CALL of the Wild

*Using language technology in the second language classroom*

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**Acknowledgements**

Voices guide me. I can hear them quite clearly. Listen: they say that they are I, as I am also becoming you. They are too numerous to mention, they extend indefinitely. The problem, as always, is where and when to stop. I owe the voices thanks for being present in my social sphere and for entering my mind, altering it in directions I could not have taken by myself.

One voice is the conglomerate of many other voices; that of the critical opponent. I admit to having thought of the doctoral seminar as somewhat archaic, a ritual procedure for the show of putting some final pressure on suffering graduate students. It is only now at the end of this work that I have come to realize that the doctoral seminar is not just for show; it is a writing support tool. The thought of the seminar creates an imaginary person to assist by posing questions as writing progresses. I have a growing suspicion that this imaginary friend and adversary will not go away, that membership in the research community comes with the cost of having to house your worst critic in your mind. However strange as it may sound, this guest is truth be told quite welcome. My new imaginary friend is also a guide, a pathfinder in the unknown.

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List of included papers

The following research articles are included in the dissertation:


**Paper V:** Karlström, P. & Lundin, E. (submitted) Using Language Technology in the Zone of Proximal Development article submitted to the *CALICO journal.*

The following papers constitute related parts of my research, even though they are not included in this dissertation:


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En avhandling skrev fram mig medans jag väntade på att bli doktor.
A thesis composed me while I was waiting for becoming a doctor of philosophy.

–Jakob Wentzer, blog entry on Delete Forever
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1. INTRODUCTION

“During the four years since his puppyhood he had lived the life of a sated aristocrat; he had a fine pride in himself, was even a trifle egotistical, as country gentlemen sometimes become because of their insular situation.”

- Jack London, Call of the Wild

This thesis is about Computer Assisted Language Learning (CALL), a subject that may at first glance seem to be a fairly straightforward venture: find out, through literature in second language learning (SLL), the most effective way of learning another language, implement a computer program that supports and enhances that pedagogy, and then measure how much more effectively people learn when using the program.

This approach is a feasible alternative in some respects (for example to support memorizing vocabulary) but it also contains some problematic presuppositions. First, the concept of “language” resists being completely reduced to a formal system, a collection of symbols and rules to be learned in a straightforward manner (Lantolf & Thorne, 2006, pp. 3-17). Second, the concept of “learning” is equally complex, and it is not entirely clear how the process of learning corresponds to its measurable outcomes (Vygotsky, 1978, p. 86). We are still a long way from explaining the process of learning a language (Ellis, 1994). Third, the simplistic notion of “effectiveness” in a cause and effect sense is unanswerable, calling for less sweeping arguments and more detailed and rigorous studies concerning variables that affect effectiveness (Felix, 2005). Fourth, the distinction between “normal” and “technology-enhanced” classrooms is problematic, because educational technology is not easily separable from its use (Chapelle, 2001, p. 54). It is not necessarily the case that people really use our tools in the manner we as researchers and designers have in mind (Bannon, 1991; Fischer, 2007; Suchman, 1987). Therefore, we should be well served by observing what students really do in order to refine our models and tools to better suit their needs.

In this thesis, I will emphasize the fourth point, in a manner that heeds the other three. To illustrate the issue, the quote above from Jack London’s famous novel is intended to criticize a techno-centric view on the CALL area, where issues of use are too scarcely described or glossed over. Perhaps we, as CALL researchers and technologues, live in an insular and proud situation being preoccupied with beautiful technological prototypes and their perceived
potentials for increasing learning efficiency? In analogy with London’s novel, exposure to the outside world may be a simultaneously grueling, shocking and liberating experience. Not to push the metaphor too far; students and teachers are (at least normally) not savages, but competent and thinking individuals with goals, wishes and motives. We should treat them as active participants in education, not as mere recipients of knowledge that is distributed by our technologies.

The introduction of novel technologies is not always rational or even predictable. Policy-makers, teachers and students will use technology that makes sense to them, suits their pedagogical and political judgments, is available for them and is promoted by experts and industry. In that respect CALL as a research area has some quite important contributions to make. On what grounds is CALL introduced? How are CALL tools put to use? What views on language propagate through the tools? What pedagogical concerns are handled? Can the tools be improved to better serve students’ and educators’ needs?

These questions come from a broad array of research areas. In no particular order, and non-exhaustively: general linguistics, second language acquisition/learning, computational linguistics, human-computer interaction, interaction design and general pedagogy all contribute to CALL. Age-old questions about the nature of language and thought merge with new technological advances, making the area particularly intriguing for someone interested in language and mind as well as technology and use of technology. Furthermore, it is an applied science – its results may have quite concrete ramifications for educators and students. Having a background in the area of language technology, my own interest was sparked by the possibility of putting computer-based language tools to important real-world uses, while discussing humanistic as well as technological issues.

Investigating use is far from a straightforward matter. As real-world use is important to me, the approach I take is not purely technological, but stems from the area of human-computer interaction (HCI). This area has seen a long standing movement from a conception of human users as “factors” in a technological system towards a conception of users as people with goals, motivations and underlying values (Bannon, 1991). This conception corresponds to a conveyance of research out from laboratory studies and into e.g. the workplace or educational site. Taking this approach, systems may be investigated ethnographically (Suchman, 1987), be built in collaboration with its users, or conceived according to sociocultural theory (Gay & Hembrooke,
2004; Kaptelinin & Nardi, 2006; Kuutti, 1995) or existential phenomenology (Dourish, 2001a, 2001b, 2004; Dreyfus, 1992; Winograd & Flores, 1986). I will argue that the journey towards human actors within the perspective of sociocultural theory not ends with systems design, but that setting may also be viewed as a matter of design.

While my overarching topic concerns how to theoretically and methodologically tackle classroom setting and task design in CALL, my scope of investigations is of course more modest. I do not claim to provide exhaustive answers to all the issues above, but have focused my studies on the use of language technology (LT) in a CALL classroom. Language technology is readily available for most language students, as it appears for example in spelling and grammar checkers across a variety of applications such as word processors, e-mail clients and web-browsers. There is no question that students do use these tools, but it is questionable whether their use is unproblematic and, if not, how possible problems may be tackled through alternative designs. The reasons for possibly problematic uses lies in limitations in language technology: language resists being completely and accurately analyzed by automated means, and any correction tool will occasionally misreport either by missing some errors or by marking some constructs as erroneous where they are not. Technologically, these two issues are commonly tackled by a balance between the two, and much important work in the area of language technology strives towards simultaneously increasing accuracy and coverage (also named precision/recall). This has lead to a current state of the art that works well enough for many first-language uses, such as grammar and spelling checkers, search engines, word auto-completion, etc. However, the problem of misreports is amplified in CALL use, as we will see (Paper I-IV), but may be mitigated not only by improving accuracy/coverage but also through novel designs that include considering task design (Paper V).

The reader schooled in language technology will already have noted that I have taken some small liberties with the term “language technology”. Language technology is normally an umbrella term for any kind of human language technologies, that is technologies that analyze or generate speech or text. These technologies emulate the human capabilities of speaking, listening, reading and writing to some degree. The implementation I will discuss here, however, contends with merely one of these, namely “reading” in the sense of analyzing human written text. This is of course merely one area of language technology. However, a more exact term like “language technology for
writing” is somewhat too bulky to use each time I will mention language technology in the text that follows. I hope language technology-schooled readers will not take issue with this. After all, “speech technology” exists as a term for the kind of language technology that involves spoken language, while its complementary term “writing technology” would have a wider scope than “language technology for writing” would imply, including for example pencils, printing presses, word processors and e-mail clients that have no analysis capabilities.

My arguments regarding language technology for writing in CALL may be roughly divided into two parts. The first part consists of a problematization of using language technology in CALL, based on challenges encountered by earlier research in the area (Paper I) as well as explorative empirical studies (Papers II-IV). This part yields a critical view of language technology in CALL, and highlights some urgent issues where common grammar and spelling checkers may misdirect second language students. Equally importantly it also begins staking out some possible directions to better serve students’ needs. Thus, the first part might be said to lay the ground and generate the hypothesis for the second part, where one such possible direction is followed (Paper V). The hypothesis concerns that tasks handed out to students, together with technological innovations and teacher guidance, probably could steer use of language technology into an activity where language technology is relieved of some of its strained linguistic authority. In this line of thought, I stress the interrelationship of technological innovation and the setting into which it is introduced. Neither technology nor context is neutral, and one strongly affects the other. How a tool is introduced may affect its use as much as the tool itself.

In other words, my contributions towards this more narrow topic of use of language technology in CALL consists of a) an argument to reintroduce language technology in CALL and b) studies on the use of one such tool, “Grim” in the hands of students, leading to problematization and suggestions for c) alternative designs of setting through task design. These studies will be used for discussing the more general topic in CALL regarding what students really do with CALL tools. My contributions on that broader topic consist of a) development of methodology and placement in sociocultural theory for investigating classroom CALL as it unfolds, b) further evidence that the introduction of novel tools demands much more than merely providing technology for students and teachers, and c) suggestions for researchers and practitioners in CALL to take considerations of setting further. Classroom
setting is not merely background to investigate in order to introduce a tool. The reciprocality of setting and tool means that the tools we introduce will change the setting, but also that how a tool is introduced may change the appropriation of the tool.

On that note, this thesis may be seen as a reply to concerns that have been raised regarding lack of background information in CALL (Felix, 2005; Heift & Schulze, 2007; Hubbard, 2005; Levy, 2002), and the backgrounded role of the language teacher in CALL design (Levy, 2002, p. 21). Pedagogical rationales, classroom settings, task formulations and teacher guidance are underdescribed in the field. If these subject areas to be explored, it is indeed important to investigate potentials of CALL by means of systematic judgmental analysis, as suggested and carried out by Chapelle (2001), Jamieson, Chapelle, & Preiss (2004), Blin (2004) and others, but these studies also lament the lack of empirical analysis of tools in use. In particular, Blin (2004) calls for more studies building on sociocultural theory (or, more precisely, activity theory), investigating real world activity as contrasted to the tasks that are handed to students.

Regarding LT-based CALL specifically, it has been suggested that research tends to concern development of tools to deal with linguistic forms, while ignoring current advances in SLL research (Heift & Schulze, 2007, p. 81). Noting this problem in the area, my studies have dealt almost exclusively with the “background” of task and setting. By foregrounding what is usually backgrounded and even implicit we may see aspects of CALL and tool use that have previously been hidden. These aspects are quite important, to the point of being paramount in design. In particular, the process of appropriation of a tool is not a simple and straightforward matter, but occurs over time and in complex relationships between teacher, task, tool and students.

1.1. Problem definitions

To recapitulate some of the points in the previous section, the first problem being attended in this thesis is how language technology may be used in CALL while avoiding inherent technological limitations. The problem occurs because language technology is readily available for students, and probably has pedagogical potential, but its use in real teaching contexts is currently under-researched in CALL due to historical non-fulfilments.

The first problem quickly leads to a second, namely that technological limitations in language tools come with company. The explorative studies
reported in this thesis demonstrate further issues with how language tools influenced student writing and their digital literacy, in particular by encouraging uncritical correction. These issues were tackled by problematizing design of classroom setting, thus guiding students towards other appropriations of language technology.

Furthermore, while investigating the latter two problems, a fourth problem became imminent, namely the methodological and theoretical problem of how to conduct studies in order to capture concrete classroom CALL situations. This problem is attended to by positioning in sociocultural theory and in the design of studies, in particular the ones in paper II, III and V.

Four research questions may be posed from these problems: 1) How can limitations in language technology be overcome? 2) How is language technology put to use when introduced in the classroom? 3) How does a different classroom task setting affect that use? 4) How do we study what students really do? These questions will be further elaborated throughout the thesis.

