# Conflict in writing

## Actions and objects

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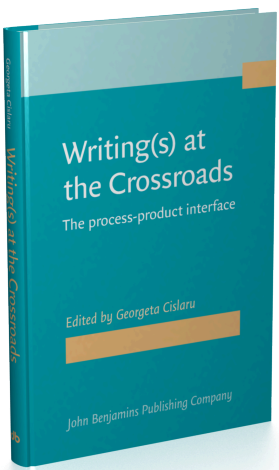


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# Conflict in writing

## Actions and objects

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This chapter argues that writing involves an interaction between conflicting cognitive systems, one designed for the construction of mental objects and the other for the taking of actions. It characterises the construction of mental objects as a problem-solving process involving the retrieval of content from episodic memory and the manipulation of content in working memory. The system for action involves the synthesis of content guided by implicit constraints within semantic memory. The chapter then reviews research investigating the effects of different types of planning and individual differences in goals and beliefs on the development of understanding during writing and on the quality of text. It concludes by discussing the effectiveness of different drafting strategies and implications for theories of writing.

**Keywords:** writing processes; dual-process model; knowledge constituting; knowledge transforming; writing strategies

### 1. Introduction

Writing should be easy. Given that we have mastered the art of transcribing language into visual signs, it should simply be a matter of transcribing whatever thoughts we have into a visual form. This process of transcription is of course a uniquely human accomplishment, taking years of education and practice before it becomes fluent, but once transcribing has been mastered writing is surely simply a matter of transcribing thought into an external form. Aren't our minds filled with thoughts every waking moment of the day? Don't we chatter away, more or less happily, to one another all the time in the course of our everyday interactions? Why, then, is writing so difficult?

The answer, of course, is that writing is rarely just a matter of transcribing thought. It may approximate to this sometimes: when, for example, we write an informal letter, or chat with one another on Facebook. But "serious" writing

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involves creating a "knowledge object" capable of standing on its own independently of the author (Galbraith, van Waes & Torrance 2007). This knowledge object, once created, becomes part of what Karl Popper called 'world 3' – the world of objective contents of thought (Popper 1972; see also Bereiter 2002). This world includes cultural artefacts, and is created by the mental processes and behavioural dispositions that make up Popper's 'world 2'. In our view, what makes writing different from other forms of language production, and more than simply a matter of transcribing thought into a visual form, is that it involves creating an independent knowledge object and that this is designed to make a contribution to world 3.

We argue in this chapter that there is a conflict at the heart of the writing process between the systematic and well-organised nature of the final product and the processes involved in text production. This is a conflict between a system designed for constructing objects and a system designed for action. In the next section, we will describe Bereiter & Scardamalia's (1987) knowledge transforming model of writing and argue that it describes a system for constructing objects. We will then summarise a dual-process model of writing (Galbraith 2009) and argue that it incorporates a system designed for action and explains how this conflicts with the object system. We will then describe the results of two recent experiments designed to elucidate the processes involved in planning and text production. We will conclude by assessing the implication of these experiments for the two models of writing.

## 2. Writing as the construction of a knowledge object

Bereiter & Scardamalia (1987) characterise reflection in writing as an interaction between two problem spaces – a content space and a rhetorical space. The content space is, in Bereiter & Scardamalia's (1987, 302) words:

> made up of knowledge states that may be broadly characterized as *beliefs*. It is the kind of space in which one works out opinions, makes moral decisions, generates inferences about matters of fact, formulates causal explanations, and so on.

By contrast, the rhetorical space is:

> specifically tied to text production. The knowledge states to be found in this kind of space are *mental representations of actual or intended text* – representations that may be at various levels of abstraction from verbatim representation to representations of main ideas and global intentions. Whereas the goal states in the content space are knowledge (in the sense of warranted beliefs), the goal states in the rhetorical space are plans for achieving various purposes in composition.

We think that these spaces can be seen as roughly equivalent to Popper's world 2 and world 3. The content space is orientated towards an individual's beliefs

and involves processes designed to manipulate these; the rhetorical space is an individual's mental representation of the desired knowledge object to be created in world 3. Writing is a matter of retrieving content from the content space in response to the requirements of the rhetorical space. The beliefs that the writer selects from the content space are shaped by the properties of the knowledge object that is to be created. Writing, therefore, shapes an individual's thinking in terms of the shared, and culturally created, properties of the knowledge objects in world 3. Klein (1999) characterises this as the *genre* hypothesis in his review of theories of writing-to-learn.

Development in writing, in this view, consists of a movement from a *knowledge-telling* approach to writing, in which text production is controlled primarily by the content space, to a *knowledge-transforming* approach to writing, in which text production is controlled by an interaction between content and rhetorical spaces. The result is that knowledge telling is a "think-say process of composition" (Bereiter & Scardamalia 1987, 304) in which the writer translates their existing beliefs into words. By contrast, knowledge transforming involves a "two-way process of information transfer, which results in the joint evolution of the composition and the writer's understanding of what he or she is trying to say". (*ibidem*) Thus, development of writing can be seen as internalising the cultural practices embodied in the knowledge objects of world 3. Once these practices are internalised, writing is transformed into an interaction between content and rhetorical space, leading to the development of the writer's understanding as they write, and enabling the writer to make more effective contributions to world 3. Learning how to write effectively enables the process of writing to also become a process of writing-to-learn, in which the production of effective text and the development of understanding go hand in hand (Klein & Kirkpatrick 2010).

In addition, Bereiter and Scardamalia also emphasized that development in writing could be influenced by increases in working memory capacity during development, and shared the common assumption in the field that cognitive overload is a fundamental problem in writing. However, they had relatively little to say about how this might be alleviated by different drafting strategies.

Research on drafting strategies (see Kellogg 1994 for a review) assumes that their function is to reduce the number of different activities that have to be carried out at the same time. In particular, it is assumed that, within a limited capacity cognitive system, resources demanded by text production can reduce the resources available for higher level planning and evaluation. This competition for resources can be reduced by separating out the different components of the writing process so that each can be carried out more effectively. Thus, in an outlining strategy, the writer concentrates on generating and organising their ideas before then focussing on translating their outline into text. In a revising strategy, text is

produced spontaneously in an initial draft, and then revised into a rhetorically appropriate form.

