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# APPROACHING THE SKILLS OF WRITING

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**Abstract.** The present chapter investigates theoretical perspectives on how to combine new information about on-line measures with end-product features. An attempt is made to delimit traditional approaches to writing, which focus primarily on aspects of the end product. In order to outline an alternative, it is suggested how writing and cognition can be operationalized and how awareness and automaticity are intertwined in writing. A pilot study of three eleven-year-old bilingual pupils is used as an example of the theoretical and methodological questions raised in this chapter. This example shows how pupils exploit their pausing time differently, and how on-line measures add information to the profile drawn from end-product measures. The chapter presents a model for the skills of writing. This model is considered to be a hypothesis which is testable by further use of the on-line measures described in the present chapter.

**Keywords:** writing, automaticity, awareness, skill

## 1 INTRODUCTION

New technology has provided new information about the process of writing. The aim of this chapter is to discuss how to combine this new information with traditional analyses of written texts. A very important methodological question in this new research on writing is to decide what emphasis to put on the end product on the one hand and on the writing process on the other. A valuable goal for such work should be to find causal relationships – explanations – between process and product (Levy & Ransdell, 1996). The present chapter is based on the claim that the basic assumptions made in mainstream linguistic and psychological theory are not well suited for solving this task (Tønnessen, 1999b). By “mainstream” is here meant the

heritage from the coupling of linguistic formalism and cognitive psychology, which is considered to have given rise to cognitive science in the 1960s (Gumperz & Levinson, 1996). Our approach is based on a coupling of connectionism and linguistic functionalism (cf. Uppstad, in press). In the present chapter, it is claimed that a “common sense of text” has been challenged over the past decades, resulting in new knowledge about writing. However, it remains unclear how these different approaches relate to a unified conception of the *skills of writing*, resulting in reductionism of different kinds. This situation provides us with a number of normative descriptions, but few explanations. Therefore, descriptions of different aspects of writing should be treated as hypotheses concerning the skills of writing. In order to be able to *change* skills, we need explanations. But first of all, we need a methodology for going from descriptions to explanations.

In this chapter we suggest a model for the skills of writing. This model contrasts with important aspects of the common sense of text, and it has the potential to combine various insights gained from the different approaches to writing. It is based on the theoretical insights formulated as *thinking-for-writing* (Strömqvist, Nordqvist & Wengelin, 2004) and a nuanced understanding of *skill* (Tønnessen, 1999a). The benefit of doing so is twofold. First, we acquire a theoretical basis for how on-line measures relate to writing and cognition. Second, we acquire a tool for balancing two important aspects of human functioning, namely awareness and automaticity. The outcome of the chapter is an example of how the balance of end-product features and on-line measures can be operationalized. A pilot study of three bilingual pupils is used as an example of some of the theoretical and methodological questions raised in this chapter.

## 2 THE WRITING PROCESS

### 2.1 *The common sense of text and contrasting views*

For the case of *understanding*, let us draw a parallel between the issues of text and of law and justice. In the legal field, we have what we may call a common sense of justice, which influences most aspects of institutionalized justice. People’s opinions about right and wrong are relevant to the legislative and judicial powers, both concerning the coherence and interpretation of the law and concerning the equal practice of the law. We also know that the common sense of justice is incomplete for the domain of law and justice; but still, it cannot be fully disregarded.

It is tempting to claim the existence of an analogous *common sense of text*. This notion could be useful when we want to highlight aspects of text construction that do not correspond to such a common sense of text. Further, it is required in order to argue in favour of a conceptual space for on-line measures in the study of writing.

The essential part of the common sense of text has been inherited from classical rhetoric (Levy & Olive, 2002). A highly influential part of this heritage is the focus on the functions of texts as well as the speaker's more or less intellectual construction of a speech. The rhetorical ideals of text construction were for the speaker to touch emotionally, to instruct and to please the listener. A valuable aspect of rhetoric – at least in its dynamic epoch – is the attention directed towards language and linguistic choices likely to be successful in actual speech. According to this position, success in speaking is evaluated according to the agreement of intention and effect. In the course of history, as rhetoric was institutionalized by the Church – e.g. in scholasticism –, rhetoric became formalized and static. The unhappy outcome was the maintenance of the formalistic focus but the loss of the pragmatic source for the rhetorical work. This tradition has had a huge impact on how the process of text writing is considered up to our own time. We could say that the history of rhetoric has nourished what we may call the common sense of text, and that reflections on text are oriented along the axes of the rhetorical tradition. In our case, two assumptions forming part of the common sense of text are highly pertinent:

- First, *speech and writing are nothing but genres of text construction*. This implies an identical or similar basis for the processing of spoken and written texts. In the history of rhetoric, insights taken from speech were transposed to the domain of writing without any important distinctions being made between speech and writing. For our approach, this is unfortunate, because on-line measures in writing are interpreted within the same framework used for the production of spoken language.
- Second, *text construction is mainly a conscious enterprise*. This implies that constructing a text amounts to carrying out the intellectual work of choosing the words that fit the subject matter and, further, arranging these words and the text in a convenient way. All in all, it is a matter of problem-solving and choice in order to bring about the fulfilment of the speaker's intention. For our approach, this point of view is unfortunate because it does not differentiate between awareness and automaticity in text construction.

It is our claim that we need to clarify these two assumptions in order to proceed in exploring the relationship between process and product.