1.2. Thesis structure

This chapter, Introduction, has introduced my research area and specific problems. The following sections of this introductory chapter will present an overview of the published articles that constitute the foundation of the research I present. This presentation is primarily intended as a reading guide, and will be more elaborated on in chapter 4, presentation of papers.

Chapter 2, Theory and positioning contains theoretical positioning with respect to CALL and second language learning. The primary focus is in sociocultural theory, albeit the two approaches to SLL labeled “focus on form” and “genre-pedagogy” will be discussed.

Chapter 3, Methodology presents the methodologies involved in my research, primarily consisting of analysis of audio and video material.

Chapter 4, Presentation of papers presents each of the five research articles that are included in this thesis, as mentioned above.

Chapter 5, Summary of results is a summary of the results from the papers presented in chapter 4.

Chapter 6, Discussion is a brief general discussion concerning results, implications for CALL and future studies.
1.3. Overview of articles and research progression

As discussed in the introduction above, the articles presented in this thesis all concern the implementation of language technology in the classroom. This is *technological* problem insofar as issues in linguistic accuracy and coverage must be tackled. However, rather than attending to the purely technological, I have chosen the alternative route to view the issues as being of tool use in context. From the very outset, this approach was used in a still quite technocentric manner, to mitigate limitations in accuracy/coverage by attending to educational context. However, early in the course of my investigations, use of language technology revealed itself to contain far more problems than merely accuracy/coverage. For example: the very view on language that is propagated through these tools may be challenged, the focus on error correction rhymes more or less well with pedagogical concerns, the authority given to language tools is questionable, and tool use changes over time. Thus, the research issue changed its appearance over the course of researching it; from accuracy/coverage to a critical examination of language technology in the classroom, and ending with tackling the relevance of language technology for the classroom by considering novel tasks for students. This chronological structure is mirrored by the logical structure; each paper deepens an issue and/or handles a problem that has appeared in a previous one.

Thus, the reader who is only interested in final results, either methodology for investigating classroom use of language technology or how to introduce language technology in the classroom, may be tempted to skip everything up to Paper V. However, I would strongly advice against this, as there are some important points to be made along the way, in particular the multi-angled critical investigation of classroom language technology that leads to the suggestions in Paper V. The route along the papers constitutes a thread as follows (a more elaborate presentation of each paper will follow in chapter 4, presentation of papers):

**Paper I – “Tools, Language Technology and Communication”** elaborates on a broad framework to handle the problem of using technology in the language classroom, in particular in the light of historical challenges in implementations of language technology. The framework is intended to consider human-computer interaction on the levels of *technology, interaction, student-system relationship, and context* when conceiving of CALL systems. This forms a base for suggesting that language students might be well served by working collaboratively with language technology, being enabled to reflect
on the tools’ output by discussing it.

**Paper II** – “Analyzing student activity in computer assisted language learning” begins to establish issues concerning language technology in use by second language students. It uses the framework above in an analytical manner, to interpret how two students used a tool based on language technology while working on an essay. Results were mixed, students did make use of the tool to reflect on linguistic form, but there were also problematic issues concerning the authority of language technology over students’ texts and the notion of student collaboration as the sole means for reflection. The reasons, however, may not have lied entirely with the application at hand, but also with student unfamiliarity with the setting. Thus, the paper ends with the question of how to encourage students to deal with a difficult task demanding a critical approach to their own text, while using a novel tool that provides only partial guidance. This question guided investigations in papers III-V.

**Paper III** – “Tool mediation in Focus on Form activities: case studies in a grammar-exploring environment” is a further elaboration of papers I and II. The levels as suggested by the framework in paper I and II were broad, and called for further theoretical and methodological tools as well as more empirical support. Further elaborations from sociocultural theory, including the methodological construct of “language related episodes” – students talking about language – were used to revisit the two students of Paper II as well as two other pairs of students using the same tool. The results were in line with paper II, highlighting the issue that language technology may reinforce a kind of writing where communicative aspects of language are set aside while linguistic form is attended to in sometimes problematic ways.

**Paper IV** – “Literate tools or tools for literacy? - A critical approach to language tools in second language learning” is a further critical analysis of the use of language technology in CALL, this time from the angle of digital literacy, viewed as a critical manner of approaching technology. For reasons elaborated in section 4.4, paper IV, the term “digital literacy” will not be used in other areas in this thesis, including the sections on theory and methodology that follows this one. The paper seeks to investigate how language checkers and their use impact and transform social practices such as reading, writing and reflecting, which may equally well be considered in the light of sociocultural theory.

Unfortunately, language tools were shown to encourage some uncritical uses
of the tool itself as well as an uncritical view on language as an object rather than as a tool for communication. In order to be of better use to students, these issues with the tools should be dealt with.

**Paper V- “Using Language Technology in the Zone of Proximal Development”** provides the final results for this thesis, showing a fruitful way of tackling the problems as displayed in papers I-IV by carefully attending to classroom setting. It also outlines a method for investigating classroom CALL, and contains empirical support for the notion that novelty effects should be avoided when researching CALL: there were large differences between the first and following sessions with the same tool.

The logical (and chronological) progression regarding research problem, theory, methodology and pedagogy in these five articles is outlined in Figure 1, below. The problem progressed from mitigating technological issues, through discovering issues in use with Grim, to one of design of classroom setting. During that venture sociocultural theory emerged as more and more emphasized. This is mirrored in methodology, which from the beginning was influenced by the sociocultural tradition, but later followed it more strictly, and expanded on it. Pedagogically, the tasks in initial studies stemmed from the “focus on form” tradition (Ellis, 2003; Long, 1991). However, in the last paper this was superseded by a pedagogical rationale in genres (Halliday & Mattiessen, 2004; Hyland, 2003, 2007; Knapp & Watkins, 2005).

The keen reader will notice that the move from focus on form to genre corresponds to a stronger emphasis on sociocultural theory. This is not accidental; genre-pedagogy merges well with sociocultural theory (Wells, 1994), while focus on form notwithstanding its name and its ambitions for balance has been criticized to belong to a school of thought that perhaps puts too strong emphasis on the structure of language as being hypothetically innate. An innatist approach to focus on form calls for tasks exclusively concerning naturally noticing form in naturalistic communication (Swan, 2005). I will have more to say about this matter in section 2.1, second language learning, and more on sociocultural theory starting with its view on tools in section 2.2.
Each article in the graph above embodies a research issue, and they are all connected through investigating a language tool from the sociocultural perspective. The tool in question, “Grim”, is an innovative language environment, designed with the intention of encouraging linguistic reflection when writing in Swedish as a second language (Knutsson, 2005; Knutsson, Cerratto-Pargman, Severinson-Eklundh, & Westlund, 2007).

### 1.4. Presentation of the language environment “Grim”

The language environment called Grim is intended for education of advanced students of Swedish as a second language. It was designed with students’ reflection and experimentation in mind, and contains several tools based on language technology for analyzing texts written in Swedish (Knutsson, 2005; Knutsson et al., 2007). In addition to the state-of-the-art grammar and spelling checkers, it also contains more general and non-corrective features, such as information concerning part of speech, possible inflections for a selected word, dictionary, concordance, automatic text summarization and syntax highlighting.
The rationale behind providing several features for linguistic information was grounded in the pedagogical standpoint that students should be encouraged to attend to linguistic form as need arose while they worked on otherwise communicative tasks (Long, 1991). A central feature of Grim is to provide information on several levels. Those levels range from explicit reports of errors and suggested corrections to implicit reports concerning only that an error has occurred, or merely encouragement to attend to some part of the text. As mentioned above, the explorative studies in paper II-IV showed that Grim did work to encourage focus on form, albeit not quite in the manner intended. Paper V shows a way to formulate tasks in a manner that guided students towards a more reflective mode of working with Grim. This way of formulating tasks was far from unpremeditated, but was the end result of a theory-guided problematization of issues and methodological concerns found when exploring use of Grim throughout papers I-IV.

The ideas realized in Grim are ones that have also been taken up in other forms elsewhere. An interesting system with a similar approach to language technology in CALL is WERTi (Acronym for “Working With English Real Texts”). The WERTi system contains syntax highlighting similar to Grim’s,
coupled with a pedagogical concerns regarding progression through exercises (Metcalf & Meurers, 2006). The WERTi system is web-based and, in contrast to Grim, intended for working with texts written by third parties. It should be intriguing to explore WERTi’s similarities and dissimilarities with Grim as research on both prototypes progress. In particular, it would be interesting to see comparisons between how tasks are taken up by students using the two systems.

While I conducted user studies on Grim, I was not directly involved in the technical development of Grim. My interest in the tool was sparked by its pedagogical possibilities and the novel modes of providing language technology for students’ free writing. While grammar and spelling checkers have existed for some time, the range of features and approach to correction in Grim is novel. The important point is that it is intended to encourage critical thinking, by providing feedback on several levels; from explicit error correction telling the student what is wrong in a sentence, to merely drawing attention to a particular part of speech, or providing information about a particular word.

That said, non-involvement in programming and tool design allowed me to perhaps be more critical to real world use of Grim than a designer more attached to the prototype would be. I have been fortunate enough to be part of a research project where that kind of critical thinking was not only allowed, but also actively encouraged. This involves a certain amount of risk taking, since we can never be sure that the original design survives critique. However, this is a necessary part of the developmental process. A dialogue between technical design and user studies is of paramount importance, if design is to move forward.

A large-scale language technology system that results in a multi-purpose language tool such as Grim builds on a large body of research in language technology and user interface design, involving the efforts of several people collaborating across several institutions. Researchers from Stockholm University, the Royal Institute of Technology, Gothenburg University and the Swedish Language Council have contributed to various parts of Grim. I am greatly indebted to everyone who has worked with the multitude of systems involved, as their work constitute the base for having a prototype to conduct user studies with at all. I can only hope that my work also in some way contributes to theirs. An elaborate description of the technologies in Grim, as well as the various phases of development including projects and people involved in its conception is available in Knutsson (2005). I will briefly
summarize the projects and technologies involved below.

Grim is a Java Web Start application that is installed on the user’s desktop through a web server, allowing developers to update the application by updating code on the server without having to ask each user to install new versions. This is useful when prototyping because the developer can always be sure that users are running the latest version. From the user’s perspective, Java Web Start applications look and behave like ordinary applications that run on their desktops. Thus, Grim looks and behaves like a word processor with linguistic features (Figure 2).

The linguistic features of Grim do not reside in Grim, but are web applications residing on servers that are invoked by Grim. The grammar checker “Granska” (English: “Scrutinize”) constitutes one such application. Apart from Granska, Grim also connects to several other web applications to analyze and get information on language at the user's request. Inflection information is retrieved from the inflection engine “Inflector” developed by the Human Language Technology Group at the Royal Institute for Technology. The dictionary feature draws information from “Lexin”, an online dictionary residing at the Swedish Language Council’s website, and concordance information (examples of word use) is drawn from “PAROLE”, developed by researchers at Språkdata at Gothenburg University. There is also an automatic text summarizer, SWESUM, residing and developed at the Royal Institute for Technology.

