

Examining the Acquisition of Welsh Phonology in L1 English Learners

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In this account we examine the pronunciation skills of adult learners of Welsh. We compare learners from a Welsh-English background with those from an English-English one, through transcribing and then acoustically analysing the subjects' attempts at a range of monophthongs and diphthongs. The implications of acoustic analysis packages in pronunciation teaching is discussed.

INTRODUCTION

Adult learners of Welsh in Wales fall into several broad groups in terms of their first language (hereafter L1) phonology: there are those that come from the area where the class is situated and speak English with a local (i.e. Welsh-English) accent (LWE group); those who come from another part of Wales and so speak with a Welsh-English accent different from that used in the area of the class (a regional Welsh accent: the RWE group); those whose origins are from outside Wales, are L1 English speakers, and speak with a non-Welsh English accent (e.g. Southern British Standard or SBS, General American, etc.: the NWE group); and finally, those whose first language is other than English.

These different groups, of course, present different problems to the acquisition of native-like competence in pronunciation. As part of an ongoing study, we aim to compare the abilities of two of these groups (local Welsh-English speakers and non-Welsh-English L1 English speakers) in a range of phonological domains (both segmental and suprasegmental¹), but in the current paper we wish to present preliminary findings from just some of the segmental aspects.

There are a range of different approaches to the assessment of pronunciation skills. This task (if undertaken at all in L2 teaching) normally takes the form of impressionistic auditory assessment by the teacher or by one or more native speakers. Much research in phonetics, however, has shown that auditory transcription of speech often lacks reliability and consistency (see discussion in Ball et al 1996), and certainly not all native speakers of a language will agree on the acceptability or otherwise (or more importantly, the range of acceptability) of the pronunciations of a learner. For these reasons, our investigation of the acquisition of aspects of Welsh phonology will utilise instrumental analysis as well as transcription data, in particular to aid in the difficult area of narrow transcription.

INSTRUMENTAL APPROACHES

If we adopt an instrumental phonetic approach to the investigation of L2 learners' acquisition of Welsh phonology, we need to ask which technique should be adopted. Instrumental phonetics (see Ball and Code 1997, Lass 1996) can generally be divided into two main categories when considering the investigation of speech production (as opposed to perception): techniques that examine articulation and those that examine speech acoustics.

Articulatory instrumentation has been devised to examine, for example, tongue-palate contact (electropalatography: see Hardcastle and Gibbon 1997), or

to image the entire upper vocal tract (for example x-radiography, magnetic resonance imaging: see Ball and Gröne 1997). However, these techniques are expensive and often invasive.

Much easier to use is acoustic analysis (see, for example, Farmer 1997 and contributions to Lass 1996). Today, acoustic analysis packages are available at relatively low cost that will operate on most personal computer platforms with acceptable degrees of accuracy. This approach allows the investigator to get details of aspects of speech including duration, frequency and intensity. These measurements are particularly suited to the study of vowels: both monophthongs and diphthongs. Studies have shown that vocalic sounds are distinguished by the existence of a set of bands of high intensity at set frequency levels (called 'formants'), and that the first three of these bands can reliably be used to assess how close a speaker's attempt at a vowel is compared to a target value for that vowel (provided, for example, by the teacher). Durational characteristics of vowels are also important linguistically, and acoustic analysis, as noted, can also provide measurements in this area, at the level of milliseconds (thousandths of a second).

It was therefore decided that for our study of the acquisition of Welsh phonology we would use acoustic analysis techniques, and in later sections we describe the methodology in more detail.

TEACHING OF PRONUNCIATION IN WELSH CLASSES

The learners taking part in this study frequent an intensive Welsh course with five 90-minute sessions per week during the first year, and four during the second year. Generally, contrastive phonology and phonetics of Welsh and English is not taught explicitly or systematically, for obvious reasons: only very few students have any prior knowledge in this area, and a surfeit of technical information is generally felt to be threatening. Instead, students are

given ample opportunity to use taped materials in a "record and compare" fashion: gapped tapes are provided on which students record their own voices, and compare these to the model recordings. These exercises are however not only concerned with the acquisition of pronunciation, but also with structure (for example syntax, or mutations) and vocabulary. Thus, several problems arise out of this approach: first of all, unless students' attention is drawn to pronunciation problems and targets, they are likely to miss many of the crucial differences between their own speech and the teacher's model (note also that although akin to a language-laboratory setting, these exercises do not provide for interactive feedback from the teacher). Secondly, in an exercise where students concentrate on avoiding other potential pitfalls, e.g. on using the correct mutation, they are unlikely to focus on pronunciation difficulties.

