Breaking up the writing process: how wikis can support understanding the composition and revision strategies of young writers

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(Received 19 August 2010; final version received 26 April 2011)

Understanding how best to support immature writers in the development of their understanding of the writing process is an important concern for researchers and teachers. Social technologies have become key features of leisure and workplace writing, yet knowledge about how to design educational settings that take full advantage of the affordances of Web 2.0 technologies to support early writing is scarce. This paper presents a small-scale study that investigated how writing in a wiki environment might facilitate and support students’ use of composition and revision strategies. Our findings show that wikis can enlarge young writers’ experience of the process of composition and revision both through their own efforts and by observing the process in others. In this study, students employed a wide range of types of revisions, both surface and text-based changes. These revisions took place during the process of composition as well as at the end. It is argued here that writing in a wiki not only provides young writers with experience of a mode of composition prevalent in the contemporary work environment, but also breaks up the process of writing in a way that may support students’ understanding of the processes of composition and revision.

Keywords: writing; Web 2.0 technologies; primary school education; collaboration

Introduction

This paper draws on a small-scale exploratory study about the use of wiki with pupils of 9–10 years of age. Our purpose is to examine the potential of a wiki to address some of the issues faced by teachers and researchers concerned with the development of writing in the early stages.

Writing is a complex endeavour requiring the orchestration of both secretarial and compositional skills. From a psychological perspective, it is argued that the cognitive demands of the writing process result in overload for young writers (Kellogg 1999; Latham 2002). Thus the development of composition from transcribing simple propositions to a more sophisticated presentation of ideas can be a slow process. Furthermore, writing is a social practice, requiring knowledge of the conventions of written text in addition to more familiar spoken language patterns (Perera 1987). It demands understanding of the communicative context of the writing task (Bearne 2003). For the teacher of writing, the classroom context needs to provide support for early writers as they develop understanding of the process of writing and learn to move from a few
words to extended and more complex prose. This paper presents a small-scale study that investigated how writing in a wiki environment might facilitate students’ use of composition and revision strategies. In this paper, we look at the evidence from a classroom-based project using a wiki to consider what it can tell us about pupils’ composition strategies.

**Developing early composition and revision**

There is general agreement about what the psychological process of text production involves, particularly with experienced adult writers: planning, transcribing and reviewing (Hayes and Flower 1980; Berninger and Swanson 1994). Chenoweth and Hayes (2001) propose a psychological model in which writing is envisaged as a sort of production chain. An idea is proposed in the brain and then translated into a language string based on the idea. This language string is evaluated and revised and passed to what is described as the transcriber to be turned into text. Reviewing is an ongoing process and revision can take place at any time during the process. However, such models consider writing as a mainly internal process in the brain of the writer. More social models of writing emphasise the need for knowledge of the purpose and audience for the writing (Roen and Willey 1988) and knowledge of social and cultural conventions for writing (Cope and Kalantzis 1993).

Much of our knowledge of the writing process is based on research with adult or experienced writers. Research that examines the process of writing in immature writers indicates that for young children the production of written text is a more direct process of ‘think it, write it’ (McCutchen 1988). Bereiter and Scardamalia (1987), in explaining how a writer becomes proficient, proposed two writing strategies of: ‘knowledge telling’, more common in novice writers; and ‘knowledge transformation’, which is used by more mature and experienced writers. Chanquoy (2009) argues that in order to transform ideas rather than merely repeating them, reviewing and planning are important parts of this process. These ideas are further developed by Sharples (1999) who conceptualised the process of text production as creative design. This is further developed by Myhill who describes writers as designers (Maun and Myhill 2005; Myhill 2009).

However, research has shown that novice writers find this design process difficult: it is argued that young children simply tell (Bereiter and Scardamalia 1987). Berninger and Swanson (1994) showed how inexperienced writers develop the writing processes of planning, translating and reviewing. They argue that their experiments show that translating appears before the planning and reviewing processes (Berninger et al. 1994). It is argued that for the immature writer the cognitive load of transcription overrides any opportunity to transform (McCutchen 1996). Research into the type of revisions that young writers make indicates that revisions are more likely to be no more than error correction and changes to the surface features of writing such as spelling and syntactic errors (Butterfield, Hacker, and Albertson 1996; Sharples 1999). It is argued that inexperienced writers find it hard to take the position of the reader (Carvalho 2002) or to make text-level changes affecting meaning (Dix 2006). However, Castedo and Ferreiro (2010) argue that where the task is sufficiently relevant to the writers, students as young as seven can take the position of the reader. In their research, children were asked to write captions for photos of members of their family. With secondary students, Myhill and Jones (2007) found that these writers adopted many revision activities during writing, not merely those concerned with surface accuracy. Indeed, it is important to recognise that design in itself is not beyond the capacity of very young children. Pahl (1999) provides extensive evidence of children as designers in
their drawing and model making. She argues that model making was less transcribed by the teachers’ cultural expectations than writing and allowed children to explore ideas within their own sociocultural contexts.

