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Mark Y. Czarnolewski

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The Free Application for Federal Student Aid (FAFSA) is a complex form completed by millions of postsecondary students each year to apply for federal financial aid. A significant number of completed forms contain errors that necessitate multiple submissions. The article describes some cognitive psychology principles and methods that have allowed researchers to describe how people understand text and complete forms. Suggestions are offered for how these methods might be applied to the redesign of the FAFSA in order to decrease completion errors.

In a recently released report entitled, "Quality In Student Financial Aid Programs," the National Research Council makes the following recommendation:

> The complexity of the forms, instructions and information booklets leads to excessive burden for applicants and is a cause of error. Thus, the Department of Education should consult experts in form and question development, such as those found at cognitive research laboratories, to aid in its efforts to improve the application materials. (1993)

One of the government forms to which the National Research Council (NRC) referred in the report is the Free Application for Federal Student Aid (FAFSA). This form was completed by approximately 8.2 million applicants during 1992-1993 who sought federal assistance (e.g., Federal Work-Study, Federal Pell Grants, Federal Stafford Loans, etc.) to attend a postsecondary institution (U.S. Department of Education, 1994). The FAFSA requires that applicants report financial, household, and other information to establish their need for financial assistance. All the information requested by the FAFSA is required by statute.

The FAFSA is submitted to a Central Processing [computer] System (CPS) which computes the amount of money that a student can afford to pay for postsecondary education (i.e., expected family contribution) (National Research Council, 1993). Approximately 68.4% of the student applications (4.8 million) are successfully processed when they are first submitted. Errors necessite the submission of most of the remaining 31.6% (2 million) applications for reprocessing, with 90% of the applications successfully processed by the second submission, and 97% by the third submission. This article argues that completion errors, especially at the first submission, will decline if cognitive science principles are applied in redesiging the FAFSA form.

Mark Y. Czarnolewski is a Research Statistician at the U.S. Department of Education in Washington, D.C.

The cognitive laboratories referred to in the NRC report examine the thought processes that respondents use to interpret and answer survey questions. The Bureau of Labor Statistics (U.S. Department of Labor) has applied these methods to the revision of forms the public

uses to report financial information to the government (Stone, van Melis-Wright, and Wright, 1993). Stone et al., redesigned the Sale Of Your Home Form (IRS Form 2119) after they gathered data measuring the cognitive and behavioral processes of those completing the form. The redesign resulted in 60% of the respondents answering all form items correctly as opposed to less than 5% answering all items correctly before the redesign.

Table 1 lists the methods used in cognitive laboratories (Forsyth and Lessler, 1991). The table lists different approaches that examine: the characteristics of a form; the person completing a form; and other people who use the form, including those who use the data obtained from the form for other purposes, such as economic forecasting (Stone et al., 1993). One of the primary approaches used for evaluating the comprehensibility of a form or text is varying the physical characteristics of a form and measuring the subject's accuracy and speed in answering the form's questions.

Tullis (1983), for example, reviews the effects that factors such as overall density, local density, grouping, and layout complexity can have on the readability and comprehensibility of text in paper and computer screen environments. Overall density is determined by the number of characters displayed, often expressed as a percentage of the total num-

TABLE 1
Cognitive Laboratory Research Methods Currently Being Used in the United States to Study the Question-Answering Process

General Type of Method	Specific Method*
Expert Evaluation	Interactional behavior coding
	Cognitive forms appraisal
	Expert analysis
Expanded Interviews	Concurrent think-aloud interviews
	Follow-up probes
	Memory cue tasks
	Retrospective think-alouds and probe questions
Targeted Methods	Paraphrasing
	Free-sort classification tasks
	Dimensional-sort classification tasks
	Vignette classifications
	Rating tasks
	Response latency
	Qualitative timing
Group Methods	Focus groups
	Group interviews
	Group experiments

*Methods were identified during a literature review as well as informal discussions with cognitive laboratory research measurement staff at the Bureau of the Census, National Center of Health Statistics, Bureau of Labor Statistics, and Westat, Inc., as well as Research Triangle Institute.

Note: From "Cognitive Laboratory Methods: A Taxonomy" by B.H. Forsyth and J.T. Lessler, (1991). In B.P. Biemer, et al. (eds.) Measurement errors in surveys, p. 397. Copyright John Wiley & Sons, Inc., 1991.

ber of possible characters. Local density is the number of filled character spaces near each character.

This factor is often manipulated by changing line spacing. Grouping is the extent that items form well-defined perceptual groups, such as alphabetical or functional blocks. Layout complexity is the extent to which the arrangement of items follows a predictable visual scheme, i.e., one can predict the location of some items. For example, a tabular format allows for the prediction of items based on knowledge of column headings and row labels. The primary approach used in the studies reviewed by Tullis may be classified as a targeted method, more specifically, response latency methodology (see Table 1).

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Tullis points out that the factors he reviewed are not mutually exclusive. For example, overall density and local density are positively related to each other, and overall density and grouping factors are negatively related to each other. In short, the more items are squeezed together, the harder it is to read a form. On the other hand, grouping elements based on, for example, their primary purpose, is associated with a less dense and therefore, easier to read form.

A second paradigm focuses on the social aspects of completing forms. For example, Stone (personal communication, November 19, 1993) noted that shaded areas in forms typically demarcate sections that are for "Office Use Only." One issue for consideration is whether shading may unnecessarily raise the discomfort level of respondents, and, therefore, affect the interaction among family members when the members are involved in completing the form. For example, it is possible that parents without a high school education and with limited experience in completing forms may become unsettled when completing a section of the form that is shaded or highlighted. As a result, this group project may become more tense and even more subject to error. Stone did not specify the methods for examining this effect, although in terms of Table 1, she has employed expanded interviews as a general method and concurrent think-aloud interviews as a specific method for identifying emotional reactions to forms (Stone et al., 1993).

