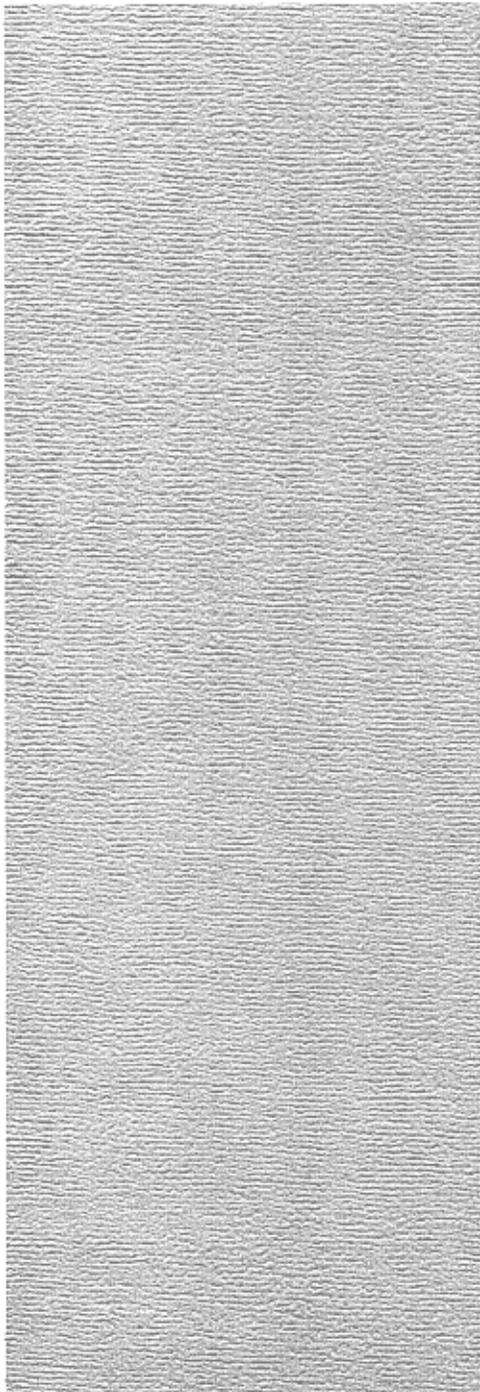


GRADUATE RECORD EXAMINATIONS



**DEVELOPMENT OF AN
INVENTORY OF
DOCUMENTED ACCOMPLISHMENTS
FOR GRADUATE ADMISSIONS**

Leonard L. Baird

GRE Board Research Report GREB No. 77-3R

June 1979

This report presents the findings of a research project funded by and carried out under the auspices of the Graduate Record Examinations Board.



EDUCATIONAL TESTING SERVICE, PRINCETON, NJ

GRE BOARD RESEARCH REPORTS
FOR GENERAL AUDIENCE

- Altman, R. A. and Wallmark, M. M. A Summary of Data from the Graduate Programs and Admissions Manual. GRE Board Research Report GREB No. 74-1R, January 1975.
- Baird, L. L. An Inventory of Documented Accomplishments. GRE Board Research Report GREB No. 77-3R, June 1979.
- Baird, L. L. Cooperative Student Survey (The Graduates [\$2.50 each], and Careers and Curricula). GRE Board Research Report GREB No. 70-4R, March 1973.
- Burns, R. L. Graduate Admissions and Fellowship Selection Policies and Procedures (Part I and II). GRE Board Research Report GREB No. 69-5R, July 1970.
- Centra, J. A. How Universities Evaluate Faculty Performance: A Survey of Department Heads. GRE Board Research Report GREB No. 75-5bR, July 1977. (\$1.50 each)
- Centra, J. A. Women, Men and the Doctorate. GRE Board Research Report GREB No. 71-10R, September, 1974. (\$3.50 each)
- Clark, M. J. The Assessment of Quality in Ph.D. Programs: A Preliminary Report on Judgments by Graduate Deans. GRE Board Research Report GREB No. 72-7aR, October 1974.
- Clark, M. J. Conditions Influencing the Career Accomplishments of Recent Ph.D.'s. GRE Board Research Report GREB No. 76-2R, June 1979.
- Clark, M. J. Program Review Practices of University Departments. GRE Board Research Report GREB No. 75-5aR, July 1977. (\$1.00 each)
- Donlon, T. F. Annotated Bibliography of Test Speededness. June 1979.
- Flaughner, R. L. The New Definitions of Test Fairness In Selection: Developments and Implications. GRE Board Research Report GREB No. 72-4R, May 1974.
- Fortna, R. O. Annotated Bibliography of the Graduate Record Examinations. July 1979.
- Frederiksen, N. and Ward, W. C. Measures for the Study of Creativity in Scientific Problem-Solving. May 1978.
- Hartnett, R. T. and Willingham, W. W. The Criterion Problem: What Measure of Success in Graduate Education? GRE Board Research Report GREB No. 77-4R, March 1979.
- Knapp, J. and Hamilton, I. B. The Effect of Nonstandard Undergraduate Assessment and Reporting Practices on the Graduate School Admissions Process. GRE Board Research Report GREB No. 76-14R, July 1978.
- Lannholm, G. V. and Parry, M. E. Programs for Disadvantaged Students in Graduate Schools. GRE Board Research Report GREB No. 69-1R, January 1970.
- Reilly, R. R. Critical Incidents of Graduate Student Performance. GRE Board Research Report GREB No. 70-5R, June 1974.
- Rock, D. A. The Prediction of Doctorate Attainment in Psychology, Mathematics and Chemistry. GRE Board Research Report GREB No. 69-6aR, June 1974.
- Schrader, W. B. Admissions Test Scores as Predictors of Career Achievement in Psychology. GRE Board Research Report GREB No. 76-1R, September 1978.
- Wild, C. L. Summary of Research on Restructuring the Graduate Record Examinations Aptitude Test. February 1979.
- Wilson, K. M. The GRE Cooperative Validity Studies Project. GRE Board Research Report GREB No. 75-8R, June 1979.
- Wiltsey, R. G. Doctoral Use of Foreign Languages: A Survey. GRE Board Research Report GREB No. 70-14R, 1972. (Highlights \$1.00, Part I \$2.00, Part II \$1.50).
- Witkin, H. A.; Moore, C. A.; Oltman, P. K.; Goodenough, D. R.; Friedman, F.; and Owen, D. R. A Longitudinal Study of the Role of Cognitive Styles in Academic Evolution During the College Years. GRE Board Research Report GREB No. 76-10R, February 1977 (\$5.00 each).

Development of an Inventory of Documented Accomplishments
for Graduate Admissions

Leonard L. Baird

GRE Board Research Report GREB No. 77-3R

June 1979

The Graduate Record Examinations Board and Educational Testing Service are dedicated to the principle of equal opportunity, and their programs, services, and employment policies are guided by that principle.

Copyright © 1979 by Educational Testing Service. All rights reserved.

Abstract

This is a report about the first two stages of a four-stage project designed to develop procedures to assess the accomplishments of applicants to graduate school. In the first stage, trial instruments were developed after thoroughly reviewing other attempts at assessing accomplishments and carefully considering the issues involved. Three prototypes were developed based on three approaches: a checklist approach, a semi-documented approach, and a CAEL-like open-ended portfolio approach. In the second stage, an instrument was developed that was designed to meet the operational and conceptual requirements of an inventory of documented accomplishments for graduate selection using as many of the positive features of earlier approaches in as simple a format as possible. This version was reviewed by a diverse group of people concerned with graduate admissions for the purpose of finding answers to the following questions:

- (1) How open-ended should the procedures be?
- (2) How should the quality of accomplishments be evaluated?
- (3) What should be the nature of the content?
- (4) What is the best strategy for documentation?
- (5) What is the best mode of delivery?

The final version represents the best balance we could devise among various answers to this question. In the third stage, the procedures will be tried out in a sample of graduate departments. The practical problem of administering, checking, and summarizing information obtained from the instrument would be considered as well as the technical issues concerning the validity of items, utility of the instrument, accuracy, and short-term validity. The fourth stage would entail a broader instrument tryout and the long-term predictive validity of the assessment instrument would be examined against a variety of criteria of graduate school success. These criteria would need to be carefully constructed after thoroughly examining the meaning of short- and long-term success in the graduate school setting. In the fourth stage, operationally feasible procedures would be refined for possible use by the Graduate Record Examinations Board and/or by graduate schools.

The work of the first two phases of this project is described in Part I of this report.

The literature bearing on the prediction of high level accomplishment from inventories assessing earlier accomplishments is reviewed in terms of its salience for graduate admissions in Part II.

Part III reproduces the instrument that is being used in the third stage of the project.

Part I: Development of the Inventory

Leonard L. Baird

This project is based on the assumption that a basic goal of graduate selection procedures is to select students who are likely to be productive, to be creative, to provide leadership, and to make a contribution to their fields. Many graduate departments' admissions committees feel the need for improved ways of assessing the out-of-class learning and accomplishments of students so they can select students more likely to be outstanding graduate students and who will eventually contribute most to the field. Thus, one purpose of the project is to develop comprehensive, concise, and accurate descriptions of the significant accomplishments of applicants, particularly when those accomplishments are not reflected in currently available assessments or application materials. The rationale is that a pattern of significant, self-initiated accomplishments frequently reflects the sort of motivation and interest that cause a person to persist through training and to achieve more in professional work.

