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ABSTRACT

A technique for Latin instruction has been developed which uses the Programmed Learning for Automated Teaching (PLATO) computer system. The program, which conjugates Latin verbs and declines nouns and adjectives, represents an improvement over traditional computer teachers. While older systems only told the student when he made an error, the PLATO program can tell him what kind of error he has made. There are several benefits to this. Once the computer is provided with a set of noun and adjective bases and case endings, it can combine these elements to produce correct Latin forms. A small amount of computer memory is needed to produce a great number of Latin forms, thus combining the contents of many lessons into one. Another benefit is error analysis. Since the computer knows what kind of error the student makes and tells him, the student can concentrate on his problem areas. As the computer tabulates the different types of errors, the instructor can discern problem areas by studying relative frequencies of these errors. The program thus assists Latin instruction at both ends, and can be a valuable tool for pedagogy. (PJM)

Two-Pronged Error Analysis from Computer-Based Instruction in Latin

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I would like to describe a new technique for error analysis in Latin instruction and share some examples to illustrate its use. The technique is embodied in a set of computer lessons on the morphology of Latin verbs, nouns and adjectives, but it need not be limited to these applications, nor even to Latin instruction. The significance of this technique will be more evident if I briefly put it into the context of computer instruction in languages.

The Latin lessons to which I refer were developed over the past three years for use on the University of Delaware's PLATO(R) system.[1] This system was itself developed at the University of Illinois at Champaign-Urbana and consists of a Control Data Corporation Cyber 173 computer supporting up to 600 student terminals. The terminals are equipped with display panels capable of high-speed display of text, complex graphics, and animation effects. Student input can be made by a typewriter-style keyset or by the touch-sensitive display panel. Despite the number of simultaneous users, response time is about one-eighth of a second and students, when they are running well-designed lessons, are drawn into a highly visual, highly interactive learning experience. The potential for computer-assisted instruction generally is very great, and the PLATO system is in my opinion the most sophisticated one available; but any computer instruction can only be as good as its courseware. In languages, the quality of lessons has not been high.

Too often, computer language lessons are primitive devices which are little better than automated flashcards.

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1. PLATO (an acronym for Programmed Learning for Automated Teaching Operations) is registered by Control Data Corporation.

Usually the programmer must encode each question and its answer, a dull, time-consuming process which, if it is to include a broad enough range of material, must entail the writing of many lessons using large amounts of computer memory. A curriculum of exercises to accompany the first year of instruction in a language may easily extend to forty or fifty lessons and a quarter of a million words of memory space. Here is a typical question from such a program: "Type the dative singular of puer bonus." A wrong answer will usually get the response, "No. Try again." Sometimes the programmer will offer a bit more, like "No, look again at the question. Remember that puer is a second declension noun." Such a comment may help, but it is a shot in the dark. The student's error may spring from any of several sources. He may be trying to use the wrong case (say, genitive for dative) or the wrong number (plural for singular); he may have one word of the phrase wrong and the other right; he may even have typed gibberish. To all of these very different errors the computer would have to make the same response. Small wonder that many teachers have become disillusioned with computer instruction.

What is needed is a "smart" lesson, one that--in effect--knows the language and can thus comment intelligently on a student's answer. For this reason I developed computer routines to conjugate Latin verbs and to decline nouns and adjectives. The benefits exceeded my expectation.

First, efficiency and variety. The computer, provided with a set of noun and adjective bases, can combine those bases with case endings to produce correct Latin forms. One noun base and one adjective base can produce ten phrases, since Latin has five major cases and two numbers. By using a pool of eighty

nouns and forty adjectives and combining noun with adjective at random, one can obtain 40,000 distinct practice phrases. A lesson can thus have thousands of question-answer sets in it without the need to program each one individually. Moreover, a single lesson can have the effect of many lessons at a great saving in computer memory. One noun-adjective phrase lesson such as I have described serves my students for the entire first year as they are learning the five Latin declensions. A student can start using it when he begins the first declension by setting it to ask him only about first declension nouns. As he progresses he can include more and more forms in his practice until he is using all five declensions. The difficulty of the lesson increases as the term continues, and the material studied is both appropriate and unique at each session.

But it is the second benefit--error analysis--that is the concern of this paper. If the computer can decline nouns, it can also analyze a student's typed response according to the rules of Latin case formation. In a word, we can have a "smart" lesson. Suppose we return to that same example, the dative singular of puer bonus. Here are some responses our "smart" lesson might make to various student attempts:

Student types	Computer responds
puer	Two words, please.
pure bunk	Noun base is wrong. Adjective base is wrong.
puero bonus	Adjective ending is wrong.
pueri buena	Noun ending is wrong. Adjective base is wrong.
puero bono	ok
bono puero	ok (accepts either order)

This is the first form of error analysis which can be done with a lesson capable of inflecting the forms; incorrect answers receive much more helpful feedback. It should be noted as well that the student is being encouraged to think structurally, to see the noun or adjective as consisting always of a base plus a case ending; or to see the verb as composed of stem, tense/mood sign, and personal ending. The logical system underlying the forms is being presented to him over and over and applied to the forms the student has himself typed.

A second, more detailed kind of error analysis can be done from the data the computer collects on student errors. To take only one example, the instructor may collect the number of errors students make in Latin verb forms. The computer can distinguish errors in the stem from those in the tense/mood sign or the personal ending, so a study of the relative frequency of such errors can be done, with obvious advantages for pedagogy. Here is a preliminary result of such a study. Since the study is not complete, I use these figures only to illustrate the potential of the technique.

Note how difficulty with stem, tense/mood sign, or personal ending increases after the introduction of certain new material which affects that segment of the word. For example, the introduction of the perfect stem more than triples stem problems between exercises 4 and 5, and the introduction of the perfect passive stem in exercise 8 has a similar effect. The first appearance of passive personal endings in exercise 7 doubles the error rate there. Even in this first stage of data collection it is possible to see areas of difficulty which call for more careful treatment in the classroom.

The figures above will be more valuable when they have been augmented by another year of student use; but I am person-

LATIN VERB FORMS: RELATIVE FREQUENCIES OF ERRORS IN STEM, STEM VOWEL & TENSE/MOOD SIGN, AND PERSONAL ENDING

TEST			
	laud -	-a -	t
1	19%	15%	66%
	laud -	abi -	t
2	15%	32%	53%
	duc -	i -	t
	duc -	e -m	t
3	17.7%	32%	50.3%
	aud -	i -	t
	cap -	ie -	t
4	7%	30%	63%
	laudav -	-	it
	laudav -	era -	t
	laudav -	eri -	t
5	23%	18%	59%
	laud	- aba -	t
6	37%	30%	33%
	laud -	a -	tur
	laud -	aba -	tur
	mon. -	ebi -	tur
7	17.5%	13.5%	69%
	laudat	-	us est
	laudat	- us era -	t
	laudat	- us eri -	t
8	49%	13%	38%
	duc -	i -	tur
	aud -	ieba -	tur
	cap -	ie -	tur
9	20%	33%	47%
	laud -	e -	t
	laud -	e -	tur
10	15%	31%	54%
	laud -	are -	t
	laud -	are -	tur
11	15%	28%	57%
	laudav	- eri -	t
	laudav	- isse -	t
12	52%	17%	31%
	laudat	-	us sit
	laudat	-us esse-	t
13	40%	15%	45%

ally convinced that this technique, refined and expanded, will yield valuable results in the study of error patterns not only in Latin morphology but in other inflected languages as well.