A Review of "Free" Massive Open Online Content (MOOC) for SAS® Learners

Kirk Paul Lafler, Software Intelligence Corporation, Spring Valley, California

Abstract

Leading online providers are now offering SAS® users with "free" access to content for learning how to use and program in SAS. This content is available to anyone in the form of massive open online content (or courses) (MOOC). Not only is all the content offered for "free", but it is designed with the distance learner in mind, empowering users to learn using a flexible and self-directed approach. As noted on Wikipedia.org, "A MOOC is an online course, content, or other resource aimed at unlimited participation and made available in an open access forum using the web." This presentation illustrates how anyone can access a wealth of learning technologies including comprehensive student notes, instructor lesson plans, hands-on exercises, PowerPoints, audio, webinars, and videos.

Introduction

The age of massive open online content (and courses), often referred to as MOOC, is not only a reality, it is gaining huge popularity among students and professionals. With education costs on the rise, and in many cases increasing out of control, several higher education institutions and organizations are challenging the current education financial model by offering MOOCs for students, professionals and others to choose from. Higher education Universities such as, Princeton University, Stanford University, Harvard University, Massachusetts Institute of Technology (MIT), University of Pennsylvania, Duke University, University of Michigan, and organizations in the private sector such as, SAS Institute Inc., Coursera, and a number of other organizations and universities around the world are now offering online courses and certificate programs. A number of public, private, and online universities are now offering degree programs that can be completed exclusively online as well.

What is a Massive Open Online Course/Content (MOOC)?

As technology continues to reach for newer and greater horizons, it is becoming increasingly more important for students, professionals, and those with a curiosity to acquire knowledge to have avenues to continue their quest for learning. Many forward-thinking organizations, universities and degree-granting institutions use the advances that technology provides to help make some of their courses available to the masses around the world. A MOOC offers learners everywhere with an alternative to mainstream courses, degrees, and certificate programs that were once only available through brick-and-mortar classrooms where attendees were forced to commute to supported locations or become a resident on college campuses.

A MOOC allows courses and content to be freely taught by the best and brightest in open- and online learning environments to massive audiences. By delivering education in a MOOC format, anyone with a computer (workstation, laptop or "smart" device), an Internet connection and a web browser, can select or enroll in one of the many "free" courses currently being offered, learn from "real-time" or recorded lessons from the comfort of their living rooms, bedrooms, dorms, offices, beach houses, or anywhere else they are in the world. Needless to say, the availability of "free" resources along with the flexibility they offer has fostered a high degree of excitement, enthusiasm and an ever-growing audience for the MOOC format.

How is a MOOC Structured?

A MOOC is structured very similar to an online course. A MOOCs structure typically consists of a course title, abstract or description of its content, a syllabus, expected learning objectives, "live" or recorded lectures or lessons, reading assignments, hands-on assignments, and quizzes. Students tune in to the "live" or recorded lectures, perform the required reading and hands-on assignments, and take the quizzes, adhering to the required scheduled timeline. At the completion of a MOOC, students receive a grade from the MOOC leader or instructor, just as if they had enrolled in a traditional course.

A Review of "Free" MOOC Resources

As the age of massive open online content (and courses) is upon us, the world of the SAS user is also being positively impacted with many "free" MOOC resources. Numerous MOOC courses and content are now available to help support SAS users in their quest to effectively improve their analytical, programming, statistical, and reporting skills. For content and courses that may contain a sizeable amount of material, some MOOC offerings may involve splitting larger and more involved topics into smaller, more digestible, pieces, a process known as specializing. So, where can SAS users find "free" MOOC resources? The following list of "free" MOOC resources is available to SAS users everywhere.

"Free" MOOC Resources for SAS Users

1) **SAS® University Edition software**

2) **Online SAS documentation in PDF and HTML format on support.sas.com**

3) **SAS Proceedings "White" papers on LexJansen.com**

4) **SAS Press and SAS Talks Webinars**

5) **SAS YouTube Channel Videos**

SAS® University Edition Software

The SAS® University Edition is "free" to anyone. It's under the SAS Analytics U umbrella and includes e-Learning modules to help you learn the SAS software. Available for PC, Mac, or Linux Workstations, the SAS University Edition includes Base SAS®, SAS/STAT®, SAS/IML®, SAS/ACCESS® for Windows, and SAS Studio. It works through Virtualization Software in standalone mode and your Browser to access to SAS software.

Base SAS Features

The Base SAS software contains a built in DATA step programming language, the ability to access a wide-range of data sources, comprehensive set of functions to handle data manipulation, an assortment of "canned" and ready-to-use procedures, a comprehensive SQL language, reporting and customization feature for reports and results using Output Delivery System (ODS), data display informats and output formats, comprehensive data visualization features known as ODS Statistical Graphics, data management capabilities, and much more.

SAS/STAT® Features

The SAS/STAT software supports the application of the latest statistical techniques. It supports the following statistical routines: Analysis of Variance, Bayesian Analysis, Categorical Data Analysis, Cluster Analysis, Mixed Models, Multivariate Analysis, Nonparametric Analysis, Regression Analysis, Survey Sampling and Analysis, Statistical Graphics, and much more.