A second purpose of the project is to broaden recognition of alternate forms of talent. There is a need to assess different types of talent somewhat removed from purely academic ability. Such talents might include the ability to write expressively and forcefully, the intuition needed to devise a scientific experiment, organizational ability and technical inventiveness. Such broadening can have several desirable effects. One is to facilitate the better use of human resources, especially in recognition of the fact that many types of talent and competence are important and necessary in a well-functioning society. Another is to improve educational opportunity through placing appropriate value on the diverse talents more likely to be found in a diverse group of potential students.

A third purpose is to provide graduate admissions committees with more appropriate selection information in order to better evaluate the accomplishments of students with special characteristics or preparation: older students, minority students, students from low income families, and students from unconventional programs. Many types of relevant information are available through current admissions procedures, but they often lack the salience of test scores or grade averages and are likely to be overlooked without a systematic reporting procedure. A related objective is to provide students with a better opportunity to present evidence of talents that he or she may feel are personally significant and worthy of attention.

Of course, a great variety of approaches are possible to achieve these purposes, and, in fact, several have been tried out in various contexts. In the first stage of this project, trial instruments were developed after thoroughly reviewing previous attempts at assessing accomplishments and carefully considering the issues involved. In the second stage, a preliminary instrument was developed that was designed to meet the operational and conceptual requirements of an inventory of documented accomplishments for graduate selection using as many of the positive features of earlier approaches in as simple a format as possible. The following sections describe the work of the first two stages.

Work of Phase 1

In the first stage, three approaches--the checklist approach, the semi-documented approach, and the portfolio approach--were examined. The checklist approach consists of lists of items that represent accomplishments in various areas of activities. The items asked students to simply check each item which described something they had accomplished, for example: "Gave an original paper at a scientific meeting sponsored by a professional society," and "Had poems, stories, or articles published in a public newspaper or magazine or in a state or national college anthology."

The semi-documented approach also asked for specific accomplishments, but requested greater detail. For example, an item read: "Have you ever won a prize or an award for some type of original art work?" Students responding "yes" are then asked to write in the nature of the work, the name of the organization awarding the prize, and the time and place of the award.

The portfolio approach asks students to assemble materials--products, writings, letters, copies of records, etc.--and organize them in a standard format so that their educational merit can be judged.

The research bearing on the technical adequacy of these approaches was studied and their appropriateness for graduate admissions work was examined.* Comparisons of the three approaches showed that each had advantages and disadvantages. The qualities of each approach could not readily be combined in a single instrument. Therefore three prototypes were developed, each based on the previous work in the method.

For the checklist method, this project replicated part of the earlier research effort of Richards, Holland, and Lutz (1967).

*A review of the relevant literature is presented in Part II of this report to familiarize the reader with the research which bears on the work of the project.

Their scales were modified, sharpened, and lengthened for use in particular fields. Four checklists were developed to assess accomplishments in the biological and physical sciences, the social sciences, the humanities, and writing. They included a number of strictly academic as well as "nonacademic" attainments, with content appropriate for graduate education selection purposes.

The work on the semi-documented approach, based on the work of Schultz and Skager (1963) and Klein (1967) resulted in a survey which asked general questions similar to those in the checklist approach but which asked for more information about accomplishments. Earlier surveys were adapted and expanded so that they could be used at the graduate level. Four forms, paralleling those of the checklist approach, were developed and represented an additional source of content for further development.

The work of the CAEL project (Knapp, 1975; Willingham, et al., 1976) was adapted to develop a modified structured open-ended instrument designed to obtain the information that might be obtained by an evaluation of a portfolio of a student's earlier educational and experiential accomplishments. The format allowed applicants to describe their previous activities in their own terms within set categories which directed their descriptions to show (1) the relevance of their experiences to graduate work in their field, and (2) the specific skills that were involved.

Several basic questions were considered to determine which of the above approaches would be the best:

- (1) How open ended should the procedures be?
- (2) How should the quality of accomplishments be evaluated?
- (3) What should be the nature of the content?
- (4) What is the best strategy for documentation?
- (5) What is the best mode of delivery?

The work of Phase 2 described below, was designed to find answers to these questions. A third and fourth phase were planned as studies which would gather short- and long-range validity information on the assessments and would investigate the problems of putting the assessments into operational use.

Work of Phase 2

The prototypes developed in Phase 1 were evaluated by reviewers who were knowledgeable about graduate education and test construction. The GRE staff at ETS also reviewed the forms for their implications for operations. These reviews and discussions led to many valuable suggestions for changes that would result in a form that could be used by the graduate community, could be operationally efficient, and which would have well worked out content and scope. As these reviews, revisions, and reconstructions progressed, it became

apparent that three competing versions represented too much material for the reviewers to examine at the same time, and as they were revised, the instruments became much more similar, so that it seemed sensible to construct one instrument that would combine as many features of the three approaches as possible. Therefore, we analyzed our basic assumptions and materials were developed and organized which would outline alternative answers to the questions listed above. The arguments on each side of the questions were formulated, and analyzed for their merits, and implications, as described below. The resulting prototype was based on the thinking shown in Table 1, which represent our best judgment of the most appropriate way to answer the first four questions above. The fifth question dealing with mode of delivery will be discussed later.

Open-ended vs. objective format. We attempted to combine the advantages of the objective approach--simple and speedy administration, operational feasibility, clarity of responses--with those of the open-ended approach--flexibility and depth of information. In the working version of the questionnaire, items ask applicants to indicate whether they had engaged in an activity, and, if they reply "yes," to indicate when; the geographical distribution or level (local, city, state, national, etc.); whether some public recognition of the accomplishment was provided (e.g., publication, prize, award); and the number of similar accomplishments. Applicants also write out important details, such as name of publisher, contest, producer, etc. At the end of the questionnaire, applicants can choose three accomplishments they consider most relevant to their graduate educations and can outline the reasons they consider each to be important indicators of their readiness for graduate work in their field. This format was designed to obtain the kind of comprehensive detail usually obtained by open-ended questions, but using an objective format so that the applicant can move quickly through the survey. The operational use of the instrument would be greatly simplified by this format, since the main body of information about accomplishments could be processed by existing scoring equipment and the pages of information about the most significant attainments could be processed and reproduced without undue bulk, mailing costs, or operational complexity. It also allows for the possibility of summarization and the preparation of comparative information.

Assessing the quality of attainments. Questions about assessing the quality of accomplishments needed to be considered, since they could affect the development of the prototype. These included the alternatives to scoring or summary that could be developed, who should do the scoring or processing, whether a computer printout could be provided, the form of the report, whether a numerical sum of attainments in general areas of attainment could be constructed, and whether standard weighting formulas or institutional or field specific weightings would be needed. Furthermore, the handling of open-ended responses will eventually need to be addressed before an operational version is produced; e.g., whether there should be any evaluation of open-ended responses before they are sent to graduate

departments, whether the applicant or ETS sends them to departments, and how extensive the interpretive materials to departments would need to be. Some consideration needed to be given to these questions before the prototype was developed. Therefore, the prototype was designed to be amenable to routine processing and summarization for most of the information while retaining a number of the features that would recommend an unsummarized assessment of attainments, including detailed information about the extent and level of achievement, the number of similar achievements, and the significance of the attainment for graduate education in the applicant's field.

The content. Discussions with representatives of various graduate disciplines suggested that the strategy of separate forms for different areas--social sciences, arts and humanities, etc.--was not the best approach since many students have had vital educational accomplishments and experiences in areas far afield from their major area of study. This fact argued for a single form that would ask applicants about a wide range of accomplishments in a wide variety of areas. Three other considerations reinforced this approach. First, the majority of students enrolling in graduate education today are in fields other than the traditional arts and science fields. That is, these fields do not really fall within the traditional categories of graduate education such as physical science, biological science, etc. These fields generally also draw upon a wide range of backgrounds and tend to be more interdisciplinary. The second consideration is that new and emerging fields also tend to be broad, interdisciplinary fields that draw on a wide range of talents. Finally, some proportion of applicants have had experiences or come from backgrounds that differ from those of the traditional applicant. In order to fairly assess their experiences and accomplishments, it is necessary to assess a wide variety of achievements.

Documentation. The form needed to be amenable to documentation and verification whether this verification is conducted by ETS or the graduate department and whether every accomplishment is checked or one of several other verification strategies is used. Therefore the items in the questionnaire needed to ask for sufficient detail about each attainment so that documentation would be possible. However, it would be operationally difficult, as well as a burdensome task for the applicant, to require extensive documentation for every accomplishment. Therefore, substantial confirming evidence was requested only for the accomplishments the applicants considered most important. Thus, in summary, this prototype was designed to meet the operational and conceptual requirements of an inventory of documented accomplishments for graduate selection using as many of the positive features of earlier approaches in as simple a format as possible. Example items from the survey accompany this report.

