

Cooperative Writer Modelling: Facilitating Reader-Based Writing with Scrawl

Susan Bull & Simon Shurville

*School of Languages, University of Brighton, Falmer, East Sussex, BN1 9PH, UK.
email: s.bull@brighton.ac.uk, sjs16@itri.bton.ac.uk*

Abstract: This paper introduces SCRAWL, a system which uses a cooperatively constructed Writer Model to represent a student's writing strategies. SCRAWL encourages audience awareness in writers, and offers advice on creating a reader-based text, to fit with a student's own writing strategies. An initial evaluation is presented to demonstrate the feasibility of this approach.

1 Introduction

One of the many things an author must consider when writing is the requirements of the intended readers. Despite its importance, this is often overlooked by student writers (Kroll, 1993). Flower (1993) urges learners that:

The first step in designing your writing to be read is to understand the needs, attitudes, and knowledge of your particular reader, and to help that reader turn your written message into the meaning you intended.

Flower (1993:193)

However, advice on creating a reader-based text must be given at the right moment, and this will differ for different authors, since writers approach writing in a variety of ways. For example, some plan extensively initially (either mentally or externally), while others start writing directly. The latter writer may be increasing their understanding through writing, while initial planners may be high self-monitors whose ideas do not get further developed during the writing phase (Galbraith, 1996). Torrance et al (1994) state that 'planning is neither a necessary nor a sufficient condition for writing success', and Piolat (1999) suggests that sentence generation coupled with revising, if well-balanced, may be as effective as planning. It is possible that some previous findings suggesting the importance of planning for effective writing may be related more to the effect of increased time on task, brought about by planning (Sharpley, 1999).

Many writers do not find it easy to alter the strategies they are accustomed to using (Wyllie, 1993), often preferring one set of approaches over others (Snyder, 1993). Indeed, even if strategy change were achieved, this does not imply that new strategies adopted by an individual will suit *them*. If instructed to follow particular methods, students could be forced into using less productive strategies (Cumming, 1995). In addition, authors may be writing in an already familiar genre, using well-developed strategies which work effectively for them (Torrance, 1996). Since experienced writers also use a variety of approaches (Chandler, 1993; Snyder, 1993), there appears little justification in expecting learners to adapt the way

they write, if they are comfortable with their current approaches. Nevertheless, the need to consider reader perspectives remains important, and students often require help with this.

Some Online Writing Labs (OWLs) remind students about their audience (e.g. Jordan Henley, 1995; Kaplan, 1998), though the advice offered is not usually tailored to the needs of the writer. Similarly, some OWLs offer suggestions of ways to approach a writing task (e.g. Berven, 1997; Purdue University, 1998), but the strategy or strategies suggested may conflict with the way writers naturally write.

SCRAWL was designed to complement static information provided by OWLs. It helps learners to identify both the needs of their readers, and their own writing strategies, using a process of cooperative user modelling. This joint model construction process enables the system to take responsibility for raising a student's strategy awareness, while the student has the responsibility of fine-tuning the model, once they have become more conscious of their writing strategies. SCRAWL can then offer advice as best suited to a learner's individual approaches to writing, as well as tailored to the needs of their readers.

2 Writing Strategies

Chandler (1995) identified the following strategies, based on a study of experienced academic writers, which he defined as *architect*, *bricklayer*, *oil painter* and *watercolourist*. Wyllie (1993) investigated these distinctions further in the context of composing on the word processor, and found an additional category which she named *sketcher*. These strategies are summarised in Figure 1 (adapted from Chandler, 1995; Wyllie, 1993).

<i>Architects</i>	usually plan thoroughly before starting to write. They tend not to correct slips as they write, but edit the whole text on completion. They often write sequentially, sometimes starting with the easiest part. Architects revise their writing quite a lot, particularly making sentence level revisions (spelling and grammar). They are very conscious of their strategy use. When wordprocessing documents, architects occasionally find the screen restrictive.
<i>Bricklayers</i>	usually rework sentences and paragraphs, forming a solid foundation before moving on. They sometimes write sequentially, rarely starting with the easiest part. Bricklayers revise quite a lot, mainly sentence-level spelling and grammar, and re-sequencing of material. They tend not to be conscious strategists. Bricklayers often find the screen restrictive when wordprocessing, and frequently lose the overall sense of the text.
<i>Oil painters</i>	do not usually plan, but write down ideas as they occur to them, revising later. Sometimes they write sequentially, and sometimes do not. They often start with the easiest part. Oil painters revise extensively, in particular: meaning and sequencing. They are usually not conscious of their strategy use. Oil painters occasionally find the screen restrictive. They generally find that wordprocessing helps them better understand their meaning.
<i>Sketchers</i>	tend to form a rough plan at the beginning, which is later revised. They sometimes write sequentially, and sometimes do not. They occasionally start the easiest part first. Sketchers revise extensively, both at sentence level, and resequencing and changes in meaning. They are quite conscious of their strategy use. Sketchers occasionally find the screen restricts them, but wordprocessing usually helps them to understand their meaning.
<i>Watercolourists</i>	usually write a single draft which needs little revision. Where watercolourists do revise, this is usually in meaning and sequencing. Watercolourists always write sequentially, and rarely start with the easiest part. They are not usually conscious strategists. Watercolourists do not find the screen restrictive, and only rarely lose the general sense of their text.