Whereas models of the text production process use various terms to indicate the different elements of the process, for the purposes of this paper, we intend to use the terms composition and revision to encompass those elements of text production that include the generation and transcription of ideas and the evaluation and reformulation of those ideas into finished written text. In the word composition, we include the generation of ideas and their transcription into written text. By revision, we mean the changes that writers make to text that has already been written. We recognise that in any model of writing, the process of composition, i.e. the production of a finished written text, will include revision. However, there is a large body of research (see Chanquoy 2009) that takes reviewing as a separate compartment within composition and argues that immature writers find this difficult. Here is the essence of our argument: the wiki provides students, teachers and researchers with a window on the process of composition, breaking up and tracking the process of composition, requiring students to engage more fully with the task of reviewing and enabling teachers and researchers to track what has occurred. In the discussion, we do indeed reiterate that reviewing is a part of composition but we intend to keep in readers’ minds the separate elements as addressed in the literature.

Thus, although much of the literature argues of the difficulty of composition and revision for immature writers, there is also evidence that students can engage with the process when the context is right. Teachers need to provide a context that supports students’ learning of the writing process to help them move from telling to transforming (Null 2010). However, although we understand something of the issues, we do not know enough about how to help young writers develop in their efficiency in the craft of writing. This paper describes how using a wiki can provide rich experience of the process of composition and revision for both young writers and the teacher with insight into how these writers have engaged in the process.

Affordances of wikis to support the writing process

Wikis are part of the emergent generation of Web 2.0 tools and applications. There are different wiki engines, but each has, as a common feature, a collaborative website whose content can be edited by visitors to the site, allowing users to easily create, edit, revise, expand or link web pages to create a text collaboratively. Acting in this way, wiki participants become publishers rather than merely consumers of information (Sigala 2007).

Several researchers have drawn attention to the potential of wiki environments to support composition processes. Thus collaborative writing is one of the most common uses that is attributable to wikis (Lundin 2008); however, most studies focus on experienced writers, usually in higher education. Different educational studies have emphasised the medium’s strengths to support the writing process. Forte and Bruckman (2006) suggested that collaborative publishing on a wiki offers an interesting model for creating authentic classroom writing activities because it can support writing-to-learn activities such as research projects or problem-based activities. Wikis may support the different stages or processes involved in complex tasks such as distributing information, collaborative artefact creation, discussion and review. They argue that these authentic writing activities are more likely to provide the context needed to move students’ writing process from telling to transforming. Furthermore, the fact that any writing is published in the wiki environment to an audience can
reinforce the social aspect of writing in which texts are produced for a particular purpose or audience (Richardson 2006).

Other studies show how wikis can support knowledge transforming strategies in writing. In a wiki, students can add to, expand and reorganise others’ ideas easily and make the text longer and more accurate. For many novice writers, expanding, organising and correcting their own work tend to be a rare event (Dix 2006). The technological features of wikis allow students the opportunity to get involved in these key writing processes. Mark and Coniam (2008) report how secondary students produced a greater quantity of text that was more coherent and accurate after there had been a considerable amount of expanding, reorganising and correcting activity in a wiki environment.

In addition to the text creation space, wikis have a negotiation space which can be used for enhancing students’ awareness of the planning stage of writing (Parker and Chao 2007). In the negotiation space, students write to brainstorm ideas and arguments about the issue under discussion and reflect on which ideas will be included in their piece of writing. Planning processes are highlighted in the literature as an important element of the writing process in mature writers, but some argue that they are rarely used by immature ones (Berninger et al. 1992). Moreover, the negotiation space can be used to argue students’ ideas and negotiate agreements on how to write a text and what content to include, thus engaging students in written reflection on the text during composition.

