Introduction

1985 was a banner year for the Education Division of SAS Institute. Twenty-five new courses were introduced and six others updated. With these additions to the training program, you have over forty courses from which to choose. These forty courses provide a complete training plan for all users—from the novice end user to the seasoned data analyst. But so many choices can be overwhelming—how do you select the right course or sequence of courses for your training needs?

To help you make a selection, we suggest five curriculum paths. These paths are designed for end users, programmers, and analysts who want SAS software training and end users and programmers who want SYSTEM 2000® Data Base Management System training. You may find one path that suits your needs. Or you may find that the best training program for you combines different paths. The five curriculum paths are shown in detail below.

Training for End Users

Some training courses are designed specifically for end users. Most end users have minimal experience with computers and want to use the computer as a tool to perform specific tasks. End users want training that is task oriented, allows branching to specific lessons, and produces quick results. Users are not interested in knowing how the software is designed or knowing all possible ways to accomplish an objective.

During course development, we consider the limited experience end users have with the computer system and their desire for quick results. Many of our end user courses are video- or computer-based, providing self-paced options and an ideal training tool for the information center. In all of these end user courses, the emphasis is on the tasks to be performed with the software, not the design of the software itself. If a task can be accomplished in different ways, only the most common method is presented.

Background: Before beginning the end user training path, you should be able to log on and off the computer system, access data files, edit data within a file, and print hard copies of files. Users with these skills are able to progress quickly through one of the foundation courses and then select courses appropriate for their desired goals with the SAS System.

The End User Path: In figure 1, you see an overview of the courses designed for and recommended to end users. Dashed lines in the boxes indicate different courses that cover similar topics. Start with one of three foundation courses. From that beginning, if you want to learn more details on using the SAS System as a programming language, follow the branches to the right. If you have special applications, such as creating graphical displays, then select from the End User Special Interest Table (table 1).

As you grow in your use of the SAS System, you may want courses with more depth or more detailed instruction. If so, look at the curriculum paths for programmers and analysts. If you study in one of the other paths, we recommend that you begin with one of the foundation SAS Basics courses. Although you have experience with the SAS System from the end user courses, the Basics courses introduce many new concepts fundamental to all other courses.

End User Special Interest Table: Once you have completed a foundation course, select courses from this table according to your goals with the SAS System. Each of these courses builds on the skills you gain in your foundation course and provides instruction in a specific area. You may select any of these courses in any order.

Jean Ussery, SAS Institute Inc.
Training for Programmers

Programmers spend a majority of their time designing systems or developing applications. Typically, programmers are interested in using the SAS language as a traditional programming tool. Programmers want to know the ins and outs of the software, details of how the SAS System operates, and tricks they can employ to accomplish a particular goal.

Courses for programmers include more details of the internal operation of the SAS System. If there is more than one way to complete a task, several options are discussed and compared. Courses oriented to programmers move at a faster pace and build on prior experience with other computer languages.

Background: These courses assume prior experience with a computer language. Typically, we do not discuss fundamental, experience with a computer language. Prior to beginning the programmer path, you should understand programming logic and be able to issue operating system commands, manage your use of computer resources, and execute programs.

The Programmer Path: The foundation of the programmer curriculum is a SAS Basics course, as shown in figure 2. Select the Basics course appropriate for your operating environment. After the foundation course, increase your skills with the SAS System as a programming language or in specific applications. Follow the right branch in the diagram for additional study in using the SAS System as a programming language. See the Programmer Special Interest Table (table 2) for special applications.

Programming Courses: These courses are designed to help you master using the SAS System as a programming language. The arrows in the diagram indicate possible sequences in which to take these four courses.

Note that the SAS® Report Writing course is listed here, rather than in the special interest table. While the report writing course is oriented to a specific application, it introduces the concept of using a series of steps in a SAS session to accomplish a desired task. Sample programs in the course require four or five steps to manipulate the data into the desired form for reporting. You learn to break problems into component steps and then write the SAS code to accomplish each step.

Also note the new course, Applications Programming Using the SAS® System. This course provides instruction in building large production jobs with SAS software, and testing and maintaining those systems. You also see methods for organizing data in multiple SAS data sets to create a conceptual SAS data base.