The history of Grim’s development began in 1996, with the grammar checker Granska, developed in a project group led by Kerstin Severinson-Eklundh. This project was succeeded by the project “Integrated Language Tools for Writing and Document Handling” that took place between during the years 1998-2000, also led by Kerstin Severinson-Eklundh. In 2001, a project called CrossCheck, led by Viggo Kann, investigated grammar checking with a special focus on second language writers of Swedish, further improving on the Granska engine, including a server based version that allowed experimenting with various user interfaces to the engine. Also, further methods for language analysis were developed, including the statistical engine ProbGranska and the “quick and dirty” SnålGranska. Furthermore, the CrossCheck project collected data in the form of a learner corpus that was used for evaluation of Granska (see Knutsson, 2005). Part of the corpus was collected in a sister project, “The use of language tools for writers in the context of learning Swedish as a second language”, led by Teresa Cerratto-Pargman and funded by the Swedish Research Council. Project participants were Kerstin
Severinson-Eklundh, Ola Knutsson and Stefan Westlund. Of great importance to my work, this project also began to utilize the possibilities of various interfaces to Granska, and had conducted user studies resulting in Grim (Knutsson et al., 2007). I joined this project while use of Grim was being investigated, as part of an undertaking years into progress and involving countless efforts in research on language technology as well as evaluations and user studies.

Grim was programmed by Stefan Westlund, as part of his master’s thesis project supervised by Ola Knutsson and Teresa Cerratto-Pargman. He continued development of Grim after his master’s thesis was finished, significantly contributing to the user interface to Granska and other language tools. Other student participants in the project contributed by conducting user studies: Erik Pihl, Helena Rastas and Anna Rockberg-Tjernberg conducted a study on the nature of explicit versus implicit feedback from Grim, supervised by me, and Henrik Lindström conducted a study on how feedback was received by users, supervised by Ola Knutsson. Ingrid Skeppstedt, who is also a teacher of Swedish as a second language, conducted judgmental and performance analyses of Grim as part of a course she attended. Teachers interested in using Grim in their work have also put considerable effort in investigating its possible uses, and Ingrid Skeppstedt has also together with Ola Knutsson written a manual for Grim including useful tips for teachers. Teachers Eva Lundin, Karl Lindemalm and Bengt Bengtsson all contributed with ideas and practical uses of Grim in their teaching.

All these technologies and people constitute parts of what makes Grim what it is: an advanced multi featured language tool displaying some of the best of what Swedish language technology for writing has to offer, collected in a comprehensive user interface.
2. THEORY AND POSITIONING

Before delving into research in an interdisciplinary field such as CALL, it is important to ask questions about the field itself. What distinguishes CALL from its neighboring fields? Which questions are asked? From which perspective(s)? What theories are used? Given the omnipresence of computers it is not immediately obvious that CALL should be treated as different from second language learning as a general field. It could be argued that there is nothing special about teachers’ and students’ use of computers anymore, and that problems of computers in learning could therefore equally well be discussed on the terms of second language learning in general. However, this shift of focus would de-emphasize two important points that are still valid, namely that the computer contains opportunities not present in other tools such as books and pencils, and that tools mediate between the learner and the learner’s objective. How that mediation takes place (or should take place) when using computers for learning languages is the central issue in CALL (Egbert, 2005, pp. 4-5; Levy & Hubbard, 2005).

CALL is a young and interdisciplinary area, gathering input from any kind of research that concerns both technology and language. To complicate matters, it is also the case that the research areas that CALL may draw from are relatively young, and contain several competing theories that aspire towards becoming paradigmatic. This is not something that is necessarily troublesome. On the contrary, the ongoing dialectic concerning the subject area is part of what makes the area exciting, calling for careful positioning by its researchers and consideration of the complexity of the issues at hand.

On the other hand, the lack of a coherent understanding of CALL can also be bewildering. The role of theory is particularly unclear, as it may be used either as a rationale for conceiving of a particular system or as basis for interpreting data, or both. Normally, results from studies should have some connection to relevant theory in one or more of the areas that influence CALL, but this is not always the case (Huh & Hu, 2005). Also, there is a danger in merely using theory for conceptions of computer applications (or not at all) in that the field risks testing specific technology rather than theory, rendering research less rigorous and applicable than other comparable fields (Egbert, 2005). This is troublesome if individual contributions are to contribute to forming a picture of CALL as an area, enabling us to draw general conclusions. Of particular relevance for this thesis, Egbert (2005) notes that the CALL area does not address differences in context and tasks very well. I will argue that a
sociocultural analysis of tools highlights precisely issues where tasks affect tool use so that the same tool in only slightly different contexts may encourage quite different activities.

In fields that have yet to form a common body of research to build on, each researcher has to form theoretical stances themselves (Kuhn, 1996, pp. 13-17). This is not to say that each contribution must present a full-fledged theoretical framework, merely that each contribution must be clear concerning the positions it takes. Each individual researcher will attempt to solve their most immediate and particular research problem before discussing theoretical standpoints. Still, any research has a more or less explicitly expressed standpoint, and these standpoints may later be used to compare the abilities of different theories (Kuhn, 1996, pp. 144-145). Therefore, there are stronger reasons to be explicit about theory in young science where no normal science exists. In their recent book on the matter, Egbert & Petrie (2005) collect several theoretical approaches, including sociocultural theories (in a wide sense and not limited to the particular vygotskyan sociocultural theory), interactionist theory of second language acquisition, systemic-functional linguistic theory and approaches that are founded on specific concepts such as “authenticy”.

Despite this spread of approaches, efficiency gains seem to represent the holy grail of CALL, at least in the opinion of CALL researchers (Hubbard, 2003). According to Hubbard, there also seems to be a visible albeit smaller strand preoccupied with the messiness of implementations in the real worlds of students and teachers. That strand is where this thesis belongs, in investigating the use of language tools in the second language classroom. Thus, my work is aligned with others who investigate use of CALL tools, and I endeavor to contribute to that area in addition to the more specific concrete issues of use of the language technology-based tool that I have investigated. My arguments are thus in line with Fischer (2007), who suggests acquiring data by monitoring students as they learn in online environments, because students’ actual doings online may have little to do with what we think they do. However, my studies concerned classroom interactions rather than online CALL, and the monitoring was conducted via audio and video rather than computer logs or screen recording software.

Concerning use of language technology, my work is also aligned with Heift’s (2001, 2004), who investigated students’ attention to feedback generated by language technology. She reports that students tended to attend more to verbose and explicit feedback concerning errors than to less explicit feedback,
but also that students tended to follow difficult paths of working through problems rather than the easy path of rushing to answers provided by the system. While these positive findings encourage the use of language technology in CALL, my investigations have concerned how students respond to tasks that include some measure of expressing meaning in addition to attending to linguistic form.

From the angle of sociocultural theory, theoretically and methodologically even more closely related to my work, Gutiérrez (2006) investigated what kind of tasks instigated the highest quality collaboration between students using various kinds of CALL as well as traditional exercises with pencils and paper in a classroom. Importantly, and also in line with my studies, she found that the task given to students may suit the computer as a medium less well than pen and paper version of the same task, urging for caution to be exercised when equating CALL task design to simply transferring paper-based tasks to a computer. Gutiérrez (2003, p. 96) also notes that there is a lack of precisely the kind of studies that concern how task characteristics affect interaction between students and between student and tool. Furthermore, there seems to be a lack of research on classroom studies, as most user studies from the sociocultural perspective concern computer mediated communication (Gutiérrez, 2006, p. 233; Warschauer, 2005). It is my intent to contribute to the emerging stand of research on sociocultural theory applied on use of classroom CALL tools.

The following sections will outline the choice of sociocultural theory from the perspectives of second language learning, tools, activity and tasks, and context and setting.

2.1. Second language learning

The two most fundamental rivaling approaches to CALL stem from debates in second language learning (SLL), and concern “nativist” versus “social-interactionist” hypotheses on language. The nativist stance is grounded on Chomsky’s (2002a, 2002b) seminal hypothesis that language structure is innate. In its perhaps most polarized form, the radical implication for second learning is the hypothesis that there is no point in teaching and learning a grammar that is already innate and that languages should instead be taught naturally. The hypothesis advocates that second languages should be acquired in the same way as children presumably learn their first language, by merely receiving “comprehensible input” from the target language in the correct manner (Krashen, 1985). The unconscious process of language use is in this
sense believed to be acquired rather than learnt (Krashen, 1981), marking a shift in terminology from the conscious study - learning - of language rules. The concept of learning was in early versions of this school of thought reserved for the conscious study of rules, and labeled as belonging to earlier behaviorist paradigms. Later developments are much more balanced and distance themselves from pure nativism. Current research that stems from acquisition-oriented theory acknowledges the need to produce output as well as receive input (Swain, 2000), and to practice linguistic form as the need arises when participating in otherwise communicative tasks (Ellis, 2003; Long, 1991; Swain, 2000).

However, this direction towards individual linguistic competence still de-emphasizes social and contextual parameters such as where and when utterances are made, what goals the interlocutors have and what is accomplished by uttering. It is not enough for utterances to be merely correct, they must also make sense in a particular context. In other words, utterances must mean something for interlocutors. To become proficient in a second language entails gaining knowledge of how notions like arguments, descriptions, irony, jokes, metaphor, etc., work in one’s new language. This is not to say that form does not matter, but that it is dependent on contextual meaning (Lantolf & Thorne, 2006, pp. 5-6). Learning a new language is not only about learning how to construct valid utterances or sentences in that language (regardless of whether that learning concerns explicit or implicit acquisition of linguistic forms), but about forming new ways of interacting with the world and people in it. In other words, a perceptual and social activity performed by individuals. Viewing this activity as the center of learning means investigating learning from the viewpoint of learners’ doings in their environment, rather than the contents of their brains (Lier, 2000).

If the activities of learners are viewed as the heart of learning, grammar certainly belongs in a theory of language learning. If nothing else, its importance appears in its ubiquitous use in actual teaching and learning situations, regardless of its status as an a priori code for language, and regardless of whether theory wishes to reinforce or discredit its instructional status. In the context of learning, we may view grammar as a tool amongst other tools for facilitating learning. In this view, the exact status of grammar as an instructional tool may (and should) of course still be challenged. However, we should not throw the baby out with the bathwater as innatist approaches would; if it seems useful for students and teachers then it probably is.

It should be noted that my primary interest in grammar is the way is is treated
as an instructional tool. That is to say that grammars in the many forms they exist as a linguistic research tools will not be delved into at length here. I do note, however (paper IV) that the grammars of language technology are quite different from those used in education.

The distinction between learning and acquisition is not always emphasized, and the terms are sometimes used interchangeably (e.g. Ellis, 1994, p. 14). For the reasons outlined above, I have chosen to predominantly use the term “learning”, and to acknowledge the place of both form and communication in second language curricula. Sociocultural theory makes the point that learning takes place in voluntary and conscious ways (Lantolf & Thorne, 2006, p. 216), while acquisition-oriented theory focuses on unconscious mechanisms. For the purposes of second language learning, theorizing on language has little use unless it can be translated in practically usable terms. In this thesis, the pedagogical concern of students’ conscious attention to linguistic form has been treated in two ways. At first my pedagogical position was in “focus on form” (Long, 1991), which was in later parts of my research superseded by pedagogy based on genres (Halliday & Mattiessen, 2004; Hyland, 2003, 2007; Knapp & Watkins, 2005).

**Focus on form**

Focus on form (FonF) is a pedagogical feature, directed towards balance between learning language by attending to linguistic form and by participating in communication. However, the feature makes a strong claim on the manner by which grammar should be attended to: by “overtly draw[ing] students’ attention to linguistic elements as they arise incidentally in lessons whose overriding focus is on meaning, or communication” (Long, 1991, p. 46).

Thus, it distinguishes itself from two other programs: focus on forms (e.g. traditional grammar exercises), and focus on communication (e.g. “naturalistic” learning by listening, reading, talking and writing). Between these two, it seems to argue for balance, but leans towards a focus on communication, because its hypotheses claims 1) that focus on forms is counter-productive and 2) that pedagogy incorporating focus on form would produce better results than without focus on form (Long, 1991, p. 47).