The early focus on creative writing in the 1960s is a clear case of opposition to the focus on the final product in the research and teaching of text construction. In fact, this approach was a reaction to the rhetorical idea that text construction is primarily an intentional enterprise in which meaning is something we have before we start formulating a text. Furthermore, it was a reaction to the formalistic approach to text construction. Indeed, the early focus on creative writing highlighted the non-intentional aspects of writing, but it has been criticized for exaggerating the focus on the creative process. In short, this approach is in clear opposition to the second assumption of the common sense of text, but it makes no important distinction as regards the first assumption mentioned above.

The works of Vygotsky and Bakhtin (Bakhtin, 1986; Vygotsky & Cole, 1978; Vygotsky & Kozulin, 1986) have generated many interesting contributions to the study and conception of writing, placing the arena of meaning in a social context. According to this position, meaning is not intentional in a strict sense, because it is always second to the social context (Kostouli, 2005). And owing to its social foundation, text construction cannot be primarily a matter of conscious problem-solving, either. This aspect raises the pertinent question of how these insights can be coupled with aspects of choice and problem-solving.

Cognitive approaches stand in contrast to the common sense of text in their focus on the *process* of writing. These approaches have focused on and identified strategies in writing, derived from “think-aloud protocols” (Bereiter & Scardamalia, 1987; Hayes & Flower, 1980; Smagorinsky, 1994), and they are grounded in cognitive psychology and may provide a record of some aspects of the conscious part of the writing process. Still, what is left open is how “processes” and “strategies” should be understood with regard to awareness and automaticity.

In the broader context of cognitive psychology, the study of temporal measures and pauses in both speech and writing has been gaining attention (Levy & Olive, 2002; Levy & Ransdell, 1996). The different approaches taken in this context tend to be compatible with what Schilperoord (2002) calls a “basic theory of language production processes”: “This theory posits four types of cognitive processes operative in text production: *planning* text and *retrieving* information from memory; *formulating* information that is retrieved; *monitoring* the text produced so far; and *repairing* already produced text.” (Schilperoord, 2002: 71). He further states: “Almost any cognitive theory of production I know starts from this distinction” (p. 71, note). However, the “processes” of the widespread “basic theory” are problematic in

an empirical sense, in that they presuppose the existence of separate processes. It is also difficult to see how these “processes” can be treated as good – i.e. falsifiable – hypotheses, given the following statement: “In principle, any interpretation attributed to a pause should be based on the basic theory” (Schilperoord, 2002: 75). Another point to be made is that the notion of “process” in cognitive psychology is claimed to be highly normative, and that “process” as a biological/physiological notion is mixed up with mental issues without any plausible explanation of how – or if – this is possible (Tønnessen, 1999b). As a consequence, the status of the notion of “process” – and therefore the basis of the “basic theory” – is highly vague and uncertain. Another characteristic of cognitive approaches to writing is the equation of production processes for spoken and written language. This is shown implicitly in Schilperoord (2002), where generalizations regarding pauses in written language are made on the basis of a speech corpus. In this sense, recent literature on writing shows that cognitive approaches tend to concur with the two above-mentioned assumptions inherent in the common sense of text, although they have qualified the second one in an important way.

The above-mentioned positions contrast with and extend the common sense of text by emphasizing aspects of text construction that have not been focused on earlier. But a major question still remains: can these aspects of the skills of writing be combined and operationalized without committing reductionism? The problem of reductionism can be illustrated by the well-known oriental parable of the blind men searching for a runaway elephant, where some got hold of the trunk while others got a grip of the tail; what they had in common was that they all claimed to be able to describe the elephant. Similarly, in focusing on one part of the object of study we risk overemphasizing the importance of this specific part without considering the object of study in its entirety. One major challenge when approaching the skills of writing is the question of how the different aspects of writing relate. In our view, the common sense of text *is* relevant to the study of writing. However, our claim is that we need to elaborate a platform for the study of writing that also contains plausible and testable positions concerning the two pertinent assumptions of the common sense of text. Among the contrasting views, cognitive approaches go far in focusing on both process and product. However, cognitive approaches also tend to concur the most with the two assumptions. What is more, Gumperz & Levinson (1996) claim that the rise of the cognitive sciences in the last part of 20<sup>th</sup> century is partly due to an interplay of linguistic formalism and cognitive psychology. In this sense, cognitive approaches are maintained both by a rich tradition of rhetoric and by a powerful combination of mentalistic approaches in psychology and

linguistics (Uppstad, in press). This paradigm is strong, although its empirical foundation in both linguistics and psychology has been questioned.

The present approach does not concur with the assumptions of this paradigm; instead, it is oriented towards linguistic functionalism and connectionism. This is not simply a matter of choice, but is guided by high standards of empirical science. In the following, we will outline how various features of the skills of writing can be combined in a way that involves a minimum of introspection and reductionism. The objective of this chapter is therefore to outline an alternative model for the skills of writing – a model that should be treated as a hypothesis. In the next section, this model will be elaborated in two steps which constitute alternatives to the two pertinent assumptions of the common sense of text. The first step represents a differentiation between speech and writing based on functional linguistics. The second step, which incorporates the insights of the first, represents a nuanced understanding of *skill* elaborated as a synthesis of behaviourism and cognitivism, based on the framework of connectionism.