Although it is pedagogically desirable that any language be taught in a non-threatening and enjoyable way, the general lack of explicitness, the lack of building up a metaknowledge which allows the students to construct for themselves a phonological monitoring system may very well turn out to be counterproductive in the long run: accurate pronunciation skills are crucial for the learner who wishes to be accepted as a partner in conversation by fluent and native speakers. Early acquisition of these skills will make further perfection of language skills easier, in that acceptance by fluent speaker provides the learner with confidence, and opportunity to speak the language. This is especially crucial for speakers from a NWE background, whose native phonology clearly marks them as "foreign" (i.e. "non-Welsh")

THE SOUTHERN WELSH VOWEL SYSTEM

There are, of course, a range of features in the phonology of Welsh that may cause problems for English learners. Intonation and rhythm differ markedly from most varieties of English (though not so much from Welsh

English), with differences in stress placement and pitch movements (see Rhys 1984, Williams 1985, 1989, forthcoming). The consonant system too differs, containing laterals and trills [ʎ], [r^h], [r] not found in English, together with the velar fricative [x] which at best is only marginal in some varieties of English (see Jones 1984). Further, phonotactic constraints differ between the languages as well (see Awbery 1984), so that combinations of consonants, and of consonants and vowels that are allowed in Welsh may not be in English, and vice versa.

However, we feel that one of the major areas of difficulty for English L1 learners of Welsh lies in the vowel system. Northern varieties of Welsh may have up to 13 monophthongs (or pure vowels), and as many diphthongs. In southern varieties the number is smaller (see Jones 1984, Ball and Williams in preparation), but even so the system in both its phonological make-up and phonetic realization differs in many respects from that of English. For this study, then, we investigated the acquisition of the long monophthong system of Southern Welsh, and a subset of the diphthongs. The pure vowels were: [i:], [e:], [a:], [o:], [u:] (as in *tŷ*, *lle*, *ffa*, *glo*, *swŷ*); the diphthongs were: [aɪ], [əɪ], [ɔɪ], [uɪ], [əu], [ɛu], [ɪu] (as in *tai*, *tei*, *troi*, *mwy*, *naw*, *llew*, *lliw*).

We were particularly interested in the ability of the learners to acquire the non-English diphthongs: [əɪ], [uɪ], [ɛu], [ɪu]. The first of these might be especially difficult as it is close to [aɪ], and there is nothing similar to it in English, whereas English [u.i] (as in *Louie*) and [j.u:] (as in *new*) might be used for Welsh [uɪ], [ɪu] respectively. [ɛu] also has no similar diphthong in English. Thus these are examples where explicit teaching (in effect, ear-training) would be highly desirable, since many learners have difficulties in perceiving phonemic contrasts outside their L1 system. Our second area of interest concerns the pure vowels, and whether learners who have diphthongal equivalents in their English would use these in Welsh as

well; it is well known that many varieties of (especially southern British) English have diphthongs ([eɪ], [ou] as in *lay* and *glow* respectively) for the mid vowels, but also for the high front and back vowels ([ɪi], [uu] as in *tea* and *sue*).

To compare the subjects' Welsh pronunciation with that of comparable English vowels, the following English monophthongs and diphthongs were also examined: [i:], [eɪ / e:], [a:], [ou / o:], [u:], [aɪ], [ɔɪ], [u.i], [əu], [j.u:].

THE STUDY: METHODOLOGY

Tokens

The Welsh vowels were embedded in tokens used within a frame sentence that translates as "there's a ___ here" (*mae ___ yma*). The English vowels were embedded in tokens used within the frame sentence "say ___ again". As usual in phonetic experimentation, the frame sentence is chosen to emphasise the token, so that there are no effects from syllable weakening (which for English speakers often results in changes to the vowels). The tokens are all open syllables as this avoids any effects from a following consonant. As different final consonants have different effects on the acoustic characteristics of preceding vowels, we would otherwise have had to find tokens with identical final consonants. Finally, for the same reason, we avoided having the final word of the frame starting with a consonant. The vowel at the beginning of both words is schwa, or the 'neutral' vowel: this has a minimal effect on preceding vowels as transitions between tongue positions are minimized.