SAS/IML® Features

The SAS/IML software is an interactive matrix programming language and supports the ability to conduct Exploratory Analysis, the integration with the R programming language, dynamically linked graphics, and much more.

SAS/ACCESS® Features

The SAS/ACCESS software supports the ability to read, write, and update data sources; provides a flexible query language; supports the access to a variety of data sources including text files, dat files, CSV files, Excel spreadsheets, Microsoft SQL Server, and ODBC; and much more.

SAS Studio

The SAS Studio software serves as the user interface; supports Web applications; the access to data files, libraries and programs; the ability to recover files; dynamically link graphics; and much more.

SAS University Edition Fact Sheet

The SAS University Edition software Fact Sheet can be access at <u>sas.com/universityedition</u>, see Figure 1, below.
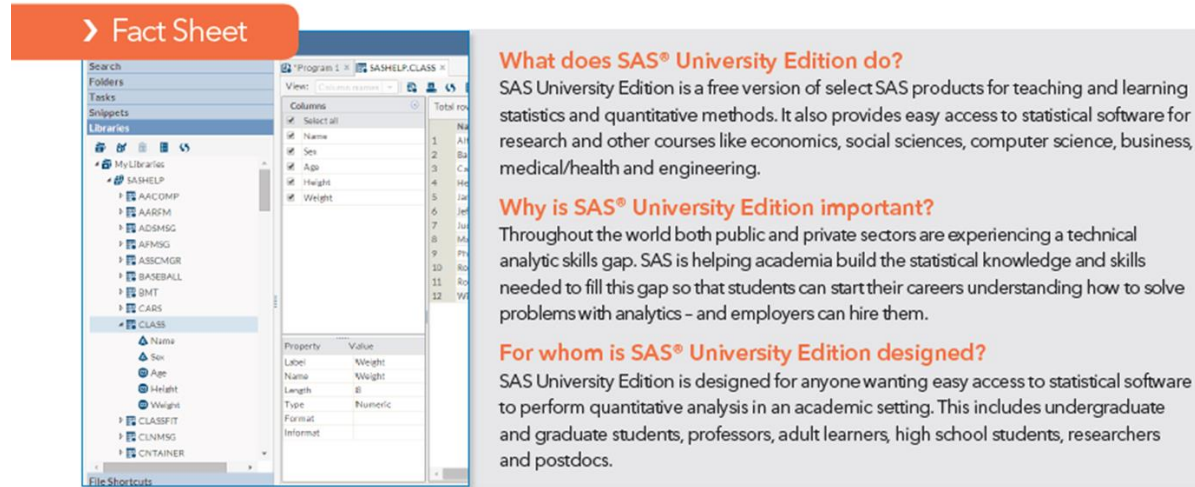
Figure 1. Snapshot from SAS University Edition Fact Sheet at sas.com/universityedition

SAS' Technical Support Website

SAS' technical support website, <u>support.sas.com,</u> contains a wealth of "free" SAS technical support content. Users are provided with access to timely information pertaining to: Admin, Programmer, Statistician and User content; the "best" in class comprehensive technical support content; training and books; what's happenings including User Group Information; access to "free" webinars and podcasts; access to code samples; access to SAS comprehensive documentation; and much more. The support.sas.com user interface is illustrated in Figure 2, below.
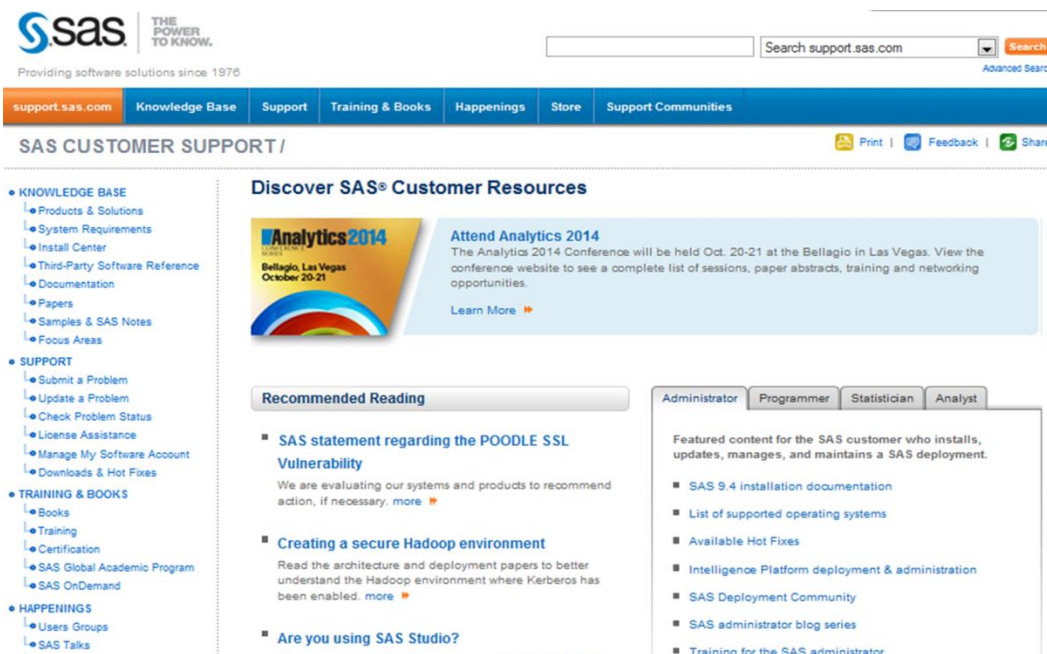
Figure 2. support.sas.com User Interface

