

Dictionary Development Program

*Ronald Moe**

I have a toolbox full of all sorts of tools. The other day I needed to pound a nail, but couldn't find my hammer. I eventually got the job done, but it would have been so much easier with a hammer and a lot easier on my thumb. What would a carpenter do without his hammer and saw, or an artist without his brush, or a shepherd without his staff? One of the basic tools of a translator is a dictionary. Many translators have gotten the job done without one, but those who have them use them all the time.¹ A good dictionary can be used for language learning, phonological analysis, interlinearization of texts, translation, and so much more. A good thesaurus can suggest alternate wordings and enrich the vocabulary of the translation. Not only will a dictionary make a profound impact on a project, but in many cases it is the most important single contribution we can make to the linguistic world. Dictionaries are also the only linguistic descriptions that are popular with the general public.

Up until now the time and effort involved in compiling a dictionary was so great that progress was agonizingly slow. Most of us translate with a small dictionary of very limited usefulness. Others give it up as not worth the bother. Some wait to produce a dictionary until after the translation is done, when it is too late to be of help! But now it is possible to produce a massive, semantically classified dictionary at the beginning of the project, so that it can be used throughout the project. Since a dictionary feeds other aspects of the program, the ripple effect will have tremendous long-term benefits.

The Dictionary Development Program (hence DDP) that makes this possible is included on the CD that accompanies issue 2.1 of Word and Deed.² This article is not intended to explain the theoretical and technical details behind the program, but to motivate you to use the program. Whether you are just beginning a project or are nearing completion, the program will enable you to quickly produce a dictionary and a thesaurus.

The following chart contrasts the historical average rate of collecting words with what is possible with the DDP.³ Historically it has taken nearly 20 years to collect 12,000 words. With the DDP you

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¹ I attended a conference on Bilingual Dictionaries and Translation, devoted to the design and use of dictionaries in translation. The professional translators at the conference use their dictionaries extensively in their work.

²Note added 2006: The article from Notes on Linguistics and the DDP documentation and materials can be downloaded from the DDP website <http://www.sil.org/computing/ddp/index.htm> </Redirect/www.sil.org/computing/ddp/index.htm>. The DDP materials and methodology have also been integrated into the FieldWorks program, which can be downloaded from the SIL website www.sil.org.

³ The historical average is based on dozens of reports from language teams both within and outside of SIL. The DDP rate is based on actual results from teams using the program.

can do that in two weeks. Of course, there is more to producing a dictionary than collecting words, but it is the necessary first step. You can't fill out an entry that doesn't exist.

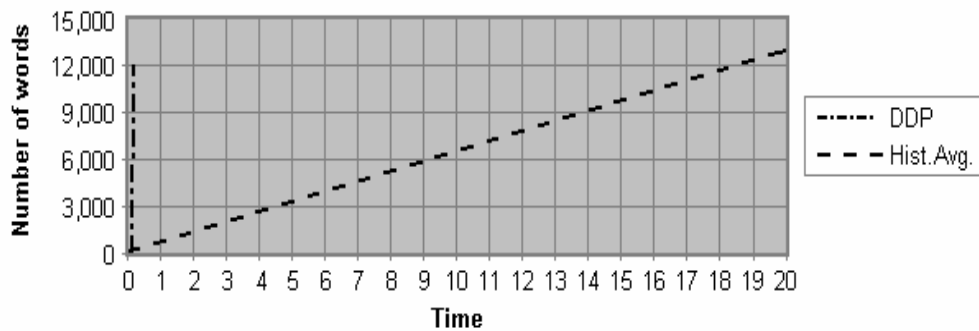


Chart 1: A comparison of rates for collecting words

How in the world can you collect the words of a language in a couple of weeks?

The mind has the incredible ability to assimilate, organize, and recall massive amounts of information. The mental dictionary contains all the words we know and all the information needed to use those words. We access this information when we speak, but lexicographers have always had difficulty in accessing it to document it in a dictionary. Fortunately there are ways to get at it.