The two sets were designed to be identical in number of syllables, and similar in consonants used, and are as follows:

Welsh

tŷ lle ffa glo swŷ tai tei troi mwy naw llew lliw
[ti: ʎe fa: glo: su: tai tɛi trɔi muɪ nau ʎeu ʎu]

'house, place, beans, coal, zoo, houses, tie, turn, more, nine, lion, colour'

For the verb *troi*, the frame sentence was slightly modified to *mae'n troi yma*, "it's turning here". No common words containing [ɔɪ] in Welsh other than verbs were identified.

English

tea lay far glow sue tie now Troy new Louis
[ti: lei fa: glou su: tai nau trɔɪ nju: lu.i]

It should be noted that two subjects pronounced 'Louis' as [lu.ɪs], and these examples are marked in the results with an asterisk.

The two lists were randomised three different ways, and each subject was recorded reading all three versions in both languages. This gives 36 Welsh tokens, and 30 English for each subject.

The Subjects

So far, 4 NWE subjects have been analysed, and 2 LWE subjects. The class teacher was also recorded as a control.

NWE Subjects

K: male, c.35 yrs, linguistic background: Berkshire, England.

Ch: male, c.30 yrs, linguistic background: Worcs, England; South Africa.

C: female, c.25 yrs, linguistic background: southern England.

R: female, c.45 yrs, linguistic background: Belfast, Northern Ireland.

LWE Subjects

S: male, c.30 yrs, linguistic background: Tredegar, South Wales

V: female, c.45 yrs, linguistic background: Barry, South Wales.

Teacher

A: Male, c. 30 yrs. linguistic background: Neath: South Wales Welsh.

Analysis

The tapes were separately transcribed by the authors. Intertranscriber reliability was 92% for Welsh and 91% for English. All disagreements were solved through subsequent consultation. Subsequently, various tokens were also analysed acoustically, using the Tiger Electronics Dr Speech™ analysis package running on a 486 PC. The tokens chosen to analyse acoustically were all from the NWE group: the high vowels were investigated to see whether any diphthongal quality could be noted, and the mid vowels were checked to see whether the diphthongal quality noted in many of the transcriptions was supported. Also the quality of the high vowels was compared with that of the teacher, as was the first element of the [au] diphthong. The

Target	K	CH	C	R
i: 'tŷ'	i:	i:	i:	i:
e: 'lle'	ɛ:	e: (e')	eɪ	eɪ
ɑ: 'ffa'	ɑ:	ɑ:	ɑ:	ɑ:
o: 'glo'	o:	o: (o ^u)	ou	ou
u: 'sw'	u:	u:	u:	u:
aɪ 'tai'	aɪ	aɪ	aɪ	aɪ
əɪ 'tei'	aɪ	eɪ (aɪ)	eɪ	eɪ
ɔɪ 'troi'	ɔɪ	ɔɪ	ɔɪ	ɔɪ
ʊɪ 'mwy'	ɔɪ	ɔɪ	ʊɪ	ɔɪ (ɔɪ)
ɑʊ 'naw'	ɑʊ	ɑʊ	ɑʊ	ɑʊ
ɛʊ 'llew'	ɑʊ	ɑʊ (u:)	ɛu:	ɛu
ɪʊ 'lliw'	u:	u:	u:	u:

Table 1. NWE - Welsh

reason for these measurements of vowel quality was to check whether the high vowels of the NWE group were as tense (i.e. peripheral to the vowel area) as the teacher's, and whether the first element of [au] was fronted (as is reported in Cruttenden 1994 for southern British English), or further back as reported (e.g. Ball and Williams, in preparation) for Welsh.

Target	K	CH	C	R
i: 'tea'	i:	i:	i:	i:
eɪ / e: 'lay'	eɪ	eɪ	eɪ	eɪ
ɑ: 'far'	ɑ:	ɑ:	ɑ:	ɑ:
ou / o: 'glow'	ou	oʊ	ou	ou
u: 'sue'	u:	u:	u:	u:
aɪ 'tie'	aɪ	aɪ	aɪ	aɪ
ɔɪ 'Troy'	ɔɪ	ɔɪ	ɔɪ	ɔɪ
u.i 'Louis'	u.i*	u.i	u.i	u.i
ɑʊ 'now'	ɑʊ	ɑʊ	ɑʊ	ɑʊ
ju: 'new'	ju:	ju:	ju:	ju:

