

# PRINCIPLES OF MULTIDIALECTAL ORTHOGRAPHY DESIGN

Gary Simons  
 Summer Institute of Linguistics  
 and Cornell University

## 0. INTRODUCTION

### 1. THE ADVANTAGES OF A MULTIDIALECTAL ORTHOGRAPHY

- 1.1 The advantage of one orthography over many
- 1.2 The advantage of a multidialectal orthography over a unidialectal one

### 2. PRINCIPLES OF MULTIDIALECTAL ORTHOGRAPHY DESIGN

- 2.1 Principle 1 - social acceptability
- 2.2 Principle 2 - psycholinguistic acceptability
- 2.3 Principle 3 - minimal potential ambiguity
- 2.4 Principle 4 - simplicity
- 2.5 Principle 5 - convergence of skewed systems
- 2.6 Principle 6 - phonemic contrast and neutralization between dialects
- 2.7 Principle 7 - overall least effort

### 3. A QUANTITATIVE METHOD FOR COMPUTING OVERALL EFFORT

## 0. INTRODUCTION

Language variation limits communication. In spoken communication, dialect variation may be so great as to prevent speakers of two dialects of the same language from understanding one another. However, many of these limits to communication can be overcome in written communication. For instance, differing pronunciations of the same word are unified by writing them identically in the orthography. Each reader assigns his own pronunciation to the written symbol.

This paper presents seven principles to follow in designing an orthography which minimizes dialect differences--a multidialectal orthography. A multidialectal orthography is one in which the phonologies of many dialects of a language are compared and accounted for in designing the orthography. The social situation pertaining to the dialects is also considered. We add the further requirement that each possible solution to an orthography problem be examined with respect to each of the dialects to determine the solution that will involve the least effort in learning to use the orthography for the language

group as a whole. The discussion of these seven principles is preceded by an examination of some advantages of a multidialectal orthography.

## 1. THE ADVANTAGES OF A MULTIDIALECTAL ORTHOGRAPHY

A multidialectal orthography is always designed to be used by many dialects. The advantages of a multidialectal orthography are discussed in two stages. First, the advantage of having one orthography for many dialects, rather than having many orthographies, is discussed. When one orthography is used for many dialects it need not be a multidialectal one. It could be a unidialectal one--an orthography based on the phonology of one dialect--which has a wide area of use. Thus the second stage of the discussion deals with the advantage of a multidialectal orthography over a unidialectal one in reaching many dialects.

### 1.1 The advantage of one orthography over many

The tremendous value of having one orthography which covers many dialects is illustrated by the English orthography. Although English spelling has been heavily criticized for not being "phonemic", it has scored a great triumph in uniting the different dialects of a very large and diverse speech community. Many of these dialects are in fact mutually unintelligible. To expand on this virtue of the English orthography, I give the following lengthy quotation from an essay by John Nist, "In defense of English spelling" (1966).

English spelling minimizes dialect and regional differences within the English language on a world-wide scale. When William Caxton made printing one of the supreme cultural forces in England in 1476, he elevated the Spoken British Standard of London to that of the Written British Standard. Thus the visual morpheme became a power in reducing differences of pronunciation to a single written version. From that reduction, of course, today the three major forms of Modern English--British, American, and Commonwealth--are very nearly identical on the printed page: a great source of the linguistic unity and cultural solidarity of Anglo-Saxon Civilization. If English spelling suddenly became phonemic, however, it would tend to fragment and divide that civilization. If all speakers of the language wrote exactly as they talked, soon would emerge a far more dangerous confusion: that of the inability to communicate with ease. What difficulty the Texan would have in reading the letters from his New York cousin; how hard it would be for the Lancashire farmer to decipher the reports of an Australian soil physicist; with what intellectual sweat a South African novelist would study the lines of an Irish poet!

Here we see the value of one common orthography in providing linguistic unity and cultural solidarity for peoples of divergent dialects. The political value of such an orthography can be seen in the history of many nations (Germany, for example) where a standard "national language" was used to unify a multitude of diverse speech communities. There is an obvious economic value as well. It is cheaper to have one orthography and one literature to serve many dialects than it is to have separate orthographies and literatures for each dialect.

When dialect variation is so great as to make one orthography for many groups impractical, dialect comparisons should still be made in order to make the orthographies as compatible as possible. This makes it easier for the reader who has developed reading skill in the orthography of one dialect to transfer his skill to that of another (Bromley 1961:81). Young (1962) advocates that languages of the same language family should be phonologically compared in order to standardize orthographies. Again, this would make for maximal ease in the transfer of reading skill (or even teaching skill) to a second language.