Figure 1: Writing strategies identified by Chandler and Wyllie

It can be seen that while it is likely to be useful for *architects* and *watercolourists* to consider their readers at the outset, and include them in their (mental or externalised) planning, writers using other strategies, e.g. *oil painter*, may find writer-based prose useful in

their exploration of ideas. Text can then be adapted towards the readers during revision—i.e. there is a 'space for oneself' in the draft, which can be developed into a 'space for others' in the final text (Alcorta, 1996). These writing strategies can be used as stereotypical descriptions (Rich, 1983; 1989) of different kinds of writer.

3 Considering the Reader and Constructing a Writer Model with SCRAWL

To find out about the target readership, SCRAWL prompts students for information about their readers, e.g. whether they are knowledgeable about the topic; whether they will be sympathetic to the argument. In this way, students build a document-specific Reader Model (see Bull & Shurville, 1999). SCRAWL can then offer reader-focused suggestions in addition to more general advice (e.g. the use of cues and signalling in a text).

To identify the student's writing strategies, SCRAWL helps them to build a model of their writing process by asking 8 questions, requiring answers on a 5 point scale. According to the results of Chandler (1995) and Wyllie (1993), these questions were hypothesised to be the smallest set which would reveal writing strategies accurately. Figure 2 shows the model construction questions.

Once the initial Writer Model has been constructed, SCRAWL presents a description of all 5 strategies (or stereotypes), and then states which are those inferred to be used by the student, based on their responses (Figure 3). Any strategy having sufficient aspects of its contents in the author's Writer Model is described, i.e. those whose score climbs above the threshold after it has been incremented, decremented, or left unchanged, according to the student's answer to

	Always	Usually	Sometimes	Rarely	Never
Does writing help you to organise your thoughts?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you correct slips as you write?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you complete a draft at the first attempt?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you start with the easiest part?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you find the screen restrictive?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Do you consciously choose your writing strategies?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	Very Much	Much	Some	Very Little	Not At All
How much do you <i>revise</i> your text at the <i>end</i> of writing?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much do you <i>plan</i> at the <i>beginning</i> ?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 2: The Writer Model construction questions

