What can SAS® Certification do for you or to you?

A multi-faceted look at objectives and their functional relationship to job performance.

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ABSTRACT

This paper will explore the stated objectives of the SAS® Certified Professional V6 (Level I) Exam, the "cornerstone" of the SAS® Certified Professional Program™ (www. sas.com/certification). What do these objectives have to do with job performance? Can these objectives help you perform better technical screenings, market your services more effectively, train others more efficiently, better support your clients, or get a better job with more money or responsibilities? This paper is an initial attempt to describe these objectives in terms of skills that relate to on-the-job performance from different perspectives.

INTRODUCTION

Who should care about SAS certification or about becoming a SAS Certified Professional? Obviously, the SAS Institute cares because it has invested much time, effort and expense on its certification program. The stated goals for the SAS Certified Professional Program™ include developing a certification program with international recognition by establishing a universal minimum standard for measuring SAS software knowledge and increasing SAS software knowledge in the marketplace (www.sas.com/service/edu/certify). Increasing knowledge may be a good goal, but knowledge alone may not directly relate to the application of specific on-the-job programming tasks, problem-solving skills, or professional experience. What will this certification mean to those who may have additional or different goals: a) hiring managers in a company, agency, or contracting firm, b) individual independent consultants, c) SAS trainers and d) individual SAS users in industry and academia?

OVERVIEW OF LEVEL I EXAM OBJECTIVES

According to the SAS Institute, the first-level exam represents the cornerstone of their certificate program. Further, it is a prerequisite for certification on the other exams because the assumptions are that those candidates passing the exam have a "solid understanding of the basics of the SAS system" and a "firm foundation on which to build their SAS programming skills" (.../certify/beta.html). There are 40 stated objectives for the first level covering five main areas: accessing data (6 objectives), creating data structures (7 objectives), managing data (18 objectives), reporting (6 objectives) and working within the SAS environment (3 objectives)(from .../certify/test1.html) as follows:

I. Accessing Data

1. Use FORMATTED, LIST and COLUMN input for raw data files.
2. Use INFILE statement options when reading raw data files.
3. Use INPUT statement with column and line pointer controls, trailing @ and double trailing @ controls.
4. Access SAS data sets with DATA step statements.
5. Combine SAS data sets using DATA step statements.
6. Use SAS/ACCESS software to access supported DBMS data.

II. Creating Data Structures

1. Create temporary and permanent SAS data sets.
2. Explain compilation and execution of the DATA step.
3. Create and manipulate SAS date values.
4. Understand the role of a BY statement in the DATA step.
5. Control which variables are processed in a SAS data set.
6. Control which observations are processed in a SAS data set.
7. Create descriptors with SAS/ACCESS software.

III. Managing Data

1. Investigate SAS data libraries using SAS utility procedures.
2. Use SAS procedures to investigate/evaluate data quality.
3. Sort SAS data set observations.
4. Apply labels to variables in SAS data sets.
5. Apply formats to variables in SAS data sets.
6. Create and use user-defined formats.
7. Use data set options to modify variable attributes.
8. Conditionally execute SAS statements.
9. Use ASSIGNMENT statements in the DATA step.
10. Explicitly define the lengths of character variables.
11. Accumulate variable values across executions of the DATA step.
12. Use SAS functions to manipulate character data, numeric data, and SAS date values.
13. Use SAS functions to convert character data to numeric data (and vice versa).
14. Process and execute SAS statements iteratively using DO loops.
15. Process data using SAS ARRAY statements.
16. Understand how to define array elements including assigning initial values.
17. Explain why a special missing value is used and how it is included.
18. Understand how to edit SAS/ACCESS descriptors.

IV. Reporting

1. Create simple PRINT procedure reports.
2. Select observations to include in a list report.
3. Group observations in a list report.
4. Add titles and footnotes to reports.
5. Produce one- and two-dimensional tabular reports using the TABULATE procedure.
6. Use TABULATE procedure statements, options, and operators to control the table appearance.

V. Working within the SAS Environment

1. Identify and resolve common problems in SAS programs.
2. Recognize data errors and corresponding messages in the SAS log.
3. Set SAS system options.

These five topic area and their corresponding objectives fit well within 3 of the 4 data-driven task functions of the SAS system to: access, manage, present and analyze data. Indeed, 75% of the objectives (30 of 40) directly deal with understanding how the SAS system processes data. The fifth area of test content, working within the SAS environment, includes two of its three objectives for debugging SAS programs by recognizing common problems and data errors in SAS programs and logs. Accordingly, almost all of the objectives involve DATA step processing using the BASE module of the SAS system, except for three objectives involving the ACCESS module, one cross-over objective using both the BASE and FSP modules to check data quality, and one miscellaneous objective for setting SAS options (these may affect data access, management, presentation, and analysis in every module). The remaining six objectives for reporting deal with simple PROC PRINT and PROC TABULATE issues in the BASE module.