#### 1.2 The advantage of a multidialectal orthography over a unidialectal one

Sarah Gudschinsky (1973:137) states that when designing an orthography, it is not wise to mix dialects, since the results will probably please no one. Thus she sees the disadvantage of a multidialectal orthography as being that it is artificial. Since it is not the way anybody speaks, it will please no one. She favours a unidialectal orthography modelled after the one most acceptable dialect in the language.

The approach I am suggesting is not one of dialect mixture, but one of dialect comparison to discover levels of phonological structure at which skewed phonemic systems converge (principle 5). By lifting an insistence on "phonemic" orthographies, we may be able to discover a solution at a phonetic, morphophonemic, or fast speech level which finds agreement between all dialects, whereas the phonemic solution would find disagreement. When such a solution is possible, the result is an orthography which is both multidialectal and the way everybody speaks.

It was Myron Bromley (1961:76) who first suggested such a type of multidialectal orthography. He saw that even though the phonemic systems of the Dani dialects (Irian Jaya) were skewed, if sound correspondences at the phonetic level were symbolized a great deal of convergence was achieved. Bromley's objective was "to develop local orthographies which make cross-dialect comparison and reading maximally easy".

Here I expand Bromley's original idea to include searching for phonological convergence at the morphophonemic and fast speech levels, as well as the phonetic. His original objective of ease in cross-dialectal comparison and reading is developed into one of overall least effort for the learners of the orthography (see principle 7). The orthography arrived at by following the seven principles should be the one which requires the least effort to learn to use, when effort is averaged for members of all the dialect groups involved. Least effort implies shortest time needed to learn and highest percentage of persons who succeed in learning. It is at this point that a multidialectal orthography has advantage over a unidialectal one; the overall effort of the best multidialectal orthography will generally be less than (at worst, equal to) the overall effort of the best unidialectal orthography.

## 2. PRINCIPLES OF MULTIDIALECTAL ORTHOGRAPHY DESIGN

By following the seven principles outlined in this section, one should be able to design a least-effort multidialectal orthography for a group of dialects. The principles are not limited in their applicability to multidialectal orthographies only. Principles 1 through 4 and principle 7 can be followed in designing an orthography for only one dialect. All of the principles can be applied to the problem of creating a unidialectal orthography for use by many dialects. In this case, the least effort criterion would indicate the best dialect out of the many on which to base the orthography.

The statement of these principles is preliminary at best. No doubt there are important considerations which have been omitted, and unimportant ones which have been discussed. Further investigation and field testing should suggest refinements in the method proposed here.

### 2.1 Principle 1 - social acceptability

When given a number of alternative solutions to an orthography problem, the solution which is the most socially acceptable is to be preferred.

At the one extreme, a totally unacceptable solution cannot be tolerated. If the solution to a single orthography problem is totally unacceptable it may lead to the rejection of the whole orthography. At the other extreme, that of total acceptability, there is no problem. A solution that is totally acceptable will meet with no opposition and the orthography will be readily used. In between, the answers are not so obvious. There may be many degrees of social acceptability. For instance, a solution may not be acceptable to the minority who are literate in the national language, though it is perfectly acceptable to the majority who are not. Here the linguist must determine if it is more important to follow the wishes of the influential minority. Many linguists have found this necessary (see for example Phillips 1973).

When considering social acceptability within a group of dialects, the problem can become even more complex. A solution could be acceptable in some dialects while unacceptable in others. Here one must rank the overall acceptability of different solutions by considering the size, location, and prestige of the dialect groups.

In any case, the solution which is the most socially acceptable is to be preferred. In a very real sense, social acceptability is the overriding principle of all the seven; where there is no acceptability, the solution cannot be tolerated, regardless of its linguistic or pedagogical desirability. However, a solution which is partially acceptable, but not the most acceptable, can be tolerated if the other principles suggest that it is the best solution.

## 2.2 Principle 2 - psycholinguistic acceptability

When given a number of alternative solutions to an orthography problem, the solution which is the most psycholinguistically acceptable is to be preferred.

The practice of psycholinguistic testing of orthographies is a common one. In essence, psycholinguistic testing attempts to determine which solution is the most "psychologically real" to the speakers and prospective readers of the language. When the linguist is not able to decide the proper solution to a phonemic analysis problem or wonders about the best way to symbolize something in the orthography, it is very helpful to present the alternative solutions to the native speakers to determine which one they feel is "right".

The phonemic level is not the only psychologically real level of phonological structuring. The phonetic level is also psychologically real. This is evidenced by the fact that native speakers of a dialect react to the "funny" accents of outsiders. They may not be able to define precisely what is different, but they nevertheless react to it as a real difference. In some cases, the phonetic level may be the most psychologically real level in the minds of the speakers. This is in evidence when speakers of a language (generally ones that are literate in other languages) insist that allophones of a single phoneme in their language be represented by separate orthographic symbols (see for example Phillips 1973). The phonetic difference of the phones is more real to them than the phonemic sameness.