The words in the mental dictionary aren't listed alphabetically like in a published dictionary. Instead the brain organizes them into a multi-dimensional web of relationships that it uses when constructing sentences. This mental web is incredibly complex and powerful. Words aren't just uniformly distributed through the brain. Instead they cluster around key concepts, much like stars cluster in galaxies, or planets revolve around a star. We call these clusters of words 'semantic domains'.

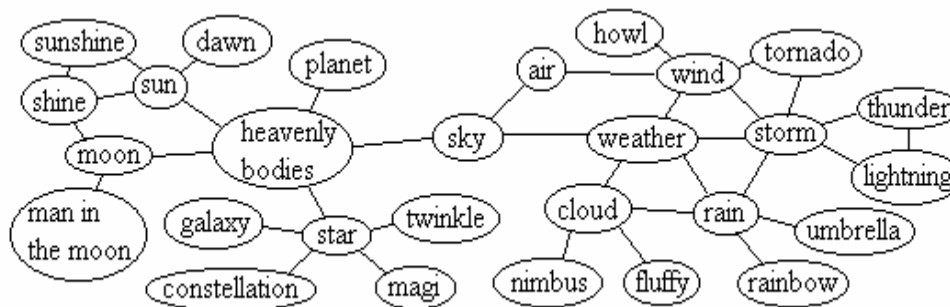


Chart 2: The domain 'Sky' and its subdomains

We play word games⁴ based on semantic domains in which we pull words out of our minds. The program makes the process of collecting words into a giant game. People find it fun. It's hard to get them to quit. The reason the method works is that the mind can easily recall the words that belong to a domain because they are all tied together by lexical relations. Try it. Pick a domain, any domain. Think of as many words as you can that belong to the domain. With a little practice you can think of words as fast as you can write them down. All you need to collect words is a group of people and a list of domains.

⁴ An example is the game 'Outburst'.

What's needed?

We need dictionaries—big dictionaries. The New Testament contains 12,000 words. Unless a dictionary is as big as the New Testament, it is too small to suggest translation options. A translator needs a semantically classified dictionary of the target language, because he is starting with a meaning and looking for a way to express it. A mother tongue translator at least needs a thesaurus, which is a semantically classified word list. If you are interlinearizing texts, you need a large dictionary so that you don't have to constantly stop to add new words to your dictionary. Language learners report that looking up a word in a dictionary is their primary vocabulary learning strategy (Schmitt:1997). Having a semantically classified dictionary enables a language learner to concentrate on an area of life. A large dictionary is a help in phonological analysis because it enables us to do things like search for rare segments, investigate CV patterns, or sort by tone pattern. A large dictionary will very likely contain all the segments and sequences that are permitted in the language. We also need dictionaries with accurate definitions. Other fields, such as part of speech or an English reversal, would be nice as well. And we need these dictionaries at the start of the project, not the end.

What's the problem?

Dictionary development has always been one of the most difficult and time-consuming aspects of our work; so much so that many teams never get beyond collecting a few thousand words and never publish a dictionary. Those brave souls who have undertaken to produce a dictionary have faced numerous hurdles. Lexicography is a specialized field, requiring specialized training. For instance, many people are confused over how to handle derivatives and what a subentry is to be used for. The difficulty of understanding and applying abstract principles places dictionary development out of the reach of most people. The DDP is like having a lexicography consultant at your elbow.

There has been no systematic way to collect the data. Most teams collect about 650 words per year, or 2.5 words per working day. So it takes around 20 years to compile a dictionary as big as that of the New Testament. Words are collected as they are encountered in the course of the work, and may or may not be described at the time, resulting in a dictionary that is uneven in its breadth and depth of coverage. It is incredibly difficult to manage the data and keep it consistent, especially when it is collected over a period of decades.

What's the solution?

What we've needed is an easy to use, step-by-step procedure that brings dictionary production within the reach of all of us. We've needed easy to understand instructions for each step. We've needed a systematic method to collect the data. We've needed an efficient way to enter the data and a data management program that helps us keep the data consistent. We've needed a list of semantic domains to classify words. Over the past three years I have been developing the DDP to do these things. In a previous article in *Notes on Linguistics* (Moe:2001) I introduced the program, the basic methodology behind it, and some of the theoretical issues involved.

What's the program like?