PREPARATION TO MEET LEVEL I EXAM OBJECTIVES

The SAS Institute does not require exam applicants to follow any prescribed curriculum, but assumes that the knowledge to successfully pass each exam comes from experience (.../certify/prep.html). Along with giving a general exam description, the SAS Institute also suggests recommended courses and reference materials for each exam. Currently, there are two recommended SAS Institute classes in preparing for the Level I exam (SAS® Fundamentals: A Programming Approach and SAS® Programming) along with four reference publications (SAS Language Reference,

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SAS Procedures Guide, PROC TABULATE by Example, and Combining and Modifying SAS Data Sets: Examples). Anyone who has tried to learn SAS by reading the reference publications can readily ascertain the utility and frustration of using this approach. However, the two recommended courses teach much of the knowledge required to pass the Level I Exam.

The first recommended course, Fundamentals, is a three-day course that does not require prior SAS programming experience, but assumes that one has at least 6-months data processing experience. This course teaches how to read, modify and summarize data in SAS. Thus, this course addresses basic Data step processing elements such as assignment operators, functions (including date functions), selecting variables (using KEEP, DROP, and RENAME key words), and conditional processing (using IF, ELSE, and WHERE statements). This course also introduces procedures (PROCs) such as PROC PRINT, PROC TABULATE, and PROC FORMAT to create simple reports. Other PROCs covered include UNIVARIATE, FREQ, CHART, PLOT, FSEDIT, etc. Not surprisingly, many of the objectives mentioned in the course materials are directly related to those objectives tested on the Level I Exam (.../courses/fpro_out.html).

The second recommended course, SAS Programming, is a three-day course that builds on the Fundamentals course and assumes that one has at least 6-months of SAS programming experience and has taken the Fundamentals course. This course goes into much more depth on how to do complex data manipulation and transformation. As such, this course deals with iterative DO loop processing, arrays, numeric functions, character functions, and character-to-numeric data conversion (and vice versa). Structured Query Language (SQL) processing is also covered, although it is not clear whether SQL is currently required to pass the Level I Exam. If SQL is not required to pass the Level I Exam, then why should we take the time to learn PROC SQL? Even with this caveat, many of the objectives in the course materials are directly related to those objectives tested on the Level I Exam (.../courses/prog_out.html).

There is a single reference to ACCESS in the index of the Programming Course Notes noting SAS file member types, but the ACCESS module is neither introduced nor taught in either course. Further, ACCESS is not discussed in any of the four references recommended by the SAS Institute as listed above. Why is there no training recommendation to learn ACCESS? How can you manage, analyze and present data that you do not know how to access? Has an executive or other professional in your company asked you to "push a button" to access data stored in an old database or asked you to integrate data stored on the executive's own PC in MS Excel? Even if this situation has never happened to you, this can be one type of "real world" problem solving using SAS. Should we assume that knowledge of the ACCESS module is necessary to pass the Level I exam? Many SAS programmers no longer have to read raw data ASCII files, because the data is already entered into some type of data base system or electronic form other than ASCII. If we assume that this knowledge is necessary to pass the Level I Exam, then how do we learn about this module? The author recommends taking the SAS Institute one-day course titled Processing Database and Spreadsheet Data with SAS/ACCESS® Software because this course introduces concepts that help solve many data access problems in the workplace. The Course Notes give many good examples and exercises.

Is one properly prepared to take and pass the Level I Exam objectives after six months of SAS programming experience, taking the six days of training recommended by the SAS Institute, taking the additional day of SAS/ACCESS training, and getting familiar with the four reference publications? Probably yes, because these sources of preparation represent a body of knowledge that is directly related to the knowledge assessed by the Level I Exam as stated in the current objectives. However, accumulated knowledge may not transfer to specific on-the-job programming tasks. Also, this knowledge may not truly reflect underlying ability or potential, flexible problem-solving skills, or qualified professional experience relevant to industry-specific needs.

MEANING FOR HIRING MANAGERS

As a hiring manager, I use many factors in gathering information to make a hiring decision including assessment of general ability, specific technical skills, problem-solving skills, personality, education, training, experience, references, etc. Of course, the best predictor of whether someone can do the job is that he/she is already doing it! Hiring decisions can be extremely important and costly to all concerned. Will knowing that someone has passed the SAS® Certified Professional V6 (Level I) Exam help in reducing interview time or result in better technical interviews? The Level I Exam represents a small subset of knowledge that is typically assessed in technical screenings or interviews. Usually, additional evidence of expertise with SAS functions, Macro processing, report writing with PROC REPORT and DATA _NULL_, PROC SQL, SAS/STAT, and SAS/GRAPH is necessary. Some knowledge in these areas may be assessed by two additional certification exams, the SAS Certified Professional – Data Management Exam and the SAS Certified Professional – Business Intelligence Exam. Beyond the minimum knowledge represented in the three certification exams mentioned above, we also need to know how job applicants have applied their knowledge in these areas to produce objective results. As such, the current Certified Professional Exams give no direct evidence regarding the functional relationships between the stated objectives and on-the-job performance required of actual job applicants. In the future, evidence should be gathered to assess whether those job applicants with SAS Certification actually answer questions better on technical screening instruments and whether their increased knowledge is related to on-the-job performance in tasks such as producing validated analyses, tables, listings and graphs. For those hiring managers who have neither the time nor expertise to conduct detailed technical screenings, the SAS Certified Professional Exams may be a useful starting point. Information from these Exams may provide an important source of technical information and a useful tool for measuring job applicant knowledge.