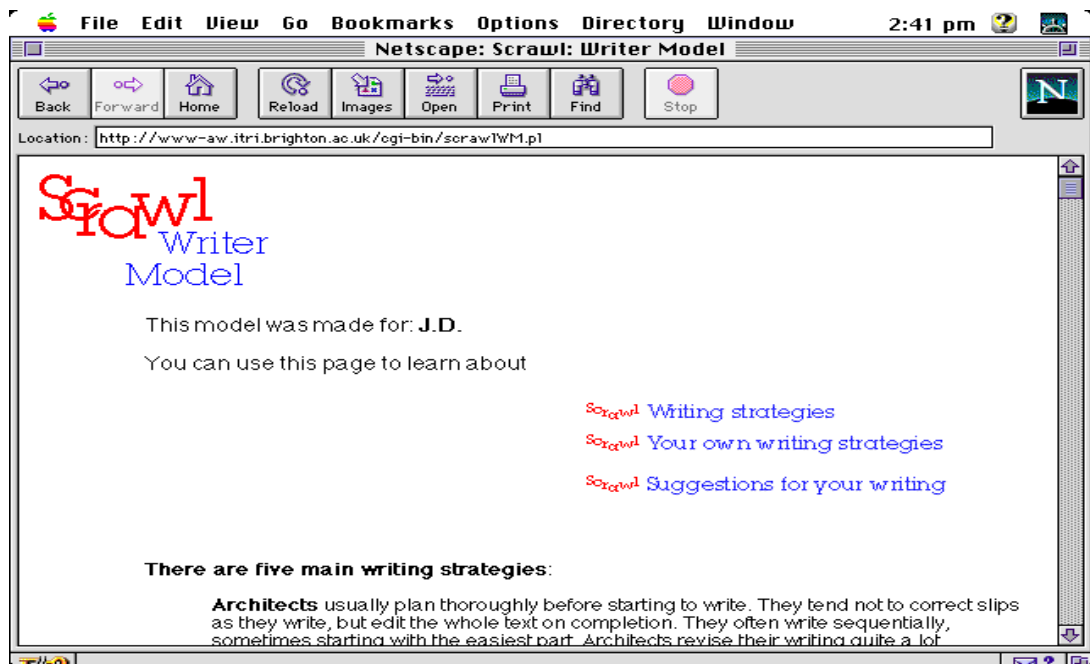


Figure 3: Introducing writing strategies to students

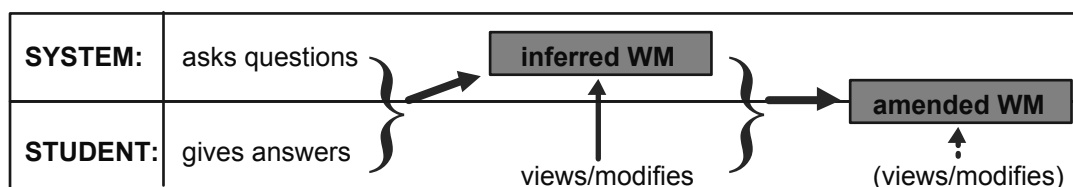


Figure 4: Steps in the construction of the cooperative Writer Model

each of the 8 model construction questions. For example, in answer to the question about planning, the score for *oil painter* is decremented by 2 if the user selects 'Very Much', and by 1 for 'Much'. The score remains unchanged if 'Some' is selected. It is incremented by 1 if 'Very Little' is selected, and by 2 for 'Not At All'. Students are asked whether they agree with SCRAWL'S interpretation of their writing strategies. If they do not, they may add or remove strategy representations. This implies that students must look at their Writer Model—an important question since Barnard and Sandberg (1996) found that students had little interest in a viewable student model. As well as assisting in the construction of the Writer Model, selection amongst explicitly stated aspects of the writing task is intended to help overcome the common perception that there is a 'correct' way to write.

Figure 4 shows the steps in the creation of the cooperative Writer Model. This is interpreted as follows:

- 1 the system offers the model construction questions;
- 2 the student responds to the system's questions;
- 3 the system infers the Writer Model (inferred WM);
- 4 the student views information in the model;
- 5 the student acknowledges or modifies inferences (amended WM).

This process results in the cooperatively constructed Writer Model which may be further amended if the student wishes (for example, if they wish to try using another strategy). This joint model building process gives learners responsibility and control over the contents of

their Writer Model, as recommended for cooperatively constructed student models (Beck et al, 1997; Kay, 1997).

