Redefining “Paradigm” for Computer-Aided Language Instruction

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Abstract: This article proposes a means by which inflectional paradigms can be promoted from their primary present status as references at the end of textbooks to a more central role in the language learning process. This can be done by encouraging each student to determine how words of a given part of speech divide into paradigms, and how those paradigms will be visually represented. This reinterpretation of the largely frozen notion of “paradigm” is derived from work on a natural language processing system that required a more rigorous definition of the word than is commonly found in most descriptive grammars. That natural language processing system, and its potential application to the task of language learning, are described in this article as well.

Introduction

Teaching and learning foreign languages using inflectional paradigms has largely been shelved along with the Latin that made paradigms famous. Highly formal approaches to language pedagogy have given way to communicative approaches or, in the best of scenarios, approaches that combine communicative activities with some of the rigor of formal grammar study. For flective languages, solid knowledge of all forms of inflecting words and the meanings carried by those forms is indispensable. However, inspiring students to memorize paradigms is a hard sell, and results are often substandard.

One reason the process is boring, not to mention ineffective, is that the very idea of paradigm has been frozen in time. The inventory of paradigms and the physical layout of the paradigm template are relatively fixed for well-studied languages: They migrate from some formal grammar to virtually all textbooks, as if derived from a single truth. But even if they did represent such a truth, that would be a truth of descriptive linguistics, not of pedagogy. If paradigms were so concretely sequential, students of highly flective languages should be able (given proper stakes) to quickly master the patterns and get it over with in the first semester. If they can memorize huge numbers of body parts for an anatomy class, why not memorize some 10 pages of tables? There is clearly something wrong with the equation.

In this article, I suggest that encouraging students to design their own paradigm templates, as well as create their own inventory of paradigms and the ways they will work with them, could be a proactive, effective method of expanding the role of paradigms in the process of learning a foreign language. A computer setting could enhance this process, although these ideas could be exploited without the computer’s bells and whistles.

The following will be assumed as true and will not be addressed further:
1. At least some nonchild learners benefit from a highly structured description of second language grammar.
2. At least some learners have visually oriented memories.
3. Different learners find different organizational schemes more helpful.
4. All learning is expedited through active rather than passive activities.
5. Computer-aided drills can be an effective supplement to other activities.

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6. Web platforms offer interesting possibilities for language education.
7. Like any complex system, grammatical inflection must, at some point, be viewed as a whole made up of various parts, even if those parts are mastered piecemeal.
8. If teachers find work on paradigms to be helpful to their students, time will be found in the curriculum for it.

**Addressing Concerns Up Front**

The efficacy of drilling grammatical forms is disputed, as noted by Armstrong and Yetter-Vassot (1994, p. 477):

> The use of technology in the language classroom is reemerging after a couple of decades of lagging interest, following rather unsuccessful experiments in the language laboratory in the 1950s and 1960s. Schwartz (1995) framed this history as a cautionary tale, reminding us that technology must be used creatively if we expect its benefits to exceed those gained through traditional methods.

It is hard to imagine how the latter point could be questioned: if a student cannot remember that the accusative case form of the Russian noun *rúka* "arm" is *rúku*, he or she will never be able to construct a grammatical sentence using this word as a direct object.

The use of technology in the language classroom is reemerging after a couple of decades of lagging interest, following rather unsuccessful experiments in the language laboratory in the 1950s and 1960s. Schwartz (1995) framed this history as a cautionary tale, reminding us that technology must be used creatively if we expect its benefits to exceed those gained through traditional methods.

Embellishing his idea, I would suggest that the goal is not simply to transport what is done in the classroom to a lifeless computer terminal, but to rethink the “givens” of language pedagogy using inspiration derived from, and methods supported by, technological advances. In doing so, however, we must keep reasonable expectations of what computers can do and what they can be expected to do in the foreseeable future, rather than wait for research in artificial intelligence to produce a teacher in a laptop.

The importance of approaching computer-aided instruction with human-driven creativity rather than with desire for computer-offered quick fixes cannot be overstated. As Armstrong and Yetter-Vassot (1994, p. 476) said: “If technology is to revolutionize language teaching, then instructors must be willing to invest time and energy in developing creative and pedagogically sound activities that will utilize those technologies.”

