Applying new technologies appropriately to foreign handwriting recognition difficulties

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Modern foreign language (MFL) learners with special educational needs (SEN) often cite copying from teachers' handwriting on the board as their single most daunting experience (McColl, 2000). Authentic target-language (TL) handwriting is even likelier to challenge these learners in general and students with Specific Learning Difficulties (Dyslexia) in particular (Jameson, 1999).

The purpose of this chapter is to describe my action research into what needs a TL handwriting-challenged student may have and how these needs might be supported in the classroom. My investigation was replicated over several years using Information and Communication Technology (ICT) as a problem-solving instrument of research and teaching.

I have divided this chapter into three sections. The first gives background information about the place of school handwriting in our digital age. In the second, I describe my school-based project applying ICT to Year 7 MFL readers' difficulties with authentic handwritten TL texts. The third section lists the principal outcomes of the study, with recommendations for further research and development.

The Background

In this section I describe the wider context of my research and more especially

- the challenges and conventions associated with the integration of TL cursive scripts into MFL teaching;
- the implications of national primary school handwriting policies and practices at home and abroad;
- the changing relationship between computers and handwriting with particular reference to the human skills of penmanship and keyboarding.

Foreign scripts

Students routinely ask teachers to read aloud or translate pen-pal letters from abroad. Often the message proves to be couched in very simple idiom, which ought to be intelligible to the recipient. It may even be in English. Further probing usually reveals that the sender's joined handwriting is the main barrier to comprehension.

Now that authentic resources play a key role in the teaching and testing of modern foreign languages, the ability to decode cursive script is a necessity. To qualify for National Curriculum (NC) Level 4 in Reading and Responding, for instance, students

must understand short stories and factual texts which are "printed or clearly handwritten." (DfEE & QCA, 1999)

General Certificate of Secondary Education (GCSE) candidates are particularly likely to encounter a handwritten letter as a reading passage in their MFL examinations. However accessible the language is, they cannot answer questions about its content if all they see is an illegible scrawl. The examiners assume that candidates already have a working knowledge of the TL script.

Most MFL course materials do now feature handwritten texts. Russian manuals begin with the individual letters of the Cyrillic alphabet, both printed and cursive. Students not only learn how to read Russian script at character, word and sentence level. They are also encouraged to use it when writing Russian by hand.

French, German, Italian and Spanish textbooks typically dispense with individual cursive character recognition practice. Although students are expected to understand handwritten messages, they are not encouraged to use the authentic foreign script when writing the TL by hand.

Conventional wisdom apparently argues that Russian script, which is based on the unfamiliar Cyrillic alphabet, must be explicitly taught, while West European scripts, which are based on the familiar Roman alphabet, can be implicitly "caught."

School handwriting policies

German federalism and French centralism extend to primary school handwriting policy-making within these respective countries. Germany's *Grundschulen* have a choice of **three** official cursive scripts (Stadt Mannheim, 1998):

- *Lateinische Ausgangsschrift*, which Baden-Württemberg adopted in 1953
- *Schulausgangsschrift*, which the then GDR introduced in 1968
- *Vereinfachte Ausgangsschrift*, which various *Länder* have trialled since 1973

France's *instituteurs* teach **one** national style of cursive handwriting that has stood the test of time. *Du graphisme à l'écriture*, a document showing the correct strokes to be used when forming and joining letters in French handwriting, can be downloaded from the World Wide Web (Bonnet, 1996).

Thomas, a Kent infant school teacher, has compared approaches to the teaching of handwriting in England and France. Her main findings (Thomas, 1998) are worth summarising.

- The teaching of handwriting is a high priority in French infant and junior schools.
- French teachers and education professionals display a higher degree of knowledge of the principles underlying the teaching of handwriting.
- In France, joined handwriting is viewed as the facilitator to creative written expression. In England, teaching handwriting and creative expression are seen as quite separate.
- French teachers believe Art and PE are closely linked to the teaching of handwriting.
- There is a wide range of literature available to teachers in France that supports their understanding and the development of their teaching of handwriting.

