Expert writing – divine inspiration or hard work?

Purpose and aims
What is the secret behind expert writing – is it divine inspiration, or prosaic hard work? The ancient Greeks attributed the gift of story-telling to the song goddess, indicating on the one hand that humans needed divine help to perform the art of writing, and on the other that for the poets and playwrights that had the love of the gods, writing was an effortless blessing. This mystical air surrounding authorship is present still today, as is the notion that really good writing is supposed to be fluent and straightforward – a direct channel leading from the mind of the inspired author to her keyboard. When the Swedish author Björn Ranelid in an interview states that he never rewrites a text, except for some reformulation and semantic changes, he enroll himself in a long tradition, with names like August Strindberg as one of the prominent figures (Sundsvalls tidning).

Everyone can and will not be an expert writer, but – as with other areas of expertise, such as music, chess, medicine, mathematics, sports or art – we can learn from observing experts. From descriptions and analyses of how they “do it” we can form a theory of how to guide less skilled members of a certain field to become better – or even experts.

This project aims to study the cognitive processes behind the text production of expert writers, e.g. authors and journalists. This will be done by using texts produced in both experimental and natural settings. Quantitative analyses of the texts will address the issues whether experts for instance use longer pauses, read their texts more or revise the texts more extensively, compared to non-expert, adult writers. The texts will also be analyzed regarding linguistic criteria, such as text length and lexical measures. Qualitative text analyses will be used to examine e.g. what type of revisions that is performed, and when. In addition, we will use interviews as a complement to get information about the writers’ thoughts about the text and about her writing in general.

More specifically, this project will address these questions:

- Are there quantitative and/or qualitative differences regarding linguistic criteria between the final products (i.e. texts) by expert and non-expert writers?
- Are there quantitative and/or qualitative differences in how texts are produced, i.e. the process of writing, between expert and non-experts?
- If so – what do the differences look like, and how can they be explained, and what is the relation between the process and the product?
- Are there general patterns in the writing process of expert writers, or do they all employ individual writing styles?

Survey of the field
In today’s society most people need to use writing in their everyday life. In our private lives, literacy skills (among other things) are necessary for understanding written information, but also for paying bills at the internet bank, booking a flight, or ordering clothes in a internet store. In addition we are expected to read and write to an increasing extent in our professional life. Today, former very practical professions comprise unexpected amounts of reading and writing – e.g. an assistant nurse must document her care, a carpenter needs to read blueprints, and a shop assistant uses her literary skills to create and control the written signs in the shop, or look up articles in the computer systems. We also use more written everyday communication than ever before: sms, chat, email, blogg (Karlsson 2006).

The increased use of writing in all areas of the society requires more information on how we do when we write. Although not everyone aspires to become an expert writer, awareness of how the best writers go about this task will add valuable knowledge to the instruction of writing. Throughout the school years, the reading and writing skills are taught, but there are
also all kinds of creative writing courses, books and websites for those who want to improve their writing skills later on in life. However, many published works addressing the writing process do not employ empirical methodology to answer the questions (Pritchard & Honeycutt, 2006).

Sometimes the term 'process writing' is used to refer to a wide range of strategies for teaching writing (e.g., pre-writing strategies, defining audience, use of external resources, planning what to write, drafting and revising). The proposed study will not study process writing, but the 'process of writing'; i.e. the manner in which an expert writer uses many of the strategies that process writing teachers suggests their students to use, in order to produce a good text, a good product.

**The cognitive processes of writing**

The cognitive processes we study may not be specific for writing, but consist of a general ability to handle many things at the same time, so-called executive attention. A large body of research suggests that this ability is actually the same as working memory capacity (Engle, 2002; Ericsson et al, 2006). Kellogg (2006) uses the main components in the writing theory from Hayes and Flowers (1980) when he states that ”a professional writer can hold multiple representations in mind while adeptly juggling the basic processes of planning ideas, generating sentences and reviewing how well the process is going” (p. 389). What makes writing expertise such a difficult thing to describe, according to Kellogg, is that it consists of so many things, but most and foremost problem solving. A professional writer can be so many things: journalist, novelists, screen writers, poets, technical writers, and e.g. authors of scientific papers – and their knowledge and strategies about writing do not always overlap.