Knowledge Base – SAS Products and Solutions

Users can easily explore the Knowledge Base of SAS Products and Solutions, System Requirements, Install Center, Third-Party Software Reference, Documentation, Papers, Samples & SAS Notes, and Focus Areas by accessing http://support.sas.com/software/, illustrated in Figure 3, below.
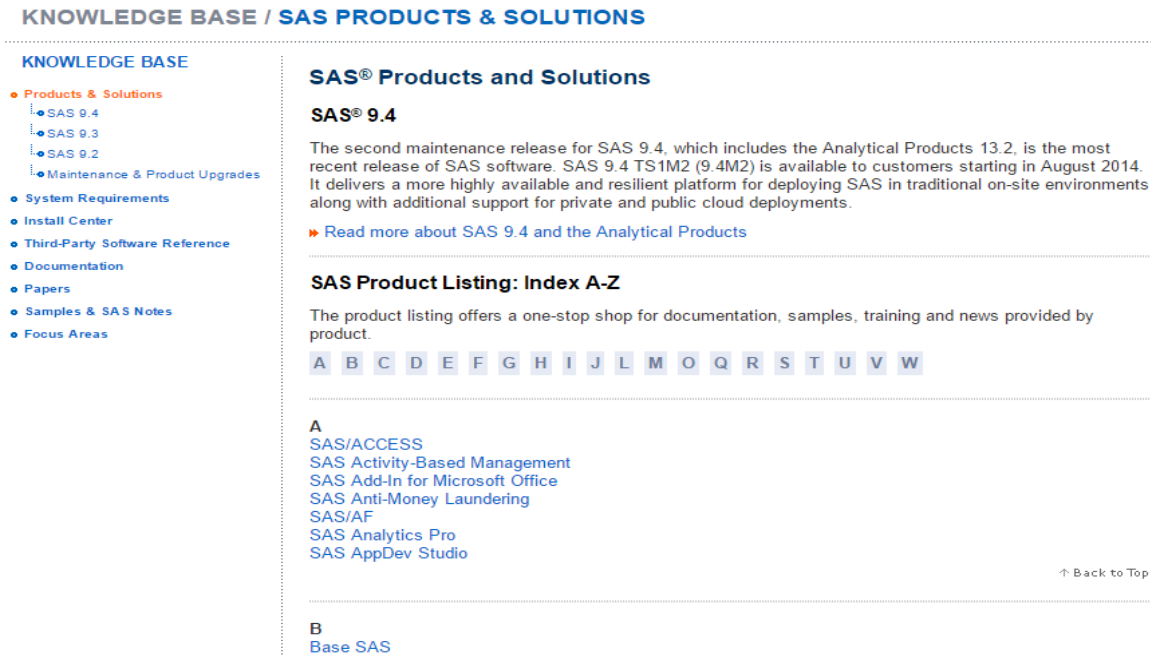
Figure 3. Knowledge Base – SAS Products and Solutions

Knowledge Base – Documentation

Users have the ability to access a comprehensive set of SAS product documentation in either HTML or PDF format and can be accessed at http://support.sas.com/documentation/index.html, as shown in Figure 4, below.
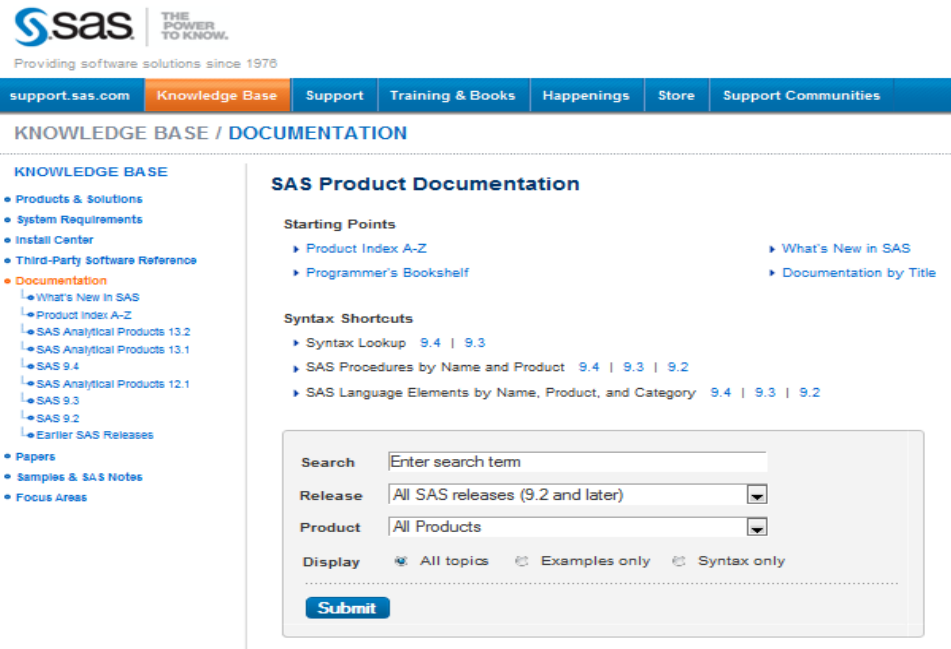
Figure 4. Knowledge Base – SAS Product Documentation