Table 2. NWE - English

RESULTS

The results of the transcriptions are given in Tables 1-4: target here refers to both the standard pronunciation and the teacher's. Transcriptions in brackets represent the form used when one of the three repetitions differed from the other two. There were no examples of three different forms. The results of the acoustic analysis follow in Figures 1-4. Using the formant tracking routine of Dr Speech, we were able to verify the transcriptions of Welsh target [e] and [o] and [i] and [u] in terms of their status as diphthongs or monophthongs, though care had to be taken

to exclude the formant transition to the [ə] vowel at the beginning of 'yma'. The vowel quality measurements were

Target	S	V	A
i: 'tŷ'	i:	i:	i:
e: 'lle'	e:	e:	e:
ɑ: 'ffa'	ɑ:	ɑ:	ɑ:
o: 'glo'	o: (ɔ:)	o:	o:
u: 'sŵ'	u:	u:	u:
aɪ 'tai'	aɪ	aɪ	aɪ
əɪ 'tei'	e'	əɪ	əɪ
ɔɪ 'troi'	ɔɪ	ɔɪ	ɔɪ
ʊɪ 'mwy'	ɔɪ	ʊɪ	ʊɪ
ɑʊ 'naw'	ɑʊ	ɑʊ	ɑʊ
ɛʊ 'llew'	ɪʊ	ɛʊ	ɛʊ
ɪʊ 'lliw'	ɪʊ	ɪʊ	ɪʊ

Table 3. LWE: Welsh

Target	S	V	A
i: 'tea'	i:	i:	i:
eɪ / e: 'lay'	e'	e'	e'
ɑ: 'far'	ɑ:	ɑ:	ɑ:
ou / o: 'glow'	o:	o:	o:
u: 'sue'	u:	u:	u:
aɪ 'tie'	aɪ	aɪ	aɪ
ɔɪ 'Troy'	ɔɪ	ɔɪ	ɔɪ
u.i 'Louis'	u.i*	u.i	u.i
ɑʊ 'now'	ɑʊ	ɑʊ	ɑʊ
ju: 'new'	ju:	ju:	ju:

Table 4. LWE: English

achieved by identifying the first three vowel formants at a central portion of the vowel using the LPC (linear predictive coding) function (see Farmer 1997 for a description of acoustic analysis of speech). Formant measures are in Hz.

For this account we have only compared the teacher's acoustic results with those of the two male NWE subjects (K and CH), as the higher pitch levels in female voices makes direct comparisons more complicated. The results have been set out in formant graphs, where F1 (the first formant) is plotted against F2 in a manner which allows a graphic display similar to traditional articulatory vowel diagrams. Figures 1-3 show the results for Subjects A, K and Ch respectively, while Figure 4 plots these results together. One token of [au] for Subject K was unanalysable due to background noise on the tape.

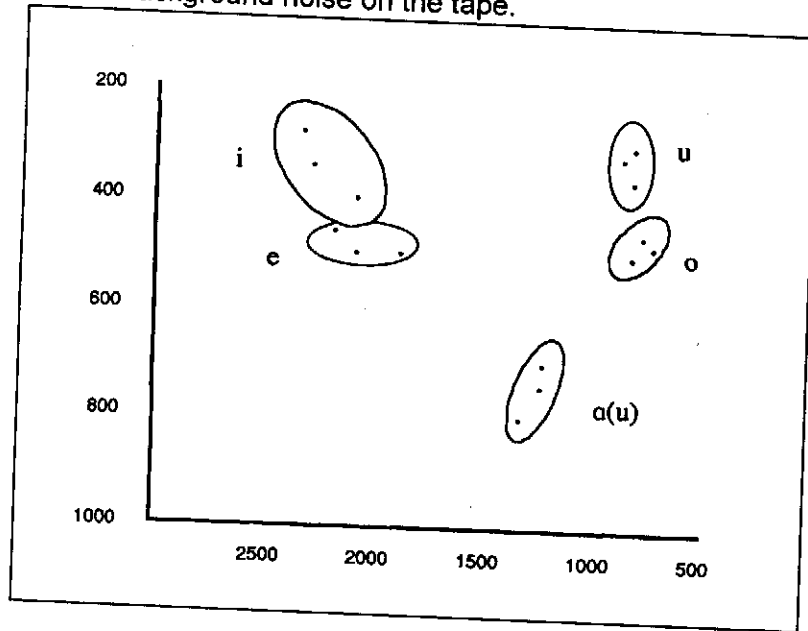


Figure 1. Formant Chart for Subject A (the Teacher)