This draft was sent to selected graduate deans, admissions officers, department heads, and faculty members in four institutions.

(Some students were asked to informally react to the survey earlier, and then opinions were reflected in the survey.) The staff and faculty members were asked to examine the questionnaire with five questions in mind:

- (a) How do you evaluate the effort and the approach we are using?
- (b) Are the kind of achievements assessed the really important ones; i.e., are they things you would want to know about in your admissions decisions?
- (c) Would this format be useful to you, or would a more objective or open-ended format provide more useful data?
- (d) Would you prefer to obtain the materials "unprocessed" or would you prefer some summarization or evaluation of the accomplishments?
- (e) How much weight do you think you would place on such information if it were included with application materials?

In addition, they were asked to check any specific items in the survey that seem to tap especially important types of accomplishments, and circle any items they felt were of dubious value or were difficult to interpret. If they thought that some important accomplishments were not on the list, they were asked to write them down.

Each institution was visited and the staff who were sent the questionnaire were interviewed using a semi-structured interview guide concentrating on the above questions. These interviews revealed consensus on some of the issues we were interested in and disagreement on others, and raised some new concerns. Specifically, concerning the basic questions (numbered 1 to 5 at the outset), their responses were as follows:

1. How open ended should the procedure be? There was general agreement that the present prototype had about the right blend of open ended and objective questions. This confirmed the judgment of the staff and the reviewers of earlier versions.

2. How should the quality of achievements be evaluated? There was no general agreement on this question. Some felt that summary scores should be provided for various areas of accomplishment, simply because of the administrative and logistical problems of dealing with so much material. Others, who tended to be in small departments, said they would like to see the entire form themselves. One option which appealed to many would be to simply record the item number and list an abstract of each accomplishment checked, and to reproduce the last three pages that explain the importance of the three best attainments. However, this question does not need to be answered immediately, but can be investigated by the research of the next phase of the project.

3. What should be the nature of the content? Most interviewees felt that the survey includes an appropriate variety of accomplishments, although they did comment about some of the items. When asked about other attainments that might be added, a number of interviewees expressed the desire to be able to assess motivation as expressed in drive, desire for the degree, or ability to overcome obstacles, although they had few ideas about how these traits could be assessed. Several people suggested that athletics involve discipline, planning, using one's time, motivation, and, in some cases, teamwork, and should therefore be added. Some suggested greater emphasis on achievements or experiences indicating service to, or skill in working with people. These last two suggestions were incorporated into the survey.

4. What is the best strategy for documentation? Much to the surprise of the ETS staff, who had put a great deal of time and thought into seeking answers to this question, there was very little concern expressed about the need for documentation. In fact more arguments were marshalled against documentation than for it. Several people pointed out the operational difficulties of the process of obtaining information substantiating the statements of applicants: that it is time consuming; that for some types of accomplishments, such as selling an art work at an art show, the applicant would have no reason to remember the name and address of a buyer, or for a regional science contest, where the applicant could only remember the sponsoring group and only has a blue ribbon, it may be very difficult to produce or reproduce any evidence for an attainment; that the admissions staff could not handle such voluminous or divergent material; that even if it were provided it would be hard to evaluate; that if the statements were systematically checked, the process would be so lengthy that the results of the checking would be available only after admissions decisions had been made; and finally, that an emphasis on "checking up" on students' statements is contradictory to the spirit of the community of scholars that the applicant is attempting to enter, and that just as we would not ask for evidence that a colleague's experiments had not been faked, we should not ask for the same kind of evidence from applicants.

5. What is the best mode of delivery? There are many possible answers to this question, and, when presented with some of them, the interviewees did not completely agree. Although most would prefer that GREB, through ETS, would handle the processing, for reasons of cost and logistics, some would prefer to perform this function themselves because they wanted to examine all materials submitted, or would like to have the information mesh with their system. A few expressed some distrust of ETS' role because they regarded ETS as too large and too mechanistic to do the job in the way they would prefer. They would prefer to send out and receive the forms themselves.

In addition to these issues that we had anticipated, the university staff members we interviewed raised several other issues that need to be considered. These will be added to the five questions numbered above.

6. How can the procedures avoid bias against students from minority and low income families? Several of the interviewees raised this question, but had few ideas about appropriate solutions. Fortunately, it was possible to ask for the recommendations of the GREB Minority Graduate Education Committee at their December 1977 meeting, for improvements in language usage, examples, phrasing, and accomplishments. Their suggestions were incorporated into the instrument.

7. How can the accomplishments of applicants from colleges of different sizes and selectivity be fairly compared? Several interviewees pointed out that it is much easier to engage in some of the activities included in the accomplishment survey in small or unselective colleges. Thus, an accomplishment in a very large or very selective institution probably represents a higher level of attainment than the same accomplishment in small or unselective colleges. One possible solution would be to provide normative or comparative information for colleges of varying size and selectivity (or, at least, indicate college size).

The version of the inventory that is being tried out in Phase 3 of this project represents our best effort to find balanced answers to these questions. The instrument is reproduced as Part III of this report.

Implications for Phase 3

Several questions and possible options emerged from these interviews which have considerable implications for the next phase of the project.

Documentation. What are the implications of the apparent lack of concern about documentation? Should we simply provide the service with no attempts to document the validity of applicants' statements, or continue our attempts to develop some form of operationally feasible documentation? (The latter could include something as simple as flagging statistically rare responses, and retaining a copy of the open ended questions at the end. This option has been recommended by the GRE staff concerned with operational issues.) The problem of memory decay--the tendency for applicants to forget details of their accomplishment--also needs to be addressed. The next phase of the project will attempt to answer these questions, particularly in terms of the materials themselves. An effort will be made to design the inventory, instructions, and procedures in such a way as to promote accurate and fair reporting and their documentation.

Evaluation. How should the responses to the survey be summarized and processed? Some possibilities that were suggested by the GRE staff, along with some related questions or arguments were as follows:

Does any scoring occur? If so,

A. Who does the scoring?

1. Scoring by ETS

2. Scoring by each graduate department

Requires a more elaborate accompanying manual

B. Scoring of checklist items

1. Computer printout of the text of each item checked, plus the magnitude or level of the accomplishment
2. Numerical sum (simple total) with option of subscores for each area
Subscores might be provided for number of items checked within a certain field (e.g., science), by the "magnitude" of the achievement, etc. As indicators of magnitude or level, the survey uses numbers of similar attainments, how widely circulated, what prize won, size of audience, size of geographic area, and college vs. post-college.
3. Numerical weighting
 - a. Standard weighting formulas for everyone
 - b. Institutionally specific or departmentally specific weighting formulas

Although these questions are quite detailed, the answers to them have strong implications for the cost and emphasis of the next phase of this project and the eventual operational use of the survey.

Clearly, there may be some degree of "scoring" in the next phase because of the analyses that will be conducted to refine the instrument and assess its soundness (e.g., to identify groups of items; to eliminate items; and to clearly distinguish outstanding from routine accomplishments). However, it is doubtful that such scoring and analyses would be the same for operational use of the instrument. It is more likely that the exploration of different methods of summarizing, reporting, and weighting, and evaluating student responses in the next phase will lead to operational analyses, summaries, and reporting formats that are quite different from the item analyses needed for research purposes.

Subgroups. The next phase will deliberately seek out and sample departments that attract applicants from colleges of different sizes and selectivity and from minority groups.

Students and faculty reactions. The reactions of graduate school faculty and staff in this stage suggested that they are generally in favor of the idea behind the instrument, but that they were less certain about how they might use it in practice. Therefore, the next phase will actively seek out the advice and reactions of department and graduate school staff in the sample who are concerned with admissions. Participating departments will

be interviewed to determine: (1) whether their faculty feel the inventory contains items that are relevant to professional accomplishments among their students and graduates; (2) the usefulness of the information provided to them; (3) their strategies for its use; and (4) any problems they may have had.

Similarly, a sample of students will be interviewed to obtain their reactions to the inventory. Students will be queried about the length of the instrument, clarity of items, ease of administration, suggestions as to additional items, accomplishments left out, and their perceptions as to the susceptibility of their self-reports to forgetting.

Summary evaluation of materials. The responses of students to the questionnaire about their experiences in completing the instrument and the responses of department admission committee members in the interviews on their use of the instrument will be tabulated, and their comments summarized. The reports of students of problems they faced in completing the assessment and departments in using the information will be actively sought, so that the operational feasibility can be estimated and eventually improved. An attempt will be made to answer questions about the normative information possible and necessary, representativeness of the samples used in the development, presentation of validity information, and problems of possible spurious effects of social desirability. The eventual instruments should be simple, reliable, comprehensive, and valid. During Stages Three and Four, close consultation with GRE program staff and ETS technical experts will be crucial in developing the format and details which would permit the instruments to be included as a service of the GRE program.

Part II

The Prediction of High Level Accomplishment: A Review
of Selected Literature

Leonard L. Baird

Purpose

The purpose of this paper is to review the research base for the development of an inventory of accomplishments suitable for use in the graduate school admissions process. The review is basically provided as background for the discussion of this development in the main body of this report.

