

Effects of writing beliefs and planning on writing performance

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### Abstract

White and Bruning (2005) distinguished two sets of writing beliefs: transactional and transmissional beliefs. In this paper we analyse their beliefs scale and suggest two hypotheses about how such beliefs relate to writing performance. The single-process hypothesis treats the beliefs as different amounts of engagement, whereas the dual-process hypothesis claims that the beliefs represent different types of engagement. We then describe the results of an experiment with 84 university students as participants that assessed the relationship between writing beliefs, different forms of pre-planning and different aspects of writing performance. Our results support the dual-process hypothesis, and suggest that transactional beliefs are about the preference for a top-down strategy or a bottom-up strategy, while transmissional beliefs are about the content that is written about. These beliefs interact in their effects on text quality, the amount and type of revision carried out, and the extent to which writers develop their understanding. They also moderate the effectiveness of outlining as a strategy.

*Keywords:* writing beliefs; writing strategies; text quality; writing processes; development of understanding.

## 1. Introduction

Performance of higher level cognitive tasks is influenced by people's conceptions of what the task involves. This is particularly true of a complex production task like writing where the "stimulus" for the writer's response comes from within the individual writer as opposed to a comprehension task where this can be objectively specified for all participants. Although the importance of task definition in writing has long been recognized (Bereiter & Scardamalia, 1987), it has typically been looked at within the context of specific tasks – how the problem representation is defined and developed, and how this then influences other aspects of the process – rather than as a more general characteristic that individuals bring to the task.

Recently, however, White and Bruning (2005) have developed a writing beliefs inventory designed to assess individual differences in conceptions of writing (see also Sanders-Reio, Alexander, Reio & Newman, 2014). Such individual differences are important not just in determining how individuals go about writing but also as a potential moderator of the effects of different writing interventions (Kieft, Rijlaarsdam & van den Bergh, 2008). White and Bruning showed that writing beliefs are systematically related to the quality of the text that writers produce, and speculated that this was because writing beliefs affect writers' engagement with the writing process. They did not, however, go into detail about the form that engagement takes in the writing process.

Our first aim in this paper is to flesh out what engagement might consist of in the context of writing. We will suggest two alternative possibilities. The first is a single-process hypothesis. It assumes, essentially, that writing beliefs affect writing quality by influencing the extent to which writers engage in knowledge-transforming processes during writing (Bereiter & Scardamalia, 1987). The second is a dual-process hypothesis. It assumes that effective writing depends on a combination of two conflicting processes – high-level problem solving and spontaneous text production – and that writing beliefs influence the extent to

which writers prioritise these two processes (Galbraith, 2009). The key difference being that the single-process hypothesis assumes that engagement varies along a single dimension – from low to high engagement – whereas the dual-process hypothesis assumes that it varies between different types of engagement.

Our second aim is to test these hypotheses. We will do this in two ways. First, we will assess effects, not just on text quality, but also on the extent to which writers revise their texts during writing, and on the extent to which they develop their understanding as a consequence of writing. We will argue that the single-process hypothesis predicts that the measures will vary in a similar way: writers who produce higher quality text will also engage in greater amounts of revision and experience greater developments of understanding as a consequence of writing. By contrast, the dual-process hypothesis, which assumes that the two conflicting processes make different contributions to text quality and the development of understanding, predicts that effects on these measures will vary depending on the way in which writers with different beliefs prioritise the two conflicting processes.

Second, we will manipulate the type of planning carried out before writing. Previous research has suggested that making an outline before writing enables writers to carry out higher-level problem solving more effectively than when writing is not pre-planned and hence is typically associated with the production of higher quality text (Galbraith, Ford, Walker & Ford, 2005; Kellogg, 1988, 1994). We will argue that the two hypotheses make different predictions about the effect that outlining will have for writers with different writing beliefs. The single-process hypothesis predicts that outlining will have similar effects on text quality and the development of understanding, and that this will be the same for writers with different writing beliefs. By contrast, the dual-process hypothesis predicts that the effect of outlining will vary depending on the extent to which writers with different beliefs prioritise higher-level

problem solving processes, and will have differential effects on text quality and the development of understanding.

In the following sections, we first describe the specific writing beliefs identified by White and Bruning. We then explain the basis for the single- and dual-process hypotheses in cognitive models of writing. We conclude by outlining the specific predictions of the two hypotheses about the effects of writing beliefs under different planning conditions on text quality, revision during writing and the development of understanding.

### **1.1 Implicit Writing Beliefs**

The Writing Beliefs Inventory (White & Bruning, 2005) consists of two uncorrelated sub-scales. One, the *transmissional beliefs* scale, represents a belief that writing involves the transmission of information from authoritative sources to the reader. Highly loading items include: “Writing’s main purpose is to give other people information”, and “Writing should focus around the information in books and articles”. The other, the *transactional beliefs* scale, represents the belief that writing is an emotional experience which involves the development of understanding as the text is built. Highly loading items include: “Writing helps me understand better what I’m thinking about”, and “Writing often involves peak experiences”.

White and Bruning found that writers with high transactional beliefs produced better quality text than writers with low transactional beliefs, and that writers with low transmissional beliefs produced better texts than writers with high transmissional beliefs. There was no interaction between these variables; hence, the two sets of beliefs had independent and additive effects on writing quality. In addition, they found that writers with high transactional beliefs or low transmissional beliefs were more likely to view writing as a means of self-expression and were more likely to write for pleasure than writers with low transactional beliefs or high transmissional beliefs. Overall, this research suggests that the two

sets of beliefs are associated with differences in writing performance and attitudes towards writing.

These findings are straightforward. What is much less clear is how the relationship between the two sets of beliefs is conceptualized and why they lead to differences in writing performance. In their paper, White and Bruning suggest that the two scales map on to a single underlying dimension of engagement. Thus, they suggest that writers with “predominantly *transmissional* writing beliefs (e.g., a high transmissional–low transactional belief configuration) would demonstrate lower levels of affective and cognitive engagement during the writing process” and that writers with “predominantly *transactional* writing beliefs (e.g., a high transactional–low transmissional belief configuration) would demonstrate higher levels of affective and cognitive engagement during the writing process” (White & Bruning, p. 168). The problem with this is that it implies that the two sets of beliefs are similar beliefs in being either predominantly transactional or predominantly transmissional. In doing so, they emphasize their similar hypothetical effects on engagement but ignore their empirical status as independent beliefs.

To overcome this ambiguity, we propose two solutions. First, we will restrict the terms “transmissional” and “transactional” to refer to the two sets of empirically independent beliefs, and use the term “engagement” to refer to the hypothetical underlying dimension through which White and Bruning assume they have their effects. Second, we propose that the difference between the two sets of beliefs is, as indicated by the items that load on the two scales, a difference between “transmissional” beliefs about the *source of content* in writing (whether it should involve authoritative sources or not) and “transactional beliefs” about the *process of writing* (whether or not it involves the development of ideas during the course of writing). The fact that the scales are uncorrelated indicates that it is possible to believe, for

example, that the process does involve developing ideas during writing while at the same time believing that writing should be about the opinions of authoritative sources.

Overall, we draw two conclusions from White and Bruning's research. First, they have identified empirically two independent sets beliefs about writing. We have added to this the suggestion that transactional beliefs are primarily about the process of writing whereas transmissional beliefs are primarily about the source of the content. Second, although the two sets of beliefs could in principle affect writing performance in different ways, White and Bruning hypothesize that they in fact have their effects through a single underlying dimension of engagement. Writers with predominantly transactional beliefs are assumed to "view the purpose of writing as a way to personally and critically construct the text by actively engaging their own thinking into the process" (White & Bruning, 2005, p. 168). Writers with predominantly transmissional beliefs are assumed to "envision writing as a way to transfer information from authoritative sources to the reader in a manner that limits how the writer's ideas are reflected in the text" (ibid. p.168). In the next section we consider two contrasting accounts of the processes that might be involved in writers "actively engaging their own thinking into the process".