Published SAS Proceedings and "White" Papers

Users are provided access to thousands of "free" published SAS "white" papers all in the form of PDF documents. Provided with a built-in Google® search applet, users are able to search for content from 1976 to the present from SGF / SUGI, SUEGI, the various Regional conferences, PharmaSUG / PharmaSUG China, PhUSE, CDISC Forum, and other venues. Papers can be accessed using the http://www.lexjansen.com/ user interface, as shown in Figure 5, below.
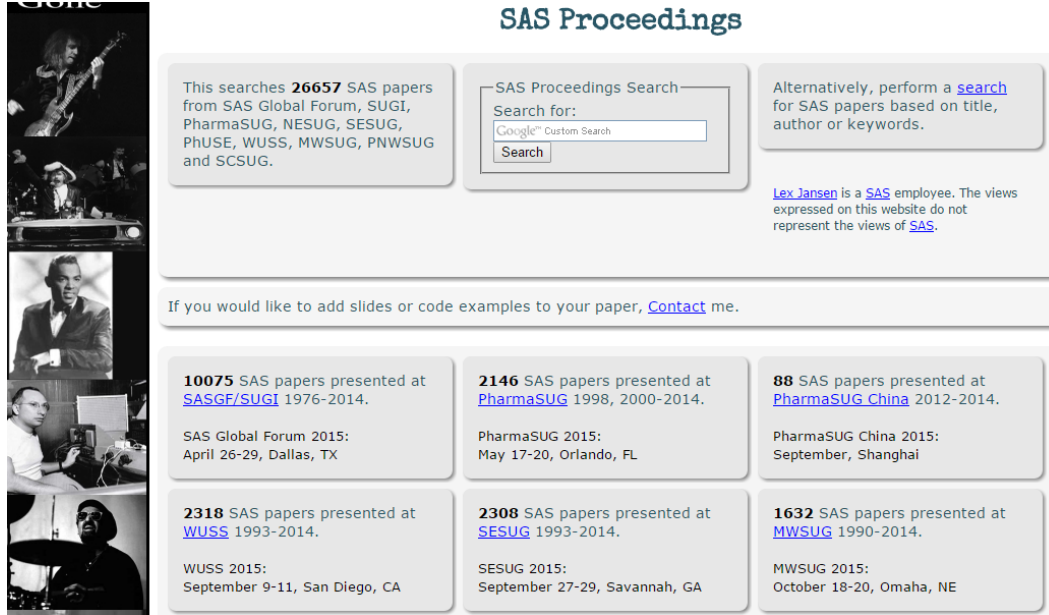
Figure 5. Published SAS Proceedings

LexJansen.com – Search Feature

LexJansen.com provides a built-in Google search applet that can be used by users to find papers of interest, as shown in Figure 6, below.
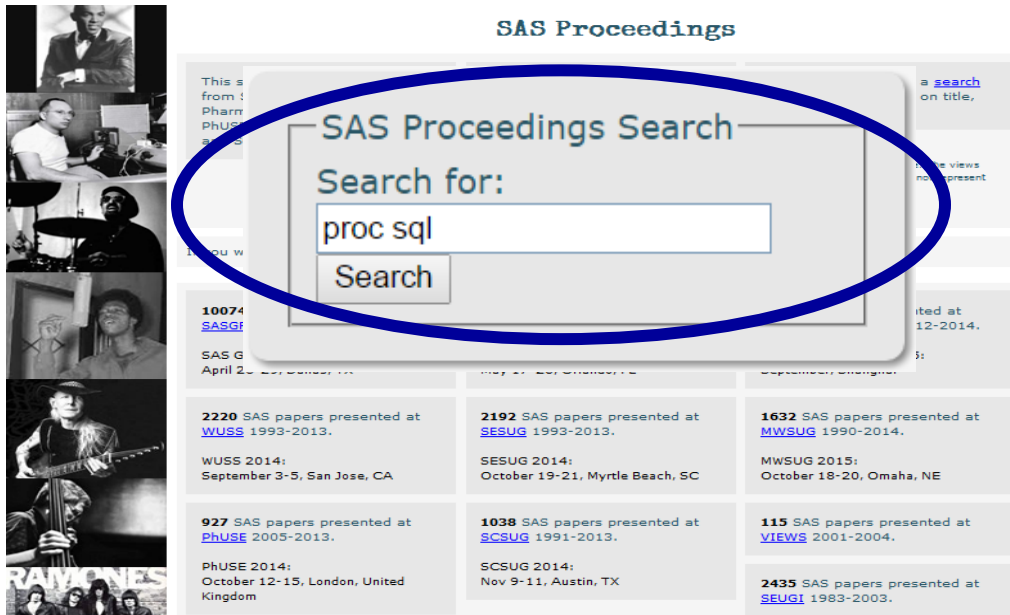
Figure 6. Built-in Google Search Applet in LexJansen.com