Kellogg's (1994) research has suggested that outlining leads to the production of higher quality text than when the writer tries to combine planning and text production in a single draft. One possibility is that this is because this enables the writer to carry out knowledge-transforming processes more effectively. Thus, when creating the outline free from the demands of full text production, the writer may be better able to construct a model of the knowledge object to be created. And, having defined their goals in rhetorical space more explicitly, the writer may be better able to engage in the interaction between content and rhetorical space required for knowledge transforming during the production of the text itself.

In conclusion, we have argued that knowledge transforming involves goal-directed problem solving designed to create a knowledge object in world 3. This involves three main assumptions about the writing process. First, producing effective text is associated also with the development of the writer's understanding. Second, text production is a relatively passive process, equivalent to knowledge telling, and is controlled by higher level problem solving operations. Third, strategies like outlining, which enable writers to separate these higher level processes from the lower level processes, should enable writers both to produce higher quality text and to develop their understanding more effectively.

## 3. Writing as action

In this section, we argue that the knowledge-transforming model underestimates the active role of text production in the generation of content. We describe a dual-process model of writing (see Galbraith 2009, for an overview), in which text production is treated as a form of action, out of which the knowledge object ultimately emerges. The dual-process model makes three main claims.

First, it claims that spontaneous text production is not simply a matter of knowledge telling, in which ideas are retrieved from memory and translated into text, but is an active knowledge-constituting process, guided by implicit constraints within semantic memory, which leads to the development of the writer's understanding.

Second, explicit planning is assumed to operate on existing ideas in episodic memory, as well as ideas created by the knowledge-constituting process, to construct a knowledge object in working memory. This is analogous to the knowledge-transforming process in that it involves creating a coherent mental model of the text designed to satisfy rhetorical goals. However, by itself, this is not associated with the development of understanding.

Third, both processes are assumed to be required for the production of effective text. The knowledge-constituting process is required to articulate the writer's implicit understanding of the topic, and the explicit planning process is required to organise the text and adapt it to rhetorical goals. Writing is a combination of actions to create content and planning processes to construct an explicit rhetorical object. However, the fact that the two processes are organised in different ways leads to a fundamental conflict in writing. This conflict is different to the cognitive overload assumed in problem-solving models of writing. It is not about the number of different processes that can be carried out at the same time but about which of two different paths to pursue at any given moment. Individual differences in writing are assumed to reflect the extent to which writers prioritise the two processes and the different ways in which they resolve the conflict between the processes.

In the next two sections, we first explain the processes involved in the knowledge-constituting process, characterising them as a form of action. We then describe the episodic and semantic memory systems that the knowledge-constituting and knowledge-transforming processes operate on.

### 3.1 The knowledge-constituting process

To give you an idea of the principles involved in the knowledge-constituting process, consider the very simple, 'toy' network shown in Figure 1. This consists of a

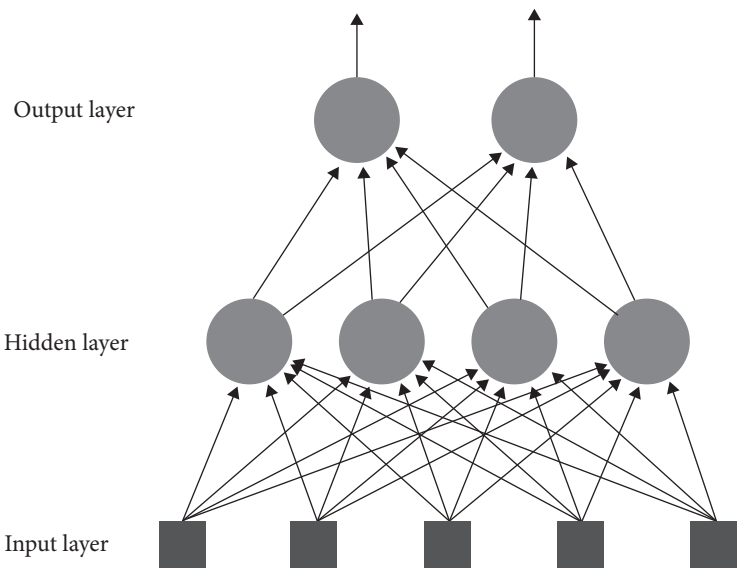


**Figure 1.** A simple feedforward network

set of simple units, roughly analogous to neurons, organized in three layers. Each unit has the function of summing up the activation passed to it via the connections from other units (shown as arrows in the diagram), and then passing on activation to other units in the network. The work of processing information is done by the connections between units, which vary in strength depending on the network's learning history. Thus, when a pattern of activation is presented at the input layer some of the units in the input layer will be strongly activated whereas others will be much less so. Each unit will then pass its activation on to the units in the next, hidden, layer, with the amount of activation it passes on depending on the strength of the connection it has with each of the units it is connected to. The overall effect on the units in the hidden layer will depend on the pattern of activation presented at the input layer and the varying strengths of the connections between this layer and the units in the hidden layer. The hidden layer will in turn pass activation forward to the output layer, which will then produce a response to the input the network has received.

The key feature of such a distributed network is that the same set of units and connections is used to produce responses to all its different inputs. Learning in such networks consists in the gradual adjustment of the strength of the connections between units to enable the same set of connections to reproduce existing responses while at the same time learning to produce new material. This is a slow process, with connections being gradually adjusted over time to assimilate new knowledge. The result is a fixed set of connections, abstracted from individual experiences to create the network's knowledge.

Scaled-up, this kind of distributed network is assumed to constitute semantic memory, with the equivalent of the hidden layer corresponding to a set of semantic features, and responses to input being synthesized by the passage of activation through the fixed set of connections between the units and layers (see Churchland (2012) for a recent overview of these operating principles and their philosophical implications, and Rogers & McClelland (2004) for specific applications to semantic memory phenomena).