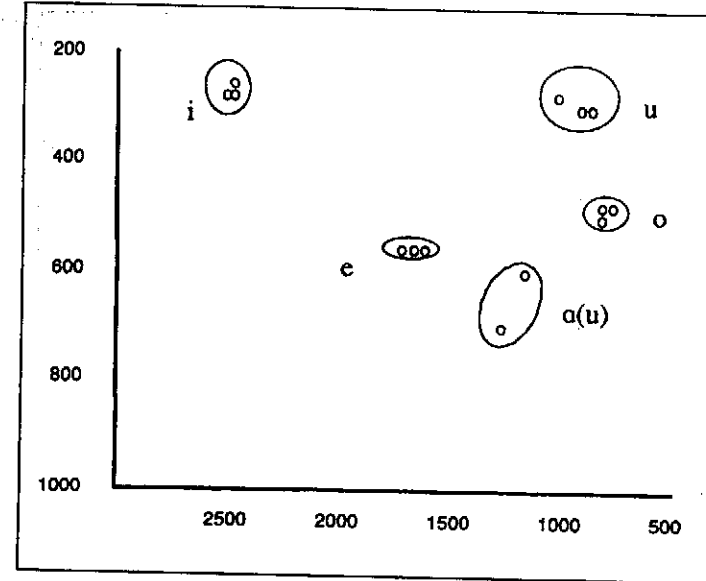


Figure 2. Formant Chart for Subject K

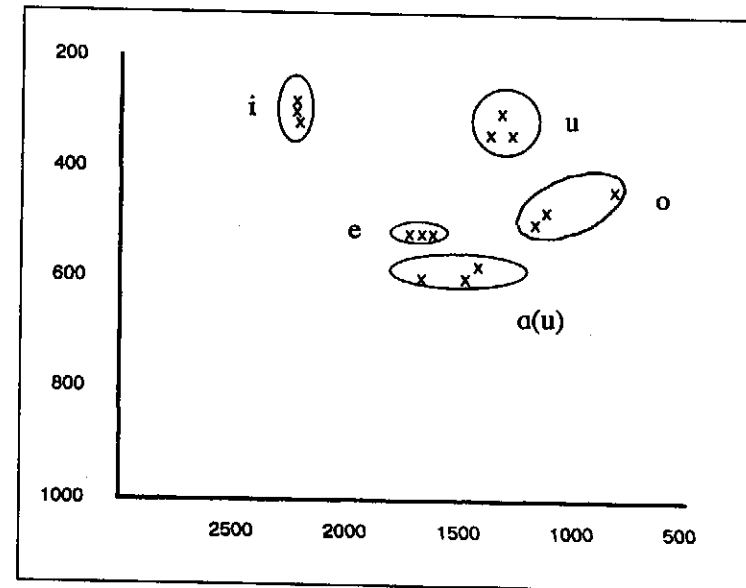


Figure 3. Formant Chart for Subject Ch

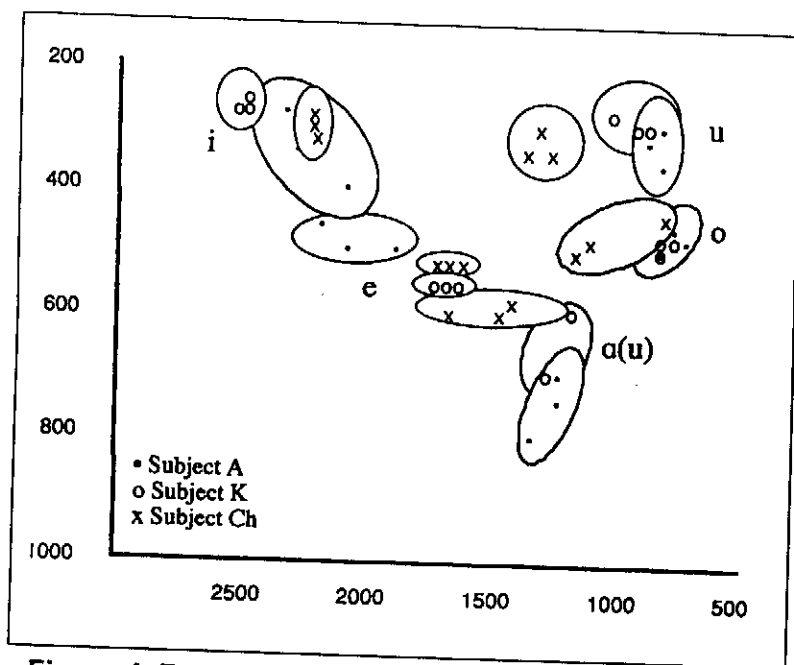


Figure 4. Formant Chart for Subjects A, K, Ch

Transcription Analysis

Pure Vowels

The LWE group were all able to produce the Welsh pure vowels as monophthongs, whereas the NWE speakers normally diphthongized the front and back mid vowels. For all speakers, this reflected their use in English, and results in a markedly "English" accent for the NWE group

[aɪ] diphthong

All speakers apart from V had difficulty with this sound. Two strategies are evident: realization as [eɪ] which maintains the contrast with [aɪ], or merger with [aɪ]. This seems to reflect a difficulty in perception as well as production.