## *2.2 First step: Thinking-for-writing*

The common sense of text has no operationalized differentiation between writing and speaking when it comes to cognition. Most differentiations are philosophical and relate to the text as a finished product. We suggest that the study of on-line measures should rely on a model where cognition is not abstracted away from the actual mode of communication: speaking versus writing. This argument is empirical, because the assumptions made about cognition in connection with writing may then be exposed to data. Otherwise, “cognition” will be too vague a concept to meet the standards of the empirical science of writing. From the viewpoint of the common sense of text, on-line measures do not make sense. First, in this tradition it is not clear if or how written language is systematic in a temporal way. Second, on-line measures are considered only as more or less random aspects of the path leading to the final text. While the cognitive approach has made these aspects more nuanced, it still retains the basic assumptions.

In other words: we need to reshuffle the cards and find out how the different aspects of writing are related, and further to find out how the on-line measures fit in with a series of arguments concerning the skills of writing. Dan I. Slobin’s theory of *thinking-for-speaking* (Slobin, 1996) focuses on how the speaker is influenced by the particular language he or she is using, thus concluding that this thinking-for-speaking is different in the world’s languages.

The title of Slobin's book chapter (1996) clearly shows the operationalization present in his perspective: "From 'thought and language' to 'thinking for speaking' ". Strömqvist et al. (2004) extend this position by means of the notions of *thinking-for-writing* and *thinking-for-signing*. According to their reasoning, the various modes of communication impose very basic constraints on cognition<sup>1</sup>. What is more, the constraints of on-line communication are highly different in speaking, writing and signing. In spoken communication, there are strong constraints of on-line processing, resulting in a high production rate and few pauses. In writing, however, neither a lower production rate nor more and/or longer pauses hamper communication. Taken together, the approaches of Slobin (1996) and Strömqvist et al. (2004) may provide a powerful differentiation between speech and writing with regard to cognition. According to this differentiation, on-line measures become relevant as systematic effects of the specific constraints on writing. There is still a need to interpret these measures, but the major progress is found in how on-line measures are central to the skills of writing. Like thinking-for-speaking, thinking-for-writing is considered to be language-specific. In a sense, this means that the relationship between writing and cognition is, at the same time, both relativized (from a universal perspective) and operationalized.

### *2.3 Second step: The notion of skill*

Having established a differentiation between speech and writing with regard to cognition, we now arrive at the challenge of how to evaluate awareness versus automaticity in writing. This challenge is part of the conceptual work of relating on-line measures to other aspects of writing, for instance the "think-aloud protocols" of Hayes & Flower (1980). Our approach relies on an understanding of writing as a *skill* as described by Tønnessen (1999a), who maintains that a skill involves both automaticity and awareness. Common to activities in connection with which the term "skill" could be used is that they all have to be carried out with some cognitive participation. "In both the learning and the performance of a skill our cognitive faculties are engaged (cf. for example: Colley & Beech, 1989; Ericsson & Smith, 1991). It is difficult to say precisely what the cognitive participation consists of, but we know it is there when a task is done better consciously than unconsciously." (Tønnessen, 1999a). Skill is therefore seen as the flexible combination of automaticity and awareness. An important point here is that awareness and automaticity can hardly be assessed or evaluated separately; according to Tønnessen (1999a), the belief in such separability is a major

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<sup>1</sup> See also Wallace Chafe's notion of "adaptation" in this context (Chafe, 1994).

weakness of assessment tools for dyslexia which are based on cognitive psychology. This nuanced understanding of “skill” also implies that the balance of automaticity and awareness is not static in the language learner (or in any person possessing or acquiring any skill), but rather in constant change. By considering writing as a skill, we will stress that the basis for the study of writing must be the dynamic interplay of automaticity and awareness. Focusing on either part only will lead to reductionism: “The demands made on cognition vary from skill to skill, but the cases where a practical skill needs explicit theoretical knowledge or understanding are comparatively rare.” (Tønnessen, 1999a). This also means that on-line measures are intertwined with and therefore relevant to other aspects of text construction. According to Tønnessen, the notion of skill is best conceived as a sound synthesis of behaviourism and cognitive psychology. While behaviourism turned out to be too mechanistic, cognitive psychology became too intellectualistic, and this leads Tønnessen to ask: “Does this mean that two important aspects of decoding have to be described by two different schools of psychology? Are two basically incompatible theories of learning being used to describe and analyse the decoding process? If so, is there any way of uniting these two factors under the same concept of learning?” (1999a: 92). His answer is that such unity is possible in the framework of connectionism. This position provides important perspectives on how primarily intellectual approaches – such as the rhetorical tradition and cognitive approaches to writing (Hayes & Flower, 1980) – can be related to approaches focusing on creative writing (Elbow, 1973) and to approaches with a social focus, inspired by the works of Bakhtin and Vygotsky. The danger lurking in all this is reductionism, and we should constantly question componential approaches to what writing is: “A skill consists of both performance and awareness, but is more than the sum of these parts.” (Tønnessen, 1999a).

In many important aspects, we consider the writing process to be similar to the reading process. When it comes to awareness, even very able writers – as well as readers – need a certain amount of more automatized *monitoring* when writing simple texts (Tønnessen, 1999a). With more advanced tasks, for instance naming and referring, the writing process demands a more conscious *steering* (Tønnessen, 1999a). Different tasks locate the writing process on a continuum ranging from monitoring to steering, where every point along the continuum represents a combination of automaticity and awareness. Even at the end-points, it is never a matter of automaticity only or awareness only; the two aspects are always intertwined in different ways: “Automaticity, then, is not the goal, but rather achieving a flexible combination of automaticity and cognitive participation.” (Tønnessen, 1999a).