The dual-process model claims that this constitutes one source of content in writing. This has two broad characteristics. First, in order to act we have to be able to bring together everything that we have learned and apply it to our present circumstances. The function of a distributed representation is not just to represent the regularities that we have induced from our past, it is also to provide the resources for acting in the present. This system is used precisely when we are required to take action in words. Indeed, the ultimate reason why a semantic memory system has evolved in the first place is precisely in order to enable us to be able to rapidly bring together all our past experiences and apply them to our current circumstances.

Second, although the synthetic nature of the process means that content is produced spontaneously without conscious deliberation, this does not mean that this is simply associative knowledge telling. Synthesis is controlled by the fixed connections between units in the network. It is these connections which constitute the implicit organisation of the writer's knowledge. The dual-process model characterises this as the writer's disposition towards the topic. Furthermore, because this is built up through exposure to examples within different rhetorical situations and genre contexts, this is not simply a repository of decontextualised content in a separate content space. Instead, the implicit relationships between content reflect the contexts within which that content has been learned. The key feature of the writer's disposition is that it is implicitly organised: it is abstracted from the totality of the writer's experience and constitutes the writer's implicit self.

By itself, this is an account of how the content of individual bursts of language is produced. However, each of these bursts is only a partial representation of the content within the writer's disposition. In order to fully articulate this implicit understanding the network has to continue to create further content. The second key feature of the knowledge-constituting process is that this is achieved by inhibitory feedback from the output to the hidden units constituting the writer's disposition. Such inhibitory connections are a common feature of recurrent networks designed to produce sequential behaviour (see Glasspool, Shallice & Cipolotti 2006, for an example of a network designed for spelling). In the present context, inhibitory feedback has the effect of suppressing units associated with the initial output, with the result that even though the external input to the network remains the same the network produces new content on the next cycle of synthesis. Notice, here, that this content is not available initially: it is only synthesized once the preceding content has been created. The sequence of content consists of bursts synthesised at the point of utterance, and the writer's understanding is discursively constituted in the text. Interrupting this process before it is complete – by, for example, evaluating individual bursts in terms of rhetorical goals – will prevent the writer from constituting their implicit understanding in the text.

In summary, the knowledge-constituting process consists of the synthesis of content, controlled by the fixed connections within the writer's disposition, followed by inhibitory feedback to create a sequence of bursts.

### 3.2 Episodic and semantic memory

A major problem with a distributed form of representation is that new examples (or experiences) tend to overwrite earlier learning: in modifying the

connections required to represent a new example, previous examples are no longer recoverable. McClelland, MacNaughton, and O'Reilly (1995) suggested that, in order to overcome this problem, two complementary learning systems are required. Both use the same general principles of processing, however, the first of these – located in the *hippocampus* – creates a sparsely coded representation of individual items of content, whereas the second – located in the *neo-cortex* – creates a distributed representation in which content is represented as different patterns of activation across the same units. In effect, then, events or experiences are stored in two different ways: they are stored as individual memories or assimilated within existing knowledge and become part of one's general knowledge. This core distinction between two distinct forms of representation has proved capable of accounting for a wide range of biological, neuropsychological, and behavioural data (see Norman 2010; O'Reilly, Battacharyya, Howard & Ketz 2011 for recent reviews.) Particularly relevant in the present context is the suggestion by Winocur, Moscovitch, and Bontempi (2010, 2340) that: "There is a dynamic interplay between the two types of memory such that one or the other may be dominant depending on their relative strength and the circumstances that elicit them at retrieval. As a result, retention and retrieval are continually evolving processes in which the memories can interact and influence each other."

The dual-process model claims that these two systems provide different sources of content in writing. The *episodic memory* system consists of a memory of ideas as individual, already created objects; the *semantic memory* system provides the conceptual resources required to take action in the present. The writing process varies depending on which of these systems is used to generate content. When the semantic memory system is dominant, writing becomes a knowledge-constituting process; when the episodic memory system is dominant, writing becomes a knowledge-telling process; when ideas retrieved from episodic memory, or synthesized by semantic memory, are evaluated and manipulated in working memory to satisfy rhetorical goals, writing becomes a knowledge-transforming process.

Writing is at its most effective when writers are able to constitute their implicit understanding in the text, and select and organise the ideas in the text so that they satisfy rhetorical goals. However, these two processes conflict with one another. The knowledge-constituting process needs to be allowed to unfold, burst by burst, in the text in order for the writer to develop their understanding, and is inhibited when it is interrupted by external goals, or when a predetermined organisation is imposed on the text. The knowledge-transforming process operates on fixed objects within working memory, and is reduced in effectiveness when ideas are not fixed but are still in the course of being constituted.

The two different processes vary in how active they are depending on a range of factors. These include:

1. *The state of the writer's knowledge*. When writers have relatively little experience in a domain, they will not have been able to build up a rich distributed representation in semantic memory, and in consequence the knowledge-constituting process will be less active, and they will be more reliant on individual ideas stored in episodic memory. This provides an alternative to Bereiter and Scardamalia's (1987) explanation of knowledge telling in younger writers.
2. *How thought is represented*. When thought is represented economically, in note-form, episodic memory is assumed to dominate, and the explicit organising process is facilitated, while the knowledge-constituting process is reduced. When thought is articulated as explicit connected propositions in full text, the synthetic process is assumed to dominate, while the explicit organising process is reduced.
3. *The goals towards which writing is directed*. When writing is directed towards rhetorical goals, the explicit knowledge-transforming process will be prioritised; when writing is directed towards dispostional goals, the knowledge-constituting process will be prioritised.
4. *Beliefs about how the processes should be combined.* Writers may be taught, or develop their own, strategies for combining different writing processes. For example, the traditional outlining strategy taught in schools would be expected to facilitate the knowledge-transforming process but reduce the knowledge-constituting process.