LexJansen.com – Search Results

LexJansen.com's search results display the most relevant results first, based on the search keyword or phrase entered in the search box, as illustrated in Figure 7, below.

This searches SAS proceedings from
SAS Global Forum, SUGI, PharmaSUG,
PhUSE, NESUG, SESUG, SCSUG, WUSS, MWSUG,
SCSUG and PNWSUG.

proc sql   Search

About 5,270 results (0.27 seconds)

powered by Google™ Custom Search

Undocumented and Hard-to-find PROC **SQL** Features
www.lexjansen.com/nesug/nesug07/bb/bb07.pdf
File Format: PDF/Adobe Acrobat
Kirk Paul **Lafler**, Software Intelligence Corporation, Spring Valley,
California ... The **SQL** Procedure contains many powerful and elegant
language features for ...

251-2012: Exploring DATA Step Merges and PROC **SQL** Joins
support.sas.com/resources/papers/proceedings12/251-2012.pdf
File Format: PDF/Adobe Acrobat
Kirk Paul **Lafler**, Software Intelligence Corporation, Spring Valley, California.
Abstract. Explore the various DATA step merge and PROC **SQL** join
processes.

070-30: Exploring DICTIONARY Tables and Views
www2.sas.com/proceedings/sugi30/070-30.pdf
File Format: PDF/Adobe Acrobat
Kirk Paul **Lafler**, Software Intelligence Corporation .... **Lafler**, Kirk Paul (2003),
" Undocumented and Hard-to-find PROC **SQL** Features," Proceedings of the ...

035-2009: Exploring PROC **SQL** Joins and Join Algorithms
support.sas.com/resources/papers/proceedings09/035-2009.pdf
File Format: PDF/Adobe Acrobat
Kirk Paul **Lafler**, Software Intelligence Corporation, Spring Valley, California ... The **SQL**
procedure is a simple and flexible tool for joining tables of data together .

Exploring the PROC **SQL** _METHOD Option
www.lexjansen.com/nesug/nesug12/cc/cc06.pdf
File Format: PDF/Adobe Acrobat
Page 1. Exploring the PROC **SQL** _METHOD Option. Kirk Paul **Lafler**, Software
Intelligence Corporation, Spring Valley, California. Abstract. The **SQL** Procedure ...

DATA Step versus PROC **SQL** Programming Techniques
analytics.ncsu.edu/sesug/2009/FF003.**Lafler**.pdf
File Format: PDF/Adobe Acrobat
Kirk Paul **Lafler**, Software Intelligence Corporation. ABSTRACT. Are you
considering whether to use a DATA step or PROC **SQL** step in your next
project?

Figure 7. LexJansen.com Search Results

Viewing a Paper from LexJansen.com

Any paper of interest that is found with the built-in Google search applet and/or displayed in the search results can be viewed, saved, or printed as needed. A "sample" paper from LexJansen.com is shown in Figure 8, below.

Paper BB03-2014

Five Little Known, But Highly Valuable and Widely Usable, PROC SQL Programming Techniques

Kirk Paul Lafler, Software Intelligence Corporation, Spring Valley, California

Abstract

The SQL Procedure contains a number of powerful and elegant language features for SQL users. This presentation highlights five little known, but highly valuable and widely usable, topics that will help users harness the power of the SQL procedure. Topics include using PROC SQL to perform FIRST., LAST. and Between in BY-group processing; constructing and searching the contents of a value-list macro variable for a specific value; data validation operations; data summary operations to process down rows and across columns; and using the MSGLEVEL= system option and _METHOD SQL option to capture and gain greater insight into the processes during query evaluation, the algorithm selected and used by the optimizer when processing a query, testing and debugging operations, and other processes.

Introduction

The SQL procedure is a wonderful tool for querying and subsetting data; restructuring data by constructing case expressions; constructing and using virtual tables known as a view; access information from Dictionary tables; and joining two or more tables to explore data relationships. Occasionally, an application problem comes along where the SQL procedure is either better suited or easier to use than other more conventional DATA and/or PROC step methods. As each situation presents itself, PROC SQL should be examined to see if its use is warranted for the task at hand.

Example Tables

The examples used throughout this paper utilize a database of two tables. (A relational database is a collection of tables.) The data used in all the examples in this paper consists of a selection of movies that I've viewed over the years. The Movies table consists of six columns: title, length, category, year, studio, and rating. Title, category, studio, and rating are defined as character columns with length and year being defined as numeric columns. The data stored in the Movies table is depicted below.