We have now presented a model for how on-line measures can be combined with other important factors of text construction. What still remains is to outline how we can relate these measures to aspects of the end product. This enterprise corresponds to the claim made by Strömquist et al., who “believe that the coupling of on-line studies of linguistic behaviour and the flow of discourse in both speech and writing with analyses of linguistic information encoding will pave the way for a richer and more fruitful scientific investigation of the production, perception/understanding, and acquisition of language” (Strömquist et al., 2004: 369). In order to find such a coupling, it is suggested that both end-product and on-line measures should be considered as important features of the skills of writing (Levy & Ransdell, 1996). However, to be able to *explain* writing behaviour, our model focuses on *writing* and not on texts that *have been written*. On-line measures should not be conceived simply as pathways leading up to the end product – such a conception of “process” represents only a slight modification of the common sense of text.

The investigation of temporal aspects of writing may reveal certain basic prerequisites for producing good texts. It is possible to identify temporal patterns that relate to different groups of writers (Levy & Ransdell, 1996; Wengelin, 2002; Wengelin & Strömquist, 2005). The point here is not to establish isomorphy between patterns and cognitive functions, because that may very well result in pure introspection. We cannot know the relationship between patterns and cognitive functions, and therefore, in order to ensure their hypothetical character, patterns should be seen as no more than patterns. Rather, what we should do is to identify patterns of writing behaviour – based on on-line measures – and relate them to groups of writers who, say, write better texts than other groups of writers. This clearly amounts to extensive work, but nevertheless this is how to proceed if we want to explore the skills of writing and not only aspects of text. Based on this reasoning, it is hypothesized that profiles of writing behaviour can be identified and related to the evaluation of the end product. Temporal patterns show both the rhetorical work of text construction and processes in a biological/physiological sense. We cannot easily separate these, but we can observe how writing unfolds in real time and what comes out of this effort at the end. We believe that our model is well suited for this enterprise. With regard to the complex interplay of biological processes and rhetorical work, we may further ask whether assessment of *reading comprehension* can support the exploration of different writing profiles. Such questions touch upon the deeper relationship between reading and writing as well as upon the question of whether creativity in writing and reading is fundamentally different from automatic behaviour. According to our position, it is not.

In this section, we have argued for a model for the skills of writing whose theoretical preferences differ from those of mainstream linguistic and psychological theory in writing research. It is argued that this approach meets high standards of empirical science and that it contributes to a platform for studying the process–product relationship in individuals. This model suggests solutions to two controversial issues of the past century: the relationship between spoken and written language (cf. Linell 1982) and that between automaticity and awareness (cf. Tønnessen, 1999a).

In order to show how these theoretical arguments can be applied in practice, we will turn to an example of bilingual pupils' writing in two languages.

### 3 AN EXAMPLE

#### *3.1 Subjects, tasks and procedure of analysis*

Our example is drawn from a pilot project on bilingual literacy focusing on the writing behaviour of three pupils in their two languages. The pupils, called Heidi, Susan and Carla, were all eleven years old when the project started, all were born in Norway and all of them are bilingual in English and Norwegian. One year before the project, they had also all participated in the international PIRLS study (see Mullis et al., 2003), which assesses reading literacy in the national language (in our case Norwegian), where they spread out nicely above and below the international mean score (Carla: 609, Susan: 543, Heidi: 484; international mean: 500). What is presented here is the writing experiment included in the pilot study (Wagner & Uppstad, 2005). The pilot study was undertaken to explore aspects of the relationship between thought and language in bilinguals writing in Norwegian and English, in order to form more precise hypotheses about this relationship. We will first outline the method and design of the writing experiment and then go on to discuss some features of this experiment. Finally, we will show how these features illustrate our theoretical position.

The pilot study has an overall design of texts written in a specific order (see Figure 1). In total, the example consists of twelve texts, four by each pupil. The on-line measures are derived from recordings of these twelve texts. This design enables assumptions and predictions to be made about a hypothetical bilingual pupil whose strongest language is considered to be Norwegian. Upper-case letters in the figure indicate a major effort, while lower-case letters indicate a minor effort; “major” and “minor” effort here refer to the fluency observed, which is taken to indicate that some contexts are easier to perform in than others. In the pilot study, the design incorporated rather precise predictions of effort in performance,

where Condition B was thought likely to be the most demanding (see Wagner & Uppstad, 2005).