MEANING FOR INDEPENDENT CONSULTANTS

As an independent consultant with over 17 years of SAS experience, my primary concern is marketing my services and expertise. Most successful independent consultants already possess the knowledge represented in the Level I Certification Exam to satisfy their customers. So why take the initial Level I Certification Exam? Can the time and expense for the Level I Exam be justified by increased sales? In the short run, the answer is "probably not", because there is no current market developed for the certification. However, a market may well develop such that clients, especially new clients, demand SAS certification as part of their Quality Control requirements. I decided to take the Level I Exam partly in anticipation of such a market developing and received notice of a passing score at the end of July just before finishing this paper. My motivation for taking the Exam was not solely for marketability, but for direct, personal interest in writing this paper. I didn't think I needed to be certified at this time, but I was curious enough to take the exam to assess my knowledge and overcome the potential embarrassment of failing. As a result of writing this paper, my company is considering whether this certification should be required of our SAS consultants because the SAS Institute, along with its customers, may have great incentives to create the necessary market. Of course, just as markets can be created, markets can also be driven away or destroyed through a variety of sources outside our control.

MEANING FOR SAS TRAINERS

As a SAS trainer, I believe the topics and objectives presented in the Level I Exam provide for a meaningful direction and focus of curricular activities. SAS trainers have an opportunity to integrate materials from at least three

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separate courses and four publications as well as designing new materials to further understanding. Rather than mere lecture, another aspect of training may be the need to assess students' progress through sample questions similar to those asked on the Exam. Indeed, a new market for Certification Exam preparation may evolve like the Microsoft Certification Exam preparation training. There is room for instructional method innovation while standardizing training objectives. One drawback is the potential waste of instructional/classroom time in obtaining objectives that do not meet particular industry, company, or individual performance goals. Also, trainers may "teach the test" in order to increase their students' passing rates and, therefore, fail to teach other pertinent data processing and programming principles.

MEANING FOR INDIVIDUAL SAS USERS

Some important criteria for assessing the importance of Certification Exams to individual SAS users in industry and academia involve obtaining a job or bettering one's current position. To what extent will the Level I Exam certification help someone get a SAS programming job, a better job, or a promotion? SAS Certification may be a good vehicle for gaining an entry-level position. It is one tangible way to objectively measure one's level of knowledge against a standard. This is particularly true if one accepts the SAS Institute's claim that mastering the Level I Exam indicates a firm foundation with a solid understanding of the basics of the SAS system. At any rate, the basics are usually a good place to begin. Whether or not the time or the expense of training (at least 7 days of full-time SAS Institute training with a cost of $2100) and certification ($150 per Exam) will be worth the effort for an individual SAS user to increase their level of SAS knowledge will be determined in the marketplace. The Level I certification will be successful to the extent that this certification can give a reasonable return on investment. Otherwise, individual SAS users may invest their time and efforts pursuing other career enhancing alternatives.

CONCLUSION

This paper explored the objectives of the SAS® Certified Professional V6 (Level I) Exam by presenting an overview of those objectives and the potential meaning(s) of the Exam from the viewpoints of a hiring manager, independent consultant, trainer, and individual user. Hiring managers may make some limited, qualified use of the objectives in this Exam as a starting point in their technical screening procedures. Independent consultants may find no compelling reasons for taking the Exam until a market develops that forces them to reevaluate the costs and benefits. Trainers may find that these objectives provide a better structure to effectively teach the basics. Some trainers may not want to invest the time and energy into creating a new, different curriculum based on these objectives, while other trainers may see the chance to provide test preparation as another market opportunity. Many individual SAS users may readily accept the certification program as a new career direction that has the potential of gaining a new job, a better job, or a promotion in their present job. The success of the SAS® Certified Professional Program™ and the SAS® Certified Professional V6 (Level I) Exam will be determined, in part, through its acceptance by SAS professionals such as hiring managers, independent consultants, SAS trainers, and individual SAS users like those found at this conference. Is the SAS Institute goal of developing a certification program with international recognition by establishing a universal minimum standard for measuring SAS software knowledge compatible with or complementary to your own goals? Is this basic knowledge related to what you need as a hiring manager, independent consultant, trainer, or user? Are these objectives useful, necessary, sufficient, or required for performing your programming tasks, solving your programming problems, or meeting your professional goals? These are questions only you can answer for yourself.

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