## 4. Empirical evidence

The main evidence for the dual-process model is research showing that different types of writers develop their ideas under different writing conditions (see Galbraith 1992; 1999, and 2009; Galbraith, Torrance & Hallam 2006).

These experiments have typically used Snyder's (1979) self-monitoring scale to distinguish between writers who prioritise either rhetorical or dispositional goals. High self-monitors are "particularly sensitive to the expression and self-presentation of relevant others in social situations and use these cues as guidelines for monitoring (that is regulating and controlling) their own verbal and non-verbal self-presentation" (Snyder 1979, 89), and are therefore assumed to be more likely to direct their writing towards rhetorical goals. By contrast, low self-monitors' "self-presentation and expressive behaviour […] seems, in a functional sense, to be controlled from within by their affective states (they express it as they feel it)

rather than moulded and tailored to fit the situation" (Snyder 1979, 89), and are therefore assumed to direct their writing towards dispositional goals.

In brief summary (see Galbraith 2009, for a review), these experiments have consistently shown that low self-monitors produce more new ideas during text production than high self-monitors, and that only the new content produced by low self-monitors is associated with the development of the writer's understanding. None of these studies found any relationship between the number of new ideas produced during text production and the development of understanding for the high self-monitors. These results are consistent with the dual-process model's claim that dispositionally guided text production is not simply a matter of knowledge telling but is an active process leading to the development of the writer's understanding.

In the earliest study, Galbraith (1992) also found that when writers were asked to make notes in preparation for an essay, rather than write full text, the effect was reversed, and high self-monitors produced more new ideas than low self-monitors. However, these were not associated with increases in understanding and Galbraith (1992) concluded that they reflected a reorganisation of existing ideas rather than the development of new content. This is consistent with the dual-process model's second claim that, although explicit planning directed towards rhetorical goals does lead to the reorganisation of content, it does not lead to the development of understanding.

This latter finding has not been followed up until relatively recently. In addition, none of the research we have described so far has assessed the quality of the texts, or how this is related to the development of understanding. In the next section, we describe two more recent experiments designed to assess the effects of planning and text production on the development of understanding and text quality. The first assesses the extent to which making an outline involves the transformation of knowledge, and how this relates to the quality of the text that is then produced. The second assesses the effects of writing beliefs and different types of planning on text production.

### 4.1 Constructing an outline

Although research has consistently suggested that outlining has beneficial effects on text quality (Kellogg 1994), there has been hardly any research investigating whether this is because it enables writers to carry out knowledge transforming more effectively. On the assumption that an outline enables writers to represent ideas in an abbreviated form, and to concentrate on constructing a model of the text to be written, one would expect that writers would be better able to transform their knowledge to satisfy rhetorical goals, and that this would be related to the quality of the final text.

In a recent study, Galbraith, Hallam, Olive, and Le Bigot (2009) compared low and high self-monitors and investigated the role of different components of working memory in knowledge transformation during the construction of an outline (see also Galbraith, Ford, Walker & Ford (2005), for a previous study addressing similar issues).

Two groups of low and high self-monitors were asked to write an argumentative text in three phases: listing ideas; creating an outline for the text; and then writing the text itself. They did this under one of four conditions, varying in the nature of the secondary task carried out during the creation of the outline, but otherwise identical. In the *control* condition, all constructed their outlines as normal. In the *spatial* and *visual* conditions, participants were asked to carry out a secondary task designed to load on the spatial and visual components of the visuospatial sketchpad (VSSP) in working memory (see Baddeley 1986). In the fourth – *interference* – condition, the participants were briefly interrupted by an unrelated stimulus towards which they had to give a brief response.

Four measures were taken to assess knowledge transforming during the construction of the outline: (i) the number of ideas in the list produced before outlining; (ii) the number of new ideas introduced during outlining; (iii) the number of rhetorical headings included in the outline; and (iv) latent semantic analysis (LSA) (Landauer, McNamara, Dennis & Kintsch 2007) was used to assess the semantic similarity between the content produced in the initial list of ideas and the content subsequently produced in the outlines.

There were two important findings. First, the high self-monitors changed the content of their outlines more compared to the initial list of ideas than the low self-monitors did (as indicated by lower LSA scores). Second, the number of new ideas introduced during outlining was reduced in the spatial condition compared to the other conditions.

These results suggest that two factors affect the way ideas are transformed during outlining: (i) rhetorical goals increase the extent to which content is adjusted during outlining; (ii) the spatial component of working memory affects the extent to which this content is differentiated into distinct ideas. Galbraith et al. (2009) argued that outlining involves the construction of a mental model of the text designed to satisfy rhetorical goals. This provides further support for the dual-process model's claim about the role of knowledge transforming in planning. Furthermore, it suggests that this literally involves the construction of a spatially extended knowledge object in working memory.

The key question is how knowledge transformation during outlining is related to text quality. However this was not explicitly addressed by Galbraith et al. (2009). We have therefore carried out a regression analysis on their data, regressing text quality on the idea change measures in the outlines, while controlling for the

**Table 1.** Regression of text quality on experimental conditions (step 1) and idea change measures (step 2)

| | Step 1 | | | Step 2 | | |
|---|---|---|---|---|---|---|
| | **B** | **SE** | **β** | **B** | **SE** | **β** |
| (Constant) | 5.92 | 0.47 | | 7.90 | 1.11 | |
| Visual condition[a] | –1.49 | 0.62 | –0.30* | –1.63 | 0.58 | –0.33* |
| Spatial condition[a] | –1.32 | 0.63 | –0.27* | –0.73 | 0.63 | –0.15 |
| Interference condition[a] | –1.80 | 0.61 | –0.37** | –1.82 | 0.56 | –0.38** |
| Self-monitoring[b] | 0.25 | 0.44 | 0.06 | 0.36 | 0.42 | 0.09 |
| Number of ideas in initial list | | | | –0.08 | 0.07 | –0.13 |
| Rhetorical headings in outline | | | | 0.22 | 0.10 | 0.23* |
| New ideas in outline | | | | 0.83 | 0.42 | 0.26* |
| LSA difference | | | | –6.70 | 1.77 | –0.46*** |

*Note.* $R = .53$, adjusted $R^2 = .21$, $F(8, 85) = 3.79$, $p < .001$.
[a] dummy coded (control = 0, condition = 1)
[b] dummy coded (low self-monitors = 0, high self-monitors = 1)
*p < .05, **p < .005 ***p < .001

number of ideas produced in the initial list and the experimental conditions. The final regression model is shown in Table 1.