**The Natural Language Processing Stimulus**

Inspiration for language technology can derive from many sources, from video games to Web surfing to reading science fiction. The paradigm-related proposal described here was inspired by a knowledgeelicitation system called Boas. The system is named after the innovative descriptive linguist and anthropologist, Franz Boas, and seeks to do for 21st century computational field linguistics what he did for 19th and 20th century person-to-person field linguistics. It guides linguistically naive speakers of any natural language (L) through the process of providing all the knowledge necessary to automatically configure a moderate-quality L-to-English machine translation system. All the resources for training the informant and converting the elicited information into processing resources are resident in the system from the outset, with no retrofitting anticipated. What the language informant is presented with is rather like a boxed cake mix: add knowledge about L, push a button, and you’ve got yourself a translation system.

In contrast to most knowledge acquisition methodologies that serve natural language processing systems, knowledge elicitation is a pedagogically supported way of gathering linguistic (and, by extension, any type of) knowledge from untrained informants. The system teaches informants everything they need to know about language description (starting with “what is a noun?”), offering what amounts to an introductory course that is oriented toward given tasks, and is presented as those tasks require. Because of its extensive resident knowledge about linguistics and its many forms of contentful and strategic help for the user, Boas has been referred to as “a linguist in the box” (Nirenburg, 1998).

While this article deals primarily with ways in which Boas’s treatment of inflectional paradigms could serve the goals of language learning, it is worth our while to give at least a fleeting description of how the system works. The knowledge elicitation tasks are organized in a dynamic task tree. The status of each task at any given time is indicated by the associated icon. That is, a green light means the task may be carried out, a “do not enter” icon means the task has unfilled prerequisites, a coffee cup means it was postponed midway through and must be finished, and an X means it was deemed inapplicable by the system, based on prior user responses. Figure 1 shows a view of the task tree when the user is about to begin the paradigmatic (flexive) morphology of nouns.

Although space does not permit a full depiction of the tasks in Boas, the following abbreviated rendering of the five major modules (ecology, morphology, syntax, and open- and closed-class lexicons) should suffice for orientation.

**Boas Modules**

**Ecology**
- Inventory of characters (letters, numbers, etc.)
- Inventory and use of punctuation marks
- Proper name conventions
- Expression of dates and numbers
• List of common abbreviations, geographical entities, famous people, etc.

**Morphology**
• Indicating language type: flective, agglutinating, isolating, mixed
• Paradigmatic inflectional morphology, if applicable
• Nonparadigmatic inflectional morphology, if applicable
• Derivational morphology

**Syntax**
• Structure of the noun phrase: noun-phrase components, word order, etc.
• Grammatical functions: subject, direct object, etc.
• Realization of sentence types: declarative, interrogative, etc.
• Special syntactic structures: topic fronting, affix hopping, etc.

**Closed-Class Lexical Acquisition**
Provide L translations of some 150 closed-class meanings, which can be realized as words, phrases, affixes, or features (e.g., Instrumental Case used to realize instrumental with, as in hit with a stick); inflecting forms of any of the first three realizations must be provided as well, as applicable.

**Open-Class Lexical Acquisition**
Build L-to-English lexicon by (a) translating entries from an English seed lexicon, (b) importing, then supplementing an online bilingual lexicon, (c) composing lists of words in L and translating them into English, or (d) any combination of the above. Grammatically important inherent features and irregular inflectional forms must be provided.

Associated with each of the preceding tasks are knowledge elicitation threads — series of pages that combine questions with background information and instruction. For example, if a user indicates that nouns in L inflect for number, the page shown in Figure 2 will be accessed. Explanatory support for decision making is provided in help links at the bottom left of the page. Thus, some pages, like the one in Figure 2, require user input, while others, like the one in Figure 3, are purely pedagogical.