Introduction

People have been concerned with the prediction of high level accomplishment for many years. Thousands of years ago, the Chinese developed the Imperial examination system in an effort to find people who would be outstanding officials and ministers of the state. More recently, researchers have undertaken a wide variety of studies to determine the antecedents of high level accomplishment in science, writing, creative arts, and leadership. This review summarizes some of this research, and shows that there is evidence that high level accomplishment can be predicted with some success, even if we do not have a complete understanding of the process of achievement. Much of this research has been conducted in samples of college students or industrial researchers.

Consequently, since our major interest is in what research suggests might be done in graduate school admissions, our argument will have to be somewhat indirect. However, many of the questions which apply to graduate school admissions have been addressed in research in other areas, so their results are more relevant than it might first appear. Let us define the area that will be reviewed.

This paper will concentrate on biographical and other simple predictors of high level performance. Studies of the creative process (Golann, 1963) or of the personality of persons who achieve at high levels (recently reviewed by Dellas and Gaier, 1970) are, of course, very valuable in our search for the bases of high level accomplishment, but this paper concentrates on biographical information about previous activities and accomplishments. Without attempting to cite all the comparative success of studies using different classes of variables to predict high level accomplishment, we will simply assert that, from the current

evidence, the conclusion of Taylor and Holland (1964) still stands: biographical information about earlier activities and accomplishments is consistently the best predictor of high level performance. Further, information about the biographical precursors and the development of accomplishment could lead to changes in personal, educational, or organizational practices that would foster greater accomplishment.

This review will also concentrate on studies of real-life criteria of accomplishment, following the guidelines of MacKinnon (1962). These include: (1) originality, uniqueness, or statistical rarity; (2) adaptation to reality, aiding in the achievement of some real-life goal, such as a scientific or aesthetic problem; and (3) sustained activity leading to the development, evaluation, and elaboration of an original idea. Studies based on such criteria as having a "creative" profile on a personality test, or other arbitrary classifications devised by a researcher will receive less attention.

Biographical inventories of earlier activity and accomplishment have been related to high level accomplishment in several populations: college students, high school students, scientists, and professionals in academic and professional practice. These studies will be reviewed in following sections.

They are presented here as evidence for the power of measures of accomplishment at one level to predict accomplishment at another. Their relevance to the graduate school will be discussed in the final section.

College students. High level accomplishment among students has been examined in many studies. As a natural outgrowth of their concern for talent, National Merit Scholarship Corporation reported a series of studies concerned with high level accomplishment. These studies include many significant relations between biographical information and achievement in college. "Achievement" consisted of such accomplishments as "Had a scientific or scholarly paper published (or in press) in a scientific or professional journal," "Received an award for acting, playwriting or other phase of drama," "Was editor or feature writer for collegiate paper, annual, magazine, or anthology, etc.," "Composed music which has been given at least one public performance," "Won a prize or award in an art competition, painting, sculpture, ceramics, etc." "Organized a college political group or campaign." Scales were developed for six areas: science, art, music, leadership, drama, and writing. In studies by Holland and Nichols (1964), and Nichols and Holland (1963), nearly every major test that has been suggested for the prediction of accomplishment was used in the predictor battery, including personality scales of all sorts, interest measures, assessments of cognitive styles, "creativity

tests," and high level ability tests. The best predictor of accomplishment in college was accomplishment in the same area in high school, as measured by simple check lists of nonacademic achievements. (Similar results have been found in a large sample study of more typical students [Baird, 1969].) Other National Merit studies by Roberts (1965) and Nichols (1966) studied the item correlates of high level accomplishment. Roberts developed scales for six areas of accomplishment: science, art, writing, music, leadership, and speech (as defined by the same sort of items described earlier). In general, more achievers in each area endorsed the items expressing interest, activity, or competence in each area than did the nonachievers. These items tended to be directly related to the kinds of accomplishments later exhibited in college. As Roberts states: "Many of the items in each scale were directly content-related to the area of criterion achievement, and a fair number were related to other specific areas of activity and achievement." For example, in the science scale, more than half of the positive predictors were "direct indicators of scientific activity or interest and several others may be "technological" in nature (e.g., photography, nature collections)." Nichols' correlations also indicated that previous behaviors were generally the best predictors of high level accomplishment in both a Merit sample and a sample representing a broad range of talent. (Biographical information about previous accomplishments was a better predictor than the personality, interest, or ability scales that Nichols also used in his study.) Other studies using large samples of average students have shown that scales measuring high school nonacademic accomplishment are the best predictors of later accomplishment in college and have sufficiently high correlations to be of practical use (Richards, Holland, and Lutz, 1967; Baird, 1969). Ability, personality, and interest measures were generally poor predictors in these studies.

The need for measures of out of class accomplishment in addition to measures of academic accomplishment is evidenced by the fact that, in all these studies, there was little relation between grades, academic ability as measured by test scores, and later accomplishment. The need is further emphasized by the work of Wallach and Wing (1969) who replicated these studies in their study of Duke University students in which little relationship between academic and nonacademic achievement was found using methods other than correlations. Baird (1968) similarly compared bright and average students and found little average difference in their nonacademic accomplishments. Elton and Shevel (1969) further clarified the issue by examining individual items on the American College Testing Programs' scales of accomplishment and finding that some out-of-class accomplishments were related to measures of academic talent but about an equal number showed a negative or no relationship.

High school students. The studies of high school students provide somewhat indirect evidence of the power of measures of previous accomplishment to predict later accomplishment. They are reviewed here because of they show that previous activity and experiences which are related to accomplishment are predictive of later accomplishment, as well as earlier accomplishment, per se. Long term activity and interest in an area may not result in publically recognizable accomplishments, but they do show that behaviors consistent with later accomplishment are important; accomplishment does not appear overnight. Taylor, Cooley, and Nielson (1963) applied a biographical questionnaire developed on NASA scientists and which concentrated on previous activity and accomplishments, to high school students participating in a National Science Foundation summer program. Using ratings of the creativity of the students' research performance as the criteria, the biographical questionnaire proved to be the best overall predictor.

Schaefer and Anastasi (1968), and Anastasi and Schaefer (1969), developed biographical inventory keys against criteria of creative accomplishment among high school boys and girls. Separate keys were developed for (a) science and (b) art and creative writing, and cross validated in second criterion groups. Cross-validated validity coefficients among the boys were .35 and .64 for the science and art-writing scales, respectively, For girls, art and writing were predicted in a cross validation with correlations of .34 and .55, respectively. Using a similar biographical inventory and the same sample, Schaeffer (1969) was able to predict creative performance in art for boys (.65), writing for girls (.55), and, in combination with personality scales, science for boys (.48) and art for girls (.55). In their discussion of the contents of these scales, Anastasi and Schaeffer (1969) pointed to the common characteristics of high performing adolescents (with some support from other studies). These were: continuity and pervasiveness of interest in the students' chosen field; prevalence of unusual, novel, and diverse experiences; and the educational superiority of the students' family background. The first point deserves some reemphasis. Two other studies (Baird, 1968, 1969b) indicate that accomplishment often begins in adolescence or before in exploratory activity, often resulting in recognized achievement. Baird and Richards (1968) and Baird (1969b) found that such accomplishment seldom begins in college; there are few "late bloomers." The great majority of students who show accomplishments in college showed similar activities in high school. Anastasi and Schaeffer (1969) point out:

Typically, the highly creative adolescent girl in this study had manifested an absorbing interest in her field since childhood and her creative activities had received recognition through exhibitions,

publication, prizes, or awards. Her initial interest was thus reinforced and reinforced early in life by persons in authority, such as parents and elementary schoolteachers. The continuity of creative achievement over time is corroborated by the findings of other investigations, notably Helson's (1965, 1967) research with college women, the surveys of National Merit Scholarship finalists (Holland & Astin, 1963; Nichols & Holland, 1964), and our own earlier study of creative high school boys (Schaeffer & Anastasi, 1968).

Similar results are reported in studies of industrial scientific and professional samples, reviewed in the following section.

Predicting high level accomplishment among scientists and other adult groups from biographical records of accomplishment and activity. Biographical variables dealing with both past accomplishments and past activity and interest similar to those just described have been found to characterize scientists who have demonstrated a high level of accomplishment. For example, Roe (1952) found many unusual biographical characteristics of scientists in her sample. Kulberg and Owens (1960) and Morrisson, Owens, Glennon, and Albright (1962) found that biographical information correlated with the creativity, professional interest, and research competence of engineers and scientists. Albright and Glennon (1961) found that biographical variables distinguished between supervisory and research oriented scientists at all levels of a laboratory organization. Smith, Albright, and Glennon (1961) also found that biographical information predicted rated scientific competence, rated creativity and number of patents within a group of research scientists. These three criteria were predicted in a cross-validation sample with correlations of .61, .52, and .52, respectively. The content of the items suggests high self-confidence and high self-conception. "This interpretation is reinforced by the frequency with which the high criterion groups say that they (a) have more readily taken advantage of opportunities presented them, (b) consider their achievements thus far to be greater than those of others with the same education, (c) work more quickly than others, and (d) prefer to have many things 'on the fire' simultaneously." It might be noted that these descriptions are based primarily on answers to factual questions about the scientists' accomplishments. Chambers (1964) used both biographical and personality test variables to study creativity in chemists and psychologists. Three personality scales and 16 biographical items were significantly related to the criterion of creativity. The more creative scientists more often had fathers who were professional men, graduated from high school earlier, spent more hours per week (more than 50) in study and research in graduate school, published more articles then, and more often met their graduate school expenses by scholarships and fellowships than by part-time work.