## **1.2 What Is Engagement?**

Cognitive models of writing share the emphasis that writing is not simply a matter of translating preconceived ideas into language but that it is an active process in which writers develop ideas in the course of writing. This assumption maps directly onto the transactional beliefs scale, which we have argued reflects beliefs about how the process of writing should be carried out. There is a less direct correspondence with the transmissional beliefs scale, which we have argued is primarily concerned with the content to be written about.

### **1.2.1 The knowledge-transforming model.**

The account that is most directly related to White and Bruning's conception is Bereiter and Scardamalia's (1987) contrast between knowledge-telling and knowledge-transforming models of writing. The key difference between these models is the extent to which writing is treated as an active transaction with the reader. Thus, in the knowledge-telling model of writing, writing is treated as a matter of retrieving existing ideas from memory and translating them directly into words, with the resulting text reflecting the structure of ideas in the writer's long-term memory. By contrast, in the knowledge-transforming model, writing is guided by the writer's rhetorical goals with respect to the reader. These goals guide the retrieval of content, and the evaluation and modification of the text as it is produced. The result is that the structure of the text is tailored to the reader's needs and the writer's understanding develops as they accommodate their ideas to their rhetorical goals.

This contrast provides a clear candidate for the cognitive component of engagement. It suggests that high engagement - "actively engaging (one's) own thinking into the (writing) process" - involves adopting a knowledge-transforming approach to writing. By contrast, low engagement is equivalent to a knowledge-telling approach to writing. It also suggests that the affective component of engagement may relate to the extent to which writers experience writing as a process of authentic communication with a reader rather than simply as a matter of transcribing their ideas onto paper.

Under this interpretation of engagement, transactional beliefs are essentially beliefs about the extent to which writing is a knowledge-telling or a knowledge-transforming process, and transmissional beliefs are about the extent to which writing involves "sticking to sources" or incorporating one's own thinking into the process. Writers with high transmissional beliefs and low transactional beliefs would be expected to be the most extreme kind of knowledge teller, a writer who essentially summarises source texts without trying to explain them to their



reader. At the opposite extreme, writers with low transmissional beliefs and high transactional beliefs would be expected to write about their own personally constructed ideas rather than summarising external sources but in addition to tailor their ideas to the needs of the reader. Thus, the two independent sets of beliefs would map onto a single underlying dimension of engagement, ranging between a less effortful knowledge-telling process and a more purposeful knowledge-transforming process, and would influence the extent to which writers revise their texts, develop their understanding during writing, and ultimately the quality of the final product.

### **1.2.2 The dual-process model.**

Although Schraw and Bruning (1999) mention in the context of their research on reading that the implicit beliefs scale may be associated with the knowledge-telling and knowledge-transforming contrast, there is no explicit mention of rhetorical goals in either the reading beliefs scale or the writing beliefs scale (White & Bruning, 2005). Rather, the focus in White and Bruning's characterisation of the most highly engaged writers is on the personal involvement of the writer in the process.

This emphasis is shared in Galbraith's (1999, 2009) dual-process model of writing. The model claims that two different kinds of process are involved in effective writing. The first process is an explicit problem solving process in which pre-existing ideas are retrieved from an explicit memory store and then evaluated and organized in working memory in order to satisfy the writer's rhetorical goals. This is equivalent to the processes involved in the knowledge-transforming model and plays an important role in organizing content and tailoring it to the needs of the reader. The key difference is that the model assumes that, by itself, this process does not lead to developments in understanding, but only involves the reorganization of existing content.

The second process is a text production process in which content is synthesized according to the constraints within an implicit semantic memory system – characterized as the writer's disposition towards the topic. The key feature of this knowledge-constituting process is that, because it is implicitly controlled, the writer is unable to predict the content that will be produced, and hence the writer has to allow text production to unfold free from external constraints. It is this process which is responsible for the development of the writer's personal understanding during writing.

The model assumes that both these processes contribute to the overall quality of the text. The explicit organizing process is required to ensure that the text is organized and tailored to the needs of the reader; the implicitly controlled text production process is required to ensure that the text fully articulates the writer's understanding of the content. However, because the two processes operate according to different principles, they lead to a fundamental conflict in writing. Individual differences in writing strategy arise from the way that writers resolve this conflict. A top-down strategy prioritizes the explicit organizing process, focusing initially on establishing the global structure of the text and then on using this to control text production. A bottom-up strategy prioritizes the dispositionally-guided text production process, focusing initially on producing text that captures the writer's understanding and then on revising this to produce a rhetorically appropriate organization.

This has three important differences to the knowledge-transforming account of engagement. The first is that it attributes the development of understanding to dispositionally-guided text production, rather than to deliberate problem-solving to satisfy the needs of the reader. This implies that the high end of the transactional beliefs scale corresponds to a greater amount of personal involvement. Writers with high transactional beliefs are assumed to view writing as a matter of trying to articulate their implicit understanding of a topic through the process of text production. These writers would be expected to employ a bottom-

up strategy for combining the two conflicting processes involved in writing, and to develop their understanding in the course of writing. This fits with White and Bruning's characterization of engagement as "actively engaging (one's) own thinking into the process" but characterizes this thinking as something that is constituted in the text rather than as reflective thought about the text. It also corresponds with their finding that high transactional writers view writing as a means of self-expression and are more likely to write for personal pleasure.

On its own, this could be taken simply as an alternative account of what high engagement in writing is and hence as being compatible with White and Bruning's claim that writing beliefs have their effects through a single underlying dimension. However, the second difference between the dual-process model and the knowledge-transforming model is that the writers at the low end of the transactional beliefs scale are not assumed to view writing as a passive process of knowledge-telling but rather to view it as an active process in which top-down control is imposed on writing. This is an equally active process but does not involve the development of understanding. Overall, then, the dual-process model views the transactional beliefs scale as a contrast between a top-down conception of writing and bottom-up conception of writing.

Finally, the dual-process model takes White and Bruning's finding that transactional beliefs are independent of writers' transactional beliefs at face value, and treats these as independent beliefs. This leaves open the possibility that transactional and transactional beliefs may interact with one another.

### **1.3 Two Alternative Hypotheses**

These two alternative accounts of the cognitive processes involved in effective writing and their relationship to the development of understanding lead to two alternative hypotheses

about the nature of engagement in writing, and the relationship between writing beliefs and writing performance.

### **1.3.1 The single-process hypothesis.**

From the perspective of the single-process hypothesis, transactional and transmissional beliefs are assumed to have their effects through a single underlying dimension of engagement which corresponds to a contrast between a knowledge-telling approach to writing and a knowledge-transforming approach to writing. The essential feature of this hypothesis is that the two sets of writing beliefs are predicted to have additive effects on writing performance, and to have a common effect on different aspects of writing performance.

### **1.3.2 The dual-process hypothesis.**

From a dual-process perspective, transactional beliefs are assumed to be beliefs about the extent to which the writing process should be a top-down or a bottom-up process. Transmissional beliefs are assumed to be beliefs about the type of content to be written about but not in themselves to have a direct influence on the process that the writer engages in. The essential feature of this hypothesis is that it predicts that the different types of writing beliefs will interact in their effects on performance, and that they will have differential effects on different aspects of writing performance.

## **1.4 This Study**

In developing these two alternative hypotheses about the nature of engagement, and the processes involved, in writing, we have identified potential effects of writing beliefs, not just on text quality, as in White and Bruning's original experiment, but also on the extent to which writers experience developments of understanding during writing, and on the extent to which they revise their text during writing. Our first aim in this study, therefore, was to assess the effects of writing beliefs on a more extended range of aspects of writing by including

measures of the development of understanding and amount of text modification along with a measure of text quality.