- The synergy between higher education institutes and local education authorities aids the teaching of handwriting as a high priority in initial teacher training and in continuing professional development.

Computers and handwriting

Normal writing instruments now share the educational stage with ICT. In both cases, the human factor — mental and manual dexterity and co-ordination — is paramount. While hand-printed lettering and hunt-and-peck typing may suffice for the interim, fluency and accuracy come with the skills of joined-up handwriting and touch-typing.

Both penmanship and keyboarding have advantages and limitations. Although pens and pencils are cheap, plentiful and portable, physical and mental co-ordination determines whether they generate calligraphy or cacography. ICT holds out a prospect of clear typography and better layouts for even untidy or dyspraxic students, but means dearer, scarcer and bulkier hardware too.

Penmanship and keyboarding are also complementary. Secretaries practise keying in from handwritten draft because the latter is the commonest form of draft in the workplace (Spencer, 1999). Conversely, busy primary and SEN teachers may produce handwriting worksheets using dedicated software, e.g. *Handwriting for Windows* (Inclusive Technology 1999), to build and reinforce letter formation and joining skills. They may even encourage slower learners to use a word-processing package enhanced with cursive fonts when preparing and submitting assignments that are meant to be handwritten. (Bonnet, 1996).

The educational benefits of electronic handwriting font technologies have been recognised by teachers of more advanced students too. Becker, a University of Wisconsin-Madison Germanist, has designed a **Sütterlin** computer font to solve the vexed problem of deciphering immigrant German family documents in the historical script (Becker, 1995; Hoecherl-Alden & Köhler-Busch, 1998). He has also found his computer-generated script to be an effective training model for archivists, because the typeface is completely free of the stylistic idiosyncrasies that characterise many German-American manuscripts.

The technology of Natural Handwriting Recognition (NHR) empowers computers to decipher handwriting with greater speed and accuracy than human readers can muster. Among its pioneers were Soviet scientists with an educational mission in the late 1960s to evaluate Russian school students' cursive handwriting (Landwehr, 1999). The world focus of NHR has long since shifted to business applications, particularly postal address, cheque, form, medical record and insurance claim automation.

Unlike Optical Character Recognition (OCR), which handles machine-printed characters, and Intelligent Character Recognition (ICR), which processes separate characters hand-printed in boxes, NHR deploys complex image analysis algorithms to identify each character. It then recombines the letters and runs dictionary checks on the letter sequences to produce meaningful output (Rawson, n.d.).

If computers can process printed letters more easily than handwritten characters, then the same is likely to hold true of human readers. The following study attempts to explore this hypothesis, with particular reference to foreign handwriting recognition difficulties of lower secondary school learners of French.

The Study

In this section I turn to the action research itself. I describe

- the geographical and institutional **context** of the study, with special reference to the high incidence of SEN in my school population;
- the **design** of the study and more particularly the definition of the TL handwriting recognition problem and the appropriateness of an ICT solution;
- the **methods** employed in the study, namely the sampling of learners as subjects, the nature of students' assignments and the monitoring procedures combining classroom observation and task error analysis.

Context

I work in the Metropolitan Borough of South Tyneside in the North East of England. South Shields in the east of the borough is a pleasant seaside resort, burdened with more than its fair share of social, economic and educational disadvantage.

A third of the 1,200 students in my over-subscribed 11-16 comprehensive school, now a DfEE-designated Technology College, qualify for free school meals. Typically 30% of the boys and 20% of the girls leave primary education with reading ages two or more years below their chronological ages. Although a tiny minority of these learners later transfer to local special schools, most remain in mainstream education receiving their full National Curriculum entitlement, including MFL.

At Harton School I have acquired a number of responsibilities over recent years in MFL and SEN impinging on the conduct of this study.

