

SAS® University Edition—Connecting SAS® Software in New Ways to Develop More SAS Users

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ABSTRACT

Are you a SAS® software user hoping to convince your organization to move to the latest product release? Has your management team asked how your organization can hire new SAS users familiar with the latest and greatest procedures and techniques? SAS® Studio and SAS® University Edition might provide the answers for you. SAS University Edition was created for teaching and learning. It's a new downloadable package of selected SAS products (Base SAS®, SAS/STAT®, SAS/IML®, SAS/ACCESS® Interface to PC Files, and SAS Studio) that runs on Windows, Linux, and Mac. With the exploding demand for analytical talent, SAS launched this package to grow even more SAS users.

Part of the way SAS is helping grow that base of users is through the interface to SAS University Edition: SAS Studio. SAS Studio is a developmental web application for SAS that you access through your web browser and—since the first maintenance release of SAS 9.4—is included in Base SAS at no additional charge. The connection between SAS University Edition and “commercial” SAS means that it's easier than ever to use SAS for teaching, research, and learning, from high schools to community colleges to universities and beyond. This paper describes the product, as well as the intent behind it and other programs that support it, and then talks about some successes in adopting SAS University Edition to grow the user base.

INTRODUCTION

Several aspects of SAS University Edition are new or different from the SAS you might be used to. This product was created to help develop more SAS users, and the following sections address who can use it, how it is helping fill the talent pipeline, and what other programs SAS offers to support these objectives.

This information will be of value to anyone who is interested in making it easier to learn SAS, whether it is to increase the pool of graduates who learned SAS while in school, train new hires, refresh out-of-date SAS knowledge, prepare for SAS certification, or develop or deepen skills attractive to prospective employers. No prior knowledge of SAS is necessary in order to use SAS University Edition, and audiences might be those in business, government, or academia who share any of these goals.

WHAT IS SAS UNIVERSITY EDITION?

SAS University Edition is a new free, downloadable offering that includes the SAS products Base SAS, SAS/STAT, SAS/IML, SAS/ACCESS Interface to PC Files, and SAS Studio (Figure 1). You can access it from the SAS website

(http://www.sas.com/en_us/software/university-edition.html, shown in Figure 2) by using your SAS profile (which you must create, if you do not already have one). To be able to download it, you must accept a click-through license agreement. SAS University Edition is designed for learning, but you are not required to be affiliated with a university or educational institution to download it. By accepting the license agreement, you consent to use the software for learning purposes only and not for commercial production work. After you download SAS University Edition to your Windows, Linux, or Mac workstation, SAS works locally on your



Figure 1: Components of SAS University Edition

machine by using virtualization software and your browser, so no further Internet access is required.

WHY DID SAS CREATE IT?

SAS University Edition was created to help grow the body of SAS users by making access to SAS easier than ever. Expanding access for academia was one major goal, because what is taught in the classroom trickles down. Professors teach what they know and their preferences are passed on, so SAS wants to be the software of choice in learning institutions around the world. SAS also offers free online curriculum resources for professors to support learning SAS. And because SAS customers need a steady pipeline of SAS talent to fill their hiring needs, they have asked SAS for help in filling this pipeline. By making its software available for free globally and readily available to professors, instructors, students, and researchers in an academic setting, SAS hopes to seed the market with SAS talent. Current customers might find SAS University Edition useful for those who want to learn about less familiar features during time away from work. And independent learners who want to study SAS can use SAS University Edition to develop or hone skills for their current job or for finding new employment. For anyone interested in learning SAS, free online e-learning and videos are available to help them better understand concepts and build skills through active learning.

HOW DOES IT WORK?

SAS University Edition is delivered as a virtual machine application called a vApp. A vApp consists of software products that have been bundled together in a single, easy-to-use file. It is designed to run on a virtual infrastructure by using a virtualization software package. The vApp enables you to run complex software products while reducing or eliminating the need to install, configure, and maintain them on your own machine.

What you download from the SAS website is a file that, by itself, doesn't do you any good at all. You need something to "play" the file, similar to the way you need Adobe Acrobat to view a PDF file. What plays the file is a virtualization package such as Oracle Virtual Box, VMware Player, or VMware Fusion. Virtual Box is open source and free of charge. VMware Player is free. VMware Fusion offers a free trial, and many universities already license it. If you don't already have one of these software packages on your machine, you need to download one before you can use SAS University Edition.