The DDP employs a new paradigm, new techniques, and new materials. Instead of collecting and describing words one by one, we now collect the words all at once and then expand the dictionary one field at a time. At the heart of the program is a list of semantic domains. The list is both exhaustive and universal, so it can be used to classify any word in any language. The list of domains can be used to efficiently and systematically collect the words of a language in a couple of weeks. I've developed

a template for each domain to help in this process. The program also includes a list of steps involved in producing a dictionary, together with the instructions and tools needed to accomplish each step.

What's a template?

A template is a mold or pattern that can be used repeatedly to produce similar objects. A ruler is a simple template for drawing straight lines. You can buy plastic templates to help you draw simple shapes as in the example below.

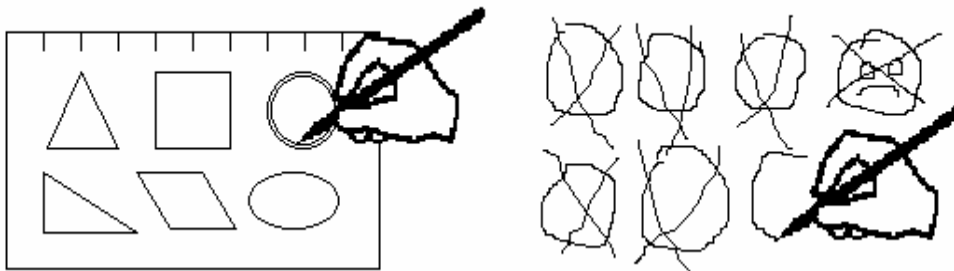


Chart 3: Drawing a circle using a template

Drawing a circle freehand

A template like this makes it easy to draw lots of lines, circles, and other shapes, each one identical to the others. With a template even a child can draw a perfect circle. Much of our work could be made simpler, easier, and more productive by using templates. A dictionary template, such as the DDP, is a guide to producing dictionaries. A domain template is a guide to collecting the words of a domain and investigating their semantics. It includes a brief description of the domain, cross-references, elicitation questions to help people think of words that belong to the domain, and sample words from English.

Example of a domain template

3.4.1.2 Laugh. Use this domain for words related to laughing—the sounds a person makes when he is enjoying himself or thinks something is funny. (cf., Humor)

What general words refer to laughing? *laugh, laughter, laugh at (something)*

What words describe the way a person laughs? *laugh aloud, laugh silently, chuckle, chortle, heehaw, guffaw, giggle, cackle*

What words refer to laughing loudly? *roar with laughter, laugh uproarously, howl with laughter, hearty laugh*

What words refer to laughing a lot? *laugh helplessly, laugh your head off, have hysterics, roll in the aisle, almost die laughing, double up, in stitches*

What words refer to laughing for a long time? *can't stop laughing, have the giggles*

What words refer to laughing at someone because they did something wrong? *laugh at, mock, titter, snicker*

What words refer to beginning to laugh? *start laughing, burst out laughing, dissolve into laughter*

What words refer to making someone laugh? *amuse, crack someone up, have someone in hysterics*

What words describe someone or something which causes people to laugh? *laughable, amusing, comic, comical, absurd, facetious, humor, humorous, sense of humor*

What words refer to the sounds a person makes when he is laughing? *ho ho ho, ha ha ha*

What words refer to trying not to laugh? *try to keep a straight face, stifle a laugh*

What's involved?

The production of a dictionary involves five basic stages.

- (1) A very high percentage of the vocabulary is collected using the list of semantic domains.
- (2) The resulting classified word list is expanded into a basic dictionary by adding one field at a time.
- (3) Working domain by domain, each word is defined.
- (4) Each entry is edited to prepare it for publication.
- (5) The front and back matter is prepared, including the book covers, title page, introduction, and appendices.