The morphophonemic level may be the most psychologically real level in certain cases. This is true with the plural morpheme in English. Following voiceless stops the morpheme is realized as the phoneme /s/, for example, /kits/ 'kits'. Following voiced stops the morpheme is realized as the phoneme /z/, for example, /kidz/ 'kids'. In other positions, /s/ and /z/ are contrastive phonemes. Here they are morphophonemically conditioned variants. Few speakers of English realize that the sounds at the end of *kits* and *kids* are different.



The sameness of the morpheme is more real than the differentness of the phonemes.

The fast speech level is also a psychologically real level. Though our literary tradition does not allow it, one often sees such spellings as "Wanna go?" for "Want to go?", and "I've gotcha!" for "I have got you!". In these cases, the fast speech level is more real to the writer than the normal speech phonemic level.

The general principle of psycholinguistic acceptability does not presuppose a "phonemic" orthography. The principle of psycholinguistic acceptability requires that the most psychologically real solution be selected.

### 2.3 Principle 3 - minimal potential ambiguity

When given a number of alternative solutions to an orthography problem, the solution which makes the greatest contribution toward the resolution of potential ambiguity is to be preferred.

Ideally, an orthography should minimize the potential ambiguity of words in context. One drawback of choosing not to distinguish phonemes with low functional load is that it may increase the potential for ambiguity. Gudschinsky (1973:120-2) discusses some of the great difficulties which ambiguities create for the beginning reader. However, the proficient reader can tolerate much more potential ambiguity because his comprehension of the total context will serve to disambiguate the meanings of specific words.

### 2.4 Principle 4 - simplicity

When given a number of alternative solutions to an orthography problem, the solution which yields the simplest orthography is to be preferred.

Powlison (1968:80) discusses simplicity as one of four key characteristics of an efficient orthography. He makes the point that, "no writing system completely represents the total phonemic system of its language, nor is such total representation necessary or desirable for an efficient orthography" (1968:77). Imagine an English orthography in which stress was marked and intonation contours were marked by assigning a pitch level to each syllable. Further meaning could be conveyed by indicating speed, volume, and tone of voice. The resulting orthography would confuse more than it would clarify, even though it would unambiguously communicate much fuller meaning. There is a point at which symbolizing additional contrasts, whether they are segmental or suprasegmental, has no advantage and is more detrimental than helpful.

Thus we see that the simplicity of an orthography is related to its readability; symbolizing too many contrasts may clutter and obscure the written message. Simplicity is also related to the teachability (and learnability) of an orthography. Each additional symbol in an orthography is an additional item that must be taught and learned.

Of course the other side of simplicity is minimal potential ambiguity. Anytime an orthography is made more simple, the potential for ambiguity is increased. Anytime potential ambiguity is decreased by introducing an additional symbol, the orthography becomes less simple. There is a constant oscillation between simplicity and minimal ambiguity, and a balance must be found.

In some cases measures can be taken to combat the potential ambiguity introduced by a simplification of the orthography. If the simplification results in the loss of contrast in only a few key pairs of words, Powlison (1968:80) suggests that the contrasts "can sometimes be restored by making arbitrary spelling distinctions between the resulting pairs of homonymous words". One could also use a paraphrase to avoid potential ambiguity whenever it would arise in a written text.

## 2.5 Principle 5 - convergence of skewed systems

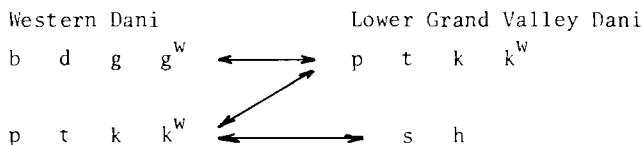
When given a number of alternative solutions to an orthography problem, the solution which finds a level of phonological structure at which skewed systems converge is to be preferred.

Under principle 2, psycholinguistic acceptability, we discussed the fact that the phonetic, phonemic, morphophonemic, and fast speech levels of phonological structuring are all psychologically real. Ideally, the orthography represents the level that is the most psychologically real in any given instance. When there is a skewing of phonological structures between dialects this is not always possible. The most psychologically real solution in one dialect need not correspond to the most psychologically real solution in another dialect. In this situation, the linguist has at least two options: (1) adopt the ideal solution for the most important dialect, or (2) attempt to find a common solution at a level of phonological structure other than the most psychologically real one.