McCutchen (1994; 2000) claims that writing is facilitated by an increased ability to coordinate several on-going processes in working memory. In a study, using thinking aloud protocol she studied the writing process of two professional writers of newspaper columns. She described their text production as a process of continuously switching the attention between the different subprocesses of writing: translation, reviewing and planning. As an effect, she describes the writer as a switchboard operator, that has to keep many things in her working memory at the same time. She further emphasized that expert writers in this study worked hard to put the words on paper. Thus, the process of writing does not seem to be facilitated through experience. Although these journalists had learnt to master or even automate several aspects of writing (typing, spelling correction, genre knowledge), they had changed their rhetorical goals and set a more challenging task for themselves (McCutchen, 1994). This is what McCutchen (2000) calls the writer’s paradox: decreasing the cognitive load does not necessarily mean that the writer (or speaker) will perform the task with greater ease. The reason for this paradox is that the skilled writer sets other rhetorical goals, including audience, style and topic, which complicate the task. McCutchen (2006) describes the result as “not necessarily an effortless writing process for the expert, but it is an effective one that yields high-quality text”. Thus, we can conclude that when cognitive capacity expands, the new space available is used by the experienced writer to achieve new goals. Another conclusion is that however interesting working memory may be, it probably is not critical for the individual writing performance.

**Theories on development of writing**

The developmental perspective of writing is usually not present when adult performance is discussed. In Scott’s (1988) overview of the linguistic development the upper end is 19 years old, and this is usually when the study of writing development ends. Studies of how adults write, and especially the process of expert writers are rare to find (for an overview, see Johansson, 2009).
Bereiter and Scardamalia (1987) distinguished two strategies that a writer may adopt in her writing. One is the Knowledge-Telling Strategy and the other is the Knowledge-Transforming Strategy. The knowledge-telling strategy is generally used by unskilled (i.e. often young) writers. A writer following this strategy will translate knowledge units in the order in which they are retrieved, without devoting much time to organizing content. This is an economical strategy but it does not create coherence at a global text level. The knowledge-transforming strategy is used by experienced writers. This strategy comprises knowledge-telling but supple-ments it with the possibility of global planning, which leads to an ability to plan and (re)orga-nize the text, the writer transforms what she knows “for the author’s benefit”.

Kellogg (2008) adds one stage to the Bereiter and Scardamalia model: The Knowledge-Crafting strategy. He claims that it will take at least 20 years (of maturation, instruction and training) to reach the third stage. The knowledge-crafting writer also include the reader’s perspective in the text composition. Only adults aiming to become skilled professional writers reach the third stage. In sum, Kellogg (2008) describes writing development as a continuum where improvement can be achieved by practicing both basic writing processes, such as planning, language generation and reviewing, and the mental representations that must be generated and held in working memory.

Galbraith (2009) explains how writers generate new, coherently organized ideas during writing. According to this connectionist model of writing, writers do not retrieve content from memory, but from pieces linked together in a semantic network. This leads to writers who learn things they ”did not know” through writing. One explanation to this knowledge-constituting process is that when you write and activate certain memory traces, you will also activate other associated information. This will prime, and facilitate the thinking about knowledge other than the one you were explicitly bringing into mind when you were writing. An increased ability to control processes (e.g. to keep certain knowledge in working memory) concurrently with associating to completely new (and unexpected) ideas by activating associated memories could be one explanation of the divine part of creative writing.

Methods used in studies of writing
Chi (2006) claims that it is hard for any expert to articulate or describe their knowledge on how to do things, because much of their knowledge is tacit and their overt intuitions can be flawed. This is one reason to use different methods for observing the performance and process of expert writers. Several methods can be used, for instance the kind of thinking aloud protocol that McCutchen (1994) uses when she describes the professional journalists as being switchboard operators. Other ways of studying writing is by using randomized probes or video observations and recordings of writing. Thinking aloud-methods have been criticized for their reactivity and other methods have received critique for not providing enough information about the processes (compared with what can be obtained through self-reporting) (Sullivan and Lindgren, 2006).