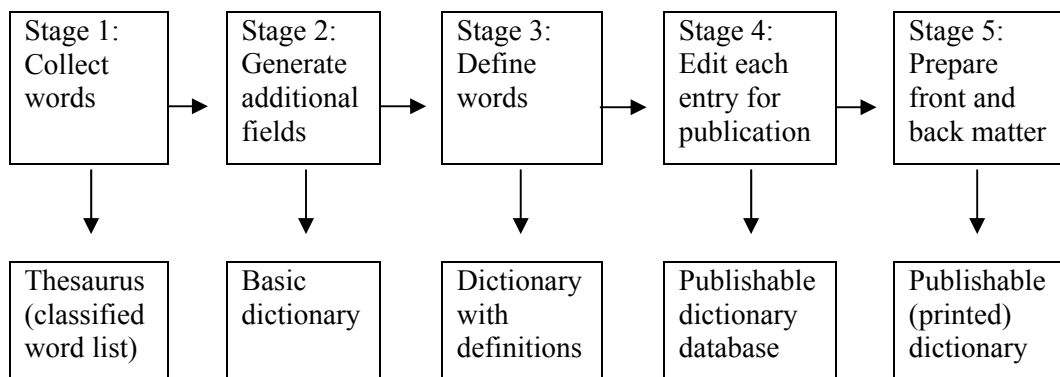


Chart 4: Stages in dictionary development

Does it work?

First the good news. The materials for stages 1 and 2 have been developed and tested. The results have been phenomenal, far exceeding my wildest dreams. Now the bad news. I estimate it will take me an additional three years to develop the materials for stage 3. I've done a pilot project and feasibility study for stage 3, and the results look equally promising. Developing the procedure and materials for stages 4 and 5 will be relatively straightforward and easy.

What does it take to do stage 1?

So far 19 languages have finished or are working on stage 1. Several have held a two-week workshop with 12–30 participants. The words can be typed during the workshop. It takes two good typists to keep up with the output. It takes an additional week to finish the typing and tidy up the database. Other languages have opted to hold a one-day training workshop. From this a few good people are

chosen to collect the words.⁵ You could even give the materials to one person and let them work alone, but the synergy of working in a group seems to help.⁶ The strategy you use will depend on your situation. The materials and basic technique can be adapted for any scenario.

The procedure requires someone to read the domain template. The people working on the domain then think of all the vernacular words that belong to the domain. These people do not have to be literate. Someone writes the words down as they are thought up. When they are finished, someone adds a simple gloss in the national language for each word. Then the domain is given to a typist for data entry.

The program uses Shoebox to enter and manage the data. However it could be easily modified to be used with LinguaLinks or FieldWorks. The list of semantic domains on the accompanying CD is given both as a Shoebox database and as a Word document that you can print. Shoebox has a data entry procedure which is about as efficient as possible. I've included an empty dictionary database with a blank entry for each domain, so that the typist doesn't have to retype the domain information for each entry. Also on the CD are instructions for holding a workshop, instructions for the participants who will collect the words, and instructions for the typists. These instructions will give you a better idea how the procedure works. It is very straightforward and easy to grasp.

What kind of results can I expect from stage 1?

I estimate that the procedure will yield about 16,000 words, perhaps more. The Lunyole workshop produced 17,000. Of these about 25 percent will occur in more than one domain, so the resulting database will contain about 12,000 unique words. I recommend that the people collecting the words also gloss them in the national language at the same time. So the output of stage 1 is a classified, glossed word list. If it is sorted alphabetically, it will have 12,000 unique entries. If it is sorted by semantic domain, it will have 16,000 entries. Here are a couple of typical Lunyole entries:

\lx omubando	\lx ohwasaaga	(lexical item)
\de flood	\de to chop	(definition-English)
\is 1.1.3.3	\is 7.7.3	(index-semantic—domain number)
\th Efula	\th Ohutema	(thesaurus—vernacular domain label)
\sd Rain	\sd Cut	(semantic domain—English domain label)

Shoebox has the ability to sort the database on any field. So you could sort on the \lx field and have an alphabetized word list, or you could sort on the \de field and have an English-vernacular finder list, or you could sort on the \is field and have a thesaurus. You could set each of these up in a different window and view all three simultaneously. You could also print the dictionary in each of these formats. For instance if you printed the Lunyole dictionary as a thesaurus, the domain for 'Rain' would look like this:

1.1.3.3 Efula amaaji, amame, amatonyaato, amatotonyo, efula, ohuduma, ohugaduha, ohugwa hw'efula, ohumuyagala, ohutoonya, ohuwaala, ohwoluuma, olufudu, omubando, omugaduho

⁵ One project reported that no one wanted to be left out. People took materials to work on them at home.