June 2002		December 2002	
Condition A: Norwegian	Condition B: English	Condition C: English	Condition D: Norwegian
THINK	THINK	think	think
write	WRITE	WRITE	write

*Figure 1:*

*Design. For the group of pupils, Norwegian is considered to be the strongest language. Upper-case letters indicate a major effort while lower-case letters indicate a minor effort (Wagner & Uppstad, 2005).*

The three pupils are all bilingual girls, with English and Norwegian as their two languages. The first two texts were written at the end of the fifth grade (when the pupils were eleven years old), and the last two were written six months later. All of the pupils attend Norwegian schools and all of them follow the ordinary syllabus of English as a foreign language. The texts were written in ScriptLog (Strömquist & Karlsson, 2001)<sup>2</sup>, an advanced computer tool for key-logging that enables the study of writing on-line. The program has a specific module for designing writing experiments, and in our case we set up a picture-elicited writing task using *The Space Story* (Nordqvist et al., 2002, Nordqvist, Leiwo, & Lyytinen, 2003))<sup>3</sup>. The Space Story is designed specifically for ten-year-olds and consists of eight pictures telling the story of a space adventure. The pupils click through the pictures, one at the time; they are not allowed to go back to the previous picture. They always see the whole text that they have written, and they can revise it at any time. Each pupil's four texts were written in a specific order (see Figure 1): At the first session (June 2002), the pupils first wrote their story in Norwegian (A). Then, after a five-minute break, followed the second recording, where the pupils wrote about the same pictures, but this time in English (B). At the second session (December 2002), they wrote the same story again, but then they first wrote in English (C) and then in Norwegian (D). The fact that the pupils thus produced texts based on the same pictures four times will naturally have lead to a decline in effort. The pupils were told that

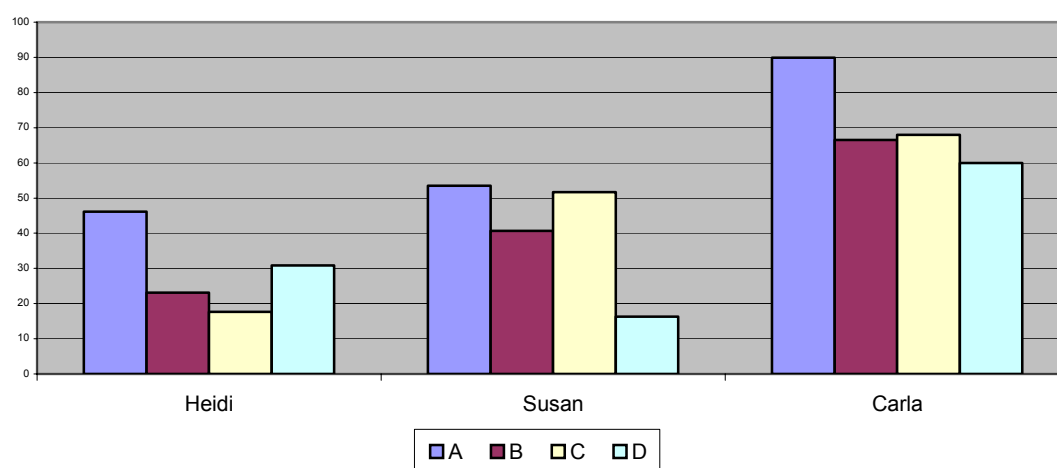
<sup>2</sup> For further information and demonstration of ScriptLog, please visit [www.ScriptLog.net](http://www.ScriptLog.net)

<sup>3</sup> For further information about *The Space Story*, please visit the project pages of "Early language development, early literacy and dyslexia", [www.jyu.fi/fennicum/wriproject/jld/index.htm](http://www.jyu.fi/fennicum/wriproject/jld/index.htm)

they could use as much time as they wanted on writing, and we emphasized that they were not supposed to translate the story in the second writing. They all knew that they participated in a research project, and we told them to perform at their very best. However, they also knew that the project was voluntary and that the texts were not going to be judged by their teacher.

### 3.2 Results and discussion

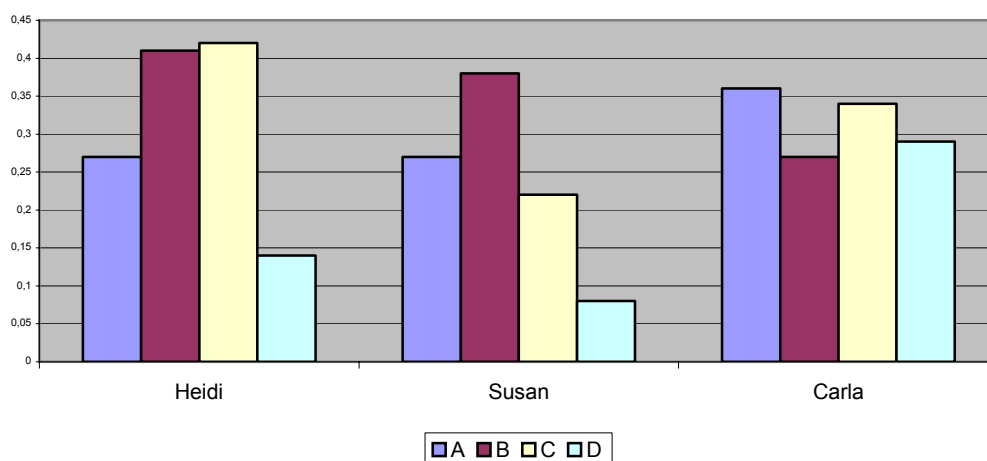
In the pilot study, we used lexical diversity as an end-product feature. Lexical diversity expresses the ratio of the number of different word types and the total number of words, and it is measured by means of VOCD (Malvern & Richards, 1997), a measure that also takes into account differing text lengths. Although there are methodological problems involved in comparisons of lexical diversity across languages owing to typological differences, we believe that the differences between English and Norwegian in this respect are truly minimal. Consequently, the patterns of lexical diversity combined with on-line measures across the four conditions may give us information about aspects of thinking-for-writing in the bilinguals' language profiles. With regard to end-product features, the pattern of lexical diversity was validated by means of a traditional qualitative text evaluation performed by six adults with extensive experience of texts. It is, however, an empirical question whether the VOCD measure can in fact be the benchmark called for by Levy & Ransdell (1996).