During the last decades, keystroke logging has been used as a method for studying the process of writing. This can be seen as less intrusive as compared to e.g. thinking aloud protocols, and the researchers can observe e.g. the writer’s pauses and revisions and replay them later. However, we still have the problem of not knowing what caused the pause, or how the writer reasoned while deciding to edit the text. Combining eye tracking with keystroke logging is one way of finding out more about that (Wengelin et al 2009).

Keystroke logging studies using experts are rare to find, but Englund Dimitrova (2006) has used it to compare expert and novice translators. She found profound differences between the two groups in how they performed the task. One finding was how the expert translators divided their tasks into fewer and larger segments than the novices.

Pause studies
Many researchers who have studied the underlying processes of writing have been interested in pauses. The underlying assumption behind the analysis of pause duration during text writing in on-line studies is that longer pause durations indicate that the ongoing processes are more complex (Alamargot and Chanquoy, 2001) The most widespread interpretation is that pauses occur because of competition for limited processing capacity (proposed e.g. by Just and Carpenter, 1992). Another reason for pausing is that the execution of a motor skill like typing (i.e. a low-level process) competes with high-level processes like planning and revision (e.g. McCutchen, 1994).

Many (or even most) of the pause-time studies using keystroke logging or audio/video recordings, with or without thinking-aloud protocols, have focused on the distribution of pauses. That is, where do the writers feel a need to pause? The general findings suggest that pausing is most likely between paragraphs and less likely within words or between words within a syntactic unit (e.g. a noun phrase) (cf. e.g. Van Waes and Schellens, 2003; Matsuhashi, 1981).

McCutchen (2000) claims that more fluent text production (as can be demonstrated by automatized typing) allows the writer to move beyond the knowledge-telling strategy and frees up more cognitive capacity for other things. Fluency, or flow during writing is also addressed by Csikszentmahalyi (1990), to describe the experience of experts deeply engaged in their craft. When a person’s skills are well matched by the demands of the task, the state of flow can occur.

Revision
Revision is an essential part of text writing. In an overview of the field, Chanquoy (2009) settles that most revision studies have focused on error detection and correction, and that revision during writing mainly lead to surface modification (e.g., spelling and punctuation). An explanation for this is that revision especially on deeper levels (semantic, content and text organization) is a highly complex activities where the limited capacity of the writer’s working memory plays an important role. One can expect an expert writer to be able to carry out most mechanical revisions without interrupting the global plan for the text, but more knowledge is needed about how writers distribute the limited resources in working memory over the various subprocesses that revising consist of.

Findings from previous projects of the research group
In her thesis, Johansson (2009) presents a study on the development of literacy during the shool age. This projects examines among other things narrative and expository texts collected with keystroke logging from age 10 to adult university level. Several findings support the fact that texts from non-expert adults and 17-year-olds are similar (regarding text length, syntactic complexity and lexical diversity and density) on the surface. However, by analyzing the process (pausing and editing behaviour) behind the text production, she finds that the adults spend less time and effort in producing their texts. The difference between the adults and the younger groups are especially salient in the expository texts, which indicates that genre knowledge is a significant cue to success in writing. One important result from the study this is that keystroke logging can reveal information that is not visible simply by studying the finished texts. However, keystroke logging alone cannot answer all questions.

In two previous projects, Produktionens och perceptionens dynamik under textskrivande (HSFR F0832/2000; project leader Kenneth Holmqvist) and Reading during writing (VR 2004-2687; project leader Åsa Wengelin) we have studied expository texts collected with keystroke logging in combination with eyetracking. This makes it possible to investigate the connection between the writers gaze behavior during writing and the pauses, editing and writing that takes place. Results from these projects show that the amount of time devoted to reading one’s own emerging text decreases with both development (age) and skill, suggesting
that reading is an important factor to consider in regard to writing expertise. (Johansson et al 2008). In an on-going project (Gaze behavior during writing (VR 2004-2009; project leader Åsa Wengelin) we have added a so-called triple task design, in order to relate specific gaze and pause behaviors to what kind of process (planning, editing, translation etc.) the writer is presently engaging in.