- I teach several Year 7 French and Year 8 German beginners' classes, averaging 25 students apiece.
- I monitor the progress of over 35 Year 7 students registered as having SEN, withdrawing individuals for basic skills practice, managing a paired reading scheme, collating literacy and numeracy learning targets and compiling Individual Education Plans (IEPs).
- I offer in-class learning support in Year 7 Design Technology, English, French, Geography, History, ICT, Mathematics, Religious Education and Science.
- I word-process the school's programmes, newsletters, annual reports and staff handbook.

I also spend one lunch-hour a week at Oakleigh Gardens, a special school for students with profound and multiple difficulties, where I assist with ICT.

Design

I had two goals in mind when I planned my investigation. First, identify the learning needs of students experiencing MFL pre-reading problems. Secondly, support the students as they negotiated solutions to such problems.

While supporting learners in the classroom, I had come across students who could not decipher their own teachers' English styles of handwriting with speed and accuracy. Copying handwriting from the board is widely recognised by SEN professionals as a major challenge to students with literacy difficulties (McColl, 2000). I surmised that transcribing authentic handwritten French would raise a further barrier in their case.

There remained the question of what help the students might require to confront and overcome this obstacle in their path. They could certainly familiarise themselves with TL handwriting by working with authentic handwritten letters and messages, but the school had neither a steady supply of suitable texts nor a French *Assistant* whose penmanship could be deployed to fill the gap.

Fortunately, an ICT solution to the problem presented itself. I chanced upon a source of authentic French script fonts on the World Wide Web (Verchery, Beaumale & Tassel, n.d.). These fonts were developed to support the teaching of handwriting in France. Their designers were French primary school teachers who generously placed the fruits of their labours in the public domain as freeware. I have described elsewhere how to download and install these TrueType fonts (Wilson, 1999).

The next step was to gauge the calibre of the simulated script and to devise accessible, authentic and appropriate tasks. Two French primary school handwriting manuals (Zacharia, 1996; Lacroix, 1998) came to the rescue. In certain fonts, the simulation of individual handwritten characters proved to be impressively accurate, although the ligatures between letters were a little variable. **Figure 1** shows how **Times New Roman** and **PlumBAL**, a pen-simulation font, transcribe the French equivalent of the English-speaking touch-typist's drill "the quick brown fox jumps over the lazy dog."

The primers also furnished sets of graded exercises to build up word and sentence handwriting skills, beginning with lower-case characters and progressing through punctuation marks to accented and capital letters. I planned to compile a similar hierarchy of tasks in my study to ensure progression and to challenge the high flyers who were likely to read TL handwriting with relative ease.

Methods

The participants in the study were all Year 7 beginners in French, who attended their twice-weekly one-hour MFL lessons in regular form registration groups. Each class of roughly twenty-five spanned a full range of ability, from high flyers to low achievers scoring reading ages of under seven years on the Suffolk Reading Scale. Students whose reading ages fall significantly below nine years tend to experience difficulties when they engage with the secondary school curriculum.

I taught some of these French classes alone, otherwise I delivered the lesson while a fellow linguist provided learning support. In the former instance, I integrated ICT into my course wherever it seemed appropriate to the topic or the learners in question. In the latter team-teaching case, one fortnightly sixty-minute period was regularly scheduled for MFL/ICT throughout the year.

At Harton School, the whole Year 7 intake receives one weekly sixty-minute period of ICT, which is usually delivered by their English teachers. I give in-class support in many of these lessons, where the students learn the fundamentals of word processing with Word 2 or 97.

In the first MFL/ICT session, I build on this prior knowledge with several teaching objectives in mind:
- introduce and generate TL-specific characters beyond the basic Roman alphabet, e.g. **à, ç, é, ï, ô, ù**;

- raise awareness of, and sensitivity to, orthographic similarities and differences between English and the TL;
- develop keyboarding fluency and proof-reading accuracy when transferring TL copy-writing skills to the computer;
- provide an authentic, accessible and appropriate workplace task where both MFL and ICT skills are required and exploited.