There is much to say about various aspects of the Boas system, but here we will focus on how the Boas module that elicits knowledge about flective morphology could be transformed into a language-learning tool.8

Many aspects of Boas, including the module devoted to inflectional morphology, are arranged according to an expectation-driven approach. On the basis of research in language universals and typology, we created an inventory of cross-linguistic parameters, parameter values, and their means of realization in the realms of ecology, morphology, syntax, and lexis. Table 1 shows some examples of parameters and values relevant for our current topic, inflection.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Realization</th>
</tr>
</thead>
<tbody>
<tr>
<td>flective</td>
<td></td>
<td>inflection</td>
</tr>
<tr>
<td>agglutinating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>isolating</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Possible realizations of these parameter values, if they are reflected grammatically in L at all, include inflection via paradigmatic (flective), agglutinating, or isolating affixation. Regardless of the type of realization, an informant must be taught what the parameters and values mean, how to decide if L inflects for them, and how to provide all the realizations to cover productive inflectional processes. For
paradigmatic inflection there is another challenge, both for developers and for informants. Developers must decide how to define paradigms for the purposes of the system, and informants, once initiated, must agree to work within those guidelines. This system is, in fact, asking an untrained informant to do a type of work that few if any linguists or teachers ever do: critically think about the very definition of paradigm.

What is a Paradigm?

What is a paradigm, after all? The question may sound simple, but just try to define it. Does it require that the inflectional endings of member words be exactly the same? Mostly the same? Different, but in predictable ways? Does it require that all words have the same inherent features, like gender for nouns? Does it assume knowledge of things like morphophonemic alternations?

It is quite common for grammars and textbooks to posit only a few paradigms (purportedly for simplicity's sake), but to follow them up with countless subparadigms and/or lists of exceptions. For example, French grammars (like Calvez, 1996) typically state that there are three classes of verbs, ending in -er, -ir, and -re, but these do not account for many subpatterns. Russian grammars typically state that there are four major nominal declensions, but Wade (1992) posits over 30 subclasses. Polish grammars tend to avoid the paradigm issue completely for nouns, giving stem-specific endings for each combination of case, number, gender, and virility (Bielec, 1998; Kaleta, 1998).

The definition of paradigm is crucial for Boas because paradigms are the raw material from which a machine learning program learns rules of inflection that will later be applied to the entire open-class lexicon. That is, the program takes as input fully specified inflectional paradigms from any natural language and creates inflectional rules that are iteratively refined in a "test-debug" loop. It is irrelevant to the program whether the language informant splits words into many narrowly specified paradigms or bunches them into more broadly defined paradigms, as long as all inflectional forms of all words in each paradigm are unambiguously predictable based solely on the spelling of the citation form (i.e., the dictionary form). That is, this particular program does not permit reference to umbrella rules, like spelling conventions, consonant and vowel alternations, or semantic classes. For this reason, traditional delineations of paradigms in textbooks are too coarse-grained for Boas. I am suggesting here that they may be too coarse-grained to best serve learners' needs as well.

This opinion took root when I was preparing data for the development and testing of Boas's machine learning program. I chose Polish as the test case because its inflectional patterns are notoriously complex. What I came to understand, however, was that Polish grammars, across the board, did not supply sufficient information to permit a nonnative speaker (or computer) to unerringly predict inflectional forms for all words. That is, they present global rules relating to morphotactics, semantic classes, and grammatical classes (with no small amount of idiosyncrasy in hidden corners), and they expect nonnative speakers to apply them in combination on the fly without making mistakes. Moreover, for most parts of speech there is no option to check that you have chosen to apply the correct rules.

What was needed, I found, was a rigorous—not pithy, succinct, or linguistically streamlined—inventory of paradigms and their members, such that all inflectional forms of all members could be unambiguously generated.

Describing Polish inflection within the Boas environment was edifying, to say the least, and quite difficult, to put it more plainly. I happened upon what I considered to be a glaring gap in the Polish linguistic literature and set about filling it. Some 200 pages later, the task was accom-
plished to some degree of precision.\textsuperscript{12} It was in the process of actively manipulating Polish paradigms that I gained a far better mastery of inflection than I had achieved in previous study and reading.