Overall, the model accounted for 21% of the variance in quality scores. As can be seen in Table 1, at step 1, all three of the experimental conditions were associated with significantly lower text quality than the control condition. When the idea change measures are added in at step 2 (after the conditions and the number of initial ideas have been controlled for), three factors show significant relationships with text quality: (i) the more rhetorical headings included the outline the higher the text quality; (ii) the more new ideas added to the outline the higher the text quality; (iii) but the more overall change in content between the initial list and the outline the *lower* the text quality.

These results clearly contradict Bereiter & Scardamalia's (1987) knowledge-transforming model. They suggest that, although high self-monitors do change the content of thought more during the construction of an outline, as would be predicted if they adapt their thought to rhetorical goals, this is negatively related to the quality of the resulting text. Instead, the quality of the final text is related to the extent to which relatively *unchanged* content is differentiated into separate ideas and organised in terms of rhetorical goals. This is consistent with the dual-process model's claim that knowledge transformation during planning involves the creation of a coherent mental model of existing ideas which facilitates effective writing but which does not by itself lead to the development of the writer's understanding.

### 4.2 Effects of outlining on text production

The preceding analysis suggests that, although outlining may improve the quality of writing, this is *not* because it enables writers to transform their knowledge more effectively. Perhaps, however, making one's goals explicit before writing enables the writer to transform their knowledge more effectively during text production itself. Alternatively, the dual-process model would expect outlining to reduce knowledge constituting during text production, and hence to prevent the development of understanding.

In a recent study, Baaijen, Galbraith, and de Glopper (2014) examined the effects of outlining and writing beliefs on the development of understanding and text quality. University students were asked to write an article for a university newspaper and their keystrokes were logged using Inputlog (Leijten & van Waes 2006) to assess the extent to which text was modified in the course of text production.

Writing beliefs were measured using the Writing Beliefs Inventory (WBI) designed by White and Bruning (2005). The WBI measures two sets of writing beliefs: *transmissional beliefs*, which represent a belief that writing involves the transmission of information from authoritative sources to the reader, and *transactional beliefs* scale, which represent the belief that writing is an emotional experience involving the development of understanding as the text is constructed. White and Bruning treat these as equivalent to a contrast between a knowledge-telling model of writing (a combination of high transmissional and low transactional beliefs) and a knowledge-transforming model of writing (a combination of low transmissional and high transactional beliefs). Consistent with the knowledge-transforming model, White and Bruning found that the two sets of beliefs had additive effects on text quality, with low transmissional beliefs and high transactional beliefs being associated with higher writing quality.

Baaijen et al. (2014) questioned this interpretation of the two sets of beliefs, pointing out that they are uncorrelated with one another (as both they and White and Bruning found), and hence do not, on the face of it, correspond to a single dimension. They suggested, instead, that the two sets of beliefs are about different aspects of writing: *transmissional* beliefs are about the content to be written about; *transactional* beliefs are about the process by which text is produced. They suggested that low and high transactional writers take an equally active approach to writing but differ in how they combine planning and text production. In particular, they suggested that transactional beliefs are about how explicit planning and text production processes are combined. Low transactional writers believe that writing should be a controlled process in which predetermined ideas are translated into text; high transactional writers believe that writing involves an interaction with the text in which ideas are developed during the course of text production. Therefore, they hypothesised that outlining will benefit low-transactional writers

because it will enable them to develop a coherent global structure for their text which they can then use to control text production. However, since this operates by facilitating the explicit organising process this will not be associated with a development of understanding. By contrast, it predicts that outlining will be less beneficial for high transactional writers because, although it might facilitate the explicit organising process, in doing so it will reduce the development of understanding during writing.

The findings supported the dual-process model. First of all, they showed that, as can be seen in Figure 2, outlining benefits low transactional writers but not high transactional writers.

This is clearly consistent with the dual-process model. However, a possible explanation in terms of knowledge transforming could be that this is because high transactional writers have a higher working memory capacity and don't need the external support of the outline in order to engage in knowledge transforming. If this is correct, then one would expect that low transactional writers should experience less development of understanding than high transactional writers when writing non-planned texts, but similar levels of development in understanding when they write outline planned texts.

This hypothesis was directly contradicted by the results for the development of understanding, which are plotted in Figure 3.

There are a number of important findings here. First, the low transactional writers did not experience increases in understanding in any of the conditions ($p > .55$ in all conditions), with their scores close to zero in all conditions, and no significant difference between the outline and synthetic conditions ($p > .15$).