Distributed authoring, which occurs during the process of collaborative learning and writing through a wiki, implies, on the one hand, that users can view pages that others have published without having to wait for a publisher to compile the collection of individual parts and, on the other hand, that being able constantly to see the work of others supports idea generation and enriches the individual’s own writing (Trentin 2009). When publishing and presenting their joint work to a wider audience, learners can benefit from the opportunity to appropriate the new ideas and transform their own knowledge through reflection. This is demonstrated in a study conducted with high school students; Allison (2005) noted that working through a wiki, students learned not only collaborative skills but also some strategies for effective composition and grammar from the other students.

Another advantage reported of wikis with regard to the development of the writing process, particularly revision strategies, is that as students work towards the final document, all intermediate copies are retained. This provides an invaluable learning tool whereby students can see what errors they initially made – and subsequently corrected. The preservation of a record of all steps in a writing process and the accessibility to material from earlier versions by multiple participants can provide a powerful environment for fostering critical revision of the writing (Carr et al. 2007). Moreover, the affordance of a wiki environment to enable revision and reflection on different versions of the same writing may help students to perceive writing as a process-orientated activity rather than a product-orientated activity (Mark and Coniam 2008).

Although it is claimed that wikis may afford many opportunities to support writing processes, there are still relatively few reports of research that show how this objective can be realised in educational settings. This is even more noticeable with novice writers as most research using Web 2.0 technologies and wikis is conducted in higher education (Carr et al. 2007; Parker and Chao 2007) or secondary schools (Allison 2005; Mark and Coniam 2008).
The research

Purpose

The data discussed in this paper arise from a case study of a classroom project using a wiki with students aged 9–10 years. This forms part of a larger research project about the affordances of Web 2.0 technologies in education. Our main aims here are to draw on data from the case study:

1. to explore how a wiki environment can be used to support primary school students’ composition and revision processes;
2. to study how students engage with composition and revision in our wiki environment and what type of writing revisions are enabled; and
3. to discuss the role of wikis in developing young writers’ composition and revision strategies.

Methods

Twenty-five primary education students aged 9–10 years participated in this study. The students came from an urban school in a lower socio-economic area of Lleida (Spain). The students worked together in pairs with the computer. For face-to-face collaborative activities and to work asynchronously in the wiki, they were grouped in groups of six. It was the first time that these students and the teacher used a wiki engine for writing. Not all the groups were able to finish the collaborative text in the time planned by the teacher for this activity. For the purposes of this paper, we analysed in depth the writing of two of the four groups of six students whose members all attended each of the wiki lessons. These two groups fully engaged with the writing process and both finished the collaborative text.

We designed a classroom-based project to prepare and scaffold the students to write collaboratively a discussion text in the wiki environment. The topic of the discussion arose from a science project on the planet Mars. The task was to create a discussion about the feasibility of setting up a colony on Mars. The instructional process engaged the students in three different learning phases with specific learning objectives (Figure 1), and the whole project lasted for 13 sessions of approximately one hour each.

Firstly, there were three face-to-face class sessions for which the main learning objective was to develop collaborative talk. In these sessions, a ‘thinking together’ approach was used (Mercer 2000), and the students worked in groups of six on activities to enhance collaborative talk.

Secondly, and during the next three class sessions, the students researched the topic they would write about later: the planet Mars and the scientific possibilities to set up a colony there. The students in pairs undertook a Web-based inquiry activity about Mars: a new topic for the students participating in this study. In the activity, the students had to search, select, integrate and argue about different types of information on the Web about Mars. At the end of this stage, every pair of students wrote an initial proposition giving some ideas related to the possibility of setting up a colony on Mars and what difficulties would need to be overcome and how.

Thirdly, each group of six students (three pairs) joined in a wiki environment to write collaboratively in pairs a final text. Seven class sessions were used for this stage. The first of these sessions focused on learning how to use the wiki spaces to write together. In this
session, the teacher presented wikis as a powerful collaborative learning tool in which students could add, delete or revise each others’ ideas as a means to write a better text. In addition, the teacher emphasized the wiki negotiation space as a collaborative space in which students would have the opportunity to explain to their classmates their ideas about the writing process and their reasons about the changes they made in the common text. During the next six sessions, the pairs took turns to work in the wiki for periods of about 10–15 minutes. In total, each pair spent between seven and eight periods working at the wiki (a total of 21 periods for group 1 and 24 for group 2 over the six sessions). The two groups showed a similar length of their written interactions in the negotiation space (group 1: 802 words; group 2: 994 words). Both groups structured their final collaborative text in four paragraphs and a title. The length of the final text was 119 words for group 1 and 184 words for group 2.