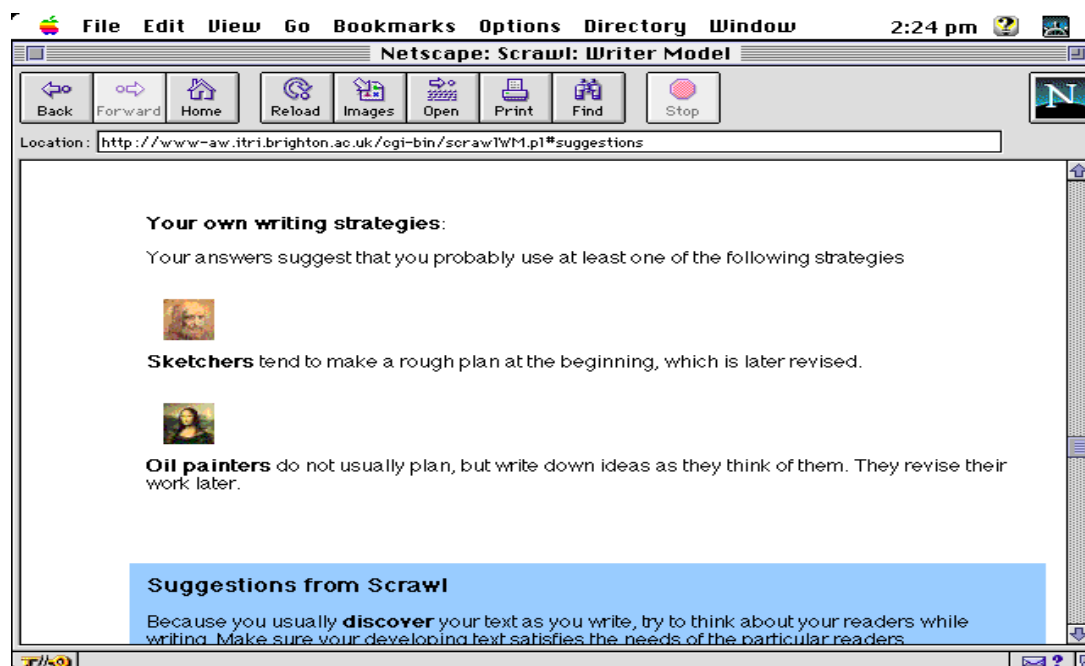


Figure 5: Advice based on the Writer Model

In SCRAWL, the importance of learner control is possibly greater. This is because the model needs to be built before the student begins composing, in order to support them in carrying out the task, since it is not possible to accurately diagnose a learner's actions dynamically in such an open-ended, complex task. Much of the writing process may naturally occur away from the computer. This may be mentally, and even at a time when the writer is engaged in some other activity. Thus cooperative user modelling may be particularly useful in this kind of domain.

Once strategy use (or choice) has been determined, SCRAWL offers advice to the writer according to their writing strategies, and suggestions for creating a reader-based text (Figure 5). This information remains available for later viewing so that an author can return to view suggestions at the time most appropriate for their way of writing. Similarly, facilities for later editing of the Writer Model are crucial in case a student wishes to change their approach to writing, as a result of increased strategy awareness (e.g. they may have been taught that they should plan first, but realise that this impedes their discovery of ideas).

4 Evaluation of the SCRAWL Writer Model

This section presents an initial evaluation of the Writer Model. The aim was to discover whether students and SCRAWL could cooperatively build a Writer Model using the process in Figure 4, and whether they would understand the resulting model.

4i Method

The study involved 49 students from 2 undergraduate degree courses: Language with Business, and Language with Linguistics. Subjects completed a short questionnaire which included a question about audience awareness. They then used SCRAWL in preparation for a writing task. Inferences based on the 8 Writer Model construction questions were made about a student's two most commonly used strategies.

4ii Results

Questionnaires were returned by 39 subjects. Of these, 9 (23%) claimed not to think about their readers at all when writing.

All 49 students constructed a Writer Model with SCRAWL. Answers to the 8 model construction questions suggested that 10 subjects used *only 1 strategy*: 4 *sketchers* and 6 *watercolourists*. SCRAWL predicted a range of *strategy combinations*, illustrated in Figure 6. Darker shading (bottom) indicates the more frequently used strategy of a pair, i.e. there were 6 combinations of *architect/bricklayer*, 4 of these having *architect* as their main strategy, and 2 with *bricklayer* as the primary strategy.