MOVIES Table

	Title	Length	Category	Year	Studio	Rating
1	Brave Heart	177	Action Adventure	1995	Paramount Pictures	R
2	Casablanca	103	Drama	1942	MGM / UA	PG
3	Christmas Vacation	97	Comedy	1989	Warner Brothers	PG-13
4	Coming to America	116	Comedy	1988	Paramount Pictures	R
5	Dracula	130	Horror	1993	Columbia TriStar	R
6	Dressed to Kill	105	Drama Mysteries	1980	Filmways Pictures	R
7	Forrest Gump	142	Drama	1994	Paramount Pictures	PG-13
8	Ghost	127	Drama Romance	1990	Paramount Pictures	PG-13
9	Jaws	125	Action Adventure	1975	Universal Studios	PG
10	Jurassic Park	127	Action	1993	Universal Pictures	PG-13
11	Lethal Weapon	110	Action Cops & Robber	1987	Warner Brothers	R
12	Michael	106	Drama	1997	Warner Brothers	PG-13
13	National Lampoon's Vacation	98	Comedy	1983	Warner Brothers	PG-13
14	Poltergeist	115	Horror	1982	MGM / UA	PG
15	Rocky	120	Action Adventure	1976	MGM / UA	PG
16	Scarface	170	Action Cops & Robber	1983	Universal Studios	R
17	Silence of the Lambs	118	Drama Suspense	1991	Orion	R
18	Star Wars	124	Action SciFi	1977	Lucas Film Ltd	PG
19	The Hunt for Red October	135	Action Adventure	1989	Paramount Pictures	PG
20	The Terminator	108	Action SciFi	1984	Live Entertainment	R
21	The Wizard of Oz	101	Adventure	1939	MGM / UA	G
22	Titanic	194	Drama Romance	1997	Paramount Pictures	PG-13

The data stored in the ACTORS table consists of three columns: title, actor_leading, and actor_supporting, all of which are defined as character columns. The data stored in the Actors table is illustrated below.

Page 1

Figure 8. A "Sample" Paper from LexJansen.com

SAS Press and SAS Talks Webinars

SAS Press and SAS Talks provide users with a number of effective presentations developed by SAS experts, instructors, authors, customers and students. Users also have for their viewing pleasure a SAS YouTube Channel with thousands of videos in a variety of unique categories: Analytics, Featured SAS Customer Stories, SAS Customer Stories, SAS Visual Analytics, SAS Data Management, SAS High-Performance Analytics, Popular Uploads, and Created Playlists. I always enjoy sharing a cost-effective method of upgrading staff member skills by scheduling monthly lunch-time pizza webinars where staff member view, eat and discuss the merits associated with the techniques they've learned from the webinar. This represents a winning scenario for everyone involved.

SAS Press Webinar Series

SAS Press provides users with a series of "free" informative Webinars that were developed and presented by authors. These archived webinars can be accessed at, http://support.sas.com/publishing/bbu/webinar.html, as illustrated in Figure 9, below.

Figure 9. SAS Press Webinar Series

SAS Talks Webinar Series

SAS Talks provides users with a series of "free" informative Webinars that were developed and presented by SAS experts, instructors, authors, customers, and students. These monthly webinars are archived for later viewing by users and can be accessed at, http://support.sas.com/community/events/sastalks/#s1=2, as illustrated in Figure 10, below.

Figure 10. SAS Talks Webinar Series

Archived SAS Talks Webinars

SAS Talks also provides users with a number of archived webinars. These webinars are archived monthly and available on-demand at, http://support.sas.com/community/events/sastalks/ondemand.html, as shown in Figure 11, below.

Figure 11. Archived SAS Talks Webinars

Getting Started with SAS® Graph Template Language
SAS R & D Director, Sanjay Matange, will demonstrate different ways to get, create or customize graphs in this live webinar.

SAS® 9.4: What's New for SAS® Administrators
SAS Principal Product Manager Amy Peters highlights what's new in SAS 9.4!

SAS® Visual Analytics for Higher Education
SAS Visual Analytics case study presented by Marc Vaglio-Laurin

How to Integrate SAS® and Teradata
Explore the nuts and bolts of integrating SAS and Teradata.

Getting Started with SAS® Graph Template Language
ways to get, create or customize graphs.

New Features: SAS® Activity-Based Management
Learn how the product morphs into SAS Cost and Profitability Management later in 2013.

Building Credit Scorecards Using SAS® Enterprise Miner™
Learn how to use Credit Scoring for SAS Enterprise Miner.

What's Hot, What's Not: Skills for SAS® Professionals
Examine the extensive array of procedures, programming tools and techniques honed by current and prior generations of users.

Getting Started with SAS®
Have no fear – we're bringing SAS experts to the rescue!

Getting Started with SAS® and Hadoop
In this live webinar, SAS technical expert Jeff Bailey covers the basics of SAS and Hadoop.