⁶ One project has tried this, but for several reasons progress has been slow. More experience is needed to know if this is a viable strategy.

There are 1,700 domains in the list, so your thesaurus would have 1,700 entries with an average of 8-10 words in each. It would probably take you a couple of weeks to set up a workshop. The workshop itself takes two weeks. It would take another week or two to tidy up the database. So you could finish stage 1 in six to eight weeks. It would take longer if you have to schedule the workshop well in advance.

What does it take to do stage 2?

I have developed and tested the procedure for stage 2 on three languages. Much of stage 2 can be automated by a computer, with incredible savings in time and effort. This strategy results in a high degree of accuracy and consistency in the data. Currently I'm using a combination of macros and the Find and Replace feature of Word together with a series of Consistent Changes tables to do the bulk of the work. So it takes a basic knowledge of Word and the CC program. If you don't know how to use CC, someone from your computer department could help you. I'm hoping that a computer programmer will help me make this procedure more user friendly and bring it within the range of the average computer user.

I can do the automated parts of stage 2 within a week. I estimate that this cuts about six months off the time it takes to produce a dictionary—six months of tedious typing. It still takes several months to check and correct the output of the automated routines and to fill in those fields that can't be automated, but most of this can be done by speakers of the language with minimal training. How much time depends on how much can be automated and how many fields you want to add. For instance in a Bantu language such as Lunyole, I would train a speaker to mark tone on all the words before generating the phonetic (\ph) field.

What kind of results can I expect from stage 2?

The following Lunyole entries are typical of what can be done in stage 2. Notice that each entry has combined two separate entries from stage 1. Each domain reference is treated as a separate sense at this stage. Determining how many senses a word has and which sense is primary will be done in stage 4 after the words have been defined. Everything in these entries was automatically generated and required no extra typing. Note that the example sentence fields still need to be filled in.

\lx bando	\lx asaag	(lexical item stripped of affixes)
\lc omubando	\lc ohwasaaga	(citation form)
\cv VCVCVNCV	\cv VCSVCVVCV	(CV pattern)
\ph omuba: ⁿ do	\ph oh ^w a:sa:ga	(phonetic IPA transcription)
\pl emibando		(plural of nouns)
\ps n	\ps v	(part of speech)
\pd 3/4		(paradigm-noun class)
\sn 1	\sn 1	(sense number)
\ge flood	\ge break	(gloss-English)
\de flood	\de to break	(definition-English)
\re flood	\re break, to	(reversal-English)
\xv	\xv	(example sentence-vernacular)
\xe	\xe	(example sentence-English translation)
\is 1.1.3.3	\is 7.7.1	(index of semantics)
\th Efula	\th Ohubbwaga	(thesaurus-vernacular)
\sd Rain	\sd Break	(semantic domain-English)
\sn 2	\sn 2	(sense number)
\de flooding	\de to chop	(definition-English)
\re flooding	\re chop, to	(reversal-English)
\xv	\xv	(example sentence-vernacular)
\xe	\xe	(example sentence-English translation)
\is 1.2.4.3	\is 7.7.3	(index of semantics)
\th Amataba	\th Ohutema	(thesaurus-vernacular)
\sd Flood	\sd Cut	(semantic domain-English)
\so 1/02	\so 1/02	(source of entry)

MDF prints these two entries (held in the \lc lines) as:

O - o	
ohwasaaga	[oh ^w a:sa:ga] v. 1) break. 2) chop.
omubando	[omuba: ⁿ do] <i>Pl: emibando. n. Prdm: 3/4.</i> 1) flood. 2) flooding.