[uɪ] diphthong

This sound was not replaced by the English equivalent [u.ɪ]. Instead all speakers in both groups either used [uɪ], or a version with a lower starting point. This last reflects the usage in some southern varieties of Welsh (though it is not the usage of the teacher), and is commonly known from place names.

[ɛu] diphthong

This sound clearly caused problems for some speakers, though it was correctly produced by two subjects in the NWE group, and one in the LWE group. Both substitutions used by the three incorrect subjects are possibly the result of interference from other common words (*lleu - llaw - lliw* 'lion - hand - colour').

[ɪu] diphthong

This diphthong caused problems for the NWE group, who all used [u:] (though not the English combination [ju:]). The LWE group had no problems with the diphthong, despite not using it in English for [ju:], which might be expected.

Acoustic Analysis

The acoustic analysis (see Figure 4) clearly shows that Subject Ch (unlike Subject K) has considerably laxer, higher vowels than the teacher, and does demonstrate the marked fronting of [u]. Subject K (and to a lesser extent Ch) has a very low front mid vowel (which supports our transcription of [ɛ] in his case); K also has a fronted and lowered [o]. Differences are also noticeable in the first element of the [au] diphthong: while the teacher has a low back starting point, Subject K has a higher initial element, and Ch a higher and fronted one. This suggests that transcriptions of [au] might be better motivated for these two subjects.

The acoustic software package used here has a comparison routine, which could be used by students to compare their own pronunciations with a prerecorded model

both auditorily and visually. Such procedures are now routinely used in speech pathology, and could be profitably integrated into language teaching. An added visual feedback stimulus can provide vital "scaffolding" in the buildup of a student's L2 phonology.

CONCLUSION

Our initial findings suggest that different groups of learners have very different needs in terms of pronunciation learning. While LWE learners have fewer difficulties in achieving an acceptable "Welsh sound", NWE learners would benefit from explicit teaching of pronunciation skills. Typical problems are loss of contrast, and thus a potential fossilization of a defective system (with implications beyond phonology, e.g. in vocabulary acquisition), and, more generally, an "English accent", with implications for the learners' acceptance by fluent and native speakers. We would expect these problems to be even more extreme in North Welsh varieties which have additional pure vowels and diphthongs.

Today, the ready availability of affordable acoustic analysis programs for personal computers (many with minimal or no added hardware other than a soundcard) means that many teachers of Celtic languages could have at their disposal a method of charting students' progress in the acquisition of pronunciation. Further, such systems can be utilized as visual feedback that students themselves can use as part of their language learning process.

We hope, therefore, we have shown the utility of employing acoustic analysis techniques in the investigation of L2 phonology. While the practical application of these to student self-monitoring and pronunciation skill development on a regular basis requires further investigation, they would appear to represent a valuable additional resource for learners.

NOTE

¹ That is to say, individual consonants and vowels (segmental), and aspects such as stress and intonation (suprasegmental).

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Preparation Aid for Text Based Irish Course

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In this paper is described facilities for the preparation of text based exercises for delivery in a computer aided language system. Supplied texts are annotated automatically and then revised by the teacher. An index of word forms is built. There are both computer generated and teacher supplied exercises.

In text based exercises, a teacher specifies a text, typically augmented with notes on words, phrases and grammatical points. Questions are posed on various aspects of the text, such as, vocabulary, grammar and general understanding. In this paper are described facilities for the preparation of text based exercises for delivery in a computer assisted language learning system.

The system has, as its kernel, a knowledge base comprising a dictionary, spell checker and grammatical rules (McElligott and Ó Néill 1996, 1995). The dictionary is an extension of *An Foclóir Beag*, (Roinn Oideachais, 1991) giving meanings and inflected forms. There are two classes of user: the person (the teacher) who annotates the text and the person (the student) who uses the annotated text for learning the language.

Annotating the text is achieved through a number of processes. These processes are initiated by the teacher. The results of each process are submitted to the teacher for