Typists divide their visual attention mainly between the monitor and the keyboard (Johansson et al 2009). Clearly, one of the functions of looking at the monitor is to read the text in order to evaluate, revise and trigger future plans. Some writers read more than others, but most writers read at least parts of their texts at some point. So-called monitor gazers, i.e. writers who look at the monitor during most of their writing time, will have access to visual feedback from the text both during pauses and concurrent with writing. Monitor gazers write significantly faster, produce more words per minute (wpm) and spend less time on the writing task, which suggests that monitor gazers need to call less upon their working-memory resources to perform the actual typing process, and consequently are more efficient and economic writers.

In Johansson et al (2009) we used cluster analyses to identify four different types of writers. The fast, linear writers are mainly keyboard gazers. They write quick and linear, with pauses, reading and editing evenly distributed throughout the writing session. They edit very little. The next group is called the careful, linear writers. Also this group is very linear in their writing, reading and editing behaviour, although they edit more than the previous group. They also spend a long time on their task. Both of these groups can be categorized as knowledge tellers. The third group is called the editing writer. They pause evenly throughout their writing, but read and edit little in the beginning, and much in the end. This was the largest group in the study, and would be categorized as knowledge transformers. The last group is named the reading writer. They don’t pause much in the beginning, edit throughout the whole session, but peaking in the end, where also reading and pausing is very frequent. Are these writers on the way of becoming knowledge-crafters?

**Project description**

**Theory**

Kellogg (2006) writes that ”much remains to be discovered about the skills of professional writers and longitudinal studies of their development would be particularly informative” (p. 399). As this quote underlines, expert writing is an understudied field of writing research. The proposed study, using keystroke logging and eye-tracking technology will be one important contribution to the description of how expert writers ”do it”.

Johansson (2009) investigated the writing process from 10-year-old writers up until adults, non-expert writers, and described the writing development. In the proposed study we want to see what happens text: What is the difference between the writing behavior between skilled adult writers and expert writers? Previous studies using keystroke logging has shown that this is a good and unintrusive method for observing the processes that occur during text writing. Results from pausing and revision studies further indicate that these processes can shed lights on the the development of writing. Further, casestudies, such as the expert journalists in the protocol study of McCutchen (1994) indicate that there may be more to learn about the thoughts and ideas that guide expert writers. Kellogg’s (2008) proposed expert stage – knowledge crafting – further suggests that there is more to investigate than the “common adult writer”. Thus, this projects aims to investigate the upper-end of the development of writing, to describe and understand the methods, actions and capacity of expert writers. In doing so, we will be able to describe the whole range of behaviour from novice writers to expert writers.

The research group possess unique data from previously projects that have investigated keystroke logging (and eyetracking). Johansson (2009) has described the development of the
typical population during the school ages, Wengelin (2002) studies adults with dyslexia, Johansson et al (2008) compare 15-year-olds and adults with and without reading and writing difficulties. In the proposed project we add to the developmental perspective by including the group of expert writers. To produce comparable data, we will carry out experiments, in order to collect texts similar to the ones collected in previous projects: narratives and expositories. The expert data will mainly be compared to the older data by non-expert adults.

However, we do not only want to compare the expert writers with texts collected in previous experiments. We want to add another dimension, and examine expert writing in a naturalistic setting. Chanquoy (2009) describes how a great deal of the revision takes place after writing, and this is especially salient for experienced writers. This is only one reason for studying how expert works on a “real” texts, where they will be able to edit as much and as long as they find necessary. We will recruit expert writers (preferably already professional authors), and study their composing of a text (of their own choice) during a longer period of time (1-3 months) in a familiar setting: we will use the keystroke logging program Inputlog (Leijten & van Waes, 2006) that can log all events taking place in Microsoft Word, whenever someone works on a document. This naturalistic setting will help in building new insights on how expert writers create and work with their texts.

Although the constraints of working memory seem to be an important component for explaining many things that differ between experts and novice writers, this project will not specifically study working memory in combination of writing. However, this is an important goal for the on-going project “Gaze behavior during writing”, that the research group also is currently engaged in. We will collect working memory tests from the experts for comparative reasons.