Introduction to Custom Tasks in SAS® Enterprise Guide®
In this session, you'll learn what custom tasks are available and how you can download and install them. You'll also see a few of the tasks in action as part of a live demo.

Live at SAS® Global Forum: Get the Most from Your SAS Experience
Taped live during SAS Global Forum 2013, this discussion outlines a number of informative resources to help users of all levels.

Key Capabilities of SAS® Grid Computing
This session shows you how to use various SAS applications running in a SAS Grid Computing environment.

SAS® Grid Manager: Meet Platform Computing
Explore the SAS Alliance with a special focus on Platform Computing's partnership on the development of SAS Grid Manager.

Getting Started with SAS® Enterprise Guide®
In this live webinar, technical experts from the SAS Customer Loyalty team will introduce you to SAS Enterprise Guide.

Getting Started with SAS® Hash Objects
If hash objects confuse you, or if you're wondering whether learning about them is worthwhile, join us for this webinar.

New Features for SAS® Text Miner
Hear details on the latest SAS Text Miner 12.1 product enhancements.

Best Practices for Configuring Your IO Subsystem for SAS®9
Best practices for configuring your IO subsystem for SAS®9

Figure 11. Archived SAS Talks Webinars (continued)

New Features for SAS® Enterprise BI Server
SAS® SAS Product Manager Rick Styll reviews the new features and functions available in SAS Enterprise BI Server and SAS BI.

Customer Segmentation Made Simple
Join author and SAS® expert Randy Collica as he explains how to use SAS® Enterprise Miner™ and the most commonly available techniques for customer relationship management (CRM).

Planned Installation? No Problem!
In this session, our presenters will break down the deployment process for SAS 9.3, direct you to critical documentation and help you understand the steps necessary to meet (or even beat) your installation goals.

Project Organization Proposal and Project Leadership Plan
In this session, you'll discover an easy-to-use Project Organization Proposal (POP) that can be implemented without adding additional resources to the MIS or IT divisions.

Time Series Data Mining with SAS® Enterprise Miner™
Udo Sglavo from SAS R&D examines the benefit of considering the time dimension in SAS Enterprise Miner projects and how users will benefit from time series similarity analysis.

An ODS Menu for All Appetites and Applications
Chevell Parker from SAS Technical Support reveals how to harness the power of various ODS destinations to generate memorable applications and reports.

Consider an Analytical Center of Excellence (and Other Ways to Create More Analytic Bandwidth)
Anne Milley, Director of Analytic Strategy at JMP.

Macros Made Easy (and More Efficient) with SAS® Enterprise Guide® 4.2 Prompts
Kenneth Sucher, SAS Certified Instructor.

Web Development with SAS® by Example
SAS Press author Frederick Pratter will introduce you to some of the products and features available for creating Web content using SAS.

Tips and Tricks for Finding SAS® Information
Get tips and tricks to help you be more productive with your SAS software.

New Goodies for the SAS® Programmer in SAS® Enterprise Guide® 4.3
Chris Hemedinger, Senior Software Manager in SAS R&D, explores tools that help SAS programmers of all skill levels to create and maintain SAS programs with greater confidence and efficiency.

SAS Web Report Studio Performance Improvement
SAS Technical Architect Angela Hall will explain how to implement performance-improving mechanisms on your SAS system using SQL pass-through functionality

That's Not What I Meant: Adventures in Defining New Variables
Statistics professor John Bailer will explore ways to confirm that you have correctly constructed or recoded variables, illustrating surprises that might arise when SAS® does what you said instead of what you meant.

Feeding Output from PROC SUMMARY into a SAS®9 OLAP Cube
SAS Regional Education Manager and Instructor Michelle Buchecker will teach you how to take your existing data sets and turn them into SAS®9 OLAP cubes.

PROC REPORT Basics: Getting Started with the Primary Statements
SAS® Certified Advanced Professional Art Carpenter will teach you how to use PROC REPORT to summarize and display your data more effectively.

Visualization of Data and Models
JMP's chief architect John Sall teaches you how to get meaningful visual analyses to answer your business questions.

Figure 11. Archived SAS Talks Webinars (continued)

CSSSTYLE: Stylish Output with ODS and SAS® 9.2
This session will teach you how to use cascading style sheet (CSS) files – enabling you to add style (e.g., fonts, colors, spacing) to your Web documents.

Making SAS® Enterprise Guide® the Center of Your Business
This session will explore how to analyze information in SAS Enterprise Guide and publish it to your organization quickly and effectively

SAS® Formats and the Format Procedure
During this session, discover the benefits and convenience of the FORMAT procedure.

Modifying ODS Statistical Graphics Templates in SAS® 9.2
This Webinar will show you how to apply the programming techniques for modifying the default graphs.

An Introduction to Creating Multi-Sheet Microsoft Excel Workbooks the Easy Way with SAS®
This talk provides basic information on how to use Base SAS®9 software to quickly and easily create multi-sheet Microsoft Excel workbooks.