McDermid (1965) found that biographical variables were the best predictors of supervisory and peer ratings of high level (in this case, creative) performance. McDermid also used personality tests (the California Psychological Inventory and the Adjective Check List) an interest test (The Vocational Preference Inventory) a high level intelligence test (Concept Mastery Test), the Social Insight Test and Welsh Figure Preference Test. All these tests had been used in other studies of creativity, but were not useful in McDermid's sample of engineering personnel. McDermid concludes "The correlations obtained in this study between paper and pencil tests and the criteria of creativity were so low as to be virtually useless for predictive purposes; biographical data, on the other hand, proved to be significant as predictors of both supervisory and peer ratings of creativity. This finding, of course, is quite consistent with the practical dictum that the best predictor of future performance is past performance. . ."

Taylor and Ellison (1967) summarized eight years of work on the identification of biographical predictors of scientific performance. In the last NASA scientist samples the cross-validated correlations with ratings of creativity were .41, with the number of publications .62, and with GS level, .72. The factors in the Taylor and Ellison study were consistent both with other studies of accomplishment in science and the studies of students just summarized. The highly performing scientists, as the students, tended to have a conception of themselves as capable of high level professional performance, be independent of others' opinions, have great dedication to their work, work very hard, have clear ideas of their goals, which they set at a high level, and be intellectually oriented, a trait that developed early in adolescence.

Finally, Munday and Davis (1974) have shown that biographical accomplishment scales administered in high school predicted adult accomplishment six years later. The adult accomplishments included such things as "was author or coauthor of scholarly or scientific article accepted for publication in a popular or professional journal or presented as a public lecture," "received an award for acting or some other phase of drama," "sold one or more works of art to collectors, museums, or the general public," "won a literary award or prize for creative writing," "composed or arranged music which was publicly performed," and "been a candidate for election to school board, city, county, or state office."

The median correlation between the high school accomplishment scales and the corresponding adult scales was .25 for men and .26 for women when graduates and nongraduates were combined. In contrast, the median correlation between high school grades and adult accomplishments was .03 for men and .00 for women, and the median correlation between ACT composite scores and adult accomplishments

was .06 for men and .10 for women. The median correlation between college grades and adult accomplishments was .09 for all students combined. This study is important because it shows the long range validity of the biographical accomplishment scales, even after the intervention of college and work, and illustrate again their superiority over other measures.

In sum, the studies reviewed here support the conclusions reached by Baird (1969a):

There is some consensus, then, that students who later achieve . . . (in creative activity, as well as academic activity) have engaged in activities and developed skills related to that area, have conscious goals and desires to achieve in that area, and describe themselves as having ability in that area.

. . . The achiever . . . has a history of activities and achievements related to his present achievement. He is motivated to achieve in this area and accurately assesses his own talents. Perhaps rather than attempting to develop new scales to describe some universal creative mind, psychologists should concentrate on the development of more accurate and reliable measures of past activities, goals, and self-description.

These results and those of the student samples suggest that measures of accomplishment could be used for the early identification of students with the potential for high level accomplishment, and as one of the bases for selecting students for special programs. In most of these studies, biographical information about past accomplishment was the best predictor of later performance, better than ability, interest or personality tests, suggesting the power of these variables for particular purposes.

Some Questions About Direct Assessment of Biographical Accomplishment Scales

We have just seen the power of biographical accomplishment information to predict subsequent high level accomplishment. The studies just reviewed indicate that this information is considerably more useful than most other kinds of information. However, before we consider using this kind of data in practice we need to answer four questions about it: (1) can we believe students' reports?, (2) can measures be constructed which meet standard psychometric criteria, (3) how would such measures be used in real-life selection situations, and (4) are such measures fair to students from disadvantaged backgrounds?

The Validity of Direct Measurement per se

Probably the most critical issue in the use of reports of accomplishments is whether we can believe a person's responses. There is some evidence that these reports can be believed. However, it may be useful to first consider the general question as to whether one can believe what people say on questionnaires, since this bears on the general validity of questionnaires concerning accomplishments. The problem is, simply, beyond obvious and innocuous information such as his vocational choice or hometown size, can or will persons give accurate accounts of their history and present status? The few studies of the validity of self-report provide a fairly consistent answer to this question. As early as 1937, Walker found that college students' reports of factual information such as their father's occupation and class standing agreed very well with official records. Harris (1946) found high validity for a questionnaire he used in a psychiatric setting. Mosel and Coyan (1952) reported high validity for application blank work histories in industrial settings. They found a high level of agreement between the claims made by job applicants and the reports of past employers with respect to weekly wages, duration of employment and job duties. All correlations except one were .90 or greater. Hardin and Hershey (1960) found that when workers' reports of their wages on a questionnaire were checked against company pay records, the worker and company figures correlated .98 among women, and .99 among men. About eight percent of the sample under- or over-stated their pay by plus or minus six percent. Interestingly, about three times as many employees understated their pay as overstated it. Clausen (1968) compared self-reports of voting in elections to official records and found an "invalidity" rate of approximately 6.9 percent. He cautions that this may be an overestimate, for "All errors that lead the investigator astray in tracking down the record of the respondent's vote, e.g., incorrectly spelled name, incorrect address, have the one sided effect of challenging the validity of the respondent's vote report." This is a very important point to remember in every study of the validity of self-reports. One should not simply assume 100 percent accuracy in official records and the reports on those records.

Calahan (1968) asked a number of Denver adults questions ranging from whether they had a phone in their homes to whether they contributed to the Community Chest. The self-reports on many factual questions were quite accurate. After a variety of analyses, Calahan noted that accuracy was higher for items concerned with recent facts. Calahan concluded that respondents generally will give accurate responses even when it may reflect on their prestige, provided that the question of fact concerns the respondent's recent activities rather than past events.

In samples of college students, Walsh (1967, 1968, and 1969) has found that students generally provide accurate reports of their past behavior, even when items deal with sensitive issues such as failing courses. However, Calahan's comments seem to apply to college students, as well. Thus, Walsh's students seemed to have a little difficulty recalling remote or insignificant events, but, ". . . if an error of plus or minus .20 was permitted in a student's report of his previous semester GPA, then the percentage of accuracy would be 100 percent." Overall, Walsh found a very high level of accuracy. In addition, Walsh did not find any difference in accuracy between interview, questionnaire or "personal data blank." In his later studies, Walsh found that the level of accuracy of self-report was not changed when students were given financial or social incentives to distort their self-report. Studies of the validity of self-reported grades reviewed by Baird (1976) also generally indicate that students provide quite accurate information about themselves.

Let us now turn directly to measures of accomplishment. As part of a comprehensive study of the accuracy of self-reports on a questionnaire administered with a national college testing program, Maxey and Ormsby (1971) studied the agreement between student-reported and school-reported nonacademic achievement on 28 items. (They also studied the accuracy of self-reported grades, and reached the same conclusions as did Baird, 1976, that students usually give very accurate reports of their grades.) Their sample included 5775 students completing the ACT battery. Their reports were checked with school reports in 134 high schools. The achievements were in athletics, leadership, music, speech, drama, art, writing, and science, and included such items as "Edited a school paper or yearbook" and "Placed first, second, or third in a regional or state science contest." The average level of agreement between student report and school records was about 90 percent. But this did not mean that 10 percent of the students were exaggerating. On the typical item only about 6 percent of the students claimed an accomplishment for which the school had no record. For the other four percent of students, the school credited them with an achievement they did not claim. The items on which there was greatest agreement tended to be highly visible, easily verifiable items such as "Placed first, second, or third in a regional or state speech contest." Conversely, the items on which there was less agreement tended to be behaviors about which the school would have little information, such as "Actively campaigned to elect another student." No systematic differences in agreement were found when the data was broken down by sex or family income level. Students who made better grades tended to be slightly less accurate than those who made lower grades. The authors think this may be due to a tendency for students with higher grades to be more active in school social activities in ways unknown to school personnel. The fact that the

students' reports of achievement were gathered while they were completing a national assessment for college admission leads one to expect them to be exaggerated. The fact that they tended not to be adds strong support to the idea that self-reports are accurate.

A great deal of other evidence on the validity and utility of self-report measures is reported in Baird (1976).

In summary, from the evidence available, it appears that questionnaire responses have useful validity. More particularly the validity of questions about past accomplishments appears useful enough for the decisions and actions that they could be used for.