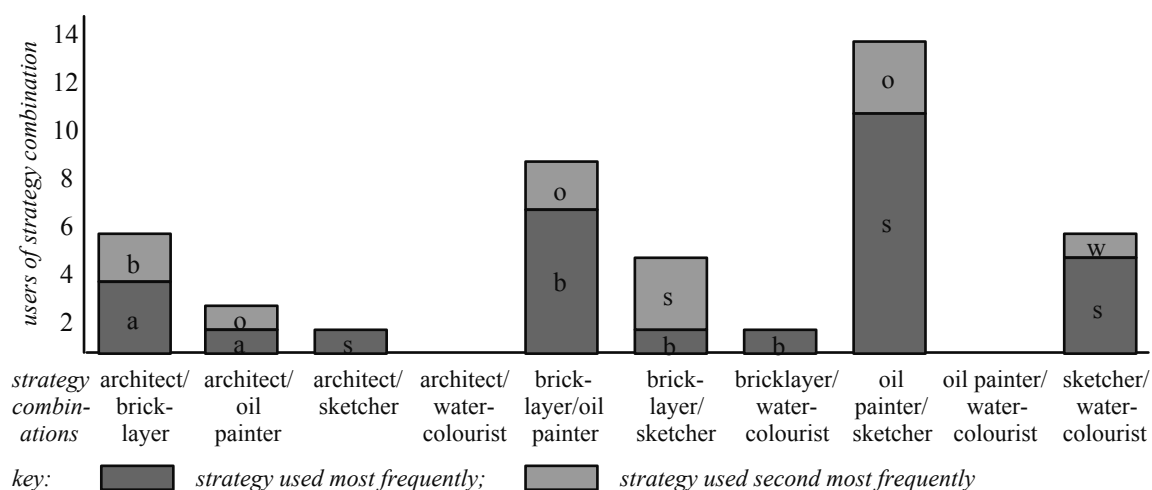


Figure 6: Strategy combinations

SCRAWL's prediction	Student's amendment
over-predictions	
sketcher + watercolourist	→ watercolourist
sketcher + watercolourist	→ watercolourist
bricklayer + oil painter	→ oil painter
architect + oil painter	→ oil painter
under-predictions	
watercolourist	→ watercolourist + bricklayer
false predictions	
sketcher	→ architect
architect + bricklayer	→ bricklayer + sketcher

Figure 7: Student amendments to their Writer Model

Thirty-one (63%) of the 49 subjects agreed with SCRAWL's evaluation of their strategy use. Seven (14%) disagreed. Figure 7 shows SCRAWL's predictions for these subjects, and the student amendments. Eleven subjects (22%) did not comment on the accuracy of their Writer Model.

4iii Discussion

Given that 9 (23%) of the 39 questionnaire respondents did not consider their readers at all during the writing process, there is clearly a need to raise audience awareness amongst writers. Five of these 9 learners were actually taking a module called 'Professional Writing' at

the time of the study. It might be speculated that students on non-writing and non-language courses have even less audience awareness.

Students were able to answer all SCRAWL's Writer Model construction questions, and SCRAWL was able to make a range of strategy predictions from these responses. All students reached the inferred model stage. At least 38 subjects (78%) viewed their inferred Writer Model (implied by the fact that 38 stated whether they agreed with its contents), indicating that in this context, many students will have enough interest in their model to view it at least once. This may be because students are involved directly in its construction. Of the users that viewed their Writer Model, 31 (82%) explicitly stated their agreement with the representations—i.e. their Writer Model was satisfactorily completed at the inferred stage. (It must, of course, remain open to change in case the learner subsequently chooses to try a different approach to writing.)

Seven of the 38 students (18%) who indicated their evaluation of the model contents, disagreed with the representations. There were 4 over-predictions (a correct strategy was inferred along with one which was not used). There was 1 under-prediction (a strategy was correctly inferred, but a second strategy was not indicated). There were 2 false predictions (a strategy was suggested in place of one that was used). SCRAWL appears to be having most difficulty with the *sketcher* and *architect* categories, though there is not yet enough data to confirm a problem. In each example of disagreement, the student concerned was able to correct their Writer Model. Thus the remaining students had a satisfactory Writer Model at the final stage (though again, the model must remain open to change). This suggests that even if SCRAWL does experience some difficulties in inferring writing strategies accurately, this will not necessarily diminish its effectiveness.

Following Bull & Pain (1995) and Kay (1995), it was assumed that if students could judge the accuracy of their inspectable user model, they understood it. In this study, therefore, at least 78% of subjects can be assumed to have understood their Writer Model. The situation of the 11 students (22%) who did not comment on their Writer Model is of some concern. It may be that they did view the inferred model, did agree with it and did understand it, and for this reason felt little need to interact with it. However, it is also possible that they did not view it, or that they disagreed with it and received inappropriate suggestions about creating a reader-based text, based on incorrect strategy representations. This is an important issue to pursue: it is necessary to determine whether a lack of interaction with the Writer Model indicates a lack of viewing, a lack of understanding, or whether it is more likely to signal agreement.

5 Summary

This paper has argued for the use of a cooperatively constructed Writer Model to raise audience awareness in student writers. An initial evaluation suggests that the approach is worth developing further, for two reasons. First, a large minority of students appeared to not think about their readers at all, when writing. Second, students are able to contribute information to a Writer Model, and in most cases they understand the model. Some questions remain—the most important at this stage being to determine the reasons of those students who did not interact with their model. Does this imply a lack of understanding, a lack of interest, or does it imply agreement with the strategies inferred by SCRAWL? Further investigation is also required into the longer term effectiveness of SCRAWL.