Principle 5 states that the second option is the preferred one. The first option, though it gives the ideal solution in one dialect, forces the speakers of the other dialects to master that aspect of the orthography by rote techniques; they are forced to memorize. The second option, however, requires no memorization. The solution, though it may not be at the most psychologically real level for either group, is based on a psychologically real level of structure for both groups. As such, the solution is internalized in the linguistic competence of speakers from both dialects. Learning should be relatively easy for both groups; under the first option, learning is easy for one group but hard for the other.

Pike discusses the ramifications of this principle at the phonetic level. He states (1947:209) that representing conditioned allophones of a phoneme with separate symbols is not a very serious error, for "the native, even though he may not hear the difference, can nevertheless build up a mechanical rule which tells him when to use the one symbol or the other; it does not demand the memorization of an arbitrary list of words". Another possibility is that a mechanical rule will not be necessary at all; the speaker may become aware of the phonetic difference after it is pointed out. In either case, since the phonetic units are internalized as part of the speaker's phonological system, no memorization is required.

To illustrate convergence at the phonetic level I will use the data given by Bromley (1961) in his attempt to design a multidialectal orthography for the Dani language of Irian Jaya. Among the eight dialects which he discusses, there are two main patterns for the stop phonemes. Lower Grand Valley Dani has one stop series and two voiceless continuants, while the other seven dialects have two stop series which correspond to these. To represent the pattern of the seven dialects I will use Western Dani. The problem comes in that the correspondence between the two series of stop phonemes in Western Dani is not one to one with the stops and continuants of Lower Grand Valley Dani. The correspondence may be diagrammed as:



That is, words in Western Dani (WD) containing the voiced stops will have their voiceless counterparts in Lower Grand Valley Dani (LGV). The voiceless stops in WD will occur in LGV either as the same voiceless stop or as /s/ or /h/--WD /t/ corresponds to LGV /s/ and WD /p, k, k<sup>w</sup>/ correspond to LGV /h/. The skewing between the phonemic system of the two dialects is apparent and to model the orthography after one system or the other would create many difficulties for users of the other dialect.

Bromley found that if these skewed phonemic correspondences were compared at the phonetic level, the result was a convergence of the patterns into a one-to-one correspondence between phones. The voiced stops of WD (which are phonetically prenasalized) correspond to the initial allophones of the LGV stops which are voiceless and unaspirated. The intervocalic and final allophones of WD (which are continuant and unreleased, respectively) correspond exactly to the intervocalic and final allophones of the LGV stops. The initial allophones of the WD voiceless stops (which are aspirated) correspond to the LGV /h/ and /s/ as described previously. The resulting correspondences, along with the orthographic symbols suggested by Bromley (1961:77-8) can be diagrammed as:



	Western Dani					Lower Grand Valley Dani					Proposed
	m <sub>b</sub>	n <sub>d</sub>	ŋ <sub>g</sub>	ŋ <sub>g</sub> <sup>w</sup>	↔	p	t	k	k <sup>w</sup>		Orthography
										initial	b d g gw
intervocalic	[	b	ɾ	g	↔	b	ɾ	g	g <sup>w</sup>	intervocalic	
final		p	t	k	↔	p	t	k		final	p t k kw
initial	[p <sup>h</sup> t <sup>sh</sup> k <sup>h</sup> k <sup>wh</sup> ↔ h s h h										ph ts kh kwh

Principle 5 works at the morphophonemic level when different dialects have different phonemic realizations of the same underlying morphophoneme. In this case, the principle requires that the morphophonemic level be symbolized in the orthography. The readers will then have the opportunity to apply the phonemic realization rules that operate in their own dialect without being confused by the realization that is already printed on the page. We can illustrate this with a simple example from the Biliau language of the Madang Province, Papua New Guinea (from personal field notes). There are two main dialects of Biliau, the eastern and the western. The following is a paradigm of the word 'forehead' in the two dialects with the singular possessive suffixes. The forms are given in a phonemic orthography.

Eastern	Western	
<i>damow</i>	<i>damow</i>	'my forehead'
<i>damom</i>	<i>damom</i>	'your forehead'
<i>damoy</i>	<i>damay</i>	'his forehead'

This kind of difference in the third person form is common throughout the language. The orthography problem here is whether to follow the eastern or the western dialect in spelling the word. The eastern spelling of *damoy* would cause some confusion to the western readers, and the western spelling of *damay* would cause some confusion to eastern readers. This problem of a skewing at the phonemic level is resolved at the morphophonemic level, however. By comparing the third person form of the western dialect with the first and second person forms we see that the final vowel of the root has a morphophonemic alternation between the phonemes /o/ and /a/. By comparing them with the eastern forms in which the root final vowel does not vary, we posit that the vowel at the underlying morphophonemic level is /o/. The alternation with /a/ in the western dialect is conditioned by the /-y/ suffix. Thus we see that the skewed phonemic patterns converge to the single vowel /o/ at a morphophonemic level. By principle 5, then, the *damoy* solution is to be preferred to the *damay* solution, and each reader can make his own phonemic realization of the written morphophonemic form.