Can biographical measures of accomplishment be made psychometrically adequate? The studies of the scales developed by the National Merit Scholarship Program (Nichols and Holland, 1964), the research on more average college students (Richards, Holland, and Lutz, 1967; Richards and Lutz, 1968) and the operational work of the American College Testing Program (ACT Technical Report, 1973) show that biographical accomplishment scales can be constructed with adequate reliability. Occasional skewness in the scales does not present a serious limitation (Holland and Richards, 1967). The validity of the scales does not seem to be affected by restrictions of range on academic talent (Holland and Richards, 1967; Baird, 1969a). The validity of the scales, discussed earlier in the review also indicates the psychometric adequacy of the scales. All of the results may be underestimates because of the brevity of the scales used in these studies. In sum, it appears that biographical accomplishment scales can be constructed which meet standard psychometric requirements.

Can biographical accomplishment scales be used in practice? Biographical accomplishment measures have seldom been used in real-life studies of the selection of college or graduate students so there are few guidelines for the person who would like to make use of these variables. A few industrial studies provide some stimulating suggestions, but these are few and far between. Certainly, very few, if any, colleges or graduate institutions have made past extra-academic accomplishment the most important basis of their selection procedures. However, a study by Baird and Richards (1968) simulates what would happen if various selection procedures were followed for admission to college and this study suggests some of the practical problems using accomplishment data in selection decisions. The authors compared the results if: 1) only academic criteria were used to admit students to college; 2) only criteria based on previous creative accomplishment in each of six areas were used; and 3) both academic and creative accomplishment were used. A close examination of the study leads one to the conclusion that an educational institution cannot have everything. For example, if an institution selected students only for high level accomplishment rather than for grades, it would increase its dropout rate. However,

an institution could still make use of nonacademic predictors of creative accomplishment. For example, as Baird and Richards suggest, ". . . a college could decide which areas of achievement it wished to emphasize; that is, whether it preferred more or fewer students with potentials for achievement in leadership or science, art or writing, speech and drama or music."

A college or graduate school's choice of a particular selection strategy is a function of the outcomes it values most. Institutions must choose the relative value of obtaining (a) a group of students who will attain high grades (b) a group of students who will achieve in the accomplishment areas it is interested in (c) a group of students who will not drop out, or (d) some other group of students which it values. Although an institution can obtain a student body which will show various proportions of these outcomes, it would be hard pressed to find an incoming group of students which is desirable in every way. On the other hand, a college or graduate school can obtain a group of students who will fit its purposes and goals to a reasonable extent.

Are the measures fair to disadvantaged students? One fundamental concern about these measures is whether they are fair to students who may not have had opportunities for accomplishment. If they have not had a chance to engage in various activities, or attended institutions lacking in appropriate facilities, they would be expected to appear lacking in accomplishments. The evidence on this point indicates that students from disadvantaged backgrounds do about as well on assessments of their real-life accomplishments as do other students. For example, Baird (1967) compared students from families with different incomes in a national sample of 18,378 college bound students. The groups ranged from "below \$5,000" (approximately the lowest quarter of incomes in the national distribution at the time of the study) to "25,000 and above" (approximately the top one or two percent). The differences between the groups were very small and, in the case of higher levels of achievement, virtually nonexistent. In a second study, Baird (1969) studied the relationship between family income and educational ambitions in a national random sample of 15,535 college bound students. Although educational ambitions were significantly related to accomplishments in several areas, family income was not. That is, students from families with different incomes did not significantly differ in the number or level of accomplishments they reported. (It is thought provoking that both studies showed significant differences among the income groups on measures of academic ability.) This lack of relation between accomplishments and family background is supported by the National Merit studies which reported no significant correlations between these two types of variables in their samples. These results suggest that the accomplishment measures do not discriminate against disadvantaged students, although disadvantaged students do score lower on academic ability tests.

Studies of the large samples of college freshmen obtained by the American Council on Education also show that Black students report just as many accomplishments of the kind we have been discussing as do White students. Bayer and Boruch (1969) compared the high school accomplishments of 12,300 Black college freshmen with those of 230,582 non-Black students enrolled in 358 colleges, and found no differences. Bayer (1972) found the same results when he compared the accomplishments of 12,927 Blacks with 158,111 non-Blacks in 324 colleges. These results held in all types of institutions. In short, the evidence indicates that reports of accomplishments do not discriminate against disadvantaged or minority students. In fact, since these studies were based on reports of high school accomplishments, where one would expect any discriminatory effects to be much larger than in college, it seems logical to believe that there would be little, if any, difference among the attainments of graduate school applicants. (In fact, in the national sample of low and other income students studied by Holmstrom [1973], there were no differences in the handful of college achievements she studies.)

Implications for a Graduate Admissions Inventory of Accomplishment

The implications can be stated fairly briefly. (1) Since the consensus of the studies indicates that information about past accomplishments is the best predictor of later accomplishments, graduate school admissions' committees who wish to select students with the greatest potential for future accomplishment should look for evidence of students' past accomplishments. (2) Satisfactory measures of past accomplishments have been constructed at other levels, so it seems plausible to believe that such measures can be constructed at the graduate school admissions level. (3) The measures that have been constructed appear to have adequate reliability, accuracy, and validity, so it seems plausible to think that measures which are adequate in these ways can be developed for graduate school admissions. (4) The measures seem independent of academic aptitude, so similar measures for graduate school admissions would probably add a good deal of information of a new kind to the admissions situation, and (5) studies simulating the use of these measures show that different selection strategies produce different results, so graduate schools should not see these measures as panaceas, but as a new kind of information.

Summary

Biographical accomplishment information provided useful prediction of later high level accomplishment in a wide variety of samples and settings. In these studies, no other class of variables proved nearly so useful. The information seems believable, it can be psychometrically adequate, and it can be used in various selection strategies. A strong case can be made for the utility and value of biographical accomplishment information.

References

- Albright, L. E., & Glennon, J. R. Personal history correlates of physical scientists' career aspirations. Journal of Applied Psychology, 1961, 45, 281-284.
- American College Testing Program. Assessing students on the way to college. Author, Iowa City: Iowa, 1973.
- Anastasi, A., & Schaeffer, C. E. Biographical correlates of artistic and literary creativity in adolescent girls. Journal of Applied Psychology, 1969, 53, 267-273.
- Baird, L. L. Family income and the characteristics of college-bound students. ACT Research Report No. 17, Iowa City: American College Testing Program, 1967.
- Baird, L. L. The achievements of bright and average students. Educational and Psychological Measurement, 1968, 28, 891-899.
- Baird, L. L. The prediction of accomplishment in college: An exploration of the process of achievement. Journal of Counseling Psychology, 1969a, 16, 246-254.
- Baird, L. L. Factors in the continuance of accomplishment from high school to college. Measurement and Evaluation in Guidance, 1969b, 2, 5-18.
- Baird, L. L. Patterns of educational aspiration. ACT Research Report No. 32, Iowa City: American College Testing Program, 1969c.
- Baird, L. L., & Richards, J. M., Jr. The effects of selecting college students by various kinds of high school achievements. ACT Research Report No. 23, Iowa City: American College Testing Program, 1968.
- Baird, L. L. Development of an Inventory of Documented Accomplishments. Proposal submitted to Graduate Record Examinations Board, 1975.
- Baird, L. L. Using self-reports to predict student achievement. New York: College Entrance Examination Board, 1976.
- Bayer, A. E. The Black college freshman: Characteristics and recent trends. ACE Research Reports, 7 (3), Washington, D.C.: American Council on Education, 1969.

- Bayer, A. E., & Boruch, R. F. The Black student in American colleges. ACE Research Reports, 4 (2), Washington, D.C.: American Council on Education, 1969.
- Calahan, P. Correlates of respondent accuracy in the Denver Validity Study. Public Opinion Quarterly, 1968, 32, 607-621.
- Chambers, J. A. Relating personality and biographical factors to scientific creativity. Psychological Monographs, 1964, 87, 7.
- Clausen, A. R. Response validity: Vote report. Public Opinion Quarterly, 1968, 32, 588-606.
- Dellas, M., & Gaier, E. L. Identification of creativity: The individual. Psychological Bulletin, 1970, 73, 55-73.
- Elton, C. F., & Shevel, L. R. Who is talented? An analysis of achievement. ACT Research Report No. 31. Iowa City: American College Testing Program, 1969.
- Forrest, A., Knapp, J. E., & Pendergrass, J. Tools and methods of evaluation. In M. T. Keeton, et al., Experiential learning: Rationale, characteristics, and assessment. San Francisco: Jossey-Bass, 1976.
- Golann, S. E. Psychological study of creativity. Psychological Bulletin, 1963, 60, 548-565.
- Hardin, E., & Hershey, G. L. Accuracy of employee reports on changes in pay. Journal of Applied Psychology, 1960, 44, 269-275.
- Harris, H. J. The Cornell Selectee Index--its use in psychiatric diagnosis. Annals, New York Academy of Science, 1946, 46, 594-603.
- Helson, R. Personality of women with imaginative and artistic interests: The role of masculinity, originality, and other characteristics in their creativity. Journal of Personality, 1966, 34, 1-25.
- Helson, R. Sex differences in creative style. Journal of Personality, 1967, 35, 214-233.
- Holland, J. L., & Nichols, R. C. Prediction of academic and extracurricular achievement in college. Journal of Educational Psychology, 1964, 55, 55-65.