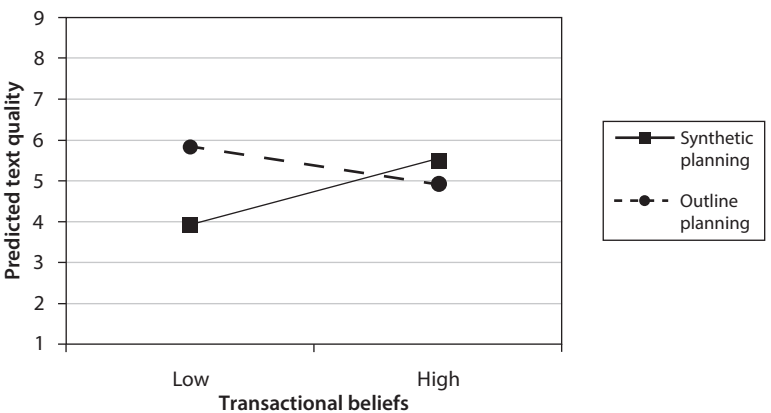


**Figure 2.** Relationship between transactional beliefs and text quality as a function of type of planning

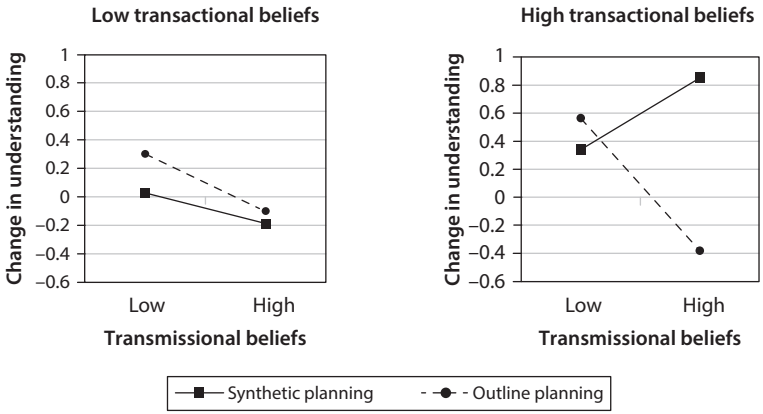


**Figure 3.** The relationship between transactional beliefs and changes in understanding as a function of transmissional beliefs and type of planning

By contrast, the high transactional writers experienced increases in understanding in all conditions ($p < .05$) except for when they also had high transmissional beliefs and made an outline before writing. This is compatible with Baaijen et al.'s (2014) claim that low and high transactional writers differ in how they control text production, with high transactional writers allowing their implicit understanding to drive text production whereas low transactional writers use their pre-existing explicit ideas to control text production. The findings also suggest, however, that the high transactional writers' general approach can be overridden when they also try to convey authoritative ideas and reinforce this by making an outline before writing.

For present purposes, the key finding is that, although outlining does improve quality, it only does so for a sub-group of writers, and does not do so by increasing the development of understanding. Quality and the development of understanding do not go hand in hand, contrary to the predictions of the knowledge-transforming model.

The hypothesis about the difference in process between low and high transactional writers received further support from Baaijen et al.'s (2014) analysis of the extent to which writers revised their text during text production. Although low and high transactional writers revised their texts to a similar extent, they differed in how revision was associated with the development of understanding and text quality. For low transactional writers, greater amounts of revision were associated with poorer quality text and unrelated to the development of understanding. This supports the claim that low transactional writers try to get their ideas straight first and then "translate" these ideas into text; revision is essentially *reactive* (see

Galbraith & Torrance 2004), occurring when the text does not adequately express pre-determined explicit ideas, and involves trying to modify the text to fit these ideas, rather than changing the ideas themselves. Outlining enables low transactional writers to create a more coherent set of ideas to guide text production, hence reducing the extent to which text needs to be revised during writing, and improving the quality of the final text. However, since this is based on pre-existing ideas in episodic memory, this does not lead to the development of understanding during text production.

By contrast, for high transactional writers, greater amounts of revision were associated with greater development of understanding and unrelated to text quality. This supports the claim that high transactional writers prioritise the text production process and focus on articulating their implicit understanding in the text, adjusting and developing the global structure of the text in response to the development of their understanding in the text. Hence, their understanding develops in the course of text production, and is associated with a greater amount of revision during writing. Outlining reduces the extent of text modification and hence the extent to which the writer's understanding develops during text production, particularly when the writer is trying to transmit pre-determined content derived from authorities (high transmissional beliefs).

## 5. Conclusion

In this chapter we have focussed on the contribution of global planning processes – as embodied in outlining – to the creation of written knowledge objects. To conclude, we want to summarise our conclusions about the nature of outlining in writing, and consider its place as a drafting strategy to be taught to novice writers, before considering more general implications for theories of writing.

### 5.1 The nature of outlining

Our first conclusion is that the main function of outlining is to create a coherent mental model of the text. We argue that this involves trying to create a spatially extended representation of the text to be written. This is based on ideas stored in episodic memory and involves reorganising these into a coherent mental model of the text that satisfies rhetorical goals. This is most effective when content is differentiated into separate ideas and these are organised in terms of the writer's rhetorical goals. To that extent this is a knowledge-transforming process, in which existing content is transformed into a rhetorical object, and the form of this object is the product of an interaction between content and rhetorical spaces. Indeed, we

argue that this literally involves constructing a spatial representation of the object of thought.

However, this does not involve a development of the writer's understanding or perhaps, to be more precise, only involves a partial development of understanding – a better understanding of the global structure of the knowledge object rather than the formulation of novel propositions about the topic. Its effects, therefore, are limited to a specific aspect of the writer's understanding.

The second question here is whether, by making their ideas and goals more structured and explicit before producing the text itself, writers are better able to develop their understanding during writing. Does having a more structured "rhetorical space" enable writers to evaluate and modify content proposed by "content space" more effectively?

Baaijen et al.'s (2014) finding that, when low transactional writers are allowed to make an outline before writing, they improve the quality of their text but do not develop their understanding clearly contradicts this. Furthermore, the fact that improvements in quality and developments in understanding are unrelated to one another contradicts the idea that these are necessarily linked. Instead, these appear to be independent aspects of writing.

The findings for high transactional writers suggest further that outlining is not necessary for effective writing or for the development of understanding during the production of text itself. The high transactional writers in the synthetic planning condition were able to do both. In addition, outlining may, for some writers, actively prevent the development of understanding. Thus, for high transactional writers who also have high transmissional beliefs, synthetically planned writing was strongly associated with the development of understanding whereas, for the same group of writers, outline planned writing was associated with a complete absence of developments in understanding. Given that high transmissional beliefs are that content should be based on authoritative sources rather than personal opinion, this suggests that the negative effect of outlining is conditional on the kind of content that is written about. Our interpretation of this is that, when writing about sources, writers have to formulate the sources in their own terms if their understanding is to develop. Synthetic planning enables them to constitute their understanding in the text, whereas outline planning constrains them to trying to translate pre-determined ideas stored in episodic memory.

