

Critical Path Learning – How to Develop Top Level SAS[®] Programmers

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ABSTRACT

Critical path learning is a method for ensuring continual learning of subject matter. In order to train statisticians to become top level SAS[®] programmers, it is important to define the guidelines of a quality training program and integrate the basic concepts so students can have a solid understanding of the fundamentals moving forward. The concept to be demonstrated in this paper is how to create a set of lessons for teaching university level statistics students the basic concepts of SAS[®] programming in a 20-hour accelerated course. As a Professor of Statistics at the University of Bologna and the CEO of CROS NT Group, I will draw on examples being implemented in both a university atmosphere and in a corporate setting through CROS NT's CROS Academy, a series of training courses and webinars from top statisticians both in the CROS organization as well as external consultants.

INTRODUCTION

CRITICAL PATH LEARNING IS A METHOD FOR ENSURING THE INTEGRATION OF BASIC CONCEPTS, FOLLOWED BY A TRAINING PATH TO ENSURE CONTINUAL LEARNING OF SUBJECT MATTER. IN ORDER TO TRAIN STATISTICIANS TO BECOME TOP LEVEL SAS[®] PROGRAMMERS, IT IS IMPORTANT TO DEFINE THE GUIDELINES OF A QUALITY TRAINING PROGRAM.

DEFINING THE NEED: PROFESSIONALS IN BIOMETRICS

The biometrics industry is in need of professionals, especially in areas of statistics, programming and data management. In order to have the necessary industry professionals, there is a need for proper training and preparation in the field. The European Union is facing a future with a lack of experts. With many outsourcing projects in the pharmaceutical industry now going to India and China, there is a lack of senior professionals with the proper skills to manage these activities.

The European Federation of Statisticians in the Pharmaceutical Industry (EFSPI) has defined a need for the statistical community to deal with the changing environment more adequately as more clinical operations like data management and statistical programming are moving to India and China.

Critical path learning at both an academic level and a professional corporate level is the best way to train professionals and maintain their skill set as they progress in their careers.

DEFINING CRITICAL PATH LEARNING

Critical path learning is a method for ensuring continual learning of subject matter. The core element is defining a training plan that allows the student to move forward in the learning process while maintaining all the previous acquired knowledge.

At the corporate level, critical path learning means a training path must be defined and an operational unit must be in place to manage training. Ideally for business critical path learning, partnerships and being involved with universities is essential for having an academic background applied to the training path.

COMPANY STRATEGIC PLAN

At CROS NT Group, the critical path learning program falls under the responsibility of the "Training and Development" department. The training path is then defined based on the company Job Ladder. An individual must be able to grow within a company and each advanced level requires an additional knowledge base.

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The training path must then be validated with a Pilot Exercise with feedback from both the instructor and the trainee. Most importantly, a training plan must be continuously updated and validated. Within the CROS NT Group, each employee is required to keep a Training Log and complete at least 10 hours of training a month. This log allows trainees and heads of unit to monitor progress in the training program.

DEFINING THE TRAINING PLAN

- The training plan needs to be drafted under the cooperation of the Training and Development department along with the Head of Unit. The head of each operational and business unit knows best the type of training required for the employees under his or her direction.
- The plan should be drafted on a yearly basis.
- Once needs are defined, the Training and Development department and the Head of Unit need to create an appropriate training plan.
- The next step is to find the best qualified trainers for the training plan. Not only is it necessary to find a trainer well qualified in the subject area, but also one who is able to communicate well and speaks the same language as the trainee.
- While developing the training plan and looking for qualified trainers, all external offerings should be considered.
- Finally, there should be a quality assessment of the trainings to be sure they are meeting the goals and objectives of the training plan.

This same process applies also for new employees. Critical path learning, whether for new or existing employees, is always an on going process. Before an employee can start relative activities, critical learning needs should be defined. The training plan for each individual should be focused on his or her responsibility within a clinical study.

CROS ACADEMY AND THE STATISTICAL SCIENTIFIC BOARD

In order to establish a proper training method within an organization, it is important to assign a task force to training and development. At the CROS NT Group, the CROS Academy was created to support internal and external training through a proper internal organization, in particularly focusing on statistical methodology, SAS programming, Oracle Clinical and Data Management procedures.

CROS Academy focuses on training configuration which includes training sessions, pre-configured exercises and eLearning.

The CROS NT Group has also established a group to support the creation and the validation of a training path and CROS Academy trainings – the Statistical Scientific Board. This group is composed of prominent statisticians who serve as a think tank for statistical methodology and programming and offer consultancy on statistical challenges facing the clinical trial environment.

The Board meets bi-annually to define training paths for consultancy and critical learning in statistics. Therefore, the Statistical Scientific Board works in conjunction with CROS Academy by supplying professional and quality training material. The Statistical Scientific Board is qualified to guide CROS Academy critical training paths based on its experience on an international level, with both the EMA and FDA, and a wealth of expertise in biostatistical analysis. This Board provides a foundation for critical path learning and training.

These two bodies are important for establishing training paths and continuous learning within a corporate organization. One body, the Statistical Scientific Board, provides the expertise and knowledge base to define training programs. The CROS Academy carries out and validates the critical learning path for employees and provides evaluation methods for ensuring the success of each employee's training path.

