matter, and should peer-tutors always be ahead of the students they support?

8.4.3 Implications for the University and its Curricula

In times when knowledge is ubiquitously available through the internet, the role of the university may be questioned – or at least reconsidered. As one consequence of the democratization of

knowledge, Delanty (2001, p. 3) observes a “battle over knowledge”. He argues that the democratization of the university in the 1960ies and 70ies had an effect on the governance of the university, but not on the production of knowledge itself. Drawing on the concept of mode 2 knowledge (Gibbons et al., 1994), Delaney observes four main changes in the mode of knowledge:

1. Knowledge production is no longer exclusively state-funded, “the historical pact between the state and knowledge that was formed in the late seventeenth century is slowly beginning to unravel” (Delanty, 2001, p. 4).
2. Society is more knowledge-dependent and more knowledge is publicly available.
3. Knowledge is more reflexive in the sense that more and more knowledge is being applied to itself rather than to physical objects.
4. “[R]elative democratization of knowledge has been accompanied by the growing contestability of knowledge claims”, which has the effect that “the self-legitimation of the older knowledge elites becomes less certain” (Delanty, 2001, p. 5).

His thesis is “that the current situation amounts to a major epistemic cognitive shift” (p. 5). Delanty’s book was published in 2001; however, in times when ‘fake news’ and ‘alternative facts’ dominate the media and are accompanied by some peoples’ denial of “the older knowledge elites” – evolutionary theory and climate change may be the most prominent examples – we see Delanty’s change 1 and 4 at work in ways he may not have anticipated.

This is happening in a situation where compulsory courses in philosophy of science and epistemology are disappearing or have disappeared from university curricula. As older generations of students have left the university, the corresponding discourse seems to have “washed out” of discussions in class. If we take Perry’s stage of *commitment* as a goal of (and unique characteristic of) university education, and assume that reflection on one’s personal epistemology does make a difference with regard to one’s intellectual development, then we would do well to offer an environment which will foster this kind of reflection. Since neither academic writing nor epistemological development take place within the four months a course is on, the proper level to address both is the curriculum – its structures and implementation.

9. References

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10. Curriculum Vitae Brigitte Roemmer-Nossek

EDUCATION

2004 ongoing:	Doctorate studies in Philosophy at the University of Vienna, Austria.
2013 - 2014:	Trainer and Expert for Academic Writing, Writersstudio, Vienna, Austria.
1997 - 2004:	*Studium irregulare* „Brain and Cognitive Science – Kognitionswissenschaft“, University of Vienna, Austria (*cum laude*).
2001:	Certificate „Software Developer“ (C, C++, Java), BfI Vienna, Austria.
1998 – 2000:	Series of internships at the Institute for Neuroinformatics, Brain Research Institute of ETH und University of Zürich, Switzerland, Group Systems-Neurophysiology, Peter König.
1991 – 1997:	Studying English and Political Sciences at Heinrich Heine University of Düsseldorf, Germany and University of Vienna, Austria.
1994 – 1995:	Linguistics and computer linguistics at Victoria University Manchester and UMIST (University of Manchester Institute of Science and Technology), UK (ERASMUS scholarship).
1990:	Abitur, Gymnasium an der Gartenstraße, Mönchengladbach, Germany.
1986 – 1987:	Wilson Area High School, Easton, Pennsylvania, USA.

EMPLOYMENT

2004 continued:	Academic staff, University of Vienna Center for Teaching and Learning (CTL) Currently: Groupleader “Academic Writing”, responsible for development and implementation of measures for students, peer-tutor qualification, and services for university teachers. Past projects/implementation of: STEOP- mentoring, curriculum and study programme development, ePortfolio , eBologna, eLearning (conceptual development, counseling, workshops, long term coaching, etc.).
2005 – 2007:	EU Sokrates Curriculum Development Project “MEi:CogSci” (Middle European interdisciplinary Master Programme in Cognitive Science) MEi:CogSci was nominated for the Lifelong Learning Award 2009, won the UNIVIE Teaching Award[2013] in the category “innovative teaching concepts”, and was nominated for the Austrian national *ars docendi* 2013.
2002 – 2004:	Research Studios Austria (Studio Smart Agent Technologies), part of Seibersdorf research GmbH - Researcher, Focus: development of social software und interaction design
2000-2001:	sysis interactive simulations [ag] – Concepts and modelling of online games The game “Austropolis” won an honorary mention in the category Net Vision/Net Excellence at Prix Ars Electronica, 2001.