Our general conclusion is that although outlining does have beneficial effects on quality for writers who view writing as a translation process (low transactional beliefs), it does not have any beneficial effects on quality for writers who are concerned with developing their understanding during text production (high transactional beliefs). In itself, it does not directly affect understanding, but can influence this negatively through its effects on the text production process.

## 5.2 Implications for drafting strategies

Outlining tends to be treated as a general strategy that should be useful for all writers – "you must plan your work" is common advice in educational contexts. This is reinforced by a view of writing as primarily a reflective process, in which producing rhetorically effective text and developing one's understanding are treated as two sides of the same coin. If, however, these are not two sides of the same coin then it becomes important to distinguish between the goals of writing. Baaijen et al.'s findings suggest that, although outlining might be a useful strategy for writing effective text, it might be a risky strategy for developing one's understanding. If our purpose is the development of understanding through writing then Baaijen et al.'s results suggest that teaching should target low transactional writer's beliefs, making them aware that a less controlled form of text production can promote the development of understanding. It is an important question for future research as to whether (and how) writers' beliefs about basic components of the writing process can be changed. Second, synthetically planned text production would be a better strategy for developing understanding. This may be particularly relevant when – as in many academic contexts – it is important for students to develop their understanding of authoritative sources. In such circumstances, all writers, rather than just those with high transmissional beliefs, are trying to demonstrate their understanding of these sources.

For writing-to-learn to be effective, then, it is important that writers understand the form of text production that it involves, and that writing is synthetically planned. Future research is needed to establish whether other forms of non-outline planned writing – including completely spontaneous text production – are more or less effective than synthetic planning.

The second set of questions here is about the effectiveness of an outlining strategy compared to other forms of drafting strategy. Kellogg's (1994) research has suggested that outlining is more effective than other drafting strategies, particularly that it is better than a revision strategy, in which an initial unplanned draft is produced and then revised. However, Galbraith and Torrance (2004) have argued that Kellogg's negative findings about the revision strategy are a consequence of the form of revision strategy that he implemented in his experiments. This involved writing an initial draft without pre-planning and without evaluating how well it was expressed, postponing evaluation and revision of expression until after the draft had been produced. Galbraith and Torrance (2004) argued that the key ingredient of a revision strategy should not just be that evaluation of expression is postponed but that the initial draft should not be explicitly organised, and should instead follow the path of thought as it unfolds. The second revision stage

then is concerned not just with revision of expression but with identifying the organisation implicit within the initial draft and rewriting this in a more rhetorically appropriate form.

In Baaijen et al.'s (2014) study, participants were asked to produce a single draft in all conditions, with only the nature of the planning before writing and the writer's beliefs varying. An important question for future research is how these conditions would compare with conditions where a revision strategy of the form specified by Galbraith and Torrance was implemented (see Kieft, Rijlaarsdam, Galbraith & van den Bergh 2006, for some suggestive findings). As things stand, Baaijen et al.'s (2014) findings suggest that outline planning writing is more effective for text quality than synthetically planned writing for low transactional writers, and makes little difference for high transactional writers. One interpretation, therefore, might be that outlining is more effective as a general strategy when the writer's goal is to produce high quality text, particularly in a practical teaching context, where it might be difficult to tailor teaching to different writing beliefs. However, this interpretation neglects the fact that outlining does not develop understanding for low transactional writers and inhibits the development of understanding for some high transactional writers. Furthermore, it assumes that the development of understanding does not contribute to text quality.

In fact, as Baaijen et al.'s (2014) study showed, high transactional writers produced higher quality text than low transactional writers in the synthetic planning condition, and this was precisely the condition in which high transactional writers produced the greatest developments in their understanding, and low transactional writers did not develop their understanding. According to the dual-process model, text quality depends on both the articulation of the writer's understanding and the organisation of the text into a coherent and rhetorically appropriate form. But these are also assumed to be mutually conflicting processes, with explicit organisation inhibiting the development of understanding, and the development of understanding disrupting explicit organisation. In Baaijen et al.'s study, the low transactional writers' approach was supported by an outlining strategy. However, the high transactional writers were not provided with a strategy consistent with their approach. Outlining may have enabled them to better organise their texts – just as it did the low transactional writers – but this was at the expense of the articulation of their understanding in the text. And to the extent that they were still able to develop their understanding, this would be expected to be at the expense of the explicit organisation of the text. Hence, there would be no overall beneficial effect on text quality for these writers. However, if they were allowed to use the revision strategy described by Galbraith and Torrance (2004), they should be able constitute their understanding in the initial draft, and then organise this into a

rhetorically appropriate form in the subsequent revision stage. The prediction of the dual-process model is that this would be of higher quality than writing produced by an outline planning strategy.

### 5.3 Actions and objects

We have argued in this paper that, in treating writing as a process of constructing knowledge objects, the knowledge-transforming model neglects the extent to which text production is an active knowledge-constituting process, and hence does not capture the way in which understanding develops during writing. Thus, although there is evidence that writers who prioritise rhetorical goals do change the content of their thought more than other writers, and that this occurs particularly when they are able to focus on higher level thinking free from the demands of text production, this is not associated with the development of their understanding. Instead, this appears to involve the reorganisation of existing ideas to satisfy rhetorical goals, as would be expected if it operates on an episodic store of fixed mental objects. Insofar as this has beneficial effects on quality, it appears to be because of its structuring effects rather than because of its effect on the development of understanding. In general, there is no evidence that it has a beneficial effect on the development of understanding, or that the development of understanding is directly linked to the production of better quality text.

We have suggested instead that the explicit structuring effects involved in the construction of knowledge objects need to be combined with the knowledge-constituting process. This provides a mechanism by which new content can be created, and involves treating thought as a form of action. In this view, knowledge objects are the residue of the movement of thought, and are shaped from this residue once thought has been externalised. The development of understanding and the production of effective text are not intrinsically linked, and need to be coordinated in a particular way if they are to be combined effectively.