The wiki environment used in our work includes two frames divided vertically. The bar that separates them is movable, so that the students can adapt the space according to their needs. The left frame is ‘consultation space’, and the right frame is ‘writing space’. The consultation space contains two tabs: (a) instructions to use the wiki and (b) the students’ initial ideas. These pop up as initial proposals from which to start the negotiation and composition processes in the wiki.

The writing space also contains two tabs (Figure 2): (a) Negotiation, this is the negotiation space of the wiki. Here, the pairs discuss and reach agreements on how they want to construct the joint text and to decide on aspects of their collaborative writing such as the following: what sections the final text will have; what content each section will have; and what content is needed to be included in the group text. This joint process draws on the negotiation carried out before and during the writing of the text. The students are encouraged to explain to their wiki group partners in the negotiation space what changes (additions, substitutions, reversions or deletions) have been made in the collaborative text and why. (b) Group page, this is the space where the group, formed by the three pairs, writes the text collaboratively. The students were encouraged to add new ideas to the text and also to review and revise those ideas.
Data collection

The data presented in this paper were collected during the seven wiki writing sessions. We collected and analysed in depth all the students’ contributions in the wiki environment. However, only the students of two groups attended all the wiki sessions and therefore finished the collaborative text. In particular, in this paper, we followed the trajectory of these two groups of six students in two different wikis through the various stages of their wiki contributions in both the negotiation space and group writing page. This paper focuses mainly on the composition and revision of the final text in the writing area but draws on evidence from the negotiation space for additional information about the negotiation which generated the text changes and to gain understanding about students’ revision processes. We discuss in more detail the collaboration and discussion that took place in the negotiation space elsewhere.

Data analysis

In order to examine the processes of revision and composition for the purposes of this study, a variation on the tried and tested Faigley and Witte (1981) taxonomy of revisions was used as suggested by Dix (2006) with students of a similar age to those in the present study. Chanquoy (2009) describes Faigley and Witte’s taxonomy as the most complete classification taking account of ‘both syntactic and semantic revisions’ (87). We adopted the Dix adaptation precisely because it draws on the scope of the Faigley and Witte taxonomy.
and does not assume a more reductive view of beginning writers’ revisions which can be seen as no more than low-level corrections (Chanquoy 2009) such as rewriting words (to improve legibility) and suppressing errors (Sommers 1980). In order to explore the affordances of wikis to support composition and revision, it was judged important to consider both text-based and surface changes.

Dix’s revised taxonomy, like Faigley and Witte, categorises revisions into these two categories of surface changes and text-based changes. The first category of surface changes is subcategorised as either formal (e.g. spelling or punctuation) or meaning preserving including additions, deletions, substitutions and restructuring. Using ‘restructuring’ to encompass the three Faigley and Witte categories of permutations, distributions and consolidations is the main difference between the original and Dix’s adaptation. The subcategory of formal surface change encompasses the changes argued to be those predominately employed by novice writers (Chanquoy 2009). The second category of text-based changes covers changes that ‘affect the meaning of the writing at concept and whole text levels’ (Dix 2006, 6). These are subcategorised as either microstructure or macrostructure; each of these can be categorised in the same way as additions, deletions, substitutions and restructuring (see Figure 3). Faigley and Witte distinguish between micro and macro structure by explaining that macrostructure changes would affect any summary of the whole text, whereas microstructure changes, although altering the meaning, do not influence any summary.

In our study, the students were working for the final text from the beginning of their collaborative writing. Therefore it was difficult to distinguish between revision during composition and revision after the draft was produced. To simplify the process, we categorised all text that was added to the end of the text as ‘new’ and all other changes to the text were categorised according to the taxonomy of revisions described above. However, in reality, the distinction between composition and revision is not an easy one to make. This will be discussed later in the paper. At this point, we also added the new category of reversion for additions or substitutions that reintroduced sections of text that had been previously deleted.