An example of principle 5 working at the fast speech level is also found in the Biliau language. In both the eastern and western dialects of the language, the five vowels /a, e, i, o, u/ occur, plus

the double vowel /aa/. /aa/ is pronounced with a lenis glottal stop separating the two vocoids--that is, /maan/ 'bird' is pronounced [maʔan]. The fact that /aa/ contrasts with /a/ is shown by the following minimal pairs from Biliau village (western dialect).

<i>wag</i>	'canoe'
<i>waay</i>	'drum'
<i>sam</i>	'canoe outrigger'
<i>saam</i>	'sky'
<i>mam</i>	'father'
<i>maam</i>	'a species of fish'

In the eastern dialect, /oo/ and /ii/ occur as well.

<i>diig</i>	'stick'
<i>wiil</i>	'yam'
<i>xroor</i>	'net bag'
<i>yidoom</i>	'night'

The complication comes in the fact that where one dialect has a double vowel, the other dialect may not. This lack of agreement between dialects seems to be the rule rather than the exception, as the following examples illustrate.

Western	Eastern	
<i>baal</i>	<i>bal</i>	'dove'
<i>dagalaaw</i>	<i>dagalaw</i>	'my thigh'
<i>aay</i>	<i>ay</i>	'tree'
<i>gab</i>	<i>gaab</i>	'gather'
<i>kak</i>	<i>kaak</i>	'elder brother'
<i>sam</i>	<i>saam</i>	'canoe outrigger'

This is a clear example of skewing between the phonemic systems of the two dialects. If a phonemic solution from one of the dialects is chosen, speakers of the other dialect will have difficulties with the orthography. When reading, /a/ could be either /a/ or /aa/, and /aa/ could be either /a/ or /aa/. For writing, the problem is even worse. To learn how to spell words with /a/ or /aa/ could be done only by memorization.

At the fast speech level, however, there is a convergence of phonological structure and a common solution. In fast speech, the double vowels are pronounced as single vowels. The phonemic contrast between double and single vowels is neutralized at this level. Thus the /baal/ of the western dialect and the /bal/ of the eastern dialect are both realized identically as [bal]. Therefore, to represent all double vowels as single vowels in the orthography, results in a solution in which the standard spellings are phonologically correct (at the fast speech level) for both dialects.

## 2.6 Principle 6 - phonemic contrast and neutralization between dialects

When given alternative solutions to an orthography problem involving phonemic contrast and neutralization between dialects, the solution which symbolizes the contrast is to be preferred for the sake of the reader, while the solution which symbolizes the neutralization is to be preferred for the sake of the writer.

When comparing the phonemes of two dialects, it is often the case that what is one phoneme in one dialect will appear as two different phonemes in the corresponding words of the other dialect. This is what is meant by phonemic contrast and neutralization between dialects-- what is contrasted phonemically in one dialect is neutralized in another.

An example of such a situation is found between the two dialects of the Biliau language. In the western dialect /d/ and /z/ are separate phonemes. In the eastern dialect only /d/ occurs; every occurrence of /z/ in the western dialect has /d/ in the corresponding word from the eastern dialect. The /d/ has no allophones in either dialect. The following examples illustrate the contrast in the western dialect and the neutralization in the eastern dialect.

Western	Eastern	
<i>damom</i>	<i>damom</i>	'my forehead'
<i>zamom</i>	<i>damom</i>	'rotten'
<i>der</i>	<i>der</i>	'a cold wind'
<i>zer</i>	<i>der</i>	'grass skirt'
<i>badi</i>	<i>badi</i>	'get up'
<i>bazi</i>	<i>badi</i>	'feather'

The principle states that the solution which symbolizes the contrast is to be preferred for the sake of the reader. Thus if /d/ and /z/ are both symbolized according to the usage in the western dialect, the solution favours the readers. In the western dialect there will be no difficulties either reading or writing, since the solution is phonemic for them. In the eastern dialect this is not so. Writing will be difficult since the only way they can learn standard spellings is to memorize them. Reading will not be difficult, however. Every time they see a /z/ they are taught to pronounce a /d/. Thus the overall advantage is toward the reader.