FonF was not initially introduced as a teaching method, but as a design feature that appeared in several teaching methods, showing similarity between them. An important argument for FonF was that instructional method is at best irrelevant and at worst destructive when attempting to improve foreign language instruction (Long, 1991). Instead, Long argued that foreign language
research should focus on “psycholinguistically relevant design features of learning environments”, of which FonF is one. This would help the area avoid falling into the trap of perceiving particular methods as panacea for language learning, with ensuing endless arguments of one method over the other. In at least that respect, FonF is an attempt to balance an otherwise polarized discussion.

Unfortunately, even seemingly balanced views such as focus on form may become quite infected and polarized. The reason for this is that FonF belongs to “task based instruction”, a school of thought that distinguishes between traditional exercises and communicative tasks. It advocates meaning-centered tasks with focus on form as not only a feature among others, but as the centre for language curricula (Ellis, 2003, p. 30). While this kind of task certainly has value for students, its elevation to the centre of curricula is problematic: The hypotheses underpinning task based instruction are unproven, its rejection of “traditional” approaches is biased, and it downgrades the role of the teacher (Swan, 2005). Two examples of these concerns regarding task based instruction, taken from one of the most influential books promoting task based instruction, are 1) that pre- task learning is seen as a possible threat, not an advantage (Ellis, 2003, pp. 246-247), and 2) that there is a worry that post-task “exercises” in forms may “subvert the ‘taskness’ of the task (Ellis, 2003, p. 259). Why, one may ask, must activities that are clearly seen as beneficial by teachers and students be discredited by theory? And, must the incidental focus on form that most teachers do encourage in class be accredited to the precise theory advocating focus on form (Sheen & O’Neill, 2005)?

However, despite these ideological swings, focus on form may still be seen as a feature among others, in curricula where “each type of instruction has something to offer to the teacher” (Ellis, Loewen, & Basturkmen, 2005). FonF seems perfectly reasonable, if viewed as a “design feature” that draws students’ attention to linguistic form in meaning-focused activities that already resides in established classroom practice that also allows other kinds of instruction. Figure 3, a drawing by Pauline Gibbons, may be used to illustrate the point. Here, the anonymous voice of a teacher corrects the grammar of a language student until the student loses interest in what he is expressing as well as the language he is expressing in.

Depending on which side of the debate one approaches this situation from, one would have different notions of what it is that goes wrong. Strongly communicative approaches including some purists’ versions of focus on form would attack the very notion of correcting, while approaches that acknowledge
more explicit grammar instruction could argue that the focus on form is attended to in the wrong manner. After all, the teacher’s comments are more correct expressions in the English language, and are intended to improve the language of the student. The problem, then, is not one of attending to form or not, but in what manner to focus on form in a specific situation.

Figure 3 Unsuccessful attention to form. Drawing by Pauline Gibbons, printed with permission from the artist.

Skehan (2003) argues that FonF-tasks can stimulate three different types of performance: complexity, accuracy and fluency. These are balanced against each other depending on students’ needs in a particular situation. In short, language learners may increase their overall knowledge of the target language
refine this knowledge by e.g. correcting themselves or being corrected (accuracy) or increase their ability to express themselves in real-time (fluency). It is not necessary to subscribe to the entire task based instruction paradigm in order to see the relevance of these categories to classroom instruction.

As stated above, my studies were conducted in real learning situations. Initially, FonF was used as a pedagogical rationale, but according to the discussion above this should not be taken to mean that I believed that FonF or task-based instruction should be the only pedagogy in language curricula. Instead, I viewed it as a term for something that teachers and students do, along with other types of tasks and exercises.

However, four (somewhat overlapping) realizations brought me to question FonF in the strong sense used in task-based instruction and turn towards genre-based pedagogy: 1) The teachers who participated in my studies did not actively engage in FonF-pedagogy. This should ring an alarm bell concerning its relevance for their pedagogy in practice even though they found some aspects of FonF sound and useful. 2) The theoretical discussion outlined above illuminated issues with FonF, at least insofar as some schools of thought use it as dogma. 3) While my studies showed that students did practice some FonF, they also showed some issues in use of language tools that were not captured by attempting to steer activity in the direction of more FonF, especially if the concept of noticing naturally should be followed. On the contrary, pure FonF would exclude some of the tasks I suggest as the logical step taken in paper V. 4) From the point of sociocultural theory, FonF in general and task-based instruction in particular is somewhat problematic. Skehan’s types of linguistic performance above, and the question concerning in what manner form should be attended to are compatible with sociocultural theory. For example, Swain (1998, 2000) investigates how students attend to form when collaborating on texts. However, the outlook on learners and tasks is quite different in sociocultural theory when compared to task based instruction. In approaches building on sociocultural theory, focus is on learner’s agency as active participants in their own learning. Tasks are transformed by learners into an activity that suits their own goals and background beliefs, and are therefore “[...] best seen as uniquely situated, emergent interactions based on participants goals and subgoals and not merely task objectives and invariant task procedures” (Donato, 2000, p. 44). For example, a learner may bring expert knowledge of grammar into the classroom, strongly affecting the activities that occur in that classroom. In that
respect, the FonF advocated in task-based instruction must be seen as too rigid, if applied a curriculum-wide manner.

In short, FonF (and task based instruction) has a strong emphasis on communication and may therefore initially seem to focus on language as a social fact. However, some of its probably sound pedagogical principles hide the fact that it stems from the nativist line of thought that exclude some kinds of explicit teaching of linguistic form, labeled as “exercises” and shunned. These issues led me to switch to pedagogy that more explicitly builds on linguistic theory that treat language as both system and social discourse.

**Genre-pedagogy**

Genre-pedagogy is based on theories of language that place the function of language as central, investigating linguistic structure as it appears in the manner people use language. It treats structure as it appears “from the outside and in” rather than “from the inside and out”. This approach differs from nativist conceptions of language that focus on contents of individual minds, and from structural approaches that place linguistic elements (as ideas) themselves as central.

The basis for grammar is, in the functional sense, descriptions of linguistic form as observed in language use and development. “Language is as it is because of the functions it has evolved to serve in people’s lives” (Halliday, 1979, p. 4), and its structures should therefore be understood in terms of their functions. There are more or less effective and socially correct ways to express oneself according to a specific situation (syntactically as well as semantically and pragmatically), but focus is on how the means of expression vary according to the range of situations rather than on how the situation fits within an overarching linguistic structure. A grammar can, when displayed by a learner, only be criticized on the grounds of being inadequate for its user, not on the grounds of someone of higher status criticizing the expressions of someone of lower status. Correcting a learner’s grammar assumes that that learner’s grammar is inadequate for the expression of that learner’s meanings (Kress, 1994, pp. 158-193).

Regarding linguistic form, the sociocultural perspective holds that “meaning and form are dialectically dependent upon one another and that one without the other presents a distorted picture of language, or, more precisely of languaculture” (Lantolf & Thorne, 2006, p. 5). This is quite similar to the functional approach to language. However, sociocultural theory and functional grammar come from slightly different directions, and research has not yet fully
merged the two. While Vygotsky’s interests was primarily in the socially affected development of mind, Halliday mainly focuses on the relationship between language and culture (Wells, 1994). It is not my intention to provide a full account of merging the two approaches here, I merely wish to draw attention to the notion that they do seem complementary because of their common standpoint in the cultural roots of language and thought (Wells, 1994).

Genre pedagogy is not only concerned with rules for what should or should not be done syntactically in sentences, but in how all parts of texts are structured in order to communicate something, and how that structure varies depending on what is communicated (Hyland, 2007; Knapp & Watkins, 2005). For example, the word class adjective is not only a modifier of nouns. More to the point, adjectives are useful when one attempts to do something with words, like persuade someone or describe something. Arguing and describing may be done more or less effectively depending on how one utilizes ones knowledge of adjectives and their relationships to other kinds of words. If one takes a purely pedagogical approach to grammar, it may be seen as a meta-language for students and teachers to systematically describe and explain what works well and less well in a certain language. Thus, imperfect and authoritarian as textbook grammars may sometimes seem, they are still relevant tools for learning. However, genre-pedagogy does not only teach grammar in the traditional way concerning spelling and syntax, but takes care to simultaneously consider the multiple levels of text: The type of text (genre), textual language (structure), syntactical language (sentence level grammar) and spelling (Knapp & Watkins, 2005). In line with Kress’s points (1994), the attitude towards using grammar for education in this manner is not towards comparing students to some overarching notion of correctness, but towards enabling students to express meaning in a successively larger variety of situations.

2.2. Tools

So far, I have casually stated that grammar may be seen as a “tool for learning”, but the immediate question then is what tools really are. Clearly, there are different types of tools; grammar as a psychological tool for learning is quite distinct from tools that modify our physical environment, such as hammers or trains. However, the distinction between mental and physical tools is not absolute. Words, for example, viewed as tools for communication, are mental tools that are in use when formulating thoughts to be conveyed, but
they are also realized physically, for example as sound waves or written letters.

The key to understanding tools in the sociocultural perspective is the realization that all tools are ideal as well as material (Wells, 1994, p. 46). Physical tools are ideal in that they mediate a historical and social code of interactions. That is to say that the way a tool is physically manifested is a representation of accumulated knowledge of how that tool has been used. The difference between physical and psychological tools is not absolute, but one of prominence between psychological and physical aspects: a psychological tool such as a word cannot exist apart from its materiality (e.g. sound waves, writing), while all hammers embody the notion of hammering (Vygotsky, 1987).

Tools are frequently treated implicitly as something neutral, a “given” that humans use for some instrumental purpose or other. From the dual nature of tools as residing in both mind and physical reality, it follows that they are far from neutral. Instead, tools constitute ways to make sense of our world (Dreyfus, 2004; Heidegger, 1982); our reality is mediated by tools (Kaptelinin & Nardi, 2006; Lantolf & Thorne, 2006; Rabardel & Bourmaud, 2003). The fact that tools alter our physical reality is straightforward, after all this is the point of using physical tools. However, it is also the case that the shaping of external reality affects the shaping of mind, and that these two kinds of shaping occur reciprocally. This reciprocity is key to the sociocultural understanding of mediation.

The most crucial aspect of mediation in sociocultural theory is its opposition to reducing tools to elements in interaction; agents and their tools are an irreducible unit. Tools are simultaneously used to relate individuals to the physical world and to human culture and history because they always carry with them the history of their use as well as their physical form. These two aspects of tools are not only instrumental for people when we carry out tasks, but allow us on a more fundamental level to make sense of the situation where we are present. That is to say that 1) there is no clear boundary between a tool and its user, and 2) social experience is accumulated in tools, both by physical improvements that have occurred over time, and in socially disseminated knowledge of how they are to be used. These two points both concern progression and development on different time scales, implying that tools should be studied in the process of use rather than as a final product.

An example taken from Wertsch (1998, pp. 27-46) illustrates these two points by taking the pole used in the track and field event of pole vaulting as an example. Regarding the first point, it is impossible to try to understand the
pole or the pole-vaulter in isolation from each other. The pole does nothing unless skillfully used by an athlete, and the athlete cannot practice pole-vaulting without the pole. This perhaps trivial observation is not to say that pole vaulting should be studied as an undifferentiated whole, but that pole and pole-vaulter are irreducibly connected in a system, and should be studied as such. Skillful action in pole-vaulting implies an agent with the conscious goal of using the pole to propel themself over a bar, and that agent’s mental system incorporates the pole.