The fundamental distinction between the two hypotheses is the role that they give to high-level problem solving in writing. For the single-process hypothesis, this is the key ingredient in both the development of understanding and the production of high quality text. By contrast, for the dual-process hypothesis, although this makes an important contribution to text quality, it is not responsible for the development of understanding, and actively conflicts with dispositionally-guided text production, which is assumed to be responsible for the development of understanding. It follows that manipulating the extent to which high-level problem solving can be carried out during writing should enable the contrasting predictions of the two hypotheses to be tested. Previous research (Galbraith et al., 2005; Kellogg, 1988, 1994) has consistently shown that making an outline before writing leads to improved text quality. It is assumed that this is because separating explicit planning and organizing processes from detailed text production reduces the cognitive load during writing, and enables writers to carry out high-level problem solving more effectively. In this study, we therefore compared an outline condition, in which writers were given five minutes to make an outline, with a non-outline condition – similar to White and Bruning’s original study, in which participants were given five minutes to write down a single sentence summing up their overall opinion of the topic. We expected that high-level problem solving should be facilitated in the outline planning condition compared to the non-outline condition. In the following sections, we specify the contrasting predictions of the two hypotheses for the combined effects of writing beliefs and type of planning on each of the dependent variables.

### **1.4.1 Text quality.**

In general, following Kellogg's research, outlining would be expected to lead to an improvement in text quality. However, the two hypotheses make different predictions about how this will be affected by writing beliefs.

According to the single-process hypothesis, outlining would be expected to enable writers to carry out higher-level problem solving more effectively, and therefore the single-process hypothesis predicts that outlining should affect the two sets of beliefs the same, and result in generally higher quality text, with the advantage for writers with high transactional/low transmissional beliefs persisting across the conditions.

The dual-process hypothesis assumes that in non-outline conditions, writers will be less able to impose top-down control on their writing, and hence that the conditions will favour the high transactional writers who prioritise implicit text production processes. The dual-process hypothesis predicts therefore that, in the non-outline condition, high transactional writers will produce better quality text than the low transactional writers. Since transmissional beliefs are assumed to be primarily about the content to be written about, the dual-process hypothesis makes no prediction about the effect of transmissional beliefs. However, in the outline condition, the dual-process hypothesis assumes that outlining will enhance the explicit planning process and reduce the extent to which the writer's thought is constituted during the course of writing. For low transactional writers, outlining should enable them to carry out top-down planning processes more effectively and therefore to lead to an increase in text quality compared to the non-outline condition. For high transactional writers, the effects should be more mixed. Outlining may enhance explicit organization, and hence contribute to an increase in quality, but would also be expected to reduce knowledge-constituting, and hence contribute to a decrease in quality. The key prediction therefore is that there will be an interaction between the type of planning carried out before writing and

transactional beliefs, with low transactional writers benefiting from outlining more than high transactional writers. The effect of transmissional beliefs should be unaffected by outlining.

#### **1.4.2 The development of understanding.**

Our second research question was how the development of understanding relates to writing beliefs, and whether this is moderated by type of planning. In order to assess the development of understanding we followed a procedure used by Galbraith (1999; Galbraith, Torrance & Hallam, 2006) and asked writers to rate how much they felt they understood the topic before and after writing, taking the difference as a measure of the extent to which the writer had developed their understanding as a consequence of writing.

At the most general level, this offers a test of the validity of the transactional beliefs scale. If the scale is valid, one would expect that high transactional writers should be more likely to experience developments in their understanding than low transactional writers. More specifically, however, the single-process hypothesis and the dual-process hypothesis make contrasting predictions about the effects of outlining and about the extent to which the effects for the development of understanding will parallel those for text quality.

The single-process hypothesis predicts that the pattern of results should duplicate the pattern for text quality, with high transactional and low transmissional writers showing greater developments of understanding, and with this difference persisting across outline and non-outline conditions.

The dual-process hypothesis assumes that the development of understanding is a consequence of dispositionally-guided text production, and that this is prioritized by high transactional writers, but is reduced when writing is outline planned. It therefore predicts that there will be an interaction between transactional beliefs and type of planning. In the non-outline condition, where text production processes are assumed to be relatively more dominant, high transactional writers are predicted to develop their understanding more than

low transactional writers. However, in the outline condition, where top-down control is assumed to be enhanced, the development of understanding will be reduced, and this will be more pronounced for the high transactional writers than the low transactional writers.

Transmissional beliefs would not be expected to have a systematic effect on the development of understanding.

### **1.4.3 Text modification.**

In order to explore how revision relates to writing beliefs we used a simple global measure derived from keystroke logs of the extent to which the text was modified during writing. This text modification index is the ratio of all the words produced in the keystroke log compared to the words included in the final text (Baaijen, Galbraith & de Glopper, 2010; 2012). Our third research question was how writing beliefs are related to text modification and how text modification is related to text quality and development of understanding through writing.

Previous research (Rau & Sebrechts, 1996) using a similar measure (total number of content revisions as a proportion of the number of words in the text) and comparing a mental planning condition with an outline planning condition found that less revision was carried out in the outline condition. We would therefore make the theory-neutral prediction that outlining should reduce the extent of text modification in this experiment.

According to the single-process hypothesis, the central contrast between less and more engaged writers is a contrast between a knowledge-telling and a knowledge-transforming approach to writing. This leads straightforwardly to the prediction that high transmissional and low transactional writers would be expected to revise their texts less than low transmissional and high transactional writers. As with the other measures, these would be expected to have independent and additive effects on the amount of text modification.



Amount of text modification would in general be expected to be positively related to the development of understanding and text quality.

For the dual-process hypothesis, the key claim is that low and high transactional beliefs represent a contrast between a top-down and a bottom-up conception of writing. In other words, writers at both ends of the scale are assumed to be engaged in active processing, but this active processing is directed towards different goals. It follows from this that transactional beliefs are not predicted to be directly related to amount of text modification. Similarly, since transmissional beliefs are assumed primarily to affect the type of content that is written about, the dual-process hypothesis does not expect this to lead to systematic differences in the amount of text modification.

Galbraith and Torrance (2004, pp. 64-65) make an important distinction here between *reactive* and *proactive* revision. They suggest that, in the context of a top-down approach to writing, revision is primarily reactive: it is concerned with “evaluating the extent to which the text satisfies the writer’s pre-established goals and modifying the text so as to better achieve those goals”. By contrast, in the context of a bottom-up approach to writing, revision is primarily proactive: it is about trying to further develop the writer’s understanding of what they are writing about. According to the dual-process hypothesis it would therefore be predicted that for low transactional writers text modification would be reactive and hence unrelated to the development of understanding, and negatively related to text quality. By contrast, for high transactional writers it would be predicted that text modification would be proactive, and therefore be positively related to the development of understanding, and unrelated to text quality.

## 2. Method

### 2.1 Participants

Eighty-four participants from the Faculty of Arts at the University of Groningen were recruited to take part in the experiment. They were all advanced students (no first year students) with an average age of 22.2 years ( $SD=3.8$ ). 16% of the participants were male. All participants were native speakers of Dutch and received €10 for their participation. One participant was removed from all analyses because they had a very low score (over 3 SDs below the mean) on the prior knowledge rating.

### 2.2 Writing Beliefs Inventory

We administered the Writing Beliefs Inventory (White & Bruning, 2005) to measure writers' transmissional beliefs and transactional beliefs (for example items, see table 1). We translated the inventory into Dutch, with the adequacy of translation being checked by both a Dutch and English native speaker. The Cronbach's  $\alpha$  for the transmissional and the transactional scale were .57 and .66, respectively. Our analysis showed that the scales were, as found by White and Bruning, uncorrelated ( $r=.016$ , NS).