The solution which symbolizes the neutralization is to be preferred for the sake of the writer. Thus if only the /d/ symbol is used according to the usage in the eastern dialect, the solution favours the writer. In the eastern dialect there will be no difficulties either reading or writing since the solution is phonemic for them. In the western dialect this is not so. Reading will be more difficult because every time they encounter a /d/ they must determine

if it is phonemically a /d/ or a /z/ for them. Writing will not be difficult, however. They will use the /d/ symbol for both the /d/ and the /z/ phonemes. Thus the overall advantage is toward the writer.

In the case of phonemic contrast and neutralization between dialects, we see that there is no one best solution. There is a conflict of interest between favouring the reader and favouring the writer. The linguist must determine which is more important in the specific situation.

### 2.7 Principle 7 - overall least effort

When given a number of alternative solutions to an orthography problem, the solution which promises the overall least effort is to be preferred.

Overall effort is measured by the amount of time required for an illiterate to become fluently literate. Once a reader has become fluent, there is no effort involved in an orthography. This is evidenced by the fact that the fluent reader of English or Chinese can read just as well as any reader of a "phonemic" orthography. The effort involved in an orthography is in learning to use it. If the English orthography were strictly phonemic, there would be no need in American schools to still be having spelling classes in the eighth grade.

The greater the overall effort required to master an orthography, the greater is the overall cost of conducting a literacy programme. This cost is realized in at least two ways: the cost of losing students and thus failing to produce readers, and the actual expense in terms of time, teachers, and equipment required for conducting the programme. The cost in terms of losing students is the more serious. Ability to succeed in becoming a fluent reader is largely governed by motivation. In a very real way, the effort required to learn can affect one's motivation. Difficulties and long periods without any seeming progress can lead to frustration and discouragement. These in turn may lead to loss of motivation and giving up. The less time and effort required to gain mastery, the greater the chances that the individual student will succeed.

## 3. A QUANTITATIVE METHOD FOR COMPUTING OVERALL EFFORT

Now we consider how principles 1 through 6 relate to the principle of least effort. As we consider each of the principles, I will suggest a method of quantifying the relative effort required by each of the solutions. The method is still very tentative. It is hoped that the input received from field studies using this method will be able to suggest refinements.

The results of the relative effort computations are recorded in a table. The rows of the table are labelled with the possible solutions being considered. For each of the dialects being considered there is one super-column. Each of these super-columns is subdivided into seven columns--one for each of the first six principles and a final one for recording the total effort for the dialect. A sample record sheet for a problem with three solutions and three dialects is as follows.

Table 1. Sample record sheet

	Dialect A							Dialect B							Dialect C							Overall Effort			
principles	1	2	3	4	5	6	T	1	2	3	4	5	6	T	1	2	3	4	5	6	T	A	B	C	T
Solution 1																									
Solution 2																									
Solution 3																									

In the boxes on the record sheet is recorded the relative effort required by a particular solution in a particular dialect with respect to a single principle. In the total columns for the dialects, the sum of the efforts for all six principles is recorded. This then gives the relative total effort required by a solution in that dialect. The overall effort super-column is for summarizing the total effort. The dialect totals are copied into the appropriate boxes and then summed to give the total overall effort, with respect to all the principles in all the dialects, for each possible solution. By principle 7, the solution with the lowest overall effort is the best solution to select.

Now we shall consider the principles one by one and suggest a scale for quantifying relative effort for each principle. In each scale the lowest values represent least effort and the highest values are most effort. The scales given here are suggestions to be followed as an initial guideline. In applying the method, the investigator may discover that he needs more degrees in a scale, fewer degrees in a scale, or a different assignment of values to the degrees in a scale. The investigator might also want to weight the effort values. If a particular principle is felt to be more or less important than the others, its effort values could be multiplied by a constant to adjust its weight accordingly. Total effort values for the dialects might also be weighted to reflect the size or prestige of the different dialects. The investigator is encouraged to make any modifications that seem necessary.

Principle 1 - social acceptability. A solution which is perfectly acceptable is, of course, the least effort solution; thus it receives a score of 0. A solution which is totally unacceptable is maximum effort and is actually an impossible solution. An arbitrarily high value must be assigned to such a solution. The value 10 is suggested here, but a higher one may be necessary. At least three degrees of acceptability in between can be distinguished: reluctantly acceptable,



which receives a value of 1; possibly troublesome, which scores 2; and definitely troublesome, which scores 4. It is felt that the amount of effort required for a definitely troublesome solution as compared to a possibly troublesome one, is much greater than the difference of effort required between a reluctantly acceptable solution and a possibly troublesome one. Thus the jump in the scoring from a value of 2 to one of 4.

Principle 2 - psycholinguistic acceptability. A solution which is the most psycholinguistically acceptable is the least effort solution and receives a score of 0. A solution which is acceptable but not the most acceptable scores 1. A solution which will possibly cause difficulty scores 2. A solution which will definitely cause difficulty scores 4. Finally, a solution which is psycholinguistically impossible scores 10.