It would also be possible to print the database as a classified dictionary:

1.1.3.3 Efula *Rain*

efula [efula] *Pl: efula. n. Prdm: 9/10.* rain.

ohuduma [ohuduma] *v.* 1) to thunder. 2) rumble; bubble. 3) boast.

ohugaduha [ohugaduha] *v.* to stop raining.

ohugwa hw'efula [ohug^wa: h^we:fula] *phr.* rainfall.

ohumuyagala [ohumujagala] *v.* to drizzle.

ohutoonya [ohuto:ɲa] *v.* 1) to rain. 2) drip.

ohuwaala [ohuwa:la] *v.* 1) sound made by rain on roof of a house; spatter.
2) jangling.

ohwoluuma [oh^wo:lu:ma] *v.* 1) the sound of an oncoming storm or hail.
2) rumble.

olufudu [olufudu] *Pl: efudu. n. Prdm: 11/10.* 1) rainbow. 2) color of a rainbow.

omubando [omuba:ⁿdo] *Pl: emibando. n. Prdm: 3/4.* 1) flood. 2) flooding.

omugaduho [omugaduho] *Pl: emigaduho. n. Prdm: 3/4.* after rainfall.

Printed as a classified dictionary

Note that a thesaurus only lists the words. A classified dictionary organizes the entries by domain rather than alphabetically. There are several classified dictionaries on the market, including Louw and Nida's (1989) *Greek-English Lexicon of the New Testament*, the *Longman Language Activator* (Summers, 1993), and the *Oxford Learner's Wordfinder Dictionary* (Trappes-Lomax, 1997). Unfortunately MDF is not sophisticated enough to print a classified dictionary, nor can it just print the sense of the word that is relevant to the domain. I can think of ways to trick it into doing the job, but the procedure is rather involved. Hopefully some computer wizard will work out an easy print procedure for us.

So what's the value of having a classified dictionary?

I cannot overemphasize the value of using semantic domains to produce a dictionary. Using semantic domains to collect words is by far the most efficient and effective way to collect words. No other method both collects and classifies words at the same time. It would take a text corpus of millions of words to equal the results in terms of numbers, and many words are so rare they may not show up in a text corpus. The corpus/concordance method does not recognize idioms, nor does it classify words by domain. How many of us have a million word computerized text corpus and a parser to process it? But we all have a mental dictionary organized by domain just waiting to be picked. As one Lugwere man said, "The words are falling out of my head."

Lexicographers recommend that words be investigated in semantic sets. It is far more insightful to compare related words than to try to figure out some word in isolation. Working through an alphabetized dictionary entry by entry is not the best way to do things. But unless you classify your dictionary, you don't have much choice.

If you are translating and need a word for some Greek concept, the chances are that you may have a dozen or more options. You really don't want to interrupt the translation process to try to think of them all. How much better to think of all of them in stage 1. Then, when you are translating, you can simply call them up on your computer and evaluate which fits the context best. Your thesaurus will help to pick the best word and avoid the trap of using generic terms.

For instance, what's the best word for translating *charis*? It means, 'X feels something good about Y. Because of this X wants to do something good for Y.'⁷ We could look in the domain 'Feel good about someone' and find: *love, like, appreciate, favor, admire, enjoy, cherish, regard, affection, delight in, hold someone dear, be pleased with, be bewitched by*. Or we could look in the domain 'Do good to someone' and find: *show love, to love, love, be gracious, grace, do a favor, favor, good will, be devoted to, devotion, be generous, generosity, liberality, be benevolent, benevolence, charity, be kind, kindness, kindhearted, be unselfish, altruism, philanthropy, humanity, show sympathy, be good to, goodness, be considerate, consideration, show mercy, compassion, want the best for, care for, care about*.

What will stage 3 look like?

It is important to define all the words of a domain together. You will gain greater insight into their meaning and greater consistency in the definitions. To facilitate this process I need to do a number of things for each domain:

1. Carefully define the domain.
2. Identify commonly occurring words from a variety of languages. For instance in the domain 'Rain' I expect most languages will have a noun *rain*, a verb *rain*, a word for a light rain *sprinkle*, a heavy rain *downpour*, a single drop of rain *raindrop*, etc.
3. Provide a sample definition for each of these common words to give the user an idea how words in the domain should be defined.
4. Identify commonly occurring semantic components. These will help the user to define words that are unique to the language.
5. Provide sample example sentences to give the user an idea of the kinds of elements and features that should be included in an example sentence.