Table 1. *Examples of Transmissional Beliefs Items (1-4) and Transactional Beliefs Items (5-8) from the Writing Beliefs Inventory (White and Bruning, 2005).*

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#### Transmissional beliefs

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1. Good writers include a lot of quotes from authorities in their writing
  2. Writing's main purpose is to give other people information
  3. Writing should focus around the information in books and articles
  4. The key to successful writing is accurately reporting what authorities think
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**Transactional beliefs**

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5. Writing requires going back over it to improve what has been written
  6. Writing helps me to understand better what I'm thinking about
  7. Writers' views should show through in their writing
  8. Writing is a process involving a lot of emotion
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Participants were asked to rate how much they agreed with the different statements about writing on a Likert-Scale of 1 to 5, with 1 representing “strongly disagree” and 5 representing “strongly agree”. We administered the Writing Beliefs Inventory at the beginning of the writing experiment, before the participants were taken through the procedure of the experiment. All participants were tested individually and the conduct of the experiment took approximately one hour per participant.

**2.3 Design and Procedure**

All participants were asked to plan and write an article for the university newspaper discussing whether “*our growing dependence on computers and the Internet is a good development or not*”. Participants were randomly allocated to one of two different planning conditions. In the *outline* planning condition, participants were given 5 minutes to make a structured outline before writing; in the *synthetic* planning condition, participants were given 5 minutes to write down a single sentence summing up their overall opinion. After the planning task, participants were given 30 minutes to write an article for the university newspaper. They wrote their papers on the computer, and keystrokes were logged using Inputlog (Leijten & van Waes, 2006). During writing, participants were allowed to consult their written outlines or synthetic plans.

## **2.4 Text Quality**

The quality of the texts was rated by two independent judges on a 9-point scale. The judges were asked to give a single rating, taking into account the coherence of the overall argument, the originality of the ideas, and the appropriateness of the tone and the relation to the audience for an article in the university newspaper. The correlation between the two raters was satisfactory ( $r=.84, p<.001$ ). The means of the two judges' scores were used for analysis.

## **2.5 Development of Understanding**

In order to assess the development of understanding we replicated a procedure from Galbraith (2009) and asked participants to rate their understanding about the topic both immediately before and after writing. This involved a simple subjective measure in which participants were asked to indicate how much they felt they knew about the topic on a 7-point scale ranging from 1=very little to 7=a great deal. The difference between the pre- and posttest was taken as a measure of the extent to which the writer had developed their understanding as a consequence of writing.

## **2.6 Text Modification Index**

In order to assess writing processes we derived a global measure of text modification from our keystroke logging data (Baaijen et al., 2010). For the Text Modification-Index (TM-Index), the total number of process words recorded by Inputlog is divided by the total words appearing in the final text. When writers transcribe their thoughts directly into text without modifying the content the index should be 1: all the words that are written down during text production will be included in the final text. To the extent that writers change the way that they express their ideas during text production, the index should increase: writers will produce more words during the process of text production than appear in the final text.

Preliminary screening of the data revealed one extreme outlier (a score more than 3 SD's above the mean) on the TM-Index. Inspection of the log suggested that this reflected

mistakes using the delete function rather than systematic modification of the text, so this participant was excluded from the process analysis. In addition, the process data – and hence the final text – from another participant were lost due to technical problems with the keystroke logging software. This participant was therefore not included in the analysis concerning the TM-Index and text quality. For the analysis involving the TM-Index we therefore have an overall sample of 81 participants.

## **2.7 Analysis**

Since the independent variables in this study are a mixture of continuous variables (transactional and transmissional beliefs, text modification) and categorical variables (type of planning), we used multiple regression to assess the effects of the independent variables on the dependent variables. In order to facilitate interpretation of interactions all continuous variables were mean centred prior to analysis. For each analysis, we began by entering variables in sets. Main effects were entered at step 1, two-way interactions at step 2, three-way interactions at step 3 and, four-way interactions at step 4. We then simplified the regression models by progressively removing non-significant terms, starting with the highest level interactions. The final, simplified models for each analysis are presented. For analyses where there were significant interactions, we carried out simple slopes analysis using the SPSS package PROCESS created by Hayes (2013). The interactions are plotted with high and low levels of continuous variables defined as 1 standard deviation above and below the mean (Aiken & West, 1991). The significance of simple slopes is tested at these levels of the independent variables involved in the interactions. We also used the Johnson-Neyman procedure to identify regions of significance at  $\alpha = .05$  (Aiken & West, 1991; Johnson & Neyman, 1936), and present the  $z$ -values defining these regions along with the percentage of participants falling within these regions.

All models were checked for compliance with assumptions of normally distributed and homoscedastic residuals. Distributions were satisfactory, and the proportion of relatively extreme cases was within the bounds to be expected for the sample size. Checks for influential cases were carried out using centred leverage, Cook's distance, standardised DfBeta and covariance ratios. No unduly influential cases were identified. Analyses were repeated with and without the most influential cases and models and relevant coefficients remained significant.

### **3. Results**

Table 2 shows the descriptive statistics and intercorrelations for all the variables.

Table 2: Means, Standard Deviations, Skew and Kurtosis (SE) and Correlations for all Variables.

	M	SD	Skew	Kurtosis	Correlations				
					1	2	3	4	5
1.Transaction beliefs	3.66	.39	0.10 (0.26)	0.07 (0.52)					
2.Transmissional beliefs	2.41	.49	-0.26 (0.26)	-0.48 (0.52)	-.02				
3.Type of planning <sup>a</sup>	.51	.50			.22*	-.27*			
4.Text modification <sup>b</sup>	1.27	.16	1.00 (0.27)	1.01 (0.53)	.00	.24*	.18		
5.Change in understanding	.20	.69	-0.30 (0.26)	1.83 (0.52)	.23*	-.12	.22*	.16	
6.Text quality <sup>c</sup>	5.17	2.00	-0.08 (0.27)	-0.68 (0.53)	.03	-.12	-.09	-.27*	-.06

Note.  $N=83$ , \* $p < .05$  (2 tailed).

<sup>a</sup>Dummy coded, outline planning = 0, synthetic planning=1.

<sup>b</sup> $N=81$  due to missing log file for 1 participant and removal of outlier.

<sup>c</sup> $N=82$  due to missing log file for one participant.

The measures of skew and kurtosis indicate that the text modification variable is relatively positively skewed and that the change in understanding variable has relatively high kurtosis. However, neither of these is statistically significant at an alpha level of .01 so we concluded that the assumption of normality was satisfied (Tabachnick & Fidell, 2007). All other variables were clearly normally distributed.

The small positive correlation between transactional beliefs and type of planning and similarly small negative correlation between transmissional beliefs and type of planning indicate that participants in the synthetic planning condition had relatively higher scores on the transactional beliefs scale and relatively lower scores on the transmissional beliefs scale. The raw correlations between the predictor variables and the dependent variables indicate that: (i) high transmissional beliefs are associated with higher levels of text modification; (ii) high transactional beliefs and synthetic planning are associated with higher levels of increased understanding; and (iii) greater amounts of text modification are associated with low levels of text quality. The interpretation of these relationships depends, however, on how they vary when the variables are entered in combination.

The analysis has two parts. We first examine the effects of transactional beliefs, transmissional beliefs and type of planning on text quality, change in understanding and text modification. We then examine the relationships between amount of text modification and text quality and change in understanding, and assess whether these are moderated by writing beliefs and type of planning.

### **3.1 Effects of Writing Beliefs and Type of Planning on Text Quality**

Table 3 shows the final model of the effects of writing beliefs and type of planning on text quality.