Method
We will investigate the writing behaviour of adult writers, without any known reading or writing difficulties, writing in their first language. We will recruit authors and journalists as expert writers. There is a possibility that there are differences between these two groups, but they will primarily be compared with data from non-expert adults collected in previous projects, and not with each others.

Study 1: Experiment and interviews:
For this task we will investigate a group of students (n=20) in the beginning and the end of their professional education to become a writer/journalist. We will recruit students from Författarskolan (“Author school”), or at the Journalist Program, both presently running at the Language and Literature Center in Lund. All students enrolled in these programs are accepted following a written admission test to test their writing skills, which will guarantee that they have reached a certain experience level in writing from the beginning of their studies. The students will be recruited through the program, but asked individually if they will agree to participate.

Experiments: We will replicate several of previously performed experiments, in order to compare the expert writers performance and processes to less-skilled writers. This includes using the keystroke logging program ScriptLog in combination with eye-tracking technology, to investigate among other things pausing, revising and reading during writing. We will investigate the narrative and expository genre. The participants will perform these experiments twice: the first and the last term of their 2-year education. In addition to the writing experiment, the participants will also perform a working memory test.

Interviews: In addition to these experiments, the writers will be interviewed about their reading and writing habits.

Study 2: Longitudinal study and interviews:
For this task, we will enroll 3-5 expert writers who are willing to share their writing process.
**Longitudinal study:** In this study we follow the writers during a longer period of time, while they are writing a text of their own choice, and working with software that they are used to. In order to increase the knowledge about how an expert writer approaches a longer text we will use another keystroke logging program, Inputlog that can be combined with Microsoft Word, in order to document the work with a longer text of the writer’s own choice. The writer will be asked to activate Inputlog whenever she works with the text. In addition to the longitudinal study, the participants will also perform a working memory test.

**Interviews:** In addition to the information collected by Inputlog, we will complete the logfiles with interviews about their thoughts and intentions about the text they are writing.

**Analyses**

*Analyses of the texts*

We will perform both quantitative and qualitative analyses of the texts collected within the project. The analyses will follow many of the analyses performed in previous writing projects. We will analyse both the final texts, and the linear or emerging text, as well as the writer’s behaviour. The texts collected from expert writers in this project will be compared with narrative and expository texts recorded with keystroke logging in combination with Eye-tracking in previous studies (Johansson, 2009; Johansson et al, 2006)

a) The writer’s final texts will be evaluated both holistically and by the use of detailed linguistic analyses, such as lexical measures (e.g., lexical variation and density), syntax, cohesion, measures of text length and text quality.

b) The writers gaze behaviour in the experimental task will be related to the holistic evaluations and the detailed linguistic analyses. It is, for instance, well documented that the duration of fixations and the length of saccades have crucial implications for text processing (Rayner, 1998).

c) The writing process will be analyzed by using logging data, that provides information of temporal patterns (including pauses) and editing.

d) Finally, the interview data and the writers’ own descriptions of intentions and considerations will be analysed, both as a way of describing the writer’s own notion of the process, but also in relation to the results in a) – c) above.

**Time frame 2012-2014**

**Year 1** We will plan the initial experiments and perform pilot interviews. We will recruit the participants for the experiment and perform the first set of experiments by the end of the year. Participating in the conference SIG Writing 2012 in Porto.

**Year 2:** We will perform the longitudinal study, and analyze data from this study as well as the data collected in the first experiment. The analyses require some additional adjustments to the analyses tool of the keystroke logging programs (ScriptLog and/or Inputlog), why we have included money for a programming during this year. Participating in the conference EARLI, with some results as to how the developmental curve develops from skilled to expert writers. We will also organize a workshop to discuss expert writing with international experts.

**Year 3:** We will collect the second set of experimental data, and continuing analyzing and writing articles. Participating in the conference SIG Writing 2014.