Since each domain is unique, the materials will vary from domain to domain. I worked with a speaker of Lunyole to determine if developing such materials was feasible and if they would be helpful. He carefully defined each word in the domain 'Divide into pieces'. Afterwards we identified the components of meaning involved in the definitions:

1. Semantic components in the domain 'Divide into pieces'.
2. The shape of the object: *split* (something long).
3. The material of the object: *break* (something brittle), *tear* (something flexible).
4. Specific object: *dig* (ground/dirt) *tear down* (structure) *thresh* (grain, with a sledge) *tread* (grain, with the feet).
5. Completeness of the action: *crack* (not a complete break) *damage* (not complete destruction).

⁷ This definition employs Natural Semantic Metalanguage, a defining language developed by Anna Wierzbicka and Cliff Goddard (Goddard:1998).

6. How many pieces: *split* (into two) *quarter* (into four) *smash* (into many).
7. The size of the pieces: *pulverize* (into extremely small pieces), *chip* (one piece is small).
8. The shape of a piece: *slice* (thin piece).
9. The instrument used: *cut* (with a knife) *chop* (with an axe) *crush/smash* (with a hammer or other blunt instrument).
10. Intentional, accidental, or with care: *break* (vi) (by accident).
11. Sudden or slow: *snap* (sudden).

When we got done, the Lunyole man said, "I wish I had had this list when I started." With this kind of help I believe it will be much easier to do semantic investigation and write accurate definitions.

When can we start?

Version 1 of the materials for stages 1 and 2 are included on the accompanying CD. I expect to release version 2 in May 2003. Since version 2 will be much improved, I would recommend waiting for it. In the meantime you can familiarize yourself with the materials and begin planning how you will do stage 1.

What if English isn't spoken here?

The materials for stage 1 are designed for use by speakers of the language. They need to be able to read them. The materials have been translated into Swahili and are being translated into French. I am looking for volunteers to translate them into the other major languages of the world. The materials are worded in simple English, so shouldn't be hard to translate. If you speak the target language, you could use the materials in an elicitation setting, giving a verbal translation of the materials as you go. You could probably work with several groups of speakers at once, since they will take some time to think of all the words in a domain and write them down.

Since the program isn't complete, what plans do you have for finishing?

I plan to work on the materials for stage 3 over the next three years. I will release the materials in sections as I finish them so that people can begin using them. During this time I will continue to improve the materials for stages 1 and 2. As more and more teams use the program, we will gain a better understanding of what is involved, what problems need to be avoided or dealt with, and what results are possible. If you use the program (and I hope you do), please send me a report. I'm especially interested in suggestions for improving the materials and method. If you try something and it works well, let me know. I expect the program to get better and better, and will be releasing periodic updates. I've already incorporated numerous suggestions from a number of users.

For instance the list of domains is designed to be exhaustive and universal. It is based on lists of semantic domains from around the world. It is necessarily somewhat etc. If the people you work with have trouble understanding a domain, let me know. Lunyole has no domain that corresponds with our domain 'Condiments'. I realized it probably was not a universal domain, so I deleted it. If you find a domain that I have overlooked, let me know. I expect the list of domains will need lots of revision. I intend to compare classified dictionaries from around the world. I will be looking for common domains, common words, and common semantic components. If you thoroughly investigate a domain, send me the results. The more universal and insightful we can make the program, the more benefit we can gain from it. Your help will be appreciated.

I also hope to integrate the materials, tools, and instructions into a comprehensive software package such as FieldWorks.⁸ However this will depend on SIL corporate support, which so far has been very encouraging. The development of tools such as this can radically increase our productivity. I calculate that stage 1 represents an increase of between 10,000 percent and 100,000 percent in the rate of collecting words. The application of strategic thinking to our work enables us to develop methods and programs that enable us to get the job done quicker and better.

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⁸Note added August 2006:

The article from Notes on Linguistics and the DDP documentation and materials can be downloaded from the DDP website <http://www.sil.org/computing/ddp/index.htm> </Redirect/www.sil.org/computing/ddp/index.htm>. The DDP materials and methodology have also been integrated into the FieldWorks program, which can be downloaded from the SIL website www.sil.org.