I begin with the generation of accented characters via the Alt key. This foreign character entry method proved popular in an online survey which I conducted on the language teachers' forum Lingu@Net and whose findings were summarised on the World Wide Web at http://www.bris.ac.uk/Depts/Education/ml/accents.htm. The next step is the keying-in of French printed words then sentences, using graded exercises modelled on a German bilingual secretaries' word-processing manual (Koch, n.d.).

The subsequent MFL/ICT session, where emphasis shifts from printed to handwritten draft, is also designed to serve a number of purposes:
- reinforce and develop existing MFL and ICT knowledge and skills;
- implement step-by-step progression from basic to more challenging authentic MFL/ICT tasks;
- promote decoding strategies when engaging with TL cursive handwriting.

The worksheet accompanying this unit about keying-in from handwritten French draft starts with a printout of the alphanumeric characters in French script, reproduced in **Figure 2.** I used MS Word for Windows with **CrayonL**, a pencil-simulating handwriting font, because this style was adopted in both French handwriting primers to which I had access.

I directed my Year 7 groups to keep this point of reference under constant review while they attempted the keyboarding exercises. On the reverse of the worksheet was a lower-case French **pangram** — a sentence where all the letters of the alphabet are represented — printed in the same pencil font. The students were asked to key this "handwritten draft" into Word using its standard Times New Roman serif font.

The follow-up exercises gradually introduced handwritten texts with pen-simulating fonts, longer sentences, punctuation marks, accented characters and capital letters, emulating the learning steps in the French primary school handwriting manuals.

I wanted my study to take account of both the **process** and the **product** of keying-in from handwritten draft. So classroom observation of the keyboarders as well as error analysis of their printouts contributed to data collection.

The Outcomes

In this section, I present
- the **results** of my classroom observations and task error analysis, showing the extent to which TL handwriting recognition challenged all MFL students and particularly those with learning difficulties;
- my **conclusions** arising from the study and **recommendations** for further research and development on integrating TL handwriting recognition into MFL teaching;

- a **postscript** listing what has happened locally within my school and nationally in the new MFL schemes of work in the TL handwriting recognition field since the completion of my project.

Results

As predicted, many students found keying-in from handwritten French draft to be a challenging activity. Their experience of difficulty manifested itself not only in their printouts but also in their verbal reactions while attempting the tasks in the ICT room.

The roles of dispassionate researcher and sympathetic teacher inevitably proved very hard to juggle. On the one hand, I wanted my students to consult one independent reference source — a printout of the alphanumeric characters in French script — as they decoded the draft, so the results would not be skewed by my intervention. On the other hand, I was reluctant to leave individuals floundering or disaffected.

The students with special educational needs showed little hesitation to voice their concerns. During one session, a boy with behaviour difficulties protested about my non-intervention: "But sir, you're a special needs teacher, you're supposed to help!" In another lesson, a group of low achievers even persuaded my support teacher to hand-print the text of the pangram, which they claimed was an illegible scrawl.

Even the better performers found the mixture of thick and thin character strokes of the pen-simulating font quite disconcerting. They also asked me for reassurance as they strove to make sense of each word as well as its constituent letters. Only a few very able students took the tasks in their stride.

On the positive side, when questioned, most students conceded the relative elegance of the French national handwriting style. They also acknowledged the authenticity of the keyboarding tasks they were invited to complete. The slower learners preferred ICT to penmanship, one of them remarking that the former "doesn't ache" his hand.

Analysis of the printouts revealed wide quantitative and qualitative variations in the students' responses to the tasks. Although the high flyers generally reproduced the texts with speed and accuracy, the slow learners only managed to complete the first task requiring a single-sentence pangram to be keyed-in.