Once each alteration to the text had been identified and categorised according to the taxonomy above, a table was constructed indicating the number of each type of revision

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**Figure 3.** Taxonomy of revisions, adapted from Faigley and Witte (1981) and Dix (2006).
used by each of the two groups. Distribution of these revisions can be seen in Table 1. This table enables comparison between these students’ writing in the wiki and other sources that report immature writers’ use (or non-use) of revision strategies. Here it can be seen that slightly more text-based changes were made than meaning preserving. However, there were only few changes to the macrostructure. The table also shows the difference between the two groups, indicating that although group 2 made more revisions than group 1, both groups used each type of change (both surface and text-based) as indicated by Faigley and Witte’s taxonomy.

**Surface changes**

Formal changes have been counted here but not discussed due to the difficulty of examining these in translation. These changes covered the expected range of spelling, punctuation and use of accents (a feature of the original Catalan language).

Although both groups made a similar number of formal changes, group 2 made many more meaning preserving changes than group 1. For example, when describing the storms on Mars, ‘much stronger’ was substituted for ‘more powerful’. Such albeit small changes show a concern for accuracy and meaning and challenge views that argue that young writers do not address changes to the text beyond simple formal changes (McCutchen 1996; Chanquoy 2009). However, they do support those who argue that more sophisticated changes are achieved when the context of the writing is sufficiently supportive.

**Text-based changes**

Additions were the largest number of microstructure changes. They were deemed to have altered the meaning as new information was added. These additions could be a whole sentence such as the addition of, ‘very poor quality light reaches it because it is a long way from the sun’, or just one word as in the addition of ‘nowadays’ in, ‘It would not be possible nowadays to set up a human colony on Mars’.

As can be seen from Table 1, few of the changes made were to the macrostructure. As indicated by Parr (1992 in Dix 2006), these tend to be more evident with experienced writers and, indeed, the examples given by Faigley and Witte are at a highly sophisticated level.
Only three of Dix’s nine young writers made changes that could be deemed macrostructure. In the current project, many of the additions which we categorised as ‘new’ would have affected any summary but we counted these as part of the composition process rather than revision (see Figure 4). One example where a revision was categorised as a macrostructure change was where one pair changed the title from ‘A human colony on Mars, possible or impossible’ to ‘A colony on Mars is impossible’, thus changing the text from discussion to argument.

The historical record of changes available in the wiki allows us to consider not just what changes were made, but also which pairs of students made which changes (see Figure 4). This enables us to see how each pair did or did not contribute to the text. It can be observed that, contrary to expectations of some commentators (as above), only three of the six pairs contributed formal changes to the text. Furthermore, all six pairs made some text-based changes, again supporting the view that this is possible for young writers if conditions are supportive. This facility can also help the teacher judge each pair’s contribution. Here it can be seen that in group 2, there was one pair who did not contribute any new text, whereas another pair added most of the new text and surface changes. It can also be noted that one pair in each group seemed to take the role of copy editor, making most of the formal changes.

Content of revisions

The types of revisions described by Faigley and Witte draw on linguistic categories; they do not focus on the content of the revisions. Flower and Hayes’s cognitive process model of the composing process refers to the writer’s long-term memory to generate text (1981, 370). In the model, long-term memory is the source of information about the topic, the audience and the writing plans; this latter seems to encompass linguistic or genre knowledge as well as task knowledge. Flower and Hayes argue that the writer not only needs to extract the necessary topic knowledge but also must reorganise and adapt this information to address the rhetorical demands of the task.

In the new and revised text in the wiki, there was evidence of both topic and linguistic knowledge. Whereas some changes drew on the writer’s knowledge of text – its structure
and the lexical choices available, other changes seemed to draw more on the writer’s topic knowledge about Mars and the conditions for life there. In group 2, the dyad of NM expanded the simple sentence ‘A colony on Mars is not possible’ to ‘We believe that a human colony will not be able to be established on the planet Mars because . . . .’ Here they expanded the text to fit the rhetorical demands of the task. The next pair, BE, added ‘nowadays’, indicating topic knowledge through an understanding of the possibility of developments in space travel.