Principle 3 - minimal potential ambiguity. Increase and decrease of potential ambiguity is calibrated with respect to the dialect being considered. The score of 2, no change in potential ambiguity, means that the given solution neither increases nor decreases potential ambiguity and 0 means a definite decrease in potential ambiguity. Conversely, 3 represents a slight increase in potential ambiguity and 4 is a definite increase. Two degrees of decrease and two degrees of increase are suggested in the case that one solution may offer a greater degree of increase than another, or that a particular solution may show a greater degree of increase in one dialect than in another.

Principle 4 - simplicity. Increase and decrease in simplicity, too, is calibrated with respect to the dialect being considered. The score of 2, no change in simplicity, means that the given solution neither increases nor decreases simplicity from what it would be in a complete orthography designed solely for that dialect. The score of 1 means that the solution offers a slight increase in simplicity and 0 means a definite increase in simplicity. Conversely, 3 represents a slight decrease in simplicity and 4 is a definite decrease.

Principle 5 - convergence of skewed systems. The solution at the most psycholinguistically real level is the least effort solution and so scores 0. In principle 5 it is stated that a solution at a common level of phonological structure is to be preferred to a solution which requires arbitrary memorization for at least one dialect. Thus the total effort for a common solution must be less than the memorization one. A solution scores 1 if it is a common level solution for that dialect--that is, it represents a psychologically real level of structuring, yet not the most real level. A solution which requires some memorization scores 3. Thus a solution which finds a common level for two dialects (total effort of 2) is less effort than a solution which is psycholinguistically the best for one dialect but requires some memorization in the other dialect (total effort of 3). A solution which requires a great deal of memorization scores 4.

Principle 6 - phonemic contrast and neutralization between dialects. Before scoring the effort for this principle, the investigator must determine whether advantage toward the reader or advantage toward the writer is of prime importance. After this has been decided the effort values can be assigned. The score of 2 means that the solution is of no advantage or disadvantage to the reader/writer--it makes no difference. The score of 1 means that the solution is slightly advantageous. The score of 3 means that the solution is slightly disadvantageous to the reader/writer, and 4 means that it is definitely disadvantageous.

A summary of the scales for quantifying relative effort is given in Table 2.

Table 2. Scales for quantifying relative effort

1. Social acceptability
  - 0 perfectly acceptable
  - 1 reluctantly acceptable
  - 2 possibly troublesome
  - 4 definitely troublesome
  - 10 totally unacceptable
2. Psycholinguistic acceptability
  - 0 psycholinguistically most acceptable
  - 1 acceptable
  - 2 possibly difficult
  - 4 definitely difficult
  - 10 impossible
3. Minimal potential ambiguity
  - 0 definitely decreases potential ambiguity
  - 1 slightly decreases potential ambiguity
  - 2 no change in potential ambiguity
  - 3 slight increase in potential ambiguity
  - 4 definite increase in potential ambiguity
4. Simplicity
  - 0 definitely increases simplicity
  - 1 slightly increases simplicity
  - 2 no change in simplicity
  - 3 slightly decreases simplicity
  - 4 definitely decreases simplicity
5. Convergence of skewed systems
  - 0 psycholinguistically most acceptable
  - 1 common level of structure solution
  - 3 solution requiring some memorization
  - 4 solution requiring much memorization

## 6. Phonemic contrast and neutralization between dialects

- 0 definitely advantageous to reader/writer
- 1 slightly advantageous to reader/writer
- 2 makes no difference
- 3 slightly disadvantageous to reader/writer
- 4 definitely disadvantageous to reader/writer

In Table 3 there is a sample overall effort computation for the /d/ versus /d/ and /z/ orthography problem in the Biliau language described under principle 6. Table 4 is a sample overall effort computation for the orthography problem concerning the double vowels in the Biliau language described under principle 5. The following paragraph explains how the relative effort values were assigned for the first example.