Another paradigm from experimental psychology and cognitive science that has been helpful in understanding the way people organize and use information is found in the work that distinguishes between the ways in which experts and novices perform a task (Czarnolewski, 1993a; Dede, 1986; Kieras and Bovair, 1984). This work has resulted in conceptualizations that distinguish between the expert and novice in terms of the amount and type of knowledge they possess of a subject.

Studying expert-novice behavior is an aspect of all four of the general methods listed in Table 1. For example, Czarnolewski (1993a,b) developed a series of text comprehensibility questions that allow readers to rate their own comprehension of a text along the dimensions in which experts typically excel when reading about subjects with which they are familiar. These dimensions include describing the actions of a legislative bill that one has just read about and knowing the implications of those actions.

This approach draws on the following methods that are found among the research methods listed in Table 1:

General Method	*Specific Method*
Expert Evaluation	Cognitive Forms Appraisal
Targeted Method	Rating Tasks
Group Methods	Group Interview (via mailing a survey)

A critical aspect of expertise is knowledge of the vocabulary of a subject matter (Dede, 1986). Consistent with this finding is the conclusion that providing definitions for terms decreases errors in form completion (Stone et al., 1993). The importance of providing definitions for terms and clear sentences cannot be overstated. Clarity of terms and sentences is positively related to one's perceived understanding of the implications of what is read as well as to one's years of membership in an organization (Czarnolewski, 1993b).

"Defining a term on the page where it occurs provides a ready aid to the novice reader."

Defining terms on the FAFSA, such as "dependent student," in a summary glossary of terms or a mini-glossary for the page on which the term appears, would allow FAFSA readers to infer the implications of the information they are asked to provide. The glossary or "mini-glossaries" might be placed on the FAFSA or in the instruction booklet.

Defining a term on the page where it occurs provides a ready aid to the novice reader. At the minimum, a glossary of all terms found in the FAFSA form, its booklet of instructions, and other related forms such as the Student Aid Report (SAR) might be placed in a currently published booklet called the *Student Guide* (U.S. Department of Education, 1993). The *Student Guide* would allow sufficient space to define each term and list the form(s) and corresponding page numbers where the terms occur.

Figure 1 is a "strawman" that depicts one possible model or cognitive map of a "FAFSA expert." The figure, at first, appears analogous to a Table of Contents. It identifies the different FAFSA sections (which an expert can describe, but a Table of Contents typically does not describe) and lists some basic facts, such as the page numbers where related information appears.

Figure 1 provides some organization for the FAFSA reader by listing the FAFSA sections and their relative placement. It also builds a crosswalk between pages in the form and the corresponding pages in the instruction booklet to which the student or parent can refer. Such organization is consistent with the approach offered by Tullis (1983), in which he focuses on the stimulus conditions that serve as a prompt and guide for reading a text. Figure 1 also encompasses another important characteristic of expertise—knowledge of the primary function of a section.

The "Primary Purpose/Use" columns could delineate the purpose of each section ("What Section Does") and the implications of the data gathered from the section ("Information Used For"). For example, for Section A of the FAFSA entitled, "Yourself" the "Primary Purpose/Use" column might state the purpose of the section (e.g., Demographic information categorizes you as either a dependent or an independent student) and might state the implications of the data gathered from the section (e.g., Determines the formulas that will calculate the amount

FIGURE 1
"Strawman" Cognitive Roadmap Model of FAFSA

Section Title	Corresponding Pages for Form	Corresponding Pages for Booklet	Primary Purpose/Use: What Section Does	Primary Purpose/Use: Information Used For
A. Yourself	1	2,3		
B. Your plans	1	3,4		
C. Education Background	2	4		
D. Federal Family Education Loan (FFEL) Program Information	2	4		
E. Student Status	2	4		
F. Household Information	2	5,6		
G. Income, Earnings, and Benefits	3	6,7		
Worksheets A,B	—	8		
Worksheets 1,2	—	11		
H. Information Release	3,4	7,8		
I. Asset Information	4	8,9		

of money your family can afford to pay, also called expected family contribution).

Thus, the "Primary Purpose/Use" columns clarify the purpose of each section and the interplay or dependence among the sections. The appropriate wording under the columns entitled "What Section Does" and "Information Used For" can be determined by FAFSA experts, cognitive scientists, document design experts and students. The specific methods corresponding to the general group methods that are listed in Table 1 can be used to elicit the appropriate wording from this group of experts and users.

A number of questions may be raised about the validity of Figure 1 in representing expert knowledge of the FAFSA. The question being posed by this writer is, "Assuming a cognitive map of expertise is identified and depicted in a schematic form as implied by Figure 1, can the cognitive map be incorporated into the FAFSA form or booklet of instructions to serve as a guide and road map for the student/parent novices to read and complete the form?" The proposed glossary or mini-glossary sections would not be included in the partitioned-off section suggested by Figure 1. Instead, they could be placed in other sections of the form, the instruction booklet, or the *Student Guide.*

It is not the intent of this article to provide a detailed articulation of how experimental psychology or cognitive science methodologies can be employed to redesign the FAFSA. Rather, the intent is to provide the readers with a sense for some of the approaches that may be considered in redesigning the FAFSA. As with many applied research endeavors, such a project would need to address concerns about its

cost and timeliness, as well as the reliability of its results and the ability to generalize those results to the heterogeneous student population that the FAFSA serves.

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