- Holland, J. L., & Richards, J. M., Jr. Academic and nonacademic accomplishment in a representative sample of students taking the American College Tests. College and University, 1967, 43, 60-71.
- Holmstrom, E. I. Low income students: Do they differ from "typical" undergraduates? ACE Research Reports, 8 (5), Washington, D.C.: American Council on Education, 1973.
- Kulberg, G. E., & Owens, W. A. Some life history antecedents of engineering interests. Journal of Educational Psychology, 1960, 51, 26-31.
- MacKinnon, D. W. The nature and nurture of creative talent. American Psychologist, 1962, 17, 484-495.
- Maxey, E. M., & Ormsby, V. J. The accuracy of self-report information collected on the ACT Test Battery: High school grades and items of nonacademic achievement. ACT Research Report No. 45. Iowa City: Author, 1971.
- McDermid, C. D. Some correlates of creativity in engineering personnel. Journal of Applied Psychology, 1965, 49, 14-19.
- Morrison, R. F., Owens, W. A., Glennon, J. R., & Albright, L. E. Factored life history antecedents of industrial research performance. Journal of Applied Psychology, 1962, 46, 281-284.
- Mosel, J. N., & Cozan, L. W. The accuracy of application blank work histories. Journal of Applied Psychology, 1952, 36, 365-369.
- Munday, L. A., & Davis, J. C. Varieties of achievement after college: Perspective on the meaning of academic talent. ACT Research Report No. 47. Iowa City: Author, 1974.
- Nichols, R. C. Non-intellective predictors of achievement in college. Educational and Psychological Measurement, 1966, 26, 899-915.
- Nichols, R. C., & Holland, J. L. Prediction of the first-year college performance of high aptitude students. Psychological Monographs, 1963, 77 (7, Whole No. 570).
- Richards, J. M., Jr., Holland, J. L., & Lutz, S. W. Prediction of student accomplishment in college. Journal of Educational Psychology, 1967, 58, 343-355.
- Richards, J. M., Jr., & Lutz, S. W. Predicting student accomplishment in college from the ACT assessment. Journal of Educational Measurement, 1968, 5, 17-29.

- Roberts, R. J. Prediction of college performance of superior students. National Merit Scholarship Corporation Research Report, 1965, 1, 5.
- Roe, A. The making of a scientist. New York: Dodd, Mead, 1952.
- Schaefer, C. E. The prediction of creative achievement from a biographical inventory. Educational and Psychological Measurement, 1969, 29, 431-437.
- Schaeffer, C. E., & Anastasi, A. A biographical inventory for identifying creativity in adolescent boys. Journal of Applied Psychology, 1968, 52, 42-48.
- Skager, R. W., Schultz, C. B., & Klein, S. P. Quality and quantity of accomplishments as measures of creativity. Journal of Educational Psychology, 1965, 56, 31-39.
- Smith, W. J., Albright, L. E., & Glennon, J. R. The prediction of research competence and creativity from personal history. Journal of Applied Psychology, 1961, 45, 59-62.
- Taylor, C. W., Cooley, G. M., & Nielsen, E. D. Identification of high school students with characteristics needed in research work. University of Utah, 1963. (mimeo)
- Taylor, C. W., & Ellison, R. L. Biographical predictors of scientific performance. Science, 1967, 155, 1075-1080.
- Taylor, C. W., & Holland, J. L. Predictors of creative performance. In C. W. Taylor (Ed.), Creativity: Progress and potential. New York: McGraw-Hill, 1964.
- Walker, K. P. Examining personal information items of a questionnaire study. Journal of Educational Research, 1937, 31, 281-282.
- Wallach, M. A., & Wing, C. W., Jr. The talented student: Validation of the creativity-intelligence distinction. New York: Holt, Rinehart and Winston, 1969.
- Walsh, W. B. Validity of self-report. Journal of Counseling Psychology, 1967, 14, 18-23.
- Walsh, W. B. Validity of self-report: Another look. Journal of Counseling Psychology, 1968, 15, 180-186.
- Walsh, W. B. Self-report under socially undesirable and distortion conditions. Journal of Counseling Psychology, 1969, 16, 569-574.

Ward, W. C., & Frederiksen, N. A study of the predictive validity of the tests of scientific thinking. Final Report to Graduate Record Examinations Board, 1976.

Whitaker, U. G. Assessors and their qualifications. In M. T. Keeton, et al., Experiential learning: Rationale, characteristics and assessment. San Francisco: Jossey-Bass, 1976.

Willingham, W. W. Predicting success in graduate education. Science, 1974, 183, 273-278.

Part III

Inventory of Activities and Accomplishments

Name : _____
-33- University : _____
Department : _____

Inventory of Activities and Accomplishments

Graduate Record Examinations Board

Educational Testing Service
Princeton , New Jersey 08541

Copyright © 1978 by Educational Testing Service

All rights reserved

BACKGROUND QUESTIONS

The following questions will be used for research purposes only. Your responses will be used to help us identify items that might be unfair to various groups of students and to help us understand the results of the study. They will not be used in any other way, will not be communicated to your department or university, and will not be seen by anyone except the research staff. We encourage you to answer all the questions so that the results of the study will be more accurate.

1. In what year did you receive your bachelor's degree?

2. What was the full name and location of the college that awarded your bachelor's degree?

Name _____

Location _____

3. Was your undergraduate major in the same field you are now studying as a graduate student?

Yes

No

4. What was your undergraduate major?

5. Considering only your last two undergraduate years, approximately what overall grade average did you receive? (If your college does not use letter grades, please mark the letter grade that is the closest equivalent to your grade average.)

D or lower

C-

C

B-

B

A-

A

6. Have you attended another graduate institution on at least a half-time basis?

No

Yes, for less than a year

Yes, for a year or more

Yes, and I obtained a Master's degree

7. What is your eventual graduate degree objective in your current field?
- Non degree study
 - Master's (M.A., M.S., M.Ed., etc.)
 - Intermediate (such as Specialist)
 - Doctorate (Ph.D., Ed.D., etc.)
 - Postdoctoral study
8. What kind of position do you hope to hold on completion of graduate school? If you are considering more than one, mark one first preference.
- Postdoctoral fellowship
 - Teaching or administration in elementary or secondary school
 - Teaching in junior college
 - Teaching in a four-year college or university
 - University research and teaching
 - College or university administration
 - Research in industry or with non-profit organization or institute
 - Self-employed professional practice
 - Professional practice with a clinic, hospital, or agency
 - Executive position (administrator, curator, etc.) in a nonacademic organization including government
 - Other (Specify): _____

9. On the average, how many hours a week did you work during your last two years of undergraduate college?
- Did not work
 - 1-10 hours
 - 11-20 hours
 - 21 or more hours
10. Did you work between the time you graduated from college and the time you entered graduate school?
- No
 - Yes, but only part-time for less than six months
 - Yes, part-time up to a year
 - Yes, full-time for less than six months
 - Yes, full-time up to a year
 - Yes, full- or part-time for more than a year
11. What is your sex?
- Male
 - Female
12. What is your age?

13. Are you a United States citizen?
- Yes
 - No
14. How do you describe yourself?
- American Indian or Native American
 - Black, Afro-American or Negro
 - Mexican-American or Chicano
 - Oriental or Asian-American
 - Puerto Rican or Spanish-speaking American
 - White or Caucasian
 - Other

The questions in this section refer to writing and publishing activities. Answer each question by BLACKENING THE APPROPRIATE CIRCLE after each question.

If you indicate below that you have engaged in a listed activity, please provide all the information about the activity as requested by the columns. If you indicate

	Have you engaged in this activity? If you mark "Yes," fill in the rows at right		When?	
	No	Yes	During college	After college
In college or prior to applying to graduate school, did you:				
1. Write a short story.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Write a poem.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Write a play.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Write a "literary" article or essay.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Write a scientific article.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Write a "general" article, (e.g., newspaper report, editorial, pamphlet).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Write a book dealing with some aspect of the sciences or social sciences.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Write a "literary" book, (e.g., novel, book dealing with social issues).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Author or coauthor an article presented at a professional meeting or conference. (Fill in the name of the professional association on the line at the right.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Compose a symphony, concerto, or sonata.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. Compose a "popular" song or "show" tune.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. Draw cartoons or illustrations.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. Obtain a patent or patent disclosure.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. Take photographs for a newspaper or magazine.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. Work as editor of a publication.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

This section deals with certain special paid or unpaid activities such as jobs, volunteer work, military activities that you may have engaged in and/or offices you may have held during college or before applying to graduate school. Please

1. Have you held a job that taught you an important skill?
2. Have you received a job promotion for outstanding performance?
3. Have you had major responsibility for another person (e.g., custodial care, emergency squad, parenting)?
4. Have you held a position in a group that tried to influence social institutions?
5. Have you been an active member of a group in which you had to interact closely with other people (e.g., youth counseling, camp counseling, church activities, community organizations)?
6. Have you supervised a group of volunteers (e.g., in a political campaign, neighborhood program for children, church organizations)?
7. Have you raised or managed money for an organization or project (e.g., community fund drive, served as treasurer of a club)?
8. Have you won an athletic award?
9. Have you participated in athletics (e.g., coached, managed, or played on a team or in a tournament)?
10. Have you been elected to a major class office (e.g., president, vice president, treasurer)?
11. Have you been appointed or elected a member of a college-wide student group, such as student council or student senate?
12. Have you been an elected officer in a community social group?
13. Have you served on a student-faculty committee?

blacken completely one circle next to your answer for each question. If you mark any "Yes" answers, please fill in the requested information in terms of the activity or role that you feel is most significant.