I am not suggesting that all language students should be presented a task as difficult as dividing up the world of Polish morphology. I am, however, suggesting that we encourage students to actively manipulate paradigms and to decide for themselves whether words \( x \) and \( y \) are similar enough to be folded together in a single paradigm or are different enough to be split. The process of making such decisions would not only permit students to cater paradigm delineation to their own preferences and learning styles, but would also require them to understand the factors that define paradigms to begin with.

**What Should a Paradigm Look Like?**

In the last section, I suggested that the inventory of paradigms should be more flexible than traditionally perceived, and now I will argue that the layout should show similar flexibility. Again, the inspiration for this idea comes from work on Boas.

Boas offers an environment that allows users to create paradigm templates organized in whatever way might be most convenient. The process (which, like everything in Boas, is supplied with extensive explanatory information), can be briefly described in the following steps:

1. Select the relevant inventory of parameters and their values: e.g., nouns might inflect for two numbers (singular and plural) and six cases (nominative, accusative, genitive, locative, dative, instrumental).

2. Order parameters: e.g., number then case.

3. Order values: e.g., singular then plural; nominative then accusative, then genitive, etc.

4. Select between the simple table layout (Table 2) and the hierarchical layout (Table 3).

5. If the hierarchical layout is selected, choose how many parameters will act as table headings (in Table 3, one parameter is a table heading).

6. Select valid combinations of parameter values (e.g., the vocative case in some languages does not inflect for all values of number).\textsuperscript{13}

7. Check that the template is correct and, in fact, practically convenient — if not, alter selections.

8. Fill the template with any number of sample words, divided into any number of paradigms.

The idea of permitting informants for Boas to create their own paradigm template in a guided yet catered manner is predicated on the notion that it matters what a paradigm looks like. While the added convenience of using a hierarchical layout is moderate for paradigms with two inflectional parameters, it becomes much greater as the number of parameters increases. For example, Polish verb forms are defined by lists of features like:

<table>
<thead>
<tr>
<th>SIMPLE TABLE LAYOUT (EXAMPLE: RUSSIAN NOUN FOR &quot;PROFESSOR&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Singular</strong></td>
</tr>
<tr>
<td>Nominative</td>
</tr>
<tr>
<td>Accusative</td>
</tr>
<tr>
<td>Genitive</td>
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<tr>
<td>Locative</td>
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<tr>
<td>Dative</td>
</tr>
<tr>
<td>Instrumental</td>
</tr>
<tr>
<td><strong>Plural</strong></td>
</tr>
<tr>
<td>Nominative</td>
</tr>
<tr>
<td>Accusative</td>
</tr>
<tr>
<td>Genitive</td>
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<tr>
<td>Locative</td>
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<tr>
<td>Dative</td>
</tr>
<tr>
<td>Instrumental</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HIERARCHICAL TABLE LAYOUT (ONE PARAMETER AS HEADING, RUSSIAN NOUN FOR &quot;PROFESSOR&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Singular</strong></td>
</tr>
<tr>
<td>Nominative</td>
</tr>
<tr>
<td>Accusative</td>
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<tr>
<td>Genitive</td>
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<td>Dative</td>
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<td>Instrumental</td>
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<tr>
<td><strong>Plural</strong></td>
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<tr>
<td>Nominative</td>
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<td>Accusative</td>
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<td>Genitive</td>
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<td>Locative</td>
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<tr>
<td>Dative</td>
</tr>
<tr>
<td>Instrumental</td>
</tr>
</tbody>
</table>
Indicative, Past, Singular, 1st, Masculine, Animate; Indicative, Past, Singular, 2nd, Masculine, Animate; etc.

Without some hierarchical structure, comprehending what verb form is required would be extremely difficult. For this reason, it was deemed worth the extra programming efforts to provide users with many options of paradigm layout.