There are several theories that acknowledge that mind extends beyond the skin (e.g. distributed cognition, Gibson’s “affordances”, etc.), but sociocultural theory goes one step further in also incorporating social factors (Wertsch, 1993). The second point above applied to pole-vaulting means that the way pole vaulting is performed is dependent on the historical development of that track-and-field event, including the technological development of the pole in use. At least two major technological changes have occurred to the pole and the track-and-field event over the course of history. At first, wooden poles were used (probably originating from the practice of jumping across streams with poles as a means of transportation) and the competition concerned length rather than height. These were replaced by bamboo and later aluminum poles that were both lighter and more flexible, significantly improving the vaulters’ performance and changing the event to concern height. The next revolution was the introduction of fiberglass poles, leading to a drastic change in vaulting styles and enormous improvements to height. There are two points to be made from this example: 1) that the limitations of previous materials did not occur to participants and spectators until a new one was invented, 2) that the new tools change the way we conceive of the event and how we think it should be performed. In other words, the history of vaulting poles are embodied in current poles by the succession of events that lead to their current implementation, and the current way to pole-vault is not stable but may change. Furthermore, these two aspects are normally hidden for us; it is rarely the case that we reflect on glass fiber versus wooden poles or possible future developments when watching an event of pole-vaulting. We see the event simply as the way pole-vaulting is naturally practiced but the basis for what is perceived as natural is socio-historical and developmental.

The sociocultural view of tools as outlined above is both broad and precise, concerning the role of tools as sociocultural mediators between subject and object. In CALL, a more everyday use of the concept “tool” lies in the distinction between the computer as a “tutor” that temporarily substitutes the
teacher, and as a “tool” that is neutral and not used in predetermined ways (Levy, 1997, pp. 178-214). This distinction is useful for drawing a line between tutors that are based on some kind of artificial intelligence that take an active role in the education of students and tools that require teacher intervention or some other kind of external knowledge. While I have used this division when relevant for discussing artificial intelligence (in paper I), my main use of the concept “tool” has been in the sociocultural sense. A more elaborate discussion on tutors and tools will follow in section 4.1 on paper I.

The direct implications of sociocultural tool mediation to my studies are twofold. First, because Grim is a novel grammar tool its use draws from the history of other grammar checkers as well as related tools such as textbook grammars and teacher’s red ink pens. This is true from the viewpoint of Grim’s design and designers as well as from the viewpoint of the students using it. Second, we do not know the exact workings of Grim and tools like it until we have studied them in concrete use. Importantly, the way that students make sense of Grim may differ from the way designers, researchers and teachers have planned. This appropriation of Grim by second language students was therefore studied by means of studying the process, or activity of how they worked with Grim.

2.3. Activity and tasks

The concepts of tools and tool mediation as outlined above do not exist in isolation, but are connected in a mesh of concepts in sociocultural theory. Mediation is the term used for describing the processes of externalization and internalization. Human activities (which will be discussed shortly) have both internal and external components, and these affect each other reciprocally, relating subjects to physical and social objects. Internalization is the transformation of the external (world) to the internal (mind), and externalization is the transformation of the internal to the external. The word “transformation” is important; it is not the case that information is merely transferred as carbon copies between mind and world, but that transformations of both subject and object occur. Kaptelinin and Nardi (2006, p. 69) use the example of typewriting. When first learning to type one may have to look at the keys to find them, but after practice it is possible to type without looking at the keys. The locations of keys and the skill of typing have been internalized. However, the typist does not see a copy of the keyboard in their mind; a transformation has occurred.

Appropriation is a term that may be used synonymously with internalization,
but emphasizing the resistances towards making others’ tools ones own. (Wertsch, 1998, pp. 53-58). The socio-historical view of mediation presented above should not be taken to mean that the internalization of artifacts usually occur smoothly. Instead, the opposite is perhaps more true; internalization involves changes in individual selves, and these changes always take time and effort. This is necessarily so; was it not the case that we resisted changing at whim, it would be hard indeed to preserve the notion of one’s self over time. Appropriation is a useful term in Human-Computer Interaction (e.g. Cerratto-Pargman & Wärn, 2003; Rabardel & Bourmaud, 2003) because it highlights the facts that there are resistances to novel technologies, and that people make artifacts their own in their own ways; what is intended in design may become something else in the hand of users. In other words, novelties may be resisted by the intended group of users, appropriation of new inventions takes time, and it involves the social and physical histories of the artifact’s and related artifacts’ developments into their current states.

Externalization, is the complementary opposite of internalization and appropriation. It occurs when we use external tools for cognitive tasks. For example when attempting to solve a math problem, one may utilize a variety of external tools such as pen and paper or calculators. It is of course not the case that a math problem is “externalized” and then stays on the outside or that the keyboard is somehow transferred into mind. Instead, internalization and externalization are reciprocal processes where both mind and world are transformed. It is this constant reshaping of reality, this transformation of physical and social worlds as well as the self, which forms the basis of human activity.

Activity is to thus be understood in a quite precise sense as purposeful interactions with the world where mutual transformations of both world and subject occur. What distinguishes sociocultural theory from other approaches that emphasize such change is the primacy of activity over both subject and object. Instead of investigating subject and object as separate entities, activity itself should be studied as the most basic unit of analysis (Kaptelinin & Nardi, 2006). Activity thus has a quite specific meaning in sociocultural theory, not always consistent with everyday uses of the word “activity”. When speaking of educational matters and sociocultural theory, it is therefore important to distinguish between activity in the sociocultural sense and activities in the everyday sense of tasks that are provided for students. Here, I will regard tasks as tools that are designed to steer activity (in the sociocultural sense) in certain directions. As such, they are subject to appropriation processes, and function
as mediators between students and their learning objectives. This means that the same task may yield quite different activities (Coughlan & Duff, 1994), and that tasks function as mediators between subjects and other tools. In the case of my work, this is a quite important point, because it means that tasks mediate between students and Grim, encouraging different internalization and externalization processes while using Grim.

In line with the discussion on FonF and sociocultural theory, the view of tasks as mediating tools differs from the one suggested in task-based instruction. In task-based instruction, tasks are strongly defined to be workplans that, among other features, “involve a primary focus on meaning”, “involves real world processes of language use” and “has a clearly defined communicative outcome” (Ellis, 2003, pp. 9-10). The difference is that approaches from sociocultural theory have no particular interest in making such strong assumptions on what may be thought of as a “task”. It is more important to figure out the manner in which various kinds of tasks work in a multitude of situations. Therefore, I contend with a much looser definition of tasks, in line with Breen (1989), as a “structured plan for the provision of opportunities for the refinement of knowledge and capabilities entailed in a new language and its use during communication”, including brief exercises as well as more complex workplans. To me, the most important part of this task definition is that it demands tasks to be structured workplans, i.e. that they are formulated by someone with some pedagogical intention(s).

That said, the kind of tasks I have utilized in conjunction with Grim are somewhat in line with task-based instruction (except perhaps in paper V). Tasks displaying the features as defined by Ellis are of kind that is in use in education, and the distinctions made by Ellis are indeed very important when discussing in what manner(s) to teach. However, I do not view tasks in the sense of task-based instruction as the only kind that should be called tasks, or indeed the only kind that is useful. In other words, I do make strong claims regarding the appropriateness of different tasks for different ways of internalizing/externalizing, but I do not intend these claims to be generalized over curricula. Tasks that are appropriate in one situation may be inappropriate in another. In the case of grammar checkers, this is illustrated by a strong focus on linguistic form. On occasions where linguistic accuracy is to be improved, one can expect that tasks that focus on errors might be beneficial, while occasions focusing on fluency would demand entirely different kinds of tasks.

The question, then, at least from the educational practitioner’s point of view is
whether there are certain kinds of tasks that sociocultural theory would recommend? The answer to that question is both yes and no. The point is not to find the “silver bullet” of tasks or definitions of tasks, but to find out what is useful for particular students in particular situations. Instead of arguing for particular panaceas such as “communication” or “structured grammar exercises”, or viewing certain kinds of tasks as central to learning, sociocultural theory focuses on learning as development in the “zone of proximal development” (ZPD). Vygotsky’s often quoted definition of the term is “The distance between the actual development 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.” (Vygotsky, 1978, p. 86). In current interpretations, focus is on any learner’s abilities to do more with the help of a tutor than they can do by themselves, thereby assisting them in their goals of performing independently.

Guiding learners is something skilled teachers do by constantly adapting their tutoring to the students and the situation at hand. Selecting the wrong task or even phrasing guidance carelessly may lead students to not work in a manner that is optimal to their learning, even to the point of being detrimental to learning. Besides other motivational factors, this occurs either because guidance was on a too high level and not understood by students or because guidance was on a too low level and containing no challenge for students. An important departure from traditional psychological models lies in focusing on the upper threshold of students’ capabilities. (Vygotsky, 1987, p. 211). For teachers, working within a ZPD concerns predicting each student’s potential capabilities. For students, it means continuously being challenged to make efforts to expand their knowledge. For researchers, the understanding of learning as transpiring in a ZPD demands methodology for capturing learning in flight and not only after it has occurred.

Investigating learning in progress entails capturing evidence of how internalization and externalization, i.e. activity occurs in classroom CALL situations. Since we do not have access to student’s minds, we have to observe what is externalized in the classroom, and draw conclusions from that. This means that activity has to be split into more discrete units of analysis, i.e. separate actions (these will be further elaborated in “methodology”, below). The actions that students conduct together form a picture of their activities, in turn yielding a picture of how Grim is appropriated. This is quite fundamental in tackling the questions presented in 1.1, above.
To conclude this section, sociocultural theory as applied to my research as presented in the papers may be summarized in the following points:

- Activity is different from tasks, in that tasks are workplans, while activity is the aggregate of empirically observed actions.
- Being concrete workplans, spoken or handed out on paper, tasks are tools that mediate between the CALL tool and the students; they affect the appropriation of the CALL tool.
- Appropriation of Grim (or any CALL tool) is not a straightforward matter; use of any computer program (or tasks) may differ from intentions from programmers/designers and will contribute to the application’s development in unforeseen ways.
- When people appropriate tools, they draw from the tools’ social and physical histories of development as well as their own individual histories of previous experiences in their social and physical worlds.

These points are important to remember in the way I interpret data. My studies have concerned classroom sessions with Grim, in sociocultural terms this corresponds to *microgenesis* (see chapter 3, methodology and paper V). However, I will also draw from the socio-historical development of Grim and other language tools as presuppositions to support my interpretations. These explicit presuppositions are of course as open to challenge as my analysis of microgenetic data and any implicit presuppositions.

2.4. Context and setting

In chapter 1, introduction, the notion of “context” appears several times. This is a broad and elusive term that bears specifying somewhat, with a brief digression into artificial intelligence as a starting point. In computer science, in particular the areas concerning context-aware computing, definitions of context tend to follow notions such as “[…] the location, identity and state of people, groups and computational and physical objects” (Dey, Abowd, & Salber, 2001). Definitions along these lines are, of course, instrumental rather than philosophical; they are intended to capture context in order to treat it for computational purposes. However, any such attempt is bound to sooner or later run into limitations. These limitations occur in part because it is not entirely clear what “people” and “groups” are, and even less clear what their “identities” and “states” are. The implication is that people have “states” similar to those of computational devices, and that human behavior is therefore computable. There is a clear danger that this kind of approaches to
context will fall into old traps reminiscent of issues that led to a research crisis in artificial intelligence (e.g. Dreyfus, 1992; Searle, 1980; Suchman, 1987; Winograd & Flores, 1986).

On the one hand, attempting to reach full human-like context-awareness in computers is probably futile, on the same grounds that full intelligence or linguistic competence seem impossible to attain. Full human-like context-awareness will never be achievable because the human mind does not predominantly work in a mode that splits context into constituent parts, but in a non-representational mode of being-in-the-world (Dreyfus, 1991, 1992; Winograd & Flores, 1986). On the other hand, if we can accept that definitions such as the above are incomplete and fail to capture the essence of human context, we can still arrive at useful applications. A balance between the opposing views of context means that we do not have to choose between somehow objectifying and constraining users’ context, and not doing so when building computer systems. We may subscribe to a more pragmatic view that states that the system’s view does not have to account for the full picture, but may still be relevant for its users (Chalmers, 2003, 2004). That view also entails that we have to stop pretending that we are designing systems that one day will achieve intelligence or context-awareness similar to humans’. However, given that we can provide a variety of more modest issues that can successfully be tackled, full context-awareness does not have to be the overarching major problem to solve.