SAS® Enterprise Guide® for the Programmer: What's in It for Me?
This Webinar will show you how SAS Enterprise Guide helps you exploit the power of SAS and publish dynamic results in a Microsoft Windows client application.

An Introduction to SAS/IML® Studio
This Webinar highlights the essentials needed to begin using SAS/IML in SAS® 9.2.

Getting Started with ODS Statistical Graphics in SAS® 9.2
This talk will give you the essentials you need to begin using ODS Graphics in SAS 9.2.

Social Networks in Data Mining: Challenges and Applications
The methodology presented in this session easily generalizes to other areas where social networks also play a crucial role, including customer acquisition, risk management and fraud detection.

SAS® Information Management: Leverage and Extend Hadoop
In this webinar, we'll explore the technology behind how SAS both simplifies and augments Hadoop.

Using Data Mining in Forecasting Problems
This session explores how to wring maximum value out of available time series data, including methodologies and examples.

Figure 11. Archived SAS Talks Webinars (continued)

SAS YouTube Channel Videos

The SAS YouTube Channel Videos are available to all users and can be accessed at, http://www.youtube.com/. Available video channels include: Analytics 2014, Featured SAS Customer Stories, SAS Customer Stories, SAS Visual Analytics, SAS Customer Intelligence, SAS Data Management, SAS High-Performance Analytics, Popular Uploads, and Created Playlists. The SAS YouTube Channel also provides access to various featured SAS channels, as shown in Figure 12, below.
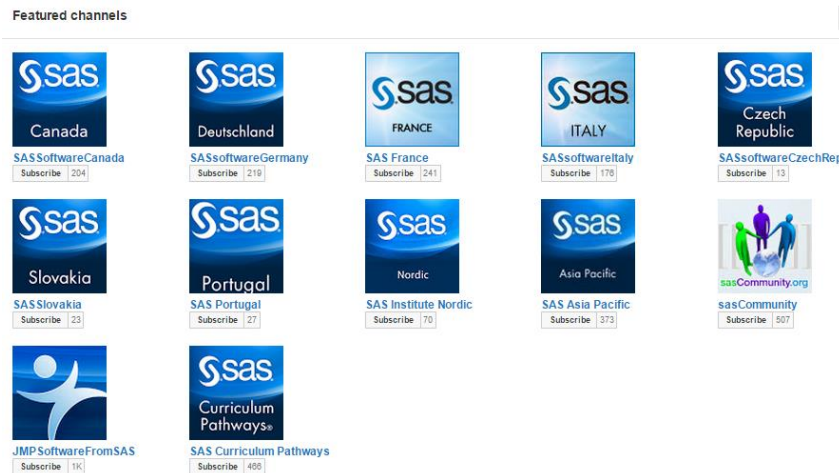
Figure 12. Featured SAS Channels

The SAS YouTube Channel supports a number of channels, as shown in Figure 13, below.

Figure 13. SAS Software YouTube Channels

Figure 13. SAS Software YouTube Channels (continued)

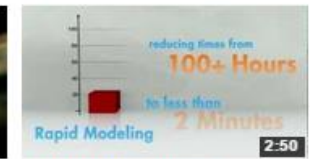**Figure 13. SAS Software YouTube Channels (continued)**

Conclusion

As technology reaches for newer and greater horizons, many forward-thinking organizations, universities and degree-granting institutions are making some of their courses available to the masses around the world. The MOOC format allows courses and content to be freely taught by the best and brightest in open- and online learning environments to massive audiences. By delivering education in a MOOC format, anyone with a computer (workstation, laptop or "smart" device), an Internet connection and a web browser, can select or enroll in one of the many "free" courses currently being offered, learn from "real-time" or recorded lessons from the comfort of their living rooms, bedrooms, dorms, offices, beach houses, or anywhere else they are in the world. Needless to say, the availability of "free" resources along with the flexibility they offer has fostered a high degree of excitement, enthusiasm and an ever-growing audience for the MOOC format.

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Lafler, Kirk Paul (2014), *"A Review of Free Massive Open Online Content (MOOC) for SAS Learners,"* Proceedings of the South Central SAS Users Group (SCSUG) Conference – 2014.

Lafler, Kirk Paul and Charles Edwin Shipp (2014), *"What's Hot, What's Not – Skills for SAS Professionals,"* Proceedings of the South Central SAS Users Group (SCSUG) Conference – 2014.

Acknowledgments

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About the Author

Kirk Paul Lafler has been using SAS since 1979 and is consultant and founder of Software Intelligence Corporation. He is a SAS Certified Professional, provider of IT consulting services, trainer to SAS users around the world, mentor, and sasCommunity.org emeritus Advisory Board member. As the author of six books including Google® Search Complete (Odyssey Press. 2014) and PROC SQL: Beyond the Basics Using SAS, Second Edition (SAS Press. 2013); Kirk has written more than five hundred papers and articles; been an Invited speaker and trainer at five hundred-plus SAS International, regional, special-interest, local, and in-house user group conferences and meetings; and is the recipient of 23 "Best" contributed paper, hands-on workshop (HOW), and poster awards.

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