Table 3. *Predicting Text Quality from Transactional Beliefs, Transactional Beliefs and Type of Planning*

	<i>B</i>	<i>SE</i>	$\beta$
Constant	5.37	0.31	
Type of planning <sup>a</sup>	-0.66	0.45	-.16
Transactional beliefs(TM)	-0.99	0.47	-.24*
Transactional beliefs(TA)	-1.16	0.77	-.23
Type of planning*TA	3.15	1.16	.41**

*Note:*  $R^2=.11$ ; Adjusted  $R^2=.07$ ,  $F(4, 77) = 2.51$ ,  $p < .05$ ; step 1 to step 2  $R^2$  change=.08,  $p=.008$ ; \* $p < .05$ , \*\* $p < .01$ .

<sup>a</sup>Dummy coded, outline planning=0, synthetic planning=1

As can be seen in the table, there is a significant negative relationship between transactional beliefs and text quality, indicating that writers with high transactional beliefs produce poorer quality text than writers with low transactional beliefs. There is also a significant interaction between transactional beliefs and type of planning, suggesting that the relationship between transactional beliefs and text quality varies depending on the type of planning carried out before writing.

Figure 1 shows the predicted values of text quality for writers with low and high transactional beliefs plotted separately for the synthetic and outline planning conditions.

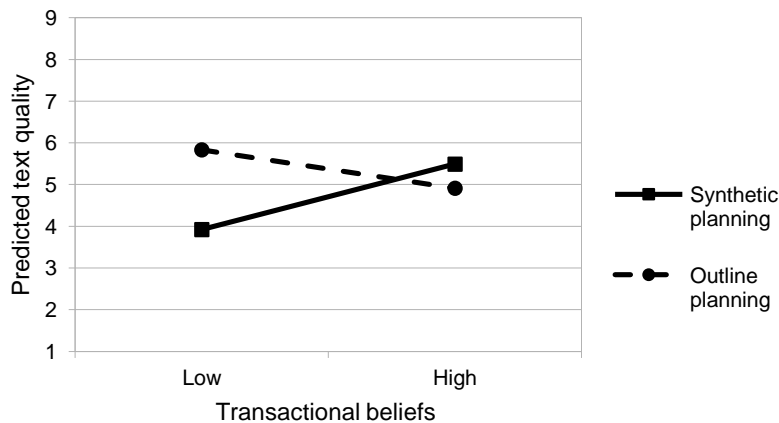


Figure 1. *Relationship between transactional beliefs and text quality as a function of type of planning.*

As can be seen in figure 1, within the synthetic planning condition, writers with high transactional beliefs produced significantly higher text quality than writers with low transactional beliefs ( $b=1.98$ ,  $se=0.84$ ,  $t(78)=2.35$ ,  $p=.02$ ). These results correspond directly with those found by White and Bruning (2005). In contrast, in the outline planning condition the relationship is in the opposite direction, and non-significant ( $b=-1.16$ ,  $se=0.77$ ,  $t(78)=1.52$ ,  $p=.13$ ). Writers with low transactional beliefs produced higher quality text when they made an outline compared to when they planned synthetically ( $b=-1.89$ ,  $se=0.67$ ,  $t(78)=2.82$ ,  $p=.006$ ); writers with high transactional beliefs showed no significant difference in quality within the two planning conditions ( $b=.58$ ,  $se=0.62$ ,  $t(78)=0.94$ ,  $p=.35$ ). The Johnson-Neyman procedure indicated that making an outline produced significantly ( $p<.05$ ) higher quality text than synthetic planning for participants with transactional beliefs lower than  $z=-0.22$  (equivalent to 42% of the participants). In addition, for participants with transactional beliefs higher than  $z=2.37$  (equivalent to 1% of the participants) outline planning produced significantly ( $p<.05$ ) worse text quality than synthetic planning.

These results indicate that high transactional writers produce better text than low transactional writers following synthetic planning, but that outlining enables low transactional writers to overcome this difference and to produce texts similar in quality to the high

transactional writers. Type of planning makes no difference for the vast majority of high transactional writers, except for those with extremely strong beliefs, who produce poorer quality text when they make an outline. High transmissional writers produce lower quality text than low transmissional writers regardless of type of planning.

### 3.2 Effects of Writing Beliefs and Type of Planning on Change in Subjective

#### Understanding

Change in understanding was regressed on transmissional beliefs, transactional beliefs and type of planning, along with the associated interactions. The final model is shown in table 4.

Table 4. *Predicting Change in Understanding from Transmissional Beliefs, Transactional Beliefs and Type of Planning*

	<i>B</i>	<i>SE</i>	$\beta$
Constant	0.10	0.10	
Transactional beliefs(TA)	-0.01	0.29	-.00
Transmissional beliefs(TM)	-0.69	0.23	-.48***
Type of planning <sup>a</sup>	0.16	0.15	.12
Type of planning*TA	0.87	0.43	.33*
Type of planning*TM	0.84	0.31	.42**
TM*TA	-0.71	0.57	-.20
Type of planning*TM*TA	1.65	0.84	.31*

*Note:*  $R^2=.25$ ; Adjusted  $R^2=.18$ ,  $F(7, 75) = 3.56$ ,  $p = .002$ ;  $R^2$  change for 3-way interaction=.04,  $p < .05$ ; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ .

<sup>a</sup>Dummy coded, outline planning=0, synthetic planning=1

Table 4 shows a significant main effect of transactional beliefs and significant 2-way interactions between both transactional and transmissional beliefs and type of planning.

However, the presence of a significant 3-way interaction indicates that changes in understanding depend on the combined effect of all three variables. This interaction is plotted in figure 2.

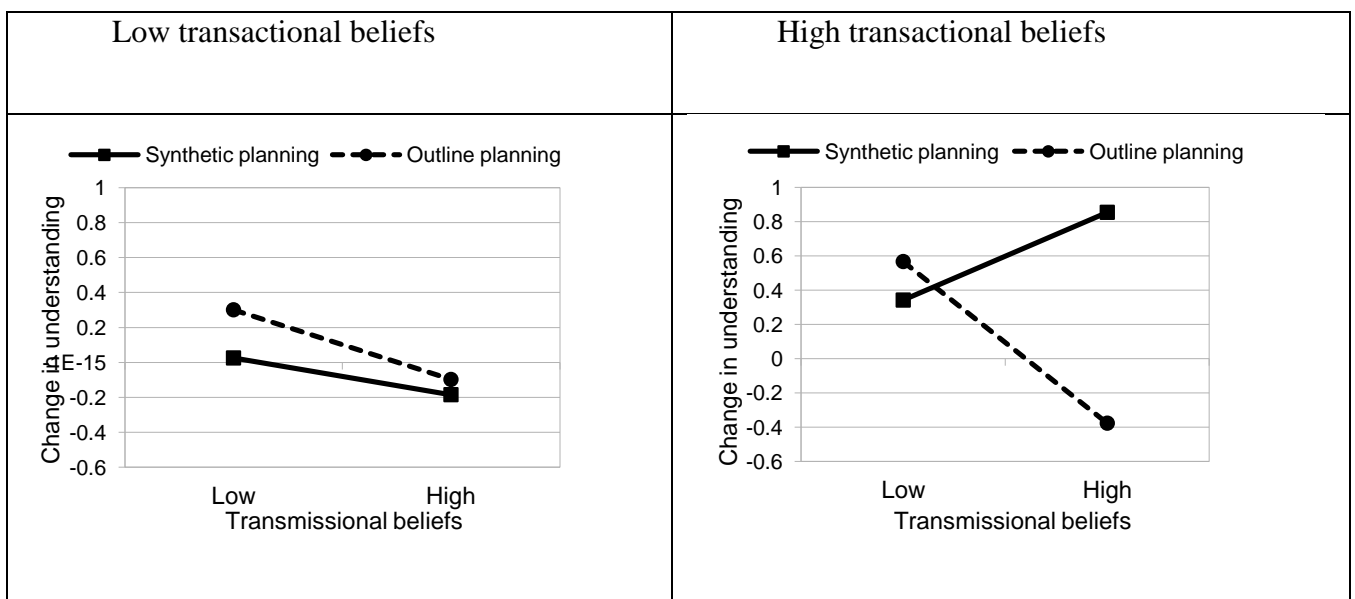


Figure 2. *The relationship between transactional beliefs and changes in understanding as a function of transmissional beliefs and type of planning.*

First, consider the writers with low transactional beliefs (the left hand panel of figure 2). This group shows no evidence of changing their subjective understanding as a consequence of writing, regardless of their transmissional beliefs or the type of planning they engage in. Their scores for change in understanding are consistently close to or below zero, and there are no significant effects of transmissional beliefs or of type of planning ( $p > .15$  for all slopes).