My reason for discussing these issues in what seems to concern context-aware computing is that I have an interest in language technology, i.e. computer applications that more or less well display some understanding of human language. Given the discussion on sociocultural theory above, it may correctly be surmised that I believe that understanding communication between humans assumes an understanding of the social and physical contexts in which they are placed, and that understanding is fundamentally non-divisible from that very context. In sociocultural terms, context is more than only a setting in which dialogue takes place,”[...] rather it is activity that produces the very arena of human conduct.” (Lantolf & Thorne, 2006, p. 215, my emphasis).

Since context in this scope is obviously too wide for conducting particular studies, I contend with the narrower notion of educational context. However, this is still a wide concept if approached from sociocultural theory. Educational context is also produced by activity, and entails the history of education, histories of tools in use, curricula, classroom situations and individual learners and teachers. Since the CALL classroom is under
consideration here, that particular context may be treated even more narrowly, as classroom setting. For my purposes, the setting is the concrete classroom situation where students participated. Importantly, this setting is still influenced by all other aspects of context, but for research purposes these may be treated as presuppositions. My unit of analysis was classroom activity and that activity was investigated by analyzing actions in a classroom setting, with support in interpretation from larger contexts. This may be controversial insofar as my presuppositions may be challenged, but it is uncontroversial in the sense that research always draws from presuppositions more or less explicitly.

Research is no more neutral than any other activity, but always strives to steer the production of context in certain directions. In particular, research concerning design manifestly strives towards affecting the world in one way or another. The work I present here is no exception; it is intended to improve on the way language tools are appropriated in the second language classroom. However, viewing context as produced in activity opens up possibilities in affecting tool use by other means than only refining the tool. If the tool is one of many parameters that affect activity, why not turn attention to other parameters, such as the setting into which the tool is introduced?

This should not be taken to mean that I intend to provide a “silver bullet” for introducing language technology in the classroom, or that I believe that changing one or more aspects of setting or tools has direct causal implications on the activity. I merely suggest that attending to the way a tool is introduced in tasks given to students will change the way in which activity is carried out. This means that I have attended to classroom setting by means of task design as suggested in paper V, but the way activities were to unfold (and context to be produced) was unknown to me until investigations were carried out.
3. METHODOLOGY

Since sociocultural theory investigates large scope questions concerning the human mind and its connections to culture and history, individual studies may vary widely in scope. It should be noted that the theory concerns higher mental functions of mind, while more basic functions are thought to be biologically endowed. The approach to the study of higher mental functions is to root it in history, which in turn should be thought of as processes of change (Lantolf & Thorne, 2006, p. 28). The scope of studying processes of change may be in any of four genetic domains. In order of time scale, Phylogenesis refers to the domain of how human mind was developed through the process of evolution, sociocultural history refers to how different mediational tools were developed in different cultures, the ontogenetic domain refers to how children appropriate mediational means as they mature, and the microgenetic domain is concerned with how mediation occurs over short time-spans such as occurrences in laboratory experiments or classrooms.

Activity, as the overarching unit of analysis must methodologically be divided into smaller units, actions (Lantolf & Thorne, 2006, pp. 216-221). Exactly what constitutes an action is a matter of definition corresponding to the level of analysis one conducts. In papers II-IV, each occurrence of students discussing language was seen as one action, specified as a language related episode (specified below). In paper V, actions were instead seen as occurrences of student questions to the teacher. In papers IV and V each change to students’ texts that were visible after the session or brought to our attention by a question from students also constituted an action.

Sociocultural theory does not prescribe any one method or even any one type of methods over others. Quantitative experimental studies have historically been conducted within the framework of sociocultural theory (e.g. traditional studies on cognition), but it does seem that most current studies applying sociocultural theory to second language learning are qualitative studies of individual learners and/or classes and focus on the social workings of language and language learning. Here, my focus is on tool (and task) mediation during at most three classroom sessions, placing my studies in the microgenetic domain. I have applied for the most part explorative and qualitative method. Where quantification occurs, it is in order to generalize findings over a particular second language class in a particular situation, not to draw conclusions concerning all possible classes in similar situations. Still, the quantifications do point in generalizable directions (particularly in Paper V),
namely the importance of attending to task design and classroom setting and that tasks in genre-based pedagogy seems useful when working with language tools in the second language classroom.

The method of data collection throughout my studies was primarily video and audio recordings of student-student or student-teacher dialogue and analysis of students’ texts. Questionnaires to students were used in a complementary manner (i.e. to support interpretations of dialogue). Dialogue was transcribed and analyzed, at first in the manner of searching for examples of possibly problematic uses of Grim (Paper II), and later by means of categorization according to schemas that were developed (papers III-V). The last two articles (Papers IV and V) added analysis of text. In paper IV, misunderstandings were caught in student’s essays in addition to their spoken dialogue, and in Paper V we investigated progressive changes to student essays between three sessions.

The method of data analysis progressed through the course of the research work. Early in my studies (Paper II), explorations of data showed some problematic issues of students correcting everything as suggested by Grim, in spite of knowing better or receiving instructions to the contrary. In Paper II, these problems were illustrated by examples from data. Paper III then elaborated on these examples (and examples from another study), categorizing student-student dialogue according to “language related episodes” (Gutiérrez, 2003, 2006; Swain, 2000). The intent of “language related episodes” is to capture when students talk about linguistic form when collaboratively conducting otherwise communicative tasks. They belong to sociocultural theory, and are intended to investigate how classroom activity corresponds to focus on form.

Swain uses language related episodes to find out how students discuss language, e.g. how various tasks stimulate students to engage in metatalk concerning their written language when working on tasks in pairs. The collaborative aspect is important; language related episodes are intended to show how students talk about language among themselves when working on exercises that demand collaboration. An example of metatalk would be when a student working with a multi-author essay discusses a particular word form with another student. These discussions may or may not refer to terminology in grammar; the importance is that some dialogue concerning language occurs, thus showing how focus on form occurs.

Regarding CALL, it is of course intriguing to investigate how metatalk is affected by computer tools, and from that draw conclusions regarding the tools’ mediational properties. For that reason, Gutiérrez (2003, 2006) as well
as the research presented here have expanded on the notion of language related episodes to consider the particularities of tool use. However, our approaches differ slightly. Gutiérrez’s interest was primarily to compare different CALL tools, as well as paper and pen varieties of tasks used in CALL. For the purpose of comparison, she conceived of the notion of “high quality episodes” that she then used to compare different activities and different tools.

In my studies, three successive elaborations were made to language related episodes. First, episodes were used to elaborate on how Grim was used when discussing form. To that end, we added the notion of metatalk concerning tool interaction. Data was placed in this category whenever Grim had affected the episode that occurred, for example, when discussing error alarms from Grim (see Paper III). All three kinds of episodes were then interpreted in order to discern the form of activity students engaged in with Grim.

The categories in Paper IV were further refinements of episodes containing tool interaction. The paper concerns episodes and text excerpts containing misinterpretations, misdirections and indiscriminate evaluation when using language checkers in second language learning, illuminating how Grim encourages uncritical acceptance of its linguistic authority.

In paper V, the categories of dialogue were expanded in such a way that they could no longer be considered language related episodes in the original sense. The reasons for this were twofold. First, the tasks in question no longer concerned collaborative writing, and dialogue therefore concerned interactions between students and their teacher. In that kind of interactions, it makes less sense to search for episodes of metatalk, since almost all dialogue is metatalk. At least in my studies students primarily asked their language teacher questions about issues in their language or the task and very rarely engaged in talk about e.g. the content of their texts. From the sociocultural perspective, studies in SLL on these kinds of interaction, as analyzed by Donato (2000) and others, concern issues regarding how the teacher scaffolds the student, and how the student is a decisive force in that scaffolding. This is of course quite different from questions of how more or less spontaneous focus on form occurs.

The second reason for expanding the notion of language related episodes was that the study in Paper V was carried out with a whole class of students, generating a need to quantify data. Language related episodes are quantifiable, but quantification would not mean anything if interesting episodes were merely labeled as “tool interaction” and then counted. In order to quantify
over a class of students, and still be able to compare the activity with the activities found in Papers II-IV, a different set of categories was needed. It should be noted that it was not the presence of a teacher that differed between the studies, but the nature of the tasks and settings. Teachers were also present during the first studies, but not consulted extensively by the students. In Paper V, all dialogue concerned teacher consultations.

The categories of dialogue in paper V, then, were intended to capture the students’ efforts in the ZPD (see 2.3, Activity and tasks). To that end, dialogue was labeled as concerning the task or not and as concerning students’ texts or not. A successful classroom activity would be one where students worked according to the task and also attended to their texts. A highly unsuccessful activity would be one where they did neither.

In papers IV and V, texts were collected and analyzed according to progressive changes students made. In papers II and III, this kind of analysis was deemed unnecessary because it could easily be seen that students worked towards an “error free” text, as the number of texts were limited. In paper V, however, quantification was needed regarding changes in texts as well. These were categorized according to how well they corresponded to task intentions, and whether they introduced any new errors. New errors were, in the light of previous results, here seen as a positive result. In sociocultural terms, these two schemes were used for investigating how student actions corresponded to the their work in the zone of proximal development.

A high degree of correspondence between on task activity and support from teacher, task and tool would mean that teacher, task and tool were instrumental in scaffolding the students. A low correspondence would mean that students were instead misguided, a result more in line with previous ones in papers II-IV.
4. PRESENTATION OF PAPERS

In this section I will present and discuss the papers that will follow in the second part of the thesis, placing them in relation to each other and to the thesis as a whole. I will take the opportunity to highlight the points of the papers that have emerged as the most relevant as research has progressed, and also how each paper follows from the previous one(s). In doing this, I will here make slight amendments to bring some of my early work into more current positions. Since multiple authors wrote the papers, I will also attempt to clarify what my individual contributions were in each paper.

4.1. Paper I – Tools, Language Technology and Communication

This book chapter concerns the status of language technology in CALL, suggesting that language technology may provide opportunities for CALL, but that these opportunities should not be realized through attending to technology alone. The chapter’s most important contributions lie in re-instantiating and modifying a framework for discussing real world uses of language-technology based CALL, and suggesting how that framework may be used for guiding design.

The framework in question was adapted from Holland and Kaplan (1995), where it was argued that it was not enough to merely improve on the accuracy and coverage of language technology as it was then being used in language tutoring systems. Instead, they argued that the way tutors displayed themselves to users and how they were put to use was as important as improving technology itself. Therefore, their framework considered context of use (e.g. classrooms and curricula), student-tutor relationship (e.g. the expectations students form concerning a CALL tutor) and tutoring (e.g. the modes of interaction with the tutor). While their article concerned the state of the art of language tutors in 1995, the points they made are still relevant today. Too little research has focused on bringing language technology to concrete CALL-specific real world uses, while significant and important technological advances to CALL specific language technology have been made. Instead, most researches in language technology-based approaches to CALL prefer performance analyses of their systems, testing variables such as speed, precision and recall rather than attending to the user interaction with the system (Heift & Schulze, 2007, p. 226).