**Significance**

The proposed study, using keystroke logging and eye-tracking technology will be one important contribution to the description of how expert writers ”do it”. The results will add to the fundamental knowledge about expertise and problem solving. Further, it will help in describing the different developmental stages that a writer goes through, and to increase the knowledge about the interplay between the various subprocesses that are active during writing.
Last, but not least, it will have crucial implications on writing instructions, both for compulsory schools, writing education at university level, and writing courses otherwhere.

**Preliminary results**
In addition to the studies of the development of writing processes that members of the project group has carried out, and which are described above, a few pilot studies of expert writing has been conducted. In a study of the original manuscript from the Noble Prize winning author Pär Lagerkvist’s short story *Far och jag*, all the proposed changes and revisions were examined. What was striking were the many suggestions of semantic change, applied on all parts of speech. Another case study of an expert writer producing an expository text (with keystroke logging and eyetracking) indicated that much more time was devoted to reading and revising, compared to non-expert adults in Johansson (2008).

**Part of project cost**
This application covers 100 % of the project’s costs during three years.

**Budget specification**
The money will cover salary (50 % for Victoria Johansson and 50 % for an assistant for 3 years; 25 % for Roger Johansson, and 20 % for Åsa Wengelin in year 1 and 3). In addition, the budget covers minor adaptation of the analyses tools in the keystroke logging softwares, 10 % during year 2, travel costs (conference, and arranging of an international workshop about expert writing during year 2), and reimbursements to participants (cinema tickets, refreshments, and travel costs if necessary) We also apply for money for proof reading of articles, for analyse computers and software.

**Equipment**
The experiments using ScriptLog and eye-tracking will take place in the Humanities Lab at Lund University, which already has the equipment we plan to use: ScriptLog, and eye tracking equipment SMI iView X (HED + HT, 200 Hz. This project we will benefit from the development and improvement of the ScriptLog software that is currently taking place in the project “Gaze behavior in Writing” (VR2009-2004, Wengelin, project leader). For the longitudinal study we will use another keystroke logging program: Inputlog, developed and provided by van Waes & Leijten, in Antwerp. The advantage with this program is that it operates behind a normal word processor, such as Microsoft Word. The Humanities lab can further provide data storage, and equipment such as audio recordings for interviews, and transcription software.

**International and national collaboration**
The research groups have very good contacts with the international writing research society. Victoria Johansson organized together with Åsa Wengelin and Roger Johansson the biennial European Writing organization SIG Writing (www.sig-writing.org) in Lund. Further, the group is connected with the ESF-financed network COST, where Åsa Wengelin is vice president, and where Victoria Johansson has been invited speaker twice, in Prague 2010 and in Potsdam 2011. The research group further contributed to the special issue of Reading and Writing: An international journal (eds.: Åsa Wengelin, Luuk van Waes and Mariëlle Leijten in Antwerp). Apart from this we co-operate with writing researchers in Poitier, France, in Stafford, Great Britain, in Stavanger, Norway and in Potsdam, Germany. Nationally, all group members are in different ways enrolled in the Linneaus research environment Thinking in time: Cognition, Communication & Learning. There is also collaboration with Eva Lindgren in Umeå.

**Ethical considerations:**
All participants that we recruit for the propsed project will be adults. We will follow the
guidelines from VR Codex concerning the information to the participants: informed consent, anonymizing, use and storage of data. In beforehand every participant will receive information about the projekt (that she will be asked to write one or several texts, and that we (in the experiment condition) will record the eye while she does so). They will be informed that they can quit the study whenever they want to, how data will be used and stored, and how they can withdraw their data from the study. All data will be anonymized and stored at the protected data base server in the Humanities Lab; the participant key will be stored separately from the collected data, locked in a fire-safe. During the study, we will carefully explain every sub-part of the study, and afterwards we offer detailed information about the purpose, and possibility to ask questions. During longer experiments, there will be coffee breaks with refreshments.

In addition, it is important to have respect for the fragile creative process that the authors are engaged in, especially if we engage students who are in the process of learning their profession.

Other grants
Åsa Wengelin has a previous VR-project (Gaze behavior in writing, VR2009-2004) 2010-2012. The proposed project builds on the development of software and methods in this project.

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