Second, consider the writers with high transactional beliefs (the right hand panel of figure 2). The essential contrast here is that high transactional writers with high transmissional

beliefs produce higher levels of increased understanding than other groups when they plan synthetically but the lowest levels of all the groups (a decrease in understanding in fact) when they are asked to make an outline before writing. The increase for the high transactional writers with high transmissional beliefs in the synthetic planning condition is significantly higher than the corresponding group of low transactional writers in the synthetic planning condition who also hold high transmissional beliefs ( $b=1.32$ ,  $se=0.45$ ,  $t(72)=2.94$ ,  $p=.004$ ). Within the high transactional writers, the conspicuous difference is that the same type of writers (high transactional/ high transmissional beliefs) score significantly lower when they are asked to make an outline compared to when they plan synthetically ( $b=-1.23$ ,  $se=0.29$ ,  $t(72)=4.18$ ,  $p<.0001$ ) and significantly lower than the writers with low transmissional beliefs making an outline ( $b=-0.97$ ,  $se=0.35$ ,  $t(72)= 2.73$ ,  $p=.008$ ). This relationship is in the opposite direction for the synthetic planning condition, with high transmissional writers scoring higher than those with low transmissional beliefs, but the slope fails to reach significance ( $b=0.52$ ,  $se=0.31$ ,  $t(72)=1.73$ ,  $p=.09$ ). The Johnson-Neyman procedure indicates that the interaction between type of planning and transmissional beliefs is significant ( $p<.05$ ) for writers with a score higher than  $z=-0.30$  on the transactional beliefs scale. Within this group, development of understanding is significantly higher ( $p<.05$ ) in the synthetic planning condition than in the outline planning condition for participants scoring higher than  $z=0.07$  on the transmissional beliefs scale. This indicates that, for 33% of the participants (those with a combination of high transactional and high transmissional beliefs), outline planning significantly reduces the extent to which writers develop their understanding compared to when writing is synthetically planned.

Overall, we draw two main conclusions from this analysis. High transactional writers typically develop their understanding more through writing than low transactional writers. This development of understanding is removed for writers who also hold high transmissional

beliefs (33% of the sample) when they are asked to make an outline before writing but not when they plan synthetically.

### 3.3 Effects of Writing Beliefs and Type of Planning on Amount of Text Modification

Amount of text modification was regressed on transactional beliefs, transmissional beliefs and type of planning. The final model is shown in table 5.

Table 5. *Predicting Amount of Text Modification from Transmissional Beliefs, Transactional Beliefs and Type of Planning.*

	<i>B</i>	<i>SE</i>	$\beta$
Constant	1.23	0.02	
Type of planning <sup>a</sup>	0.09	0.04	.28*
Transmissional beliefs(TM)	0.10	0.04	.32**
Transactional beliefs(TA)	-0.02	0.04	-.04

*Note:*  $R^2=.13$ ; Adjusted  $R^2=.10$ ,  $F(3, 77) = 3.79$ ,  $p = .014$ ; \* $p < .05$ , \*\* $p < .01$ .

<sup>a</sup>Dummy coded, outline planning=0, synthetic planning=1

Table 5 shows a significant positive relationship between type of planning and amount of text modification<sup>a</sup>, and a significant positive relationship between transmissional beliefs and amount of text modification. However, there is no significant effect of transactional beliefs.

Overall, these results suggest that outline planning is associated with a reduction in the amount of text modification during writing, and that high transmissional writers revise text more during writing than low transmissional writers.

### 3.4 Relationships between Amount of Text Modification and Text Quality and Change in Understanding

#### 3.4.1 Relationship between amount of text modification and text quality.

There was a significant negative correlation overall between amount of text modification and text quality ( $r=-.27$ ,  $N=81$ , 2-tailed,  $p=.02$ ). In order to assess the extent to which this relationship varied depending on writers' beliefs and type of planning, text quality was regressed on text modification, transactional beliefs, transmissional beliefs, and type of planning. The final reduced model is shown in table 6.

Table 6. *Predicting Text Quality from Amount of Text Modification, Transactional Beliefs and Type of Planning*

	<i>B</i>	<i>SE</i>	$\beta$
Constant	5.27	0.31	
Type of planning <sup>a</sup>	-0.46	0.46	-.12
Text modification(TMI)	-2.22	1.46	-.18
Transactional beliefs(TA)	-1.15	0.74	-.23
Transmissional beliefs(TM)	-0.54	0.48	-.13
TMI*TA	7.45	3.69	.23*
TA*Type of planning	2.80	1.14	.37*

Note:  $R^2=.21$ ; Adjusted  $R^2=.14$ ,  $F(6, 74)=3.25$ ,  $p=.007$ ; step 1 to step 2  $R^2$ change =.13,  $p=.004$ ; \* $p<.05$ .

<sup>a</sup>Dummy coded, outline planning=0, synthetic planning=1

Table 6 shows the same effects as in the earlier analysis of text quality without text modification included. However, there is also a significant interaction between amount of text modification and transactional beliefs. In order to determine the source of this interaction, simple slopes analysis was carried out of the relationship between text modification and text quality for writers with high and low transactional beliefs. These relationships are shown in figure 3.

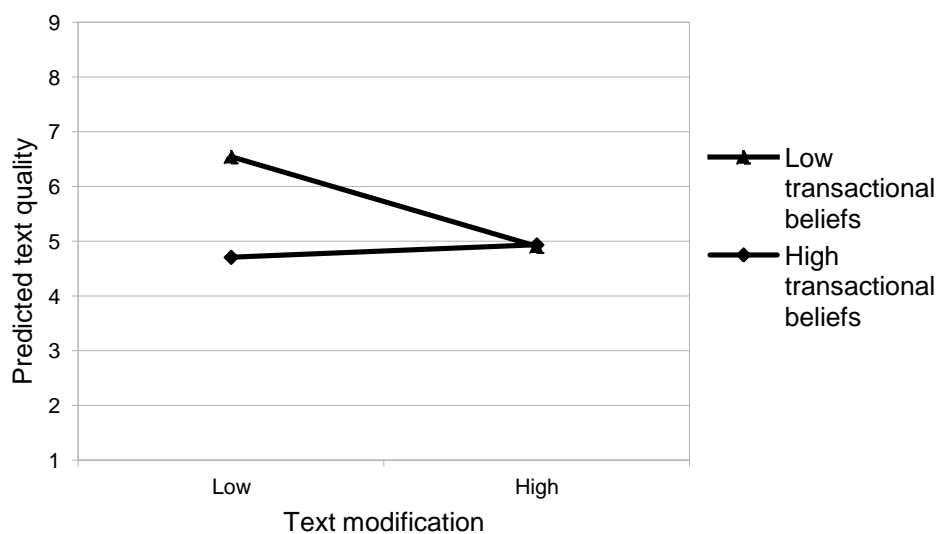


Figure 3. *The relationship between amount of text modification and text quality as a function of transactional beliefs.*

Figure 3 shows that there is essentially no relationship between amount of text modification and text quality for high transactional writers ( $b=0.72$ ,  $se=2.32$ ,  $t(77)=0.31$ ,  $p=0.76$ ).