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References

- Alcorta, M. (1996) The Role of Rough Drafts in Written Text Production: the Transition from a 'Self-Directed' Text to a Text 'Geared to Others', in G. Rijlaarsdam, H. van den Bergh & M. Couzijn, *Theories, Models and Methodology in Writing Research*, Amsterdam University Press, 329-348.
- Barnard, Y.F. & Sandberg, J.A.C. (1996) Self-Explanations, do we get them from our students?, in P. Brna, A. Paiva & J. Self (eds), *Proceedings of European Conference on Artificial Intelligence in Education*, Edições Colibri, Lisbon, 115-121.
- Beck, J., Stern, M. & Woolf, B.P. (1997) Cooperative Student Models, in B. du Boulay & R. Mizoguchi (eds), *Artificial Intelligence in Education*, IOS Press, Amsterdam, 127-134.
- Berven, E. (1997) How to Begin to Write: Organization, Introductions, Conclusions, *The Roane State Community College Online Writing Lab*, <http://www2.rsccl.edu/~writing/>
- Bull, S. & Pain, H. (1995) 'Did I say what I think I said, and do you agree with me?': Inspecting and Questioning the Student Model, in J. Greer (ed), *Proceedings of World Conference on Artificial Intelligence in Education*, Washington DC, AACE, 501-508.
- Bull, S. & Shurville, S. (1999) Reader, Writer and Student Models to Support Writing, to appear in *User Modeling: Proceedings of the Seventh International Conference*, Springer Wien New York.
- Chandler, D. (1995) *The Act of Writing, a Media Theory Approach* University of Wales, Aberystwyth.
- Cumming, A. (1995) Fostering Writing Expertise in ESL Composition Instruction: Modeling and Evaluation, in D. Belcher & G. Braine (eds), *Academic Writing in a Second Language*, Ablex Publishing Corporation, Norwood NJ, 375-397.
- Flower, L. (1993) *Problem-Solving Strategies for Writing*, Harcourt Brace Jovanovich, Inc.
- Galbraith, D. (1996) Self-Monitoring, Discovery through Writing and Individual Differences in Drafting Strategy, in G. Rijlaarsdam, H. van den Bergh & M. Couzijn, *Theories, Models and Methodology in Writing Research*, Amsterdam University Press, 121-141.
- Jordan-Henley, J. (1995) Tone and Audience Awareness, *The Roane State Community College Online Writing Lab*, <http://www2.rsccl.edu/~writing/>
- Kaplan, M. (1998) Writing for the A: The Professor as Audience, *Undergraduate Writing Center*, <http://www.hamilton.edu/academic/Resource/WC/>
- Kay, J. (1995) The UM Toolkit for Cooperative User Modelling, *User modeling and User-Adapted Interaction* 4, 149-196.
- Kay, J. (1997) Learner Know Thyself: Student Models to Give Learner Control and Responsibility, in Z. Halim, T. Ottman & Z. Razak (eds), *Proceedings of International Conference on Computers in Education*, AACE, 18-26.
- Kroll, B. (1993) Teaching Writing IS Teaching Reading, in J.G. Carson & I. Leki (eds), *Reading in the Composition Classroom: Second Language Perspectives*, Heinle and Heinle Publishers, Boston, 61-81.
- Piolat, A. (1999) Planning and Text Quality among Undergraduate Students: Findings and Questions, in M. Torrance & D. Galbraith (eds), *Knowing What to Write: Conceptual Processes in Text Production*, Amsterdam University Press, 121-137.
- Purdue University (1998) Writing Research Papers: A Step by Step Procedure, *Purdue University Writing Lab*, <http://owl.english.purdue.edu/Files/94.html>
- Rich, E. (1983) Users are Individuals: Individualizing User Models, *International Journal of Man-Machine Studies* 18, 199-214.
- Rich, E. (1989) Stereotypes and User Modeling, in A. Kobsa & W. Wahlster (eds), *User Models in Dialog Systems*, Springer Verlag, Berlin, 35-51.
- Sharples, M. (1999) *How We Write. Writing as Creative Design*, Routledge, London.
- Snyder, I. (1993) Writing with Word Processors: a research overview, *Educational Research* 35(1), 49-68.
- Torrance, M. (1996) Strategies for Familiar Writing Tasks, in G. Rijlaarsdam, H. van den Bergh & M. Couzijn, *Theories, Models and Methodology in Writing Research*, Amsterdam University Press, 283-298.
- Torrance, M., Thomas, G.V. & Robinson, E.J. (1994) The Writing Strategies of Graduate Research Students in the Social Sciences, *Higher Education* 27, 379-392.
- Wyllie, A. (1993) *'On the Road to Discovery': a study of the composing strategies of academic writers on the word processor*, MA Dissertation, University of Lancaster.