Table 3. The /d/ and /z/ problem in Biliau

	Western dialect							Eastern dialect							Overall effort		
	1	2	3	4	5	6	T	1	2	3	4	5	6	T	W	E	T
1. /d/ and /z/	0	-	2	2	-	2	6	1	-	1	3	-	2	7	6	7	13
2. /d/ only	2	-	3	1	-	3	9	0	-	2	2	-	2	6	9	6	15

Table 4. The double vowel problem in Biliau

	Western dialect							Eastern dialect							Overall effort		
	1	2	3	4	5	6	T	1	2	3	4	5	6	T	W	E	T
1. Distinguish double vowels as used in western dialect	0	0	2	2	0	-	4	1	4	2	2	3	-	12	4	12	16
2. Distinguish double vowels as used in eastern dialect	2	4	2	2	3	-	13	0	0	2	2	0	-	4	13	4	17
3. Symbolize all as single vowels	0	1	3	1	1	-	6	0	1	3	1	1	-	6	6	6	12

The problem concerning /d/ and /z/ is primarily one of phonemic contrast and neutralization. There are two possible solutions--to represent the contrast of /d/ and /z/ as is done in the western dialect, or to represent the neutralization with just /d/ as is done in the eastern dialect. Before quantifying the social acceptability it must first be noted that the western dialect has a true ascendancy in terms of prestige. In Biliau, the key village of the western dialect, there is a primary school, a medical aid post, an airstrip, a church, a large

trade store, and it is a regular port for a major shipping line in the Madang area. Of a comparable nature, the eastern dialect has only a church and a small trade store. To represent the neutralization would be perfectly acceptable in the eastern dialect but possibly troublesome in the western dialect. To represent the contrast would be perfectly acceptable in the western dialect. It might even be perfectly acceptable in the eastern dialect, though we will score it as reluctantly acceptable.

It is felt that psycholinguistic acceptability and convergence of skewed systems are not directly relevant to the problem. The problems of acceptability and arbitrary memorization are certainly relevant in one sense; however, they must be gauged either with respect to the reader or to the writer. Results will differ in either case. Since it is primarily a problem of reader versus writer, the scoring of this aspect of the problem is reserved for the principle of phonemic contrast and neutralization.

As to the potential ambiguity, the /d/ and /z/ solution makes no change in the western dialect since this is the phonemic solution in that dialect. However, for the eastern dialect, this solution would offer a slight decrease in potential ambiguity. The /d/ solution, being the phonemic solution for the eastern dialect, would offer no such change for that dialect, though for the western dialect it would entail a slight increase in potential ambiguity.

In terms of simplicity, the /d/ and /z/ solution in the western dialect offers no change since this is the phonemic solution for this dialect; the /d/ solution offers a slight simplification in the orthography. In the eastern dialect, the /d/ solution offers no change since it is the phonemic solution; the /d/ and /z/ solution introduces a slight decrease in simplicity into the orthography for the eastern dialect speakers.

For principle 6, we first determine that the advantage to the reader is more important for our applications than advantage to the writer. In the eastern dialect, the /d/ solution makes no difference since it is the phonemic solution. The /d/ and /z/ solution should also make no appreciable difference to the readers of the eastern dialect; they simply must be taught to pronounce all /z/ symbols as /d/. It should not introduce reading difficulties. In the western dialect, the /d/ and /z/ solution makes no difference since it is the phonemic solution. The /d/ solution would involve a slight disadvantage to the readers for they would have to determine if it was really their phoneme /d/ or /z/.

In the totals for overall effort, we see that the contrast solution has a relative effort of 6 in the western dialect as opposed to 9 for the neutralization solution. In the western dialect, the neutralization solution has an overall effort of 6 as opposed to 7 for the

contrast solution. Considering overall effort with respect to the whole language group, we see that the contrast solution has an overall effort of 13, whereas the neutralization solution has an effort of 15. Thus by principle 7, the contrast solution--to symbolize /d/ and /z/ according to the usage of the western dialect--is to be preferred.

#### BIBLIOGRAPHY

- Bromley, H. Myron, 1961. *The phonology of Lower Grand Valley Dani: a comparative structural study of skewed phonetic patterns*. Verhandelingen van het Koninklijk instituut voor taal-, land- en volkenkunde, deel 34. 'S-Gravenhage: Martinus Nijhoff.
- Gudschinsky, Sarah, 1973. *A manual of literacy for preliterate peoples*. Ukarumpa, Papua New Guinea: Summer Institute of Linguistics.
- , 1970. More on formulating efficient orthographies. *The Bible translator* 21(1):21-5.
- Nist, John, 1966. In defense of English spelling. *Linguistics* 23:81-9.
- Phillips, Donald J., 1973. The influence of English on a tribal alphabet or the phoneme or the allophone. *Pacific linguistics* A 38:29-78.
- Pike, Kenneth L., 1949. *Phonemics: a technique for reducing languages to writing*. Ann Arbor: University of Michigan Press.
- Powlison, Paul, 1968. Bases for formulating an efficient orthography. *The Bible translator* 19(2):74-91.
- Smalley, William A., ed., 1964. *Orthography studies*. London: United Bible Societies.
- Young, Rosemary, 1962. The phonemes of Kanite, Kamano, Benabena and Gahuku. *Studies in New Guinea linguistics, Oceanic linguistic monographs* 6:90-110.