However, for low transactional writers, there is a highly significant negative relationship ( $b=-5.15$ ,  $se=1.75$ ,  $t(77)=2.94$ ,  $p=.004$ ). The Johnson-Neyman procedure showed that the negative relationship between text modification and text quality was significant ( $p<.05$ ) for writers with transactional beliefs below  $z=-.20$  (equivalent to 42% of the participants).



### 3.4.2 Relationship between amount of text modification and change in understanding.

Multiple regression was carried out with text modification, transactional beliefs, transmissional beliefs, and type of planning as predictors of changes in understanding. The final model is shown in table 7.

Table 7. *Predicting Change in Subjective Understanding from Amount of Text Modification, Transmissional Beliefs, Transactional Beliefs and Type of Planning.*

	<i>B</i>	<i>SE</i>	$\beta$
Constant	0.13	0.10	
Transactional beliefs(TA)	0.11	0.28	.06
Transmissional beliefs(TM)	-0.80	0.22	-.57***
Type of planning <sup>a</sup>	0.06	0.16	.04
Text modification(TMI)	1.19	0.48	.27*
Type of planning*TA	0.72	0.43	.28
Type of planning*TM	0.92	0.30	.46***
TM*TA	-0.96	0.57	-.28
TMI*TA	2.58	1.24	.23*
Type of planning*TM*TA	2.20	0.84	.41*

*Note:*  $R^2=.33$ ; Adjusted  $R^2=.25$ ,  $F(9, 71)=3.92$ ,  $p <.0005$ ;  $R^2$  change for 3-way interaction=.06,  $p=.01$ ; \* $p<.05$ , \*\* $p<.01$ , \*\*\* $p<.005$

<sup>a</sup>Dummy coded, outline planning=0, synthetic planning=1

Table 7 shows that, in addition to the effects shown in the earlier analysis of the effects of writing beliefs and type of planning on change in understanding, there is a significant main effect of text modification and a significant interaction between amount of text modification and transactional beliefs, indicating that the relationship between text modification and changes in understanding varies depending on the writers' transactional beliefs. This interaction is plotted in figure 4.

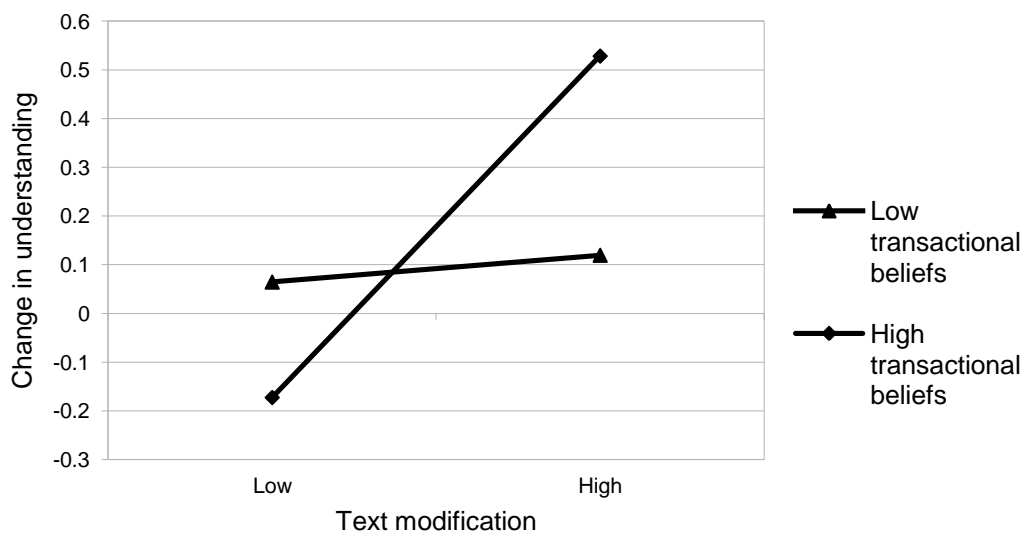


Figure 4. *The relationship between amount of text modification and change in understanding as a function of transactional beliefs.*

Figure 4 shows that there is a highly significant positive relationship between the amount of text modification and increased understanding for high transactional writers ( $b=2.21$ ,  $se=0.77$ ,  $t(77)=2.86$ ,  $p=.005$ ) but no significant relationship for low transactional writers ( $b=0.17$ ,  $se=0.59$ ,  $t(77)=0.29$ ,  $p=.77$ ). The Johnson-Neyman procedure indicated that the positive relationship between text modification and increased understanding was significant ( $p<.05$ ) for participants with transactional beliefs higher than  $z=-.25$  (equivalent to 60% of the participants).

Taken together, these results suggest that text modification is associated with different effects for low and high transactional writers. For low transactional writers, text modification is associated with lower quality text and unrelated to changes in understanding; for high transactional writers, text modification is unrelated to text quality, but strongly related to increased understanding.

#### **4. Discussion**

We will first consider how the data map onto the two conflicting hypotheses about how beliefs relate to processes. Are writing beliefs essentially a single motivational dimension or do they lead to different, but equally active, writing processes? We will then step back and consider the implications for future research and for educational practice.

##### **4.1 Single-Process Hypothesis versus Dual-Process Hypothesis**

These results are problematic for the single-process hypothesis. Thus, although we found that transactional and transmissional beliefs are uncorrelated and do predict writing performance – supporting White and Bruning’s general claim that there are two different sets of beliefs and that these are associated with differences in writing performance - these beliefs did not have additive effects on the measures, and the effects were not consistent for the different measures. These results, therefore, contradict the hypothesis that transactional and transmissional writing beliefs have their effects through an additive contribution to a single underlying dimension of engagement. By contrast, many of the predictions of the dual-process hypothesis have been supported, and provide a coherent explanation for the overall pattern of results.

The strongest evidence for the dual-process hypothesis comes from the results for text modification. These support the prediction that low and high transactional writers would produce similar amounts of text modification but that this would have different relationships with the development of understanding and text quality for the two groups.

The positive relationship between text modification and increased understanding for high transactional writers is compatible with the claim that writers with these beliefs prioritise the bottom-up, knowledge-constituting process. The dual-process model assumes that this form of text production involves the synthesis of content according to the constraints within semantic memory. These constraints constitute the writer's implicit understanding of the topic (see Galbraith, 2009). When the writer's understanding is already clear, text production will be fluent and little text modification will be required, and no developments of understanding will occur. When the writer's understanding is not clear, writers will engage in *proactive revision* (Galbraith & Torrance, 2004) – revising the text in order to better capture their implicit understanding of the topic – and hence will produce greater text modification and show increases in understanding. The fact that this kind of revision is associated with the maintenance of text quality suggests that this is an effective form of revision.

The fact that text modification was not associated with increased understanding for the low transactional writers is compatible with the claim that they prioritise the top-down, explicit organising process, and hence text production becomes a process of “translating” pre-determined ideas into words. They therefore experience essentially no developments of understanding during text production – change in understanding was close to zero in all conditions for this group. Instead, text production is guided by their plan for the text: when this can be translated fluently the text is of high quality; when this breaks down, they engage in *reactive revision* – revising the text to make it conform to their predetermined ideas (Galbraith & Torrance, 2004). The fact that this is associated with a decline in quality suggests that this is a less effective form of revision, perhaps because it involves modifying the text to satisfy a preconceived plan rather than changing the plan to better capture the writer's understanding.