Programmer Special Interest Table: These courses are designed to help you use the SAS System in specific applications. The Programmer Special Interest Table (table 2) lists application areas and specific SAS software and lists courses that provide training in these areas. Note that these courses may be taken in any order and presume that you are proficient with SAS programming at the level presented in the Basics courses. Dashed lines in the table indicate different courses that cover similar topics.
Training for Analysts

Analysts use the computer primarily for data manipulation and data analysis. In this respect, the analyst is an end user. Most analysts, however, completed one or more computer programming courses in college and are quite comfortable using the computer system. In this respect, the analyst is a programmer. The curriculum for analysts builds from both end user and programmer foundation courses.

Background: The analyst needs some computer and analysis skills before beginning this curriculum. You should be able to log on and off the system, access data files, use an editor, and produce hard copies. In addition, you need some background in statistics—at least an introductory college level course. If you need a refresher course in statistics, be sure to take one of the introductory courses shown in figure 3. These courses were developed for those who have taken a college level course but need a review before going on to some of the more advanced topics in the curriculum. If you have a more extensive background in statistics, you can bypass the introductory course.

The Analyst Path: The suggested path for analysts is diagramed in figure 3. From the foundation course, follow the right branch if your primary interest is regression analysis. The dotted line in the second box indicates that you can select one of these courses before continuing on the regression path. If you are interested in other applications, see the Analyst Special Interest Table (table 3).

![Figure 3 Analyst Path](image)

Table 3 Analyst Special Interest

<table>
<thead>
<tr>
<th>Task</th>
<th>SAS Software</th>
<th>Course</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyzing &quot;messy&quot; data</td>
<td>base SAS®</td>
<td>Analysis of Research Data: Practical Applications</td>
</tr>
<tr>
<td>Analyzing general linear models</td>
<td>base SAS®</td>
<td>Experimental Design and Analysis</td>
</tr>
<tr>
<td>Performing factor and cluster analysis and canonical correlation</td>
<td>base SAS®</td>
<td>Applied Multivariate Analysis: Concepts and Applications</td>
</tr>
<tr>
<td>Generating forecasts</td>
<td>SAS/ETS®</td>
<td>Automatic Forecasting for Decision Support</td>
</tr>
<tr>
<td>Solving network flow problems and linear, integer, and mixed integer problems</td>
<td>SAS/QP™</td>
<td>Operations Research *</td>
</tr>
<tr>
<td>Constructing control charts and performing capability analysis</td>
<td>SAS/QC®</td>
<td>Basic Statistical Quality Control</td>
</tr>
</tbody>
</table>

* Note that the Operations Research course does not require an introductory statistics course. You should have experience with linear programming.

Training for SYSTEM 2000 End Users

End users of SYSTEM 2000 data bases want to be able to access a data base and extract data. The two courses in this path are designed for end users with minimal computer experience.

Background: Prior to entering this path, you should be able to log on and off the system and use the terminal to enter data and commands.

The SYSTEM 2000 End User Path: Figure 4 shows the path for end users of SYSTEM 2000 DBMS. The course for nonprogrammers provides instruction in interpreting the data base definition and constructing commands to retrieve data interactively. In the report writing course, you learn how to produce reports from the data base.

![Figure 4 SYSTEM 2000 End User Path](image)
Training for SYSTEM 2000 Programmers

This path serves two types of programmers: those who want to extract data from the data base for use in a COBOL, FORTRAN, or PL/I program and those who are data base administrators responsible for creating and maintaining SYSTEM 2000 data bases.

Background: Before entering this curriculum, you should understand programming logic and be able to issue operating system commands to perform common data processing tasks.

The SYSTEM 2000 Programmer Path: Figure 5 starts with the fundamentals course for basic concepts on the internal file structure of SYSTEM 2000 data bases and for learning the ACCESS language for retrieving and updating data. If you want to use data from a data base within a COBOL, FORTRAN, or PL/I program, continue with the applications programming course. If you are a data base administrator, you should take the design and implementation course.

Conclusion

The curriculum paths discussed here are suggestions. Your training program may follow one of these paths or you may create your own by mixing ideas shown here. If you need assistance in selecting the appropriate course for your needs, contact the Education Marketing and Sales Department at SAS Institute. We will be happy to discuss your background and your goals and to advise you on a training path. If you are a training coordinator, we can help you plan a training program to meet the needs of all your SAS software and SYSTEM 2000 DBMS users. We welcome your written suggestions for enhancing existing courses or for new courses you would like to see developed.

For more details on all of the courses, please see SAS Training®, our semi-annual training directory. Each issue of SAS Communications® contains training announcements and a schedule of public lecture and lecture/workshop courses. Detailed descriptions of each course are available from the Education Marketing and Sales Department.

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