*Figure 2:*  
Lexical diversity. The vertical axis indicates the VOCD measure according to Malvern & Richards (1997), and the horizontal axis indicates the order of recordings for the three pupils (Wagner & Uppstad, 2005).

We see that the measure of lexical diversity decreases for all three pupils between the first and the second text; the effort is greatest when the picture series is unfamiliar. We also notice a difference between Susan and Carla on the one hand, whose lexical diversity is always linked to the order of the languages, and Heidi on the other hand, whose lexical diversity is linked to the specific language (Norwegian always has a higher diversity, regardless of the order of the two languages).

When it comes to on-line measures, we have focused on pausing time in writing. The notion of on-line measures refers to transition times between events on a keyboard, in which temporal patterns of writing activity can be studied. Pauses are studied by means of ScriptLog, and a pause is here defined, in all contexts, as a stop lasting five seconds or more. In research using key-logging, a two-second criterion is most often used (Strömqvist et al., in press). While a five-second pause may thus seem rather a long stop, it should be noted that these pupils' keyboard skills are not at the expert level, and a five-second pause is clearly distinct from their average transition times between letters. By means of this definition of a pause, we believe that what we capture are transition times that concern primarily the more steering-related aspects on the awareness–automaticity continuum. Our interest lies in how these aspects relate to different layers in the process of writing for different pupils. We believe that this is an important point concerning the flexible combination of automaticity and cognitive participation.



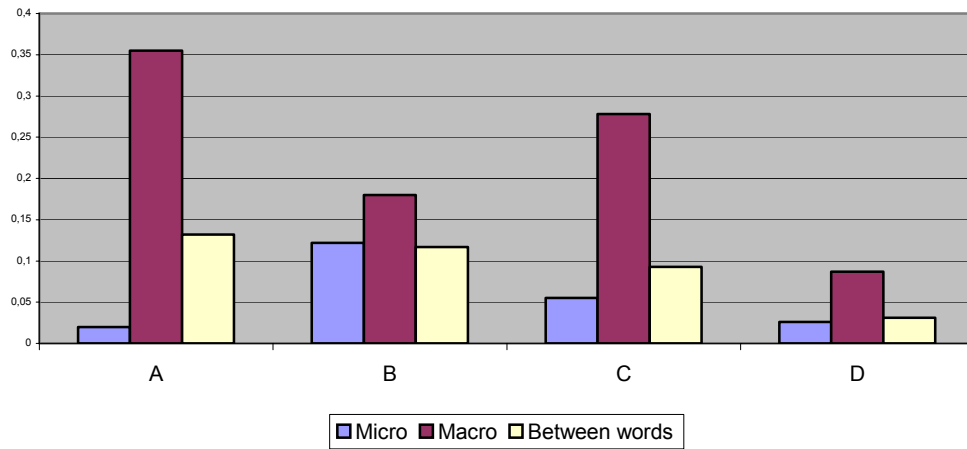
*Figure 3:*

*Overall pausing time. The vertical axis indicates the proportion of the total writing time devoted to pauses, and the horizontal axis indicates the order of recordings for the three pupils (Wagner & Uppstad, 2005).*

However, it should be remarked that our approach represents only one aspect of the huge material of on-line measures provided by key-logging tools. Figure 3 shows how much time each pupil spent on pausing in relation to total writing time. We notice that Carla's four texts are more equal in pausing time than the other two pupils' texts. What is more, Carla's pausing pattern is associated with recording order, as is her lexical diversity, whereas Heidi's and Susan's pausing patterns follow language in the sense that their English texts always have the largest amount of pausing in each session. However, the figure gives us only the overall pausing time; it does not say anything about what the pupils actually do when pausing. In the pilot study, we therefore defined three main pause contexts:

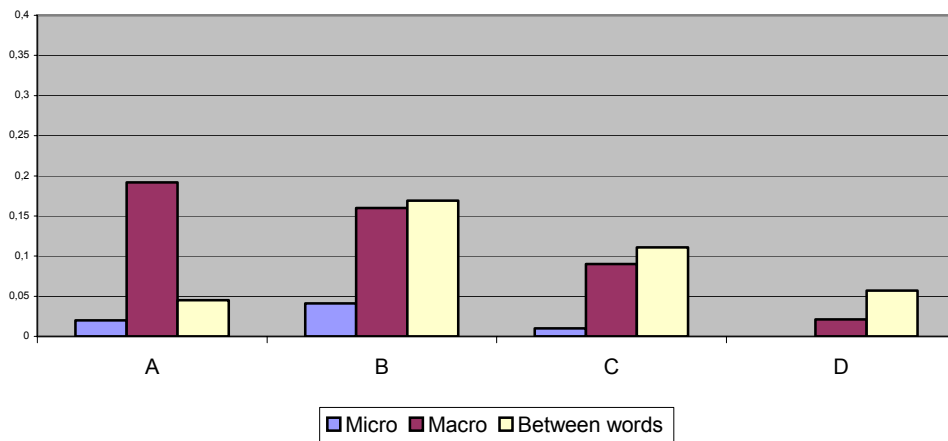
- Micro contexts, which include pauses made inside words and pauses related to correction of the latest word written;
- Macro contexts, which include pauses made before a major delimiter (full stop, question mark), pauses made after a major delimiter and pauses related to correction of something other than the latest word written;
- Pauses made between words.