In the article, some modifications to the terminology of Holland & Kaplan’s
A few notes should be made regarding the tutor/tool distinction. It is, as also noted in the paper, not my intention to argue against tutorial CALL per se, even though I do argue against tutors that assume a very strong notion of artificial intelligence. Tutors may work quite well within limited contexts, if no pretenses are made towards abilities to do anything beyond those limited contexts. Instead, my concern is that language technology needs not be inherently tutorial when applied in CALL. My central argument regarding CALL based on language technology is that issues in language technology must be tackled on the level of use because technology will never be able to fully analyze or “understand” language. In that sense, the tutor/tool dichotomy is somewhat blunt. Levy’s (1997) conceptualization of tools/tutors in CALL acknowledges the problem of grammar checkers; are they tutors because they evaluate language or are they tools because of their peripheral function and rudimentary way of reporting on errors? The problem with maintaining a clear dichotomy becomes even more acute in mixed environments containing a variety of technologies as suggested above. This blurred boundary has been more elaborated by Hubbard & Siskin (2004), who argue that tutors have been discredited on the basis of myths and misconceptions and note that there is emerging research that combines the two. Moreover, the notion of tools in the sociocultural sense (see 2.2, tools) does not seem to rhyme well with the tutor/tool dichotomy because the theory views tools as mediational, and far from being neutral equipment. In these more complex senses of tools, a view where tutors are seen as a certain kind of tools would probably be preferable. This has led me to adopt the terminology suggested by Knutsson (2005) in
later work (see Paper IV), dividing between active and passive tools, where active tools are those that do something with information (e.g. language checkers), while passive ones display content on request (e.g. online dictionaries).

Another note regarding Paper I is that a linguist may perceive my use of the term “formal” as somewhat sloppy. The reason for this lies in different uses of the word in different contexts. In the context of discussing language tools as being pedagogically too formal, it means that the tools may focus too much on surface linguistic form (syntax) at the expense of language as communication. In the context of general linguistics, however, “formal” usually means any aspect of language that has been formalized, including semantic and pragmatic rules. It has been pointed out to me that the paper occasionally confuses these two uses of “formal”, and ask of the reader to bear in mind that I usually intend the pedagogical meaning; formality as displayed by the tool for the user.

**Individual contributions**

The paper was written by me, and was supervised by Teresa Cerratto-Pargman and Robert Ramberg. I wrote most parts of the overview of the subject areas and the arguments concerning the framework and language technology in CALL. However, at the time of writing, my proficiencies were mainly in language technology. Influences from sociocultural theory and human-computer interaction originate from the other two authors. Also, the article was written as part of a project where the prototype Grim already existed. Ola Knutsson and Stefan Westlund should therefore be credited as strong influences, as they were active in discussing the suggestions in the paper from the outlook of Grim’s design, albeit they did not participate in writing.

4.2. Paper II – Analyzing student activity in computer assisted language learning

This conference paper, written by Teresa Cerratto-Pargman and me built on the framework introduced in the previous book chapter in two ways. First, the notion of student collaboration as a means to mitigate problems in language technology was explored. Second, the framework from article A was used in an analytical manner, for interpreting how the prototype Grim was used during three sessions with two students collaboratively working on a revising an essay. Data from their sessions was collected by recording and transcribing the students’ dialogue.
The student-system relationship was seen as especially interesting regarding results. In the sense of a dichotomy between tutors and tools the two students treated Grim more like a tutor than a tool. Drawing from the discussion on tutors and language technology above, this would mean that grammar checkers may lean towards a tutorial role in practice. Levy’s (1997, p. 181) decision to label even “rudimentary” grammar checkers as tutors thus seems to have been the right one.

Of even more significance for my further studies was how this result contradicted the intentions in design and suggestions in Paper I. This interesting observation strongly influenced and guided further inquiries in two major ways. First, it was seen as a problem to be solved in its own right because it reaffirmed issues with language technology in applied CALL. Second, delving into how this student-system relationship occurred called for deepening the notions of tools and the activities people perform with them, drawing more from the sociocultural theory of mind.

**Individual contributions**

The article was written by me and was supervised Teresa Cerratto-Pargman. The study was designed and conducted primarily by me, with supervision from Teresa Cerratto-Pargman who provided guidance on the research design and participated during one of the three sessions. I performed the analysis of data and most parts of writing, with input from Cerratto-Pargman regarding sociocultural theory, in particular the view of tools as under a process of appropriation. I adopted this view in later papers.

Also, I am grateful to the teacher of the class, Karl Lindemalm, and the two anonymous students, for the time and effort they dispensed when participating in this study. Lindemalm also provided much valuable feedback on the possible uses of Grim.

4.3. Paper III – Tool mediation in focus on form activities

This paper is a journal-length elaboration of the study from Paper II together with another study of two pairs of students who worked on text revision with Grim during two sessions. The second study reaffirmed findings from the first; that Grim tended to assume control over the students’ texts rather than provide guidance towards improving the texts. As mentioned in section 1.3, Overview of articles and research progression (also see figure 1), the elaborations in this paper puts stronger emphasis on sociocultural theory. In particular, the observed student activity with Grim was interpreted with
support from the concept of *mediation*. Also, the concept of *activity* was more
developed, and investigated in accordance within the sociocultural
methodological notion of *language related episodes* (Gutiérrez, 2003; Swain,
2000), as described in chapter 3, methodology. Data was collected by means
of video and audio recordings, and transcribed and partitioned into language
related episodes. In our study, language related episodes were used to find out
how students discussed their language, in particular dialogue that included or
was caused as a response to output from Grim. We were particularly
interested in how Grim affected their focus on form. We found some
instances where Grim indeed seemed helpful towards students perfecting their
texts grammatically, but it was also the case that many episodes that involved
Grim misdirected the students. This strengthened the results from Paper II in
two ways; first by additional data from other students in another setting and
second by illuminating use of Grim by means of the concept of tool mediation
in the sociocultural tradition.

Grim was in both groups of students found to mediate between the language
to be learnt and the learner in such a way that students treated language as a
rule-governed object to be learnt mainly by sentence-level correction. This
would not necessarily have been problematic had the tasks been solely
corrective in nature. However, the teachers’ instructions, the pedagogical
rationale in focus on form, and the tool Grim were all intended to encourage
focus on language structure as a consequence of attending to expression of
meaning. In that sense, Grim encouraged correction in problematic ways.
One problem occurred in misreports, that students did not know how to
handle faulty output. A perhaps more serious problem was the linguistic
authority ascribed to Grim. It misguided students to attend to all errors it
suggested, while leaving unmarked ones as they were. This occurred even
though explicit instructions to the contrary were given by researchers and
teacher and acknowledged by students. The resulting strained authority given
to the language checker of Grim probably has implications for other kinds of
grammar checkers. What occurs, for example, whenever teachers ask students
to submit grammar-checked papers? How do language checkers in general
affect our writing?

**Individual contributions**

This article was written by me, Teresa Cerratto-Pargman, Henrik Lindström
and Ola Knutsson. My contributions were supervised by Teresa Cerratto-
Pargman, and Henrik Lindström’s contributions were supervised by Ola
Knutsson. I performed the first study with supervision from Cerratto-Pargman. The second study was performed by Henrik Lindström, with supervision from Ola Knutsson and parts of the analysis performed by me.

4.4. Paper IV – Literate tools or tools for literacy?

This article discusses spell and grammar checkers from a general perspective in digital literacy. The notion of digital literacy is a complex one that expands quite extensively on the notion of literacy as the ability to read and write. In part, this is metaphorical, in the everyday sense of being able to use computers. This metaphorical expansion of the term has been criticized to conflate too many various areas of human conduct, to the point of rendering the term “literacy” meaningless (Kress, 2003, pp. 23-24). One may speak of a too wide array of literacies, including “musical literacy”, “visual literacy”, “television literacy”, and so on indefinitely. I partly agree with this criticism, and believe that the term “literacy” is, at least scientifically, perhaps best reserved for reading and writing. However, the skills of reading and writing now occur increasingly on computer screens. Kress (2003) further argues that texts are becoming part of more and more multimodal contexts, to the point of being subordinated to imagery. From a semiotic viewpoint, then, the study of how we read and write becomes the study of how multimodal texts are comprised of signs including images, typography, sound and video. Literacy in that sense still concerns the interpretation of the structure of signs, only the range of signs present in reading and writing has been expanded (and this is enough to suggest that the natures of reading and writing have changed since the advent of micro-computers). CALL research has been argued to concern literacies in this wider scope, because it involves novel ways of interacting with these novel types of text (Schetzer & Warschauer, 2000).

While the argument to limit “literacy” to the study of signs is quite valid from a semiotic viewpoint, there are other areas of research that are interested in reading and writing. For example, ethnographers and sociologists may be interested in environments and power structures where reading and writing occur, asking questions different from how they occur. Literacy is then seen as a situated practice, notwithstanding the more narrow and well-defined meaning of the term in linguistics and semiotics. It is from that wider scope of literacy that the terms computer literacy and digital literacy is usually derived. In CALL, the term has been suggested to be used in both the sense of being able to evaluate information and the sense of being able to interpret and produce multimedia (Warschauer, 2008, pp. 60-63). In the article, we found it
interesting to explore this wider meaning of “digital literacy”, albeit the arguments presented above should indicate that I now do have doubts regarding the adequacy of the term.

Research on computers in education has been argued to concern literacies in this much wider scope. Lankshear & Knobel (2006), for example, argue that extending the semantic reach of “literacy” to media other than text in the manner of Kress above is not enough. Instead, they argue, literacy could be seen as a multitude of qualitatively different social practices of reading and writing. The key argument, with which most linguists (probably including Kress) would disagree, is that these different practices are more important than the encoding of text.

Digital literacy from this angle concerns the myriad social practices involved in meaning making via digital media. It may thus be seen as a shorthand for how ideologies, social conventions, producers of meaning, and audiences are manifest in digital media (Buckingham, 2006). Paper IV seeks to investigate how these social issues affect language checkers and the use of language checkers. In particular, the paper seeks to investigate how language checkers and their use impact and transform social practices such as reading, writing and reflecting.

The article summarized several studies conducted by our research group, having noted the same type of problems occurring with several various groups of second language learners. We identified misdirections from the tool, misinterpretations of the tool by the learners and indiscriminate use of the language checkers. These types of problematic uses where then discussed according to Buckingham’s aspects of digital literacy above, suggesting that they be tackled by carefully attending to how linguistic information from language tools is presented to the user, how tasks affect their tool use, and how language technology is conceived of and used to describe language.

**Individual contributions**

The article was written by me, Teresa Cerratto-Pargman and Ola Knutsson.

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1 The first constituent of the term, “digital”, is equally problematic, since it means that something is divided into discrete units, not necessarily by means of computers. The most direct interpretation of “digital literacy” in the traditional semiotic sense would then be “being able to read and write e.g. morse code, semaphors, smoke signals, etc.”. The intention of using the word “digital”, however, is to include all kinds of micro processor-based devices, not limited to desktop computers.
Data was collected from various studies by our research group and our students, and re-analyzed and categorized by me. The ideas expressed in discussion stem in roughly equal parts from all three authors.

4.5. Paper V - Using Language Technology in the Zone of Proximal Development

This paper followed through on the suggestion in paper IV to attend to the setting into which language tools (i.e. Grim) are introduced by carefully designing tasks. Appropriate tasks were thought to potentially steer activity with Grim away from the problematic issues noted in the previous articles in this thesis.