TEACHING

2004 continued:	University of Vienna, Faculty of Philosophy and Education, since 2007 teamteaching with Elisabeth Zimmermann in MEi:CogSci (http://meicogsci.eu) Courses: „Introduction into Cognitive Sciences“, „MEi:CogSci Student Conference Seminar“, and „Special Topics in Cognitive Science“
Summersemester 2017:	University of Vienna, German Department „Schreibmentoring: Vertiefung“
2009 - 2015:	Danube University Krems, Austria, Master in Gifted Education Courses: „Introduction to Cognitive Science“, „Knowledge, Learning, Giftedness“
October 2014:	Hradec Kralove, EU-Project “Innovation and Internationalization of Teachers Training in the 21st Century”
Summersemester 2013:	“Pädagogische Hochschule Niederösterreich”, Baden, Austria. Seminar: „Pedagogical Psychology“ (Focus Neuro- and Cognitive Sciences)
March 2013:	Interdisciplinary College (IK 2013) in Günne, Germany (http://www.interdisciplinary-college.de/), Basic Course “Cognitive Science”
April 2013:	University of Ljubljana, Faculty of Philosophy (ERASMUS teacher mobility scholarship)
April 2012:	University of Ljubljana, Faculty of Philosophy (CEEPUS teacher mobility scholarship)

PRESENTATIONS IN CONTEXT OF THIS THESIS

Roemmer-Nossek, B. (2016). *Wissenschaftliches Schreiben lernen fordert und fördert die epistemologische Entwicklung*. GewissS, Dornbirn 2016.

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11. Abstract

The US can look back upon more than a century of writing didactics and research. In recent years, many German-language universities have established writing centers, which are connecting to these traditions by importing and adapting process-oriented writing didactics and by establishing writing research. They are building on models of writing as a cognitive and developmental process which are firmly rooted in cognitivism: Writing, including academic writing, is seen as taking place in a separate mental module for writing and understood as problem solving based on propositions; the development of this writing module (rather than the writer) is understood as proceeding in stages, where each stage is characterized by a new cognitive process.

This thesis develops an alternative view of academic writing as a cognitive developmental process, drawing on an understanding of cognition as embodied, embedded, extended, and enactive. In this view, the 'aim' of cognition is not understood as representing the world, but as enacting a world in a process of self-individuation. An important consequence is that knowledge cannot be understood as a resource that is fed into the writing process while leaving the process itself untouched; instead, academic writing is understood as intentional and as shaped by the writer's personal epistemology. The environment and particularly the role of artifacts as well as the academic community scaffold and shape this process. The novice student is not only challenged to master academic language and genres, becoming an academic writer also means to develop an *acceptable voice* and a sophisticated epistemological position within the respective discipline and thus to eventually become a knowledge-producer.

12. Zusammenfassung

Die USA können auf über ein Jahrhundert Schreibforschung und -didaktik zurückblicken. In den letzten Jahren haben sich an deutschsprachigen Universitäten Schreibzentren etabliert, die an diese Tradition anschließen, indem sie prozessorientierte Schreibdidaktik importieren und weiterentwickeln und Schreibforschung betreiben. In ihrer Arbeit bauen sie auf kognitivistische Modelle, die Schreiben als kognitive Prozesse sowie als Entwicklungsprozesse verstehen: Schreiben, auch akademisches Scheiben, wird als Problemlösungsprozess verstanden, der innerhalb eines separaten mentalen Moduls abläuft und auf der Verarbeitung propositionaler Wissenseinheiten basiert. Die Entwicklung des Mentalen Moduls (nicht der/des Schreibenden) vollzieht sich in Stufen, die jeweils durch einen neuen kognitiven Prozess charakterisiert sind.

Diese Dissertation entwickelt eine theoretische Sicht auf akademisches Schreiben als kognitiven Entwicklungsprozess, der Kognition als verkörpert (*embodied*), eingebettet (*embedded*), ausgedehnt (*extended*) und enaktiv versteht. Aus dieser Perspektive ist die Rolle von Kognition nicht, die Welt zu repräsentieren, sondern sie aktiv hervorzubringen, in einem Prozess der Selbstwerdung (*self-individuation*). Eine Konsequenz ist, dass Wissen nicht als Ressource verstanden werden kann, die in Schreibprozesse „eingefüttert“ und verarbeitet wird, während der Prozess selbst unverändert bleibt, sondern als konstitutiv für den Schreibprozess. Akademisches Schreiben ist intentional und der Schreibprozess wird durch die persönliche Epistemologie der/des Schreibenden beeinflusst. Die Umwelt, besonders Artefakte und die *academic community* stützen und formen diesen Prozess. Akademisch Schreibende lernen daher nicht nur, Wissenschaftssprache und Genrewissen zu erwerben, sondern in der Disziplin die eigene Stimme als akademisch Schreibende und eine eigene Position zu entwickeln, um so von WissensrezipientInnen zu WissensproduzentInnen zu werden.