Most of the recorded changes to the text, either as it developed in the negotiation or as it was written on the text page, fitted into one of these two categories. However, another category was observed which we labelled ‘personal content knowledge’. Only three instances of this were recorded but seemed worth noting. In these cases, the writer added something to the text that did not come from the topic research they had conducted to find out about the planet Mars, nor did it seem to arise from textual knowledge but it seemed to arise from the pair of writers’ personal interest. For example in group 1, MA, in response to the discussion about travel, added ‘an ecological train of electric solar beams’. This idea does not arise from the research into topic knowledge for the writing task but from the writer’s imagination. This insertion is challenged in the negotiation by the next pair, AM, asking how they can go by train when a spaceship is hardly possible. The next pair also demands that it be removed. When they next return to the computer, MA add, ‘To explain about the ecological train it’s a spacecraft and would go out of the Earth as a satellite’. However, at their next visit, AM delete this and change it to ‘we would have to go by space ship’. This seems to indicate, in the composition of MA at least, evidence of that element in students’ writing that Graves (1983) called ‘voice’, the imprint of ourselves in the writing process. This element lies outside of the model offered by Flower and Hayes in that it lies outside the rhetorical demands of the task and, it could be argued, denies the importance of the audience in favour of the interest of the author. However, this evidence of authorial voice must also be an indication of progress in the development of a writer. From Table 2, it can be observed that whereas each pair contributed both topic and text knowledge to the composition, there was difference in the amount of personal content knowledge contributed.

Discussion

Wikis as supportive environments to develop composition and revision processes

The small-scale project reported here provides evidence of the way in which a wiki environment can provide opportunities for young writers to experience the process of composition and revision both through their own efforts and by observing the process in others. This

Table 2. Content of revisions.

| Group | Pair | Topic knowledge | Text knowledge | Personal content knowledge |
|-------|------|-----------------|----------------|----------------------------|
| 1     | AM   | 2               | 5              |                            |
|       | MA   | 1               | 1              | 1                          |
|       | AV   | 1               | 1              |                            |
| 2     | NM   | 2               | 8              | 3                          |
|       | BE   | 4               | 3              | 1                          |
|       | MA   | 1               | 1              | 1                          |


paper has shown evidence that wikis can provide a rich environment to support composition and revision for young writers. The data provide a case of one project and are not presented as evidence of writing development. Our intention is to argue the potential of wikis as supportive environments for students and teachers. The wiki enabled us to view students’ composition processes by breaking up the writing processes of planning, transcribing and revising for these young writers. Next, we highlight some evidences that support this claim.

Firstly, students were engaged in a space which led them to share and discuss ideas and arguments about the topic of their writing. We designed a wiki project that encourages students to use the wiki negotiation space to share ideas, and students indeed used this space for this purpose. Furthermore, students were asked to explain in the wiki negotiation space their reasons for each change made in the collaborative text. From our perspective, this discussion about key aspects of their writing supported students’ awareness and understanding of composition and revision. Moreover the enduring record of their negotiation and changes to the text provided a unique insight for their teacher; one that is not usually available from a collaborative writing task.

Secondly, the wiki highlighted the need for students to become simultaneously readers and writers. Every time students worked in the wiki environment, students found a new draft of the text to read and a new opportunity to write. In our opinion, the wiki project gave a space where students could jointly present and publish their own writing to an audience who would be looking at their writing for new content in order to fulfil their collaborative writing task. This facility to publish writing in a space where others can read it, and add, reorganise, revise or delete ideas gave an opportunity for students to learn through others’ ideas and points of view to enrich their own writing.

Thirdly, the affordance of wikis that students can interplay these two roles simultaneously – as readers and writers – may also help them to develop evaluation and revision skills; every time that students worked in the wiki environment they found a new draft of the text to revise and make a new contribution to. Therefore, in the wiki project, students were involved in a peer review process which educational literature has highlighted as powerful in the development of students’ critical reflection about what they have written and why, in provision of prompts to improve their piece of writing and stimulation to self-reflection about what they have done (Nixon and Topping 2001; Phielix, Prins, and Kirschner 2010).

The number and distribution of revisions for the young writers that participated in our study contrast to some previous research which argues that immature writers make little more than surface revisions to their writing. The findings from these 12 students indicate, as Dix previously mentioned, that even students in primary school have access to the full range of revision processes identified in the literature when an appropriate learning environment is created. Although this can be no more than speculation because of the scale of our study, it can be argued that working through the medium of the wiki provided these young writers with the opportunity to be fully engaged in revision processes. During the composition process, students received commentary from peers about their revisions and viewed and commented on the revisions of others. This must inevitably have widened their experience of the process of composition and revision. As students collectively examine and manipulate wiki writing, they not only present each other with opinions and criticism but also provide a real audience for each other’s work, a valued audience to work with and to revise each other’s writing in order to fulfil the common commitment of improving the collective text. Thus the wiki helped students to engage with the process of composition and become more actively engaged with the design process than may be possible in the usual classroom-based writing tasks. Although the instances of our new category of ‘reversion’ were few and were only observed in one of the groups, the possibility of engaging in and
reflecting upon a disagreement within the composition process must have contributed to a sense of the choices available to writers as they write.