No	Yes	
<input type="radio"/>	<input type="radio"/>	If you marked "Yes," please fill in the.....
<input type="radio"/>	<input type="radio"/>	Nature of skill
<input type="radio"/>	<input type="radio"/>	Position you were promoted to
<input type="radio"/>	<input type="radio"/>	Nature of responsibility
<input type="radio"/>	<input type="radio"/>	Nature of group
<input type="radio"/>	<input type="radio"/>	Nature of group
<input type="radio"/>	<input type="radio"/>	Nature of group
<input type="radio"/>	<input type="radio"/>	Name of organization or project
<input type="radio"/>	<input type="radio"/>	Name of sport or activity & award
<input type="radio"/>	<input type="radio"/>	Name of sport or activity & nature of participation
<input type="radio"/>	<input type="radio"/>	Position held
<input type="radio"/>	<input type="radio"/>	Position held
<input type="radio"/>	<input type="radio"/>	Club or organization
<input type="radio"/>	<input type="radio"/>	Committee

Section IV (cont'd.)

14. Have you served as a research or laboratory assistant either in college or outside of college?
15. Have you served as a tutor for someone?
16. Have you started your own business?
17. Have you actively participated in a college, community, or religious service organization or program (e.g., served as chairman of a charity drive)?
18. Have you participated in any activities in the arts, humanities, or sciences that were not covered by this questionnaire?

If you marked "Yes," please
fill in the

No Yes

Content area

Subject

Type of business

Sponsoring organization

Activity or achievement

Please choose up to three experiences that you consider highly significant in your preparation for graduate study, or that gave you the greatest sense of accomplishment, whether or not they appear in the preceding lists. Then, please answer the following questions for each one.

Accomplishment 1

1. Briefly describe the experience, providing specific details about where and when it occurred and how and why it was initiated.

2. What skill(s), competence (s), knowledge, or special accomplishment(s) resulted from the experience described above?

3. Can you give any evidence of the quality or level of attainment that this achievement represents (e.g., prize, certificate, letter, recognition, impact on individuals)?

4. What makes the skills, competence, or knowledge resulting from the experience or any aspect of the experience relevant or prerequisite to your graduate educational goal?

5. Give the names and locations of those individuals that are acquainted with your work in this area.

Accomplishment 2

1. Briefly describe the experience, providing specific details about where and when it occurred and how and why it was initiated.

2. What skill(s), competence (s), knowledge, or special accomplishment(s) resulted from the experience described above?

3. Can you give any evidence of the quality or level of attainment that this achievement represents (e.g., prize, certificate, letter, recognition, impact on individuals)?

4. What makes the skills, competence, or knowledge resulting from the experience or any aspect of the experience relevant or prerequisite to your graduate educational goal?

5. Give names and locations of those individuals that are acquainted with your work in this area.

Accomplishment 3

1. Briefly describe the experience, providing specific details about where and when it occurred and how and why it was initiated.

2. What skill(s), competence(s), knowledge, or special accomplishment(s) resulted from the experience described above?

3. Can you give any evidence of the quality or level of attainment that this achievement represents (e.g., prize, certificate, letter, recognition, impact on individuals)?

4. What makes the skills, competence, or knowledge resulting from the experience or any aspect of the experience relevant or prerequisite to your graduate educational goal?

5. Give names and locations of those individuals that are acquainted with your work in this area.

Evaluation of the Inventory of Activities and Accomplishments

We want to make this survey as accurate and fair as possible. You could help us do this if you spend a few minutes looking back over the questionnaire with the following questions in mind: (1) How do you feel about the whole questionnaire? (2) Were there any questions that caused you trouble because they were unclear, difficult to answer, or asked for details you could not provide? (3) Did any of the instructions cause you problems because they were unclear or confusing?

1. Did you understand the purpose of the inventory?

- Yes
- No, not really
- Only generally, but I was not sure how it would be used

2. About how long did it take you to complete the survey?

_____ minutes

3. If you were filling out the questionnaire as an applicant to graduate school, would you consider the time needed to complete it to be time well spent?

- Definitely
- Yes, with reservations
- No, with reservations
- Definitely not

Comments: _____

4. Would you like to have a survey like this available as part of routine application procedures?

- Definitely
- Yes, with reservations
- No, with reservations
- Definitely not

Comments: _____

5. Do you feel that the inventory allows you to present an accurate picture of your activities and accomplishments?

- Yes
- No

Comments: _____

6. In the space below please list the item number of any question that caused you trouble, indicate the nature of the trouble, and provide any comments about how to improve the question.

Nature of Problem
(check as many as apply)

Item number	Unclear	Hard to answer	Asked for details that were hard to remember	Comments
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

7. Did any of the instructions create problems for you? If so, please list the page and section, and describe the problem (e.g., confusing, unclear, etc.). Any suggestions for improvements would be especially welcome.

Page/Section	Problem

8. Would you be willing to be interviewed about the inventory by an ETS staff member?
 Yes No

If yes, how can we contact you?

Address: _____

Phone number: _____

GRE BOARD RESEARCH
REPORTS OF A TECHNICAL NATURE

- Boldt, R. R. Comparison of a Bayesian and a Least Squares Method of Educational Prediction. GRE Board Professional Report GREB No. 70-3P, June 1975.
- Campbell, J. T. and Belcher, L. H. Word Associations of Students at Predominantly White and Predominantly Black Colleges. GRE Board Professional Report GREB No. 71-6P, December 1975.
- Carlson, A. B.; Reilly, R. R.; Mahoney, M. H.; and Casserly, P. L. The Development and Pilot Testing of Criterion Rating Scales. GRE Board Professional Report GREB No. 73-1P, October 1976.
- Carlson, A. B.; Evans, F.R.; and Kuykendall, N. M. The Feasibility of Common Criterion Validity Studies of the GRE. GRE Board Professional Report GREB No. 71-1P, July 1974.
- Donlon, T. F.; Reilly, R. R.; and McKee, J. D. Development of a Test of Global vs. Articulated Thinking: The Figure Location Test. GRE Board Professional Report GREB No. 74-9P, June 1978.
- Echternacht, G. Alternate Methods of Equating GRE Advanced Tests. GRE Board Professional Report GREB No. 69-2P, June 1974.
- Echternacht, G. A Comparison of Various Item Option Weighting Schemes/A Note on the Variances of Empirically Derived Option Scoring Weights. GRE Board Professional Report GREB No. 71-17P, February 1975.
- Echternacht, G. A Quick Method for Determining Test Bias. GRE Board Professional Report GREB No. 70-8P, July 1974.
- Evans, F. R. The GRE-Q Coaching/Instruction Study. GRE Board Professional Report GREB No. 71-5aP, September 1977.
- Fredericksen, N. and Ward, W. C. Development of Measures for the Study of Creativity. GRE Board Professional Report GREB No. 72-2P, June 1975.
- McPeck, M.; Altman, R. A.; Wallmark, M.; and Wingersky, B. C. An Investigation of the Feasibility of Obtaining Additional Subscores on the GRE Advanced Psychology Test. GRE Board Professional Report GREB No. 74-4P, April 1976.
- Powers, D. E.; Swinton, S.; Thayer, D.; and Yates, A. A Factor Analytic Investigation of Seven Experimental Analytical Item Types. GRE Board Professional Report GREB No. 77-1P, June 1978.
- Powers, D. E.; Swinton, S. S.; and Carlson, A. B. A Factor Analytic Study of the GRE Aptitude Test. GRE Board Professional Report GREB No. 75-11P, September 1977.
- Reilly, R. R. and Jackson, R. Effects of Empirical Option Weighting on Reliability and Validity of the GRE. GRE Board Professional Report GREB No. 71-9P, July 1974.
- Reilly, R. R. Factors in Graduate Student Performance. GRE Board Professional Report GREB No. 71-2P, July 1974.
- Rock, D. A. The Identification of Population Moderators and Their Effect on the Prediction of Doctorate Attainment. GRE Board Professional Report GREB No. 69-6bP, February 1975.
- Rock, D. A. The "Test Chooser": A Different Approach to a Prediction Weighting Scheme. GRE Board Professional Report GREB No. 70-2P, November 1974.
- Sharon, A. T. Test of English as a Foreign Language as a Moderator of Graduate Record Examinations Scores in the Prediction of Foreign Students' Grades in Graduate School. GRE Board Professional Report GREB No. 70-1P, June 1974.
- Ward, W. C.; Fredericksen, N.; and Carlson, S. B. Construct Validity of Free-Response and Machine-Scorable Versions of a Test of Scientific Thinking. GRE Board Professional Report GREB No. 74-8P, November 1978.
- Ward, W. C. and Fredericksen, N. A Study of the Predictive Validity of the Tests of Scientific Thinking. GRE Board Professional Report GREB No. 74-6P, October 1977.