### Example of Verbal Paradigm for French
(Laid Out to Facilitate Memorizing Inflectional Forms)

#### Arriver

<table>
<thead>
<tr>
<th>Present (Ind.)</th>
<th>Present (Sub.)</th>
<th>Imparfait (Sub.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>arriver</td>
<td>arrive</td>
<td>arrivassse</td>
</tr>
<tr>
<td>arrive</td>
<td>arrives</td>
<td>arrivasses</td>
</tr>
<tr>
<td>arrivons</td>
<td>arrivons</td>
<td>arrivassions</td>
</tr>
<tr>
<td>arrivez</td>
<td>arrivez</td>
<td>arrivassiez</td>
</tr>
<tr>
<td>arrivent</td>
<td>arrivent</td>
<td>arrivassent</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passé simple (Ind.)</th>
<th>Imparfait (Ind.)</th>
<th>Futur Simple (Ind.)</th>
<th>Présent (Cond.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>arriva</td>
<td>arrivai</td>
<td>Arriverai</td>
<td>arriver</td>
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<tr>
<td>arrives</td>
<td>arrivais</td>
<td>Arriveras</td>
<td>arrive</td>
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<td>arriva</td>
<td>arrivaît</td>
<td>Arrivera</td>
<td>arriver</td>
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<tr>
<td>arrivâmes</td>
<td>arrivâmes</td>
<td>Arriverons</td>
<td>arriver i ons</td>
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<tr>
<td>arrivâtes</td>
<td>arrivâtes</td>
<td>Arriverez</td>
<td>arriver i ez</td>
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<td>arrivèrent</td>
<td>arrivèrent</td>
<td>Arriveront</td>
<td>arriveraient</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Passé (Sub.)</th>
<th>Passé composé (Ind.)</th>
<th>Plus-que-parfait (Ind.)</th>
<th>Futur antérieur (Ind.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>sois</td>
<td>suis</td>
<td>étaient</td>
<td>serai</td>
</tr>
<tr>
<td>soyons</td>
<td>sommes</td>
<td>étaient</td>
<td>serons</td>
</tr>
<tr>
<td>soyez</td>
<td>êtes</td>
<td>étaient</td>
<td>serez</td>
</tr>
<tr>
<td>soit</td>
<td>sont</td>
<td>étaient</td>
<td>seront</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Passé (Con.) 1</th>
<th>Passé composé (Sub.)</th>
<th>Plus-que-parfait (Sub.)</th>
<th>Futur antérieur (Ind.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>serai</td>
<td>serai</td>
<td>fus</td>
<td>fus</td>
</tr>
<tr>
<td>serions</td>
<td>serions</td>
<td>fussions</td>
<td>fussions</td>
</tr>
<tr>
<td>serai</td>
<td>serez</td>
<td>fussiez</td>
<td>fûtes</td>
</tr>
<tr>
<td>serez</td>
<td>seront</td>
<td>fussent</td>
<td>furent</td>
</tr>
</tbody>
</table>

arrivé(e)(s)
If Boas were expanded to target language-learning applications, the computational substrate could be made even more sophisticated: drag-and-drop technology could be used to permit virtually any layout of paradigm cells, coloring options could permit emphasis of inflectional endings, highlighting could be used to underscore particularly difficult forms, and so forth. One example of what a user-designed paradigm template might look like is shown in Figure 4. In this case, I am the user (resurrecting my college French) and the template reflects what I would find organizationally helpful if I were to need to completely memorize the gamut of French inflectional verb forms. (Obviously, this is only a mock-up, since Language-Learning Boas is at this stage a proposal, not an implemented system.)

This organization of the paradigm emphasizes similarities between subparadigms, which should facilitate their memorization, at least for those students with visually oriented memories. For example, in the upper left corner of Figure 4, the present indicative and present subjunctive are mostly merged since they have the same forms, except for the additional i in the 1st and 2nd plural of the latter. In the middle section, the table to the left (past simple indicative and imperfect indicative) and the table to the right (future simple indicative and present conditional) have parallel inflectional endings in all of the shaded cells, with only the stem (arrive vs. arriver-) being different. In other words, the tables could be superimposed upon one another with most of the endings in the respective cells matching. The bottom section shows all the compound verb forms, with the past participle — whose forms are predictable based on general principles — in the center, acting as the hub. The shaded tables in the lower left show that identical inflectional forms can express two different grammatical meanings (past conditional and plus-que-parfait); the adjacent placement of the two forms of the past conditional are a reminder that they are alternatives; and the placement of all forms with the root fu- in the bottom row shows which grammatical meanings can be formed by these graphotactically similar forms of the auxiliary.