These three contexts were defined based on an analysis of six different pause contexts, among which five were defined by reference to traces of some specific event and one was defined by the absence of such traces. The function of this latter type of pause context is most unclear, as we have no logged traces of what the pupils were doing. Nevertheless, this context is clearly distinguished from the other contexts and certainly involves cognitive participation in searching for words in general among poor writers and for convenient words among skilled writers. We expect to find differences between stronger and weaker writers as regards these different pause functions (see Wengelin, 2002).



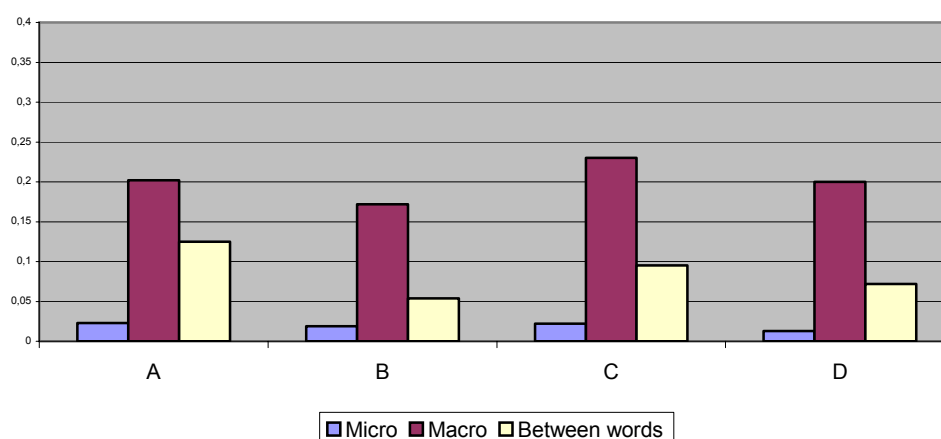
*Figure 4a:*

*Heidi's pause contexts. The vertical axis indicates the proportion of the total writing time, and the horizontal axis indicates the different pause contexts in the four recordings (Wagner & Uppstad, 2005).*



*Figure 4b:*

*Susan's pause contexts. The vertical axis indicates the proportion of the total writing time, and the horizontal axis indicates the different pause contexts in the four recordings (after Wagner & Uppstad, 2005).*



*Figure 4c:*

*Carla's pause contexts. The vertical axis indicates the proportion of the total writing time, and the horizontal axis indicates the different pause contexts in the four recordings (after Wagner & Uppstad, 2005).*

Heidi's most prominent pauses (Figure 4a) are probably those related to the two texts written first in each session (Conditions A and C), and the pause context is associated with the function of planning a new sentence. We consider this to be a general pattern, due to the work of elaborating the narrative plot in a text. Susan's most prominent context (Figure 4b) is the one between words, which is associated with both English texts. Carla's texts (Figure 4c), in fact, reveal no clear prominent pause contexts; the only possible candidate is the time spent on macro corrections in one of the English texts (Condition C). Across all three pupils, even when we look at some specific pause patterns, we see that they apparently exploit their pausing time differently<sup>4</sup>. With regard to diversity, a strong pupil, such as Carla, seems to benefit from her pausing; she probably searches for the appropriate word or phrase and thus obtains a high level of lexical diversity. The weaker pupil, however, will search for words in general, with low diversity as a consequence (Wagner & Uppstad, 2005).

From the analysis above, we have hypothesized that pausing time is associated with different phenomena. First, Carla's pausing time is longest in the first text in each session (Conditions A and C). Heidi's pausing time, on the other hand, is longest each time she writes in English. Second, the three pupils exploit their pausing time differently, as indicated by the lack of correlation between lexical diversity and pausing time.

<sup>4</sup> For a more detailed analysis of these profiles, see Wagner & Uppstad (2005).

However, the comparison of on-line measures and end-product features is not our primary concern. Instead, our primary interest is how to deal with cognitive participation in writing, because we believe that this issue needs clarification in order for us to proceed in discussing the relationship between process and product. Without such clarification, we will easily end up focusing on aspects of finished texts and lose sight of other important aspects of the skills of writing. Therefore, the on-line measures are not secondary to aspects of text; rather, on-line measures and aspects of texts are equally important features of the skills of writing. The distribution of pause contexts in the three pupils (Figure 4a–c) is interpreted as indicative of how different pupils' writing behaviour is differentiated with regard to aspects of steering. In Heidi's case, the indications of steering in micro contexts in her English text are interesting as regards her skills of writing. Likewise, the fact that the amount of pausing time in the three pause contexts differs across the conditions is interesting with regard to her bilingualism. When it comes to Susan (Figure 4b), she writes without corrections and without extensive planning. Her overall pausing time is also much shorter than that of the other two pupils, which indicates that she writes in a rather fluent way. Still, this fact does not necessarily mean that she is a skilled writer. In her case, the indications of steering in the pause context between words may represent an important feature of her skills of writing. Concerning Carla (Figure 4c), there are only minor differences between the conditions, specifically a longer pausing time in the first recording of each session, probably owing to the unfamiliarity of the plot. Besides this fact, Carla seems to do the same things in every context, and comes across as a skilled writer in both languages. The regular pause patterns throughout her four texts are a strong indication of her well-developed writing skills, with regard to both automatic and creative aspects of writing.