## References

Baaijen, Veerle M., David Galbraith, and Kees de Glopper. 2014. "Effects of writing beliefs and planning on writing performance." *Learning and Instruction* 33: 81–91. DOI: 10.1016/j.learninstruc.2014.04.001

Baddeley, Alan. 1986. *Working Memory.* New York: Oxford University Press. DOI: 10.1017/s0033291700025228

Bereiter, Carl. 2002. *Education and Mind in the Knowledge Age.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Bereiter, Carl, and Marlene Scardamalia. 1987. *The Psychology of Written Composition*. Hillsdale, NJ: Erlbaum. DOI: 10.2307/327270

Churchland, Paul M. 2012. *Plato's Camera: How the Brain Captures a Landscape of Abstract Universals*. Cambridge, Massachusetts: The MIT Press. DOI: 10.1007/s11023-012-9295-x

Galbraith, David. 1992. "Conditions for discovery through writing." *Instructional Science* 21: 45–72. DOI: 10.1007/bf00119655

Galbraith, David. 1999. "Writing as a knowledge-constituting process." In *Knowing What to Write,* ed. by Mark Torrance, and David Galbraith, 139–160. Amsterdam, NL: Amsterdam University Press. DOI: 10.5117/9789053563076

Galbraith, David. 2009. "Writing as discovery." *British Journal of Educational Psychology Monograph Series II 6 – Teaching and Learning Writing*: 5–26. DOI: 10.1348/978185409x421129

Galbraith, David, and Mark Torrance. 2004. "Revision in the context of different drafting strategies." In *Revision: Cognitive and instructional processes,* ed. by Linda Allal, Lucile Chanquoy, and Pierre Largy, 63–86. Dordrecht, NL: Kluwer Academic Publishers. DOI: 10.1007/978-94-007-1048-1

Galbraith, David, Sheila Ford, Gillian Walker, and Jessica Ford. 2005. "The contribution of different components of working memory to knowledge transformation during writing." *L1 – Educational Studies in Language and Literature* 5: 113–145. DOI: 10.1007/s10674-005-0119-2

Galbraith, David, Mark Torrance, and Jenny Hallam. 2006. "Effects of writing on conceptual coherence." *Proceedings of the 28th Annual Conference of the Cognitive Science Society*: 1340–1345.

Galbraith, David, Luuk van Waes, and Mark Torrance. 2007. "Introduction." In *Writing and Cognition: Research and Applications*, ed. by Mark Torrance, Luuk van Waes, and David Galbraith, 1–10. Amsterdam, NL: Elsevier. DOI: 10.1075/wll.13.2.07man

Galbraith, David, Jenny Hallam, Thierry Olive, and Nathalie Le Bigot. 2009. "The role of different components of working memory in writing." *Proceedings of the 31st Annual Conference of the Cognitive Science Society*: 3028–3033.

Glasspool, David, W., Tim Shallice, and Lisa Cipolotti. 2006. "Towards a unified process model for graphemic buffer disorder and deep dysgraphia". *Cognitive Neuropsychology* 23(3): 479–512. DOI: 10.1080/02643290500265109

Kellogg, Ronald, T. 1994. *The Psychology of Writing*. New York: Oxford University Press.

Kieft, Marleen, Gert Rijlaarsdam, David Galbraith, and Huub van den Bergh. 2006. "The effects of adapting a writing course to students' writing strategies." *British Journal of Educational Psychology* 77(3): 565–578. DOI: 10.1348/096317906x120231

Klein, Perry D. 1999. "Reopening inquiry into cognitive processes in writing-to-learn." *Educational Psychology Review* 11(3): 203–270.

Klein, Perry D. and Lori C Kirkpatrick. 2010. "A framework for content area writing: Mediators and moderators." *Journal of Writing Research* 2(1): 1–46.

Landauer, Thomas K., Danielle S. McNamara, Simon Dennis, and Walter Kintsch. 2007. *Handbook of Latent Semantic Analysis*. Mahwah, NJ: Lawrence Erlbaum Associates. DOI: 10.1177/0261927x08317982

Leijten, Marielle, and Luuk van Waes. 2006. "Inputlog: New perspectives on the logging of online writing." In *Computer keystroke logging and writing: Methods and applications*, ed. by Kirk P.H. Sullivan, and Eva Lindgren, 73–93. Amsterdam: Elsevier.

McClelland, James. L., Bruce, L. McNaughton, and Randall C. O'Reilly. 1995. "Why there are complementary learning systems in the hippocampus and neocortex: Insights from the successes and failures of connectionist models of learning and memory." *Psychological Review* 102: 419–457. DOI: 10.1037//0033-295x.102.3.419

Norman, Kenneth A. 2010. "How hippocampus and cortex contribute to recognition memory: Revisiting the Complementary Learning Systems model." *Hippocampus* 20(11): 1217–1227. DOI: 10.1002/hipo.20855

O'Reilly, Randall C., Rajan Bhattacharyya, Michael D. Howard, and Nicholas Ketza. 2011. "Complementary Learning Systems." *Cognitive Science* April 2011: 1–20. DOI: 10.1111/j.1551–6709.2011.01214.x

Popper, Karl R. 1972. *Objective Knowledge*. Oxford: Oxford University Press. DOI: 10.1007/bf02381520

Rogers, Timothy, T., and James, L. McClelland. 2004. *Semantic Cognition*. Cambridge, MA: MIT Press.

Snyder, Mark 1979. "Self-monitoring processes." *Advances in Experimental Social Psychology* 12: 86–131. DOI: 10.1016/s0065-2601(08)60260–9

White, Mary J., and Roger Bruning. 2005. "Implicit writing beliefs and their relation to writing quality." *Contemporary Educational Psychology* 30: 166–189. DOI: 10.1016/j.cedpsych.2004.07.002

Winocur, Gordon, Morris Moscovitch, and Bruno Bontempi. 2010. "Memory formation and long-term retention in humans and animals: Convergence towards a transformation account of hippocampal–neocortical interactions." *Neuropsychologia* 48: 2339–2356. DOI: 10.1016/j.neuropsychologia.2010.04.016