Having an idiosyncratic layout, especially if it is designed by the student, can be memorable to begin with, especially if thought goes into making it — the way one remembers information written on a crib sheet. It can also lead to any number of mnemonics to aid in learning. Moreover, if some effective visual representation of the paradigm for a given part of speech were presented from the outset, it would give students a place to deposit (i.e., write in) information relating to those forms. So, not only can inflectional forms go in the cells of the paradigm, but other information, like uses of the forms, can too. In this way, the paradigm could be a much more central construct in language learning than just a reference at the end of the textbook.

The main point is that trying to learn paradigms from typical presentations in textbooks and grammars is rather like trying to memorize a telephone number written without dashes or parentheses. Using visually stimulating, self-determined methods of organizing a paradigm adds the dashes and parentheses. Students' use of self-created highlighting techniques is not new. The novelty I suggest here is to encourage them to work creatively with paradigms, in terms of both content and layout. One student might have five paradigms and apply graphotactic or other rules to account for variations; another might have 20 paradigms to memorize by rote repetition. Similarly, paradigm layouts could be as basic or idiosyncratic as the student desires.

**Incorporating Paradigms into Computer-Aided Instructional Tools**

Little imagination is required to understand how the study of paradigms could be incorporated into extant types of computer-aided instruction, since one of the strongholds of computer-aided instruction remains, as it always has been, drilling morphological forms (see Teaman, 1984). For example, once the student has designed the personalized paradigm template, he or she could select which inflectional forms of which words from the resident word list are to be drilled. The system would then present blank templates reflecting his or her own design, with the relevant cells highlighted and supplied with text fields for form insertion. It would check if the forms were correct, and if not, provide them by some highlighting convention. Another option would be for the student to carry out sentence-completion exercises and, in case of mistakes, be shown the full paradigm for missed words, with options to see other words that belong to the same paradigm, to shift to drills for that paradigm, and so forth. Permutations of such exercises are limitless, all pointing toward the goal of overlearning paradigmatic forms in order to speed their activization and long-term retention.

One development option involves a multiuser system architecture that would connect the teacher's "superuser" version of the system to the student versions. The teacher then could create an inventory of paradigms for all the words to be covered in the class (and more, if desired) and make all or subsets of them available to students at appropriate times. These could be imported into each student version and organized based on the student's paradigm preferences (grouping vs. bunching, layout, etc.). In addition, students and superusers from different areas could have access to each other's resources over the Internet.

In short, I am not suggesting any groundbreaking technology or leap in natural language processing capabilities, but that we fundamentally reconsider the role of paradigms in language teaching and learning. Further, I am...
showing that existing technology need only be creatively enhanced to foster the realization of a new approach.

Potential Criticisms
Any proposal to significantly shift an ensconced approach must foresee and address potential pitfalls. (I will not address here the issue of scarcity of classroom and study time, or the hierarchy of priorities in teaching given that scarcity.) For example, one might argue that having students develop idiosyncratic paradigm layouts and inventories could lead to some degree of “speaking a different language” in the classroom. That is, rather than refer to Nominal Paradigm 1 (which should be known by everyone as such), the teacher would have to use more supple and creative means. Were it true that such a firm inventory of paradigms existed for every language, and that students actually knew this inventory well, this objection would be well founded. However, the very need for approaching paradigms in a new way derives from the fact that students do not know them well even after many years of study, and the study of paradigms has, in many settings, dwindled down to an afterthought. Furthermore, if teachers desire some common inventory, they can firmly present mandatory divisions (Paradigms a, b, c, etc.) but leave further subdivisions to the students.

Another potential criticism involves portability. It is common for students to have a variety of teachers at a variety of institutions throughout their course of study, and not all teachers will adopt the approach to paradigms proposed here, or be interested in talking about paradigms at all. Where does this leave the student who adopts this approach midstream, or who begins with it but moves to a curriculum that does not use it? In the first instance, there is no reason why a student cannot continue to use their self-constructed paradigms, and simply use the computer tools for practice and the filling of lacunae. In the second instance, the knowledge of paradigms is the student’s to keep; there is no demerit for producing correct forms that are conceptualized a bit differently.