The article forms the final results of the thesis on two levels: the concrete level of classroom use of language technology, as well as on the levels of method and theory for classroom CALL. On the practical level of using language tools in the second language classroom, it was suggested that careful attention be paid to the presentation of tasks and to teacher guidance while working with the tool. In order to find out whether the new tasks were successful, we needed to empirically investigate how they corresponded to student activity. Therefore, a method of investigating classroom CALL as it unfolds was developed in connection to sociocultural theory. The method consisted of analytical schemas to be applied to transcripts of student-teacher dialogue and students’ texts. These schemas were connected to sociocultural theory by the concept of activity, and in particular by the zone of proximal development (ZPD). In sociocultural theory, the ZPD is the foundation of learning; students working towards expanding their current proficiencies with assistance from more capable peers, teachers and tools (see section 2.3 Activity and tasks).

The zone of proximal development (ZPD) emerged as a key concept in the study, being used to analyze dialogue between teacher and student as well as the texts that students wrote. Perhaps the most important task conducted by teachers is to constantly evaluate the students’ ZPD and adapt their teaching to that. As we have seen, however, introducing a novel tool such as Grim may affect student activity to steer away from the tasks intended by their teachers (i.e. from revision and reconstruction to sentence-level correction). Grim might on those occasions be said to have steered away from optimal learning in the ZPD. We were interested in whether a different introduction to Grim, in particular in the form of different tasks, would encourage a more appropriate activity with Grim.

The tasks in question, then, were based on genre-pedagogy (see section 2.1.
Second language learning). This allowed us to be precise regarding what linguistic forms students should attend to while still retaining an overall focus on expressing meaning in their essays. Also, we were careful to suggest using Grim’s non-corrective features for working with the tasks. However, we did not discourage correction entirely, and most of the students did also correct.

The analytical schemas were intended to compare actual activity to the intentions in the designs of tasks given to students working with Grim. Motivated students are not automatons, but quite involved in their own learning. If the students would deem Grim or the tasks as useless for their purposes in learning, they would probably refuse to participate in the tasks or engage in other matters with their texts. Thus, the analytical categories regarding student-teacher dialogue concerned how questions from students corresponded to their tasks as well as whether they concerned their texts: on task and text related (“on topic”), off task and text related (“improvements”), on-task, not text related (“clarifications”), and off task not text-related (“breakdowns”). Of these, a majority of “on topic” questions would mean that we had estimated the students’ ZPD well and that Grim was used in an appropriate manner. Too many “breakdowns” on the other hand would mean that the activity was not optimal for learning. The other two categories would fall somewhere in between, they correspond to students attending to issues in their texts not demanded in the tasks and questions regarding the task or Grim.

Similarly, changes in students’ texts were analyzed according to correspondence to task. Also, changes that ensued from an on-task change were counted, as well as any newly introduced errors. Given the tendency to avoid errors in earlier studies, newly introduced errors would indicate a different activity than previous ones.

In sociocultural terms, the question of student activity was posed as: “did the students actions (i.e. questions they posed to the teacher and changes they made to their texts) indicate an activity that corresponded to our evaluations of their ZPDs as manifest in our task designs coupled with Knutsson’s (2005) and Knutsson et. al.’s (2007) design of Grim?” We studied a class during three sessions where students were working on one of their own essays throughout the sessions, with different tasks handed out to them in the beginning of each session. The results were positive regarding the last two sessions and negative regarding the first session, with respect to how much of the dialogue and changes to text that occurred in the categories as outlined above.

These results have three important implications. First, and most practically,
that genre-based tasks worked well with a language tool that contained highlighting features, but that students needed some time to adapt to tool and tasks. This implies the second point, that language teachers as well as CALL tool designers and researchers should consider the tasks they hand to students or otherwise imply when conceiving of tools. Third, and perhaps most importantly for the field of CALL, that instructional method, teacher guidance, and time to appropriate the tool are issues that should be accounted for in research. If it is the case that CALL studies in general lack descriptions of these, it is of utmost importance to investigate more CALL tools in manners similar to the ones suggested here, lest issues similar to the ones I have observed also appear in use of other CALL tools.

**Individual contributions**

I conducted the study, with assistance from Eva Lundin. I conducted analysis of dialogue and questionnaires. Analysis of text between sessions as well as post sessions was conducted by Eva Lundin and supervised by me. The categories for dialogue as well as text were conceived by me, and interpretation of data was conducted by me. Both authors attended to the discussion concerning genre-based pedagogy, while discussion and methodology according to sociocultural theory were performed by me.
5. SUMMARY OF RESULTS

The papers presented above have concerned research on second language learners’ use of the prototype Grim, researching the problem of how language technology in the form of tools for analyzing text may be used in CALL while avoiding inherent technological limitations. This research problem occurred because language technology presents uncharted opportunities for use in second language learning, and is also already available to students and teachers, e.g. in the form of language checkers. The question of use is therefore an important one; we need to know how use occurs and how tools may be adapted for use in specific learning situations.

To investigate the issue of use, I have argued for re-instantiated use of language technology in CALL, and conducted studies on a language tool in use by students. I have based my work on sociocultural theory and conducted studies based on analysis of audio and video transcripts of dialogue between pairs of students and between students and their teacher.

Paper I presented a framework for discussing the concrete implementation of technology in the second language classroom, as well as suggestions for implementations drawn from the general framework. Papers II-IV then explored these suggestions as they were implemented in the prototype Grim. Results in papers II-IV were mixed. On the one hand, students did work on issues with grammar and spelling in their texts, but on the other they did so at the expense of other issues in communicating through texts. In paper II, I found that the student-system relationship seemed problematic; students treated Grim as a larger linguistic authority than it was intended as or capable of being.

Papers III and IV expanded on this observation in sociocultural terms. The activity I observed indicated that Grim mediated between students and the language to be learnt in a way such that language was treated as predominantly a rule-governed object. Rules are used to describe regularities in language, and are important for learning how to express oneself properly in particular languages. However, a single-minded attention to form is problematic if it overshadows the complementary view of language as a tool for expressing meaning.

Paper V suggests a solution by carefully attending to the tasks handed out to students. The results in paper V show 1) that setting and task workplans play a great role in how Grim was appropriated, and 2) that appropriating novel tools
such as Grim takes time. The importance of these findings lie in the observation that tackling the issues found in papers II-IV takes strong efforts from educational practitioners and designers of language technology-based CALL. We need to be quite explicit about how we position our technology and pedagogical choices in theory, and we need to introduce the technology quite carefully to students. While improving on language technology itself, with respect to how well it handles coverage/accuracy, is indeed important, attending to technology alone is not enough to move the field forward and into the classroom.

Furthermore, the research progression leading to the conclusions in paper V are also part of my results. Studies of the ways tools are used are under-represented in CALL. In particular studies of classroom activity from the sociocultural perspective are under-researched. Therefore, an important result from my studies lies in developing theory and methodology for that kind of studies, focusing on the use of language technology. The results on the level of theory-guided methodology consist of the framework for introducing CALL (in particular language technology based CALL) in the classroom in Papers I and II, language related episodes applied to CALL in Paper III, a wide notion of literacy applied to language technology-based CALL in Paper IV and a novel way of examining students’ work in the zone of proximal development while using a language tool in Paper V.
6. DISCUSSION

“It filled him with a great unrest and strange desires. It caused him to feel a vague, sweet gladness, and he was aware of wild yearnings and stirrings for he knew not what.”

—Jack London, Call of the Wild

Arriving at the final part of this work, the quote above may be seen as relating to myself rather than investigations of language technology in CALL. Having received at least some answers to my questions only serves to awaken an urge for more explorations into the unknown. As the final remarks of Paper V asks, what would occur in use of Grim during a longitudinal study over a semester? Would students use e.g. highlighting functions without receiving tasks that specified their use? What would their relationship to language checkers in general be? Also, it would be interesting to investigate the appropriation process of other CALL tools such as language labs, classic tutors and tutoring environments, multimedia CALL, etc. We do currently not know in detail how students use and appropriate a countless number of systems. Sociocultural theory is a fruitful theoretical framework on which to base studies in classroom interactions with a CALL tool, in particular by providing critical analyses of how tools are put to use. The process of appropriation is a complex one. My studies have taken place on a microgenetic level, showing only the beginning of the students’ appropriation process of Grim, and the importance of attending to task design in that beginning.

While tasks and activities are my primary concern here, it would not bear to investigate activities carried out with technology that seemed unfit for the purpose of learning a second language. I argue that language technology is useful in CALL classrooms for several reasons. The first and perhaps most important reason is that it is already there. Students already have access to language checkers, word predictors and text summarizers, and teachers have access to tools like plagiarism checkers. We do currently not know precisely how these tools are put to use. That reason alone should instigate scores of researchers of computers in education to investigate in detail how these tools influence education. For some reason, however, research remains relatively silent on this topic. In part, this may be explained by the earlier disappointments in research concerning artificial intelligence in education (see Paper I), and in part because research on computer mediated communication currently seems to overshadow most other areas of computers in education, including user studies on CALL.
The second reason for researching language technology in CALL is also based on the fact that it is generally available. It has been developed to a point where implementations exist, and these implementations, or modified ones may provide opportunities for second language learning. It is not necessary to repeat the mistakes of “good old-fashioned artificial intelligence” in order to conceive of new applications that utilize language technology.

I have shown that language technology may be used in a reflective activity with focus on fluency, as a complement to traditional form-based uses. Fluency-oriented tasks might mitigate some of the problems in language technology sometimes being too authoritarian while simultaneously not always being an authoritative source regarding linguistic information. I have tackled this issue by broadening the design of language tools to incorporate design of classroom tasks, stressing the importance of adapting tasks to students’ near-future proficiencies. This approach yielded an activity that differed significantly from the previously observed and more commonplace uses of language technology as correction tools.

My work shows that there are instances where we should perhaps focus less on the artifact and more on its use. In other words, emphasizing the “human” and the “interaction” in human-computer interaction, and not necessarily placing the interactions to be designed the computer or other microprocessor-based technology. Figure 5, taken from Paper V, illustrates how genre-based tasks were introduced in the classroom setting. This adaption of the setting involved the teacher, the teacher’s background in genre-pedagogy, possibilities given in Grim, the teacher’s judgement on student’s essays, and, not to forget restrictions given by the research design. These parameters all influenced the teacher as she guided students by handing out carefully designed tasks and provided guidance in their classroom. Each task was followed up during the next session, and each task was designed according to what she perceived that the students should do while learning within the ZPD.
Designing tasks for particular settings is a venture that probably looks much like this even if other tools, other teacher backgrounds and other tasks are considered. The particularities will of course vary, but the basic iterations would probably the same. It is not enough to throw CALL tools into the hands of teachers and students, we need to enlighten teachers as well as ourselves on when, where and how our tools are useful. Furthermore, we need to be prepared to be proactive in informing teachers of how the task design might occur.

Interaction design and/or human-computer interaction should be well suited for an approach that extends “design” into the world, being the logical extension of following research out from laboratories and into the contexts where technology is used (Bannon, 1991). In particular, this approach can be argued from the perspective of sociocultural theory, where all aspects of activity may be said to influence all other aspects.

However, even in sociocultural approaches to interaction design there is a tendency to end up with design of some artifact, or tool (for example Gay &
Hembrooke, 2004; Kaptelinin & Nardi, 2006). One textbook definition of interaction design reads: “designing interactive products to support the way people communicate and interact in their everyday and working lives” (Sharp, Rogers, & Preece, 2007, p. 8). In my view, definitions like this are unfortunate because of the strong emphasis on the types of interaction that occurs between products and the people who use them. I am aware that textbook definitions are intended for students and interaction designers in the making, and as such probably fulfill their purposes of improving products that we use in our everyday lives. Still, in precisely that pursuit we would be well served to investigate how interaction between people affects interactive products, and vice versa.

Sociocultural theory in second language learning on the other hand tends to perform studies on concrete situations focusing on descriptive research rather than guidance on how teaching should occur. Both areas have something to learn from each other’s ways of drawing from sociocultural theory, and both areas have something to offer to classroom CALL.


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