CRITICAL TRAINING PATH FOR SAS[®] PROGRAMMERS (CORPORATE SETTING)

Before divulging into the integration between corporate critical learning and university learning, it is important to put the corporate learning path to test in the corporate setting. Using the case of SAS[®] programmers, CROS NT has worked to define a structured training path based on employee comprehension levels and learning objectives. As discussed earlier, the training path is defined through the Training & Development Unit which collaborates with the Head of Unit.

In this case at CROS NT, the Head of Unit for Statistical Programming defines a clear training path to ensure each SAS[®] programmer that enters into the organisation has a chance to grow professionally and reach advanced level training courses.

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At CROS NT, SAS® Programmers follow the following critical training path:

- Survival Analysis Using the Proportional Hazards Model
- Statistical Process Control Using SAS/QC Software
- Statistical Graphics with ODS
- Statistical Analysis with the GLIMMIX Procedure
- Introduction to Programming with SAS/IML Software
- Getting Started with SAS Office Analytics
- Fitting Poisson Regression Models Using the GENMOD Procedure
- Determining Power and Sample Size Using SAS/STAT Software
- Design and Analysis of Probability Surveys
- Bayesian Analyses Using SAS
- Applied Clustering Techniques
- Advanced Statistical Modeling Using the NLMIXED Procedure
- Advanced and Specialty Courses

The following is a visual representation of the SAS® Programmer training path as defined by the Head of Unit.

INTEGRATION IN UNIVERSITY SETTING

Critical path learning can benefit from partnerships with universities. CROS NT has formed partnerships, so far, with neighboring universities for two reasons: (1) integration through university courses and CROS Academy and (2) support for internal internships

The university setting can help create courses in the critical learning path. The CROS NT CEO is a Statistics professor at nearby Bologna University and can take the academic course work and apply it to SAS® Programming. Therefore, SAS® Programmers can begin training in a 20-hour accelerated course which will set them on the critical learning path to reach advanced levels. As demonstrated in the diagram above, SAS® Programming starts with the essentials. Looking at the above training path, a 20-hour accelerated course should contain the following basics:

- Navigating the SAS windowing environment
- Reading and understanding SAS data sets
- Cleaning SAS data sets
- Creating variables
- Creating summary reports

The 20-hour accelerated course will focus on LLSA (Lifelong Learning and Self Assessment). The most important part of university courses is the feedback from students. As part of the Quality Assessment of courses, students are asked to share their learning experiences. The feedback allows proper evaluation of the critical learning path, for example by CROS Academy. Partnering with a university allows the course to be accredited, and therefore ensures true professionals are being trained.

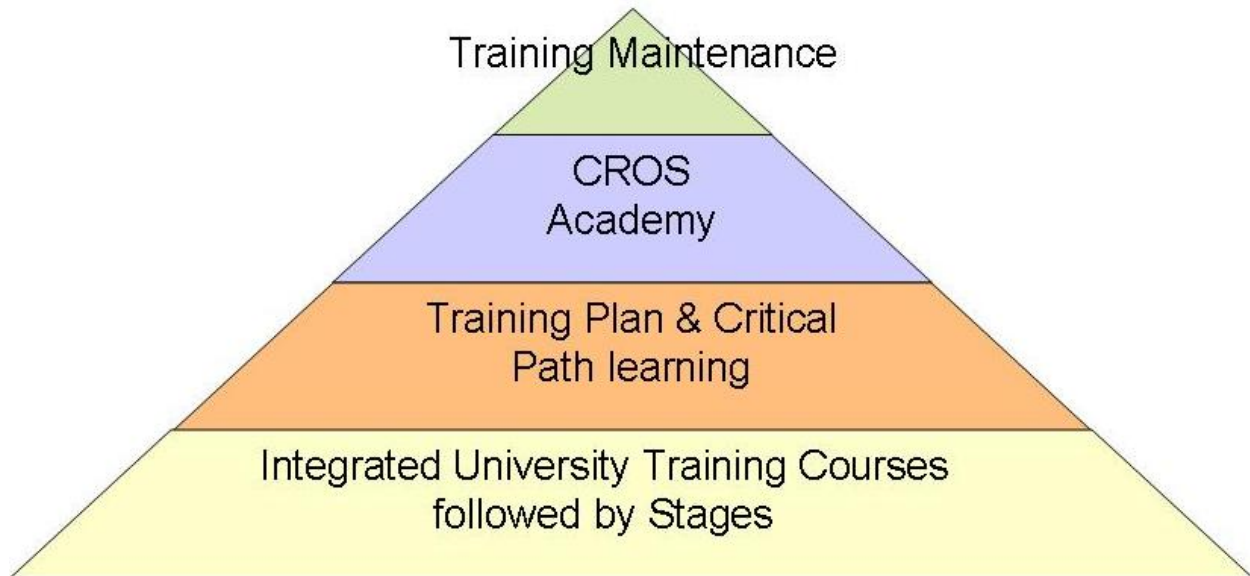
Finally, integration with universities can lead to internship opportunities in the corporate setting. Internships can be a transition from the university to corporate environment based on advancement in the critical learning path. Once “students” have basic SAS programming essentials they can apply these skills to real projects and learn new SAS® programming methods based on their comprehension.

CONCLUSION

To summarise, developing top level SAS® programmers involves a critical training path within the corporate setting and an integration with university learning. To compete with the growing market of talent abroad, SAS programmers need to be trained using the essentials and build a foundation of learning to advance to the top level.

A training development body, like the CROS Academy, is essential for defining and maintaining training programs for SAS® programmers. The following image can define the best way to develop SAS® programmers.

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