A third possible point of concern regards linguistics. Some small portion of language students will carry on to graduate school, where a linguistics course might require knowledge of some canonical division of words into paradigms. It might be argued that a free form approach to paradigms could cause a conflict in this scenario. I would counter that learning a language and studying it from the linguistic perspective are completely different. For example, a one-stem verb system for Russian was developed by Slavic linguists (starting with Jakobson); it has all the rigor, coverage, and conciseness of good linguistic description, but is not widely used in the classroom today because of the conceptual overhead. So, although learning the one-stem system is excellent training for Russian specialists, it neither relies on a compatible approach to inflection early on, nor promises any improvement in language skills thereafter.

Obviously, both teachers and students of foreign languages have quite a lot on their plate to begin with, and it would be unrealistic to expect less-motivated students to bring to the task of learning inflectional forms the kind of interest or creativity that the current proposal would require. However, even if this approach were fully exploited only by the best of students, and even if it could be adopted only piecemeal in some settings, I would suggest that the basic idea could be seamlessly incorporated into current curriculum with little expenditure of effort on the part of the teacher. The level of benefit would match the student’s level of effort.

Summing Up
In this article I have:
- Argued that working with paradigms can and should be part of the curriculum for inflectional languages, but that viewing and presenting paradigms as frozen representations of some higher truth of grammar is both wrong and counterproductive.
- Shown how the requirements of a knowledge elicitation system called Boas inspired my fresh look at the nature and status of paradigms in language description and pedagogy.
- Suggested how the Boas approach and technology might be applied to pedagogical ends.
- Responded to anticipated concerns of language teachers.

There are broader implications as well. The methodology of knowledge elicitation cursorily described here can be used to guide any untrained informant through the process of carrying out virtually any task — as long as it is, in theory, within his or her intellectual scope. Accordingly, it permits teachers to redefine students as active participants in crafting their own learning materials, and permits students to use computer-based instruction to supplement classroom learning — or even replace it, as in distance-learning contexts. Another implication of this discussion is that no aspect of teaching or learning should ever be considered set in stone: Everything remains open for reanalysis, be it by a profession, a teacher or a student.

The ideas presented here have not been tested with students because the envisioned language-learning modifications to Boas have not yet been implemented. However, exploiting these ideas is not contingent upon a modified Boas. Much of what was suggested here could be applied without computer support at all, by drawing multicolor paradigms on paper or creating them with a word processor. With a computer, on the other hand, one could independently design tools for creating and manipulating paradigms in a simpler way than was done in Boas, which is,
after all, a machine-translation resource and unnecessarily complex for a learning tool.

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Notes

1. The exceptions include things like juxtaposing the order of presentation of certain cases for inflecting nominals. While such matters have fallen under considerable debate on theoretical and pedagogical grounds (e.g., in the Slavic literature), they are relatively minor when viewed in the context of how much stays the same in all presentations of paradigms.

2. I omit some psycholinguistic details here, but the point is that inventories of any type of information should be amenable to memorization, even if they can only be reproduced as such and not applied, as in speech production.

3. The benefits of interaction, graphics, self-directed and self-paced study, catering to user preferences, and so forth, are mentioned in virtually all works devoted to the use of computerized and perhaps even print resources) into English.

4. The Expedition System, whose goal is to expedite the ramping up of translation systems from low density languages (i.e., those lacking computational and perhaps even print resources) into English.

5. Actually, the terms knowledge elicitation and knowledge acquisition are often used interchangeably in the literature. However, in our writings about the Boas system, we make a hard distinction between the two, with acquisition being carried out by computational linguists and elicitation referring to methods of guiding novices through the process of providing information.

6. The open-class lexicon contains nouns, verbs, adjectives, adverbs, and all related collocations, idioms, and so on. See McShane and Zacharski (2003) for discussion of the lexicons in Boas.

7. Descriptions of various aspects of Boas can be found in Nirenburg (1998); Nirenburg and Raskin (1998); McShane et al. (2003); and other articles listed on the Expedition web site: http://crfl.nmsu.edu/expedition.

8. References