The finding that high transactional beliefs were associated with greater amounts of text modification than low transactional beliefs also contradicts the single-process hypothesis' assumption that high transactional beliefs should be associated with less engagement than low transactional beliefs. The present results suggest instead that high transactional beliefs, which lead the writer to select "public", objective facts to write about rather than to express their personal point of view, make it harder for the writer to express their thoughts coherently, and hence require greater amounts of text modification. This supports the dual-process hypothesis' assumption that the two sets of beliefs are about different aspects of writing: transactional beliefs are about the processes that are involved; transactional beliefs are about the type of content that should be written about.

Having noted that the results for text modification are compatible with the dual-process hypothesis, we should also note that adding text modification to the models predicting text quality and development of understanding only explains a relatively small proportion of variance in each case. Our argument here is essentially about the contrasting direction of the relationships for each variable. Text modification is a relatively crude measure of a global feature of writing processes. We would expect future research, using more specific measures of process, to explain more of the variance.

The results for the development of understanding are generally compatible with the dual-process hypothesis. As we have mentioned, the fact that low transactional writers did not show evidence of increased understanding in any of the conditions supports the claim that top-down translation does not lead to the development of understanding. In addition, the fact that outlining did not lead to increased understanding for the low transactional writers supports the claim that explicit organising processes do not, by themselves, lead to increased understanding.

Moreover, the fact that the highest levels of increased understanding in the experiment occurred for writers with a combination of high transactional and high transmissional beliefs writing synthetically planned texts, and that the lowest levels occurred for the same writers when they were asked to make an outline before writing, is direct support for the dual-process hypothesis' assumption that transactional and transmissional beliefs may interact in their effects, and the prediction that outlining would prevent the knowledge-constituting process from occurring. However, these findings are weakened by the fact that writers with high transactional/ low transmissional beliefs did not show similar effects of outlining on the reduction of understanding. This may in part be a consequence of a lack of power: the high transactional/ low transmissional groups were neither significantly lower than the highest levels for high transactional writers nor significantly higher than the low transactional writers, and therefore lie somewhere in between these effects. Further research with more participants is needed to achieve sufficient power to unpack the detailed differences responsible for the complex three-way interaction.

Our conclusion for the development of understanding is that outlining can, as the dual-process model predicts, inhibit the development of understanding, but that this effect is moderated by the writer's transmissional beliefs, and may depend on whether the precise balance of different influences results in a shift towards a top-down method of text production.

The results for text quality are clear cut. They show that high transactional writers produce better quality text than low transactional writers in the synthetic planning condition, but that this difference is removed in the outlining condition because outlining increases text quality for the low transactional writers but not for high transactional writers.

The key assumption of the dual-process hypothesis is that text quality depends on a combination of the explicit organising process and the dispositionally-guided text production

process. This would provide the following explanation for the finding that high transactional writers produced higher text quality than the low transactional writers in the synthetic planning condition. In this condition, explicit organisation has to be carried out at the same time as text production and hence is assumed to be relatively reduced in effectiveness for both groups of writers. Differences in quality would be expected therefore to depend primarily on the kind of text production that is carried out. The dual-process hypothesis assumes that low transactional writers impose top-down control on text production whereas high transactional writers allow their implicit disposition towards the topic to guide text production. Since it also assumes that dispositionally-guided text production enables the writer to articulate their understanding more fully in the text, it follows that high transactional writers would be expected to produce higher text quality in the synthetic planning condition. Under this interpretation, these results support the dual-process hypothesis that dispositionally-guided text production makes an independent contribution to text quality.

The hypothesis would also explain why outlining has a positive effect for low transactional writers but no effect for high transactional writers. Outlining presumably enables the low transactional writers to carry out the explicit organising process more effectively, and therefore enables them to develop a more coherent plan and then to translate this more fluently into text. By contrast, outlining does not help high transactional writers because, although it facilitates the explicit organisational process, it is assumed at the same time to reduce the knowledge-constituting process.

If this interpretation is correct, then an important implication is that high transactional writers would write best, not by using an outlining strategy, but by using a revision drafting strategy, in which the writer produces an initial draft driven by their implicit understanding, and then explicitly organises this draft into a well formed and rhetorically appropriate text. This would enable them to combine knowledge-constituting (in the initial draft) with explicit

organisation (in the revision draft), and hence should lead to the production of better text than the low transactional writers' outline condition, where it is assumed that explicit organisation is not accompanied by knowledge-constituting.

Finally, it is worth noting that, in a just-published study, Sanders-Reio et al. (2014) found a negative relationship between transactional beliefs and text quality. This provides further evidence that there is not a consistent relationship between transactional beliefs and text quality. As we have shown, the dual-process hypothesis provides a straightforward explanation for this by claiming that the relationship between transactional beliefs and text quality is moderated by type of pre-planning. This would therefore explain Sanders-Reio et al.'s findings by suggesting that the writing assignment used in their study may have involved a relatively pre-planned form of writing. An important implication for future research assessing the relationship between transactional beliefs and text quality is that it should include information about, or explicitly manipulate, the type of planning carried out before writing.

## **4.2 Implications**

Our results demonstrate that writing beliefs predict differences not just in text quality but also in the extent to which writers revise their texts, and in the extent to which they develop their understanding in the course of writing. Furthermore, they show that outlining has different effects for writers with different transactional and transmissional beliefs. Overall, they suggest that beliefs and writing strategies have their effects through a dynamic interaction between planning and text production processes. Given the complex nature of these interactions, future research is needed with larger samples than in the present study to tease out the precise nature of these interactions. In addition, an important next step is to establish whether our findings transfer to more academic writing tasks, and whether the same effects apply not just to subjective measures of developing understanding but also to



more objective measures of learning. Subjective measures may capture participants' own feelings about whether they understand a topic better but these may not necessarily correspond to an objectively "better" understanding of a topic.

In academic writing tasks, students are asked to cite authoritative sources and it was precisely the writers with high transmissional beliefs – writers who believe that writing should be about citing authorities - who produced lower quality text than writers with low transmissional beliefs. An important question is whether the negative ratings of text quality for transmissional beliefs are a consequence of the fact that these beliefs are not appropriate for the kinds of tasks that have been studied so far – writing an article for a university newspaper in our case, writing a personal narrative for White and Bruning - or whether writers find it hard to do this and at the same time incorporate their own understanding in the text, as is suggested by the fact that amount of text modification increases for high transmissional writers? Clearly it is important to establish in future research whether transmissional beliefs have the same relationship with text quality in academic contexts.

This also makes it particularly important that it was precisely for writers with high transmissional beliefs that outlining had the most pronounced negative effects on the development of understanding. If academic tasks mean, in effect, that all writers are put into more transmissional contexts, then it becomes important that outlining has such a negative effect on the development of understanding. If it turned out that these effects are also present in more academic contexts, then we would recommend that instructors avoid blanket recommendations that students make an outline before writing. Asking students to complete the writing beliefs scale would be a quick indicator as to what kind of strategy to recommend.

Finally, our results indicate that low transactional writers do not develop their understanding through writing. An important question is how deeply embedded this is. Is it a consequence of a temperamental difference: low transactional writers need to impose top-

down control on text production, perhaps because they lack confidence in their own thinking abilities? In this case, one would want to direct writing instruction towards developing the writer's confidence. Alternatively, if it is simply a consequence of the writer believing that this is the right way to write, then one should focus attention on demonstrating that there are other possible ways of writing.

### **4.3 Conclusion**

Our results suggest that writers' beliefs about the processes involved in writing and about the kinds of content it should include affect their writing processes and, through these, the development of understanding and the quality of the final product. They also suggest that these beliefs moderate the effectiveness of different writing strategies. They suggest that writers' implicit beliefs about writing -and how these affect writing processes- should be the focus of future research and should be taken into account in educational practice.

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