We believe that these examples show how temporal measures point to important basic insights concerning thinking-for-writing (Strömqvist et al., in press). We also consider that the temporal patterns found in our pilot study – though limited – indicate that talking of “strategies” in a more intellectual sense is rather remote from what the skills of writing are really about. We believe that these patterns should be interpreted from the viewpoint of an understanding of “skill” as the good combination of automaticity and awareness. This is a point that becomes evident in, for example, Heidi's bilingualism, but it is considered to be of equal relevance to monolinguals learning written language.

#### 4 CONCLUSION

In scientific studies of the skills of writing, we consider it a major goal to reduce introspection and reductionism. In this chapter, we have so far suggested that reductionism can be reduced if we focus on how different approaches to writing may be combined. Introspection can be reduced if we leave the intellectualistic or cognitive approach to writing, and focus instead on the important interplay of awareness and automaticity.

Still, these reflections only hint at the direction we should take. Without a clear scientific procedure, they are simply some interesting points of view. In approaching the skills of writing, we need a procedure in order to achieve our ambitious goals. The major tasks of science concern *understanding*, *description* and *explanation*, and the procedure followed in approaching the skills of writing should be differentiated according to these three domains. Importantly, the domains of understanding, description and explanation cannot be separated, because they interact. Still, however, they should be differentiated. We claim that the lack of such differentiation is part of the reason for the reductionism that can be identified in some scientific studies of writing. With the notions of *thinking-for-writing* and *skill*, we believe ourselves to be able to discern between matters of description, explanation and understanding in a fruitful way: Thinking-for-writing enables us to make testable descriptions of writing associated with cognition. The important interplay of awareness and automaticity encompassed by the notion of *skill* belongs primarily to the domain of explanation.

In approaching the skills of writing, researchers should be conscious of which domain (understanding, description or explanation) they are focusing on at different points of time. We believe that the confusion of these domains hampers both progress in research and success in teaching. The domain of *understanding* is primarily about the immediate experience of a phenomenon, involving empathy. The domain of *description* is primarily about the logical coherence of conscious knowledge, with an emphasis on cognitive/intellectual abilities. The description is not objective, owing to subjective limitations in the use of language and in perception. The domain of *explanation* is reserved for causal relations. The units of description should not be used *a priori* in the causal explanation, in order to avoid circular explanations. In our case, the patterns of on-line measures concern primarily the domain of description. These patterns are hypothetical constructs which relate to the domains of both understanding and explanation, but without being fully valid in either of them. This clearly indicates how the domains cannot be

separated, even though they must still be differentiated. When these patterns are used in explanations, their hypothetical character cannot be overestimated. If differentiation is not maintained, what we will get are descriptions disguised as explanations. Such a situation will be fatal to teaching. When we emphasize the interplay of automaticity and awareness, we raise questions of the common denominator of the skills of writing. At the same time, we also raise the question of the relationship between the skills of reading and writing. These questions are highly related to matters of *explanation*. Reading and writing performance can be described differently, but the question is whether they can be explained in similar ways.

We should note that the coupling of on-line measures and end-product assessment is primarily a matter of description, not of explanation. Levy & Ransdell (1996) highlight the importance of finding causal relationships – explanations: “[I]t would be important to know whether this relation is causal or merely correlational. If it is causal, then possibly with a sufficiently clever methodology, it should be feasible to intervene in the writing process, nurture the appropriate pattern, and thereby enhance the finished work” (p. 159). Our contribution to such a methodology is a model for the skills of writing that has a potential for explanation and avoids introspection. The connectionist position maintained by Tønnessen (1999a) represents a framework for explaining how patterns come about, in a way that cognitive psychology and folk psychology never could. In teaching writing, both understanding and explanation are required. The teacher must focus on aspects of writing that can be understood, and further reflect on explanations in order to provoke change and progress. As for researchers, their scientific enterprise is continuously to differentiate between – not separate – the domains in order to gain new insights and ensure the quality of the research. Following the pathway outlined here, this amounts to keeping temporal patterns as hypothetical patterns in descriptions without connecting them directly to cognitive functioning. This indirect, hypothetical relationship is what lies in the notion of skill, where awareness cannot be separated from automaticity.

In this chapter, we have argued for the relevance of temporal patterns in text writing. These patterns are descriptive, and the question of this chapter is how to relate them to the process of writing. In our effort to approach the skills of writing, we have exemplified how to conceive of cognitive participation in writing. This is first done by drawing on the position of thinking-for-writing (Strömquist, et al, 2004), which provides a basis for the *description* of central aspects of the skills of writing. This theoretical position further opens for a nuanced conception of “skill” (Tønnessen, 1999a) in order to *explain* central aspects of the skills of writing.

It may be questioned whether we need a theoretical platform that may appear as additional to mainstream theory. As an evaluation criterion, one may investigate the risk of circularity, introspection and reductionism in the different platforms. Such flaws of science are proposed to be identifiable in the lack of differentiation concerning description, explanation and matters of understanding.

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