Almost two-thirds of the twenty-six letters of the alphabet represented in this pangram generated misspellings. One of the sixteen — **w** — was transcribed in no less than eight different wrong ways. The problematic four vowels **a**, **e**, **o**, **u** and twelve consonants **b**, **f**, **h**, **k**, **l**, **n**, **r**, **s**, **v**, **w**, **x**, **z** are reproduced in French script in **Figure 3** with their miscues printed in brackets.

If so many of the lowercase characters in the French script lent themselves to such confusion, then their uppercase equivalents were liable to prove even more vexatious. Fortunately, uppercase characters are confined in French handwriting to initial letters of proper nouns and sentence-opening words. Uppercase titles, signs, acronyms and the like are printed in block capitals.

Conclusions and Recommendations

- Beyond peradventure, authentic handwritten French is a challenge to students with learning difficulties.
- Even confident and competent readers need reassurance when engaging with TL handwritten draft.
- Most students appreciate the authenticity of handwriting-to-print tasks as prescribed in the French keyboarding unit.
- French handwriting recognition requires far more practice, and differentiated activities, than was feasible in the present study.
- Using one of the authentic handwriting fonts, MFL teachers might word-process signs and flashcards with key vocabulary and phraseology for display in non-ICT lessons to ensure skills transfer.
- MFL teachers might consider putting one or several of the fonts at the disposal of their students as an active learning model or an "authentic" keyboarding resource for MFL correspondence.
- Further research is required to determine whether students' bottom-up cursive letter recognition skills would benefit from explicit teaching of individual cursive letter formation, perhaps via nonsense words.

Postscript

When CrayonL was later installed on the school's network, Year 7 students began integrating it into their MFL/ICT work without further prompting. The pencil font appeared in signatures on French greetings cards and in the caption of the tourist poster in **Figure 4**. CrayonL even became the quite unselfconscious font of choice of several Year 9 SEN students while word-processing reviews of the film *Titanic* for their English teacher.

The new key stage 3 schemes of work encourage students to engage with French cursive script from the outset (DfEE, 2000):

- Displays of letters should use French handwriting in order to familiarise pupils with authentic French handwriting at an early stage in their learning**. (Unit 2: *En famille*)
- (Pupils) compare French and English handwriting and note the letters and numbers which are formed differently and are likely to cause a problem to an English reader (**Unit 6: *Comment tu t'amuses?***)

Although neither unit mentions computer-generated French handwriting, this font technology has enormous potential as an alternative learning model and source of authentic materials.

The best ICT resources appeal to the curiosity, imagination and ingenuity of teachers and students alike. They also represent authentic and accessible solutions to real human needs. Their "appropriateness" lies in the sense of "ownership" that they confer upon their users.

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Figures

Portez un vieux whisky à ce juge blond qui fume
PORTEZ UN VIEUX WHISKY À CE JUGE BLOND QUI FUME

Figure 1: French pangram transcribed in serif and cursive fonts

AA	BB	CC	DD	EE	FF	GG
HH	II	JJ	KK	LL	MM	NN
OO	PP	QᴬQ	RR	SS	TT	UU
VV	WW	XX	YY	ZᵒZ	ÀÀ	ÂÂ
ÇÇ	ÈÈ	ÉÉ	ÊÊ	ËË	ÎÎ	ÏÏ
ŒŒ	ÔÔ	ÙÙ	ÛÛ	1	2	3
4	5	6	7	8	9	0

Figure 2: Alphanumeric characters in cursive font

A	[i] [e]	**H**	[f] [r]	**O**	[a] [e]	**V**	[n] [r] [u]
B	[l]	**K**	[b] [f] [r]	**R**	[n] [s]	**W**	[m] [n] [nu] [r] [ru] [rv] [u] [v]
E	[a] [i] [u]	**L**	[b] [f]	**S**	[a] [l]	**X**	[sc] [se]
F	[l]	**N**	[m] [r]	**U**	[e] [ii] [ll] [y]	**Z**	[3]

Figure 3: Transcription error analysis

Figure 4: Example of new cursive font application