**Wikis as research tool**

The project has, in addition, given further indication to researchers about the way in which young writers engage in composition and revision and some evidence of the differences in that engagement. In addition to supporting some previous research about young writers’ capacity to revise as they compose, we have added a new dimension to the discussion of composition and revision. The record of the joint composition process has indicated differences in focus for pairs within the group. For these 12 students, one pair within each of the groups had a greater focus on linguistic revisions, perhaps indicating a greater facility with writing and language production. It is also noticeable that, except for one pair, the contribution of scientific knowledge was spread relatively evenly with each pair contributing something of scientific knowledge to the task. This is an important observation, since it is often the case that those students who are less able to write well appear to lack ability in other curriculum areas due to their underperformance in writing. From our point of view, the technological affordances of wikis that allow students to use a wide variety of ways to respond to their classmates’ thoughts and writing, by editing, by expanding, by revising or by responding on the negotiation page, helped all students to find their own ‘role’ and their own ‘voice’ in the collaborative writing process. The addition of personal content knowledge to topic and text knowledge as a source of content for the composition of text has provided further embellishment to Flower and Hayes’ (1981) model of the writing process. The idea of ‘voice’ in writing is not new but is often missing in both cognitive and pedagogical models of composition. This freedom in the way to participate in wiki-based collaborative writing certainly challenges more common ways of fostering students’ composition and revision and might encourage each student to develop their own ways of composition through the online collaborative task.

**Classroom implications in using wikis in primary education**

Our study also has raised some pedagogical issues related to the use of wikis in primary education. The technological characteristic of wikis to record all the writing steps and versions of the document is highlighted as a powerful learning tool because it can foster students’ critical revision of the piece of writing. From our point of view, this characteristic of wikis can also become a powerful tool for teaching. The students’ writings are regularly available in the wiki for teachers to look back over the timescale of the collaborative writing experience to explore how students have engaged with and contributed to the writing. The wiki enabled the teacher to judge each pair’s engagement and contribution. There was also a permanent record of each stage of the process that could be drawn upon for record keeping or teaching purposes.

Whatever the potential of wikis to support key learning processes, some studies have already highlighted that to rely too much on the technological affordances of wikis to facilitate critical interaction capable of engaging students in productive collaborative writing does not always work (Lundin 2008; Cole 2009), and an instructional process that explicitly embeds how to use wikis to reach collaborative learning objectives is needed. Our work took into account this statement and designed an educational intervention that prepared and guided students to use the affordances of wikis as powerful tools capable of mediating understanding of the writing processes. From our perspective, it could be argued that the
‘thinking together’ approach used during the project could be effective in this preparation because students made a great effort to share, discuss, take each other’s opinion and revise each others’ writing (more can be read about this aspect in Pifarré and Kleine Staarman 2011). In future research work, our intention is to get more empirical evidence to support this statement.

The conclusions drawn in this work present a positive and promising pathway to the design of classroom contexts that use informational and communicational technologies to support the development of composition and revision strategies for young writers. It is also considered that such learning environments that use ‘social software’ would be helpful in the development of those digital competences that will allow our students to actively participate in the creation of information dynamically in the network global society. Different voices have already alerted the educational community that although students possess the easy familiarity with Internet technology that characterises them as ‘digital natives’, there is little evidence that large numbers of young people are making extensive contributions to Web 2.0 resources including wikis and few young people are developing innovative skill sets in their interactions with new technologies (Buckingham 2007). Web 2.0 technologies require participants to develop specific competences related to collaborative knowledge creation, competences which cannot be developed spontaneously, but students’ critical participation in these new technological environments is needed. If Web 2.0 technologies are to be deployed usefully across formal and informal learning, teachers and learners need to develop shared strategies and understandings around a participatory and creative approach to technology use in schools (Clark et al. 2009). Our project can also be seen as a contribution of this understanding.

Acknowledgements

This research was funded by the Ministerio de Ciencia y Tecnologia of the Spanish Government (project number: EDU2009-11656) and by the Departament Universtitat of the Catalan Government (2008ARIE00028). The authors would like to thank the teacher and their students for their participation in the study reported in this paper.

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