How to Download SAS University Edition

Step 1: Verify that you have a compatible virtualization software package.

Because SAS University Edition is a virtual application (or vApp), you need virtualization software to run it. Compatible virtualization software packages are listed in the table below. If you don't already have compatible virtualization software, you can't download a package using the links below.

Windows	VMware Player 6.0 or later	Oracle VM VirtualBox
OS X	VMware Fusion for OS X 4.0	Oracle VM VirtualBox
Linux	VMware Player for Linux 3.0 or later	Oracle VM VirtualBox

Step 2: Get the Quick Start Guide (PDF or video) for your virtualization software package.

Don't just download the PDF – actually read it. Or watch the video if that's more your thing. Or do both! You'll find a lot of useful info in the Quick Start Guides, including step-by-step instructions. Seriously – you won't regret it.

- VMware Player quick start guide
Download the PDF
Watch the video
- VMware Fusion quick start guide
Download the PDF
Watch the video
- Oracle VM VirtualBox quick start guide
Download the PDF
Watch the video

Step 3: Download SAS University Edition.

Choose the appropriate download file for your virtualization software package. You will then be prompted to:

- Create or sign in to your SAS profile.
- Accept the user licensing agreement.
- Begin the download.

Note: The file is over 1 GB. Depending on your Internet connection, it might take awhile to download. Grab a snack, take a break, read a book – it will be done before you know it. And remember – you're getting the world's most powerful analytics software. It's worth the wait!

System Requirements

Windows OS X

Linux

- Microsoft Windows 7 or later
- 64-bit hardware with a minimum of 1GB of RAM
- One of the following virtualization software packages:
 - VMware Player 6.0 or later
 - Oracle VM VirtualBox
- One of the following web browsers:
 - Microsoft Internet Explorer 9, 10 or 11
 - Mozilla Firefox 21 or later
 - Google Chrome 27 or later

Got a question? Need help? Contact us.

SAS Analytics@SAS.com
800-727-4025
ext:102

Figure 2: Download SAS University Edition

WHY DELIVER SAS UNIVERSITY EDITION AS A VAPP?

Let's face it: getting access to software is often hard, especially if you want the newest release of a product. If your organization has a SAS license, someone else is usually responsible for distributing it, and that person is usually very busy. SAS needed to find a way to enable people who want to learn SAS to serve themselves. But just getting access isn't enough—software also needs to be easy to get up and running. Installing and configuring a powerful package like SAS can be a challenge. And these days any learning software must run on a Mac, because Apple has at least 50% of the university market and is growing rapidly in personal computer usage. So giving learners “regular” SAS to download wasn't going to work.

Enter the concept of a vApp: build a virtual machine with SAS already installed and configured on it, and deliver that virtual machine ready to go. The virtualization packages run on all the most commonly used operating systems—Windows, Mac, and Linux—so they take care of running in the right places. You don't have to interact directly with the virtual machine at all—just start it up and point your browser to the virtual machine by using a URL that brings up SAS Studio. The SAS that you're “talking to” is actually running on Linux on the virtual machine.

The extra benefit of the vApp approach is that it's easy to update. When the vApp starts up, and if an Internet connection is available, SAS University Edition checks with SAS to see if any updates are available. While connected, the vApp might from time to time automatically send certain nonindividually identifiable information regarding software usage and configuration back to SAS to assist with future development and support of the software.

An update can be as small as a security patch for the Linux machine to address a new security problem or as substantial as a whole new release of SAS. You are given information about the size of the update, and you can choose the best time to download and apply it. Updates are cumulative, so you'll get all the ones you've missed if you've waited a while. The virtual machine is “locked down,” meaning that you don't have any data or preferences stored on it; this enables SAS to modify or completely replace it during an update (if necessary), without destroying any of your configurations.

WHAT IS SAS STUDIO?

Normally, you talk to SAS by bringing up the SAS Windowing Environment (affectionately known as SAS[®] Display Manager) or SAS[®] Enterprise Guide[®]. These interfaces aren't suited for the vApp world, since either you have to run the interface in the same environment as SAS (which means the vApp can't be locked down) or you have to install a client on the local machine to talk to the SAS server. Fortunately, a new interface to SAS happened to be released right when it was needed: SAS Studio. New in SAS 9.4, SAS Studio began shipping with Base SAS in 2014. SAS Studio runs in a web browser, so nothing needs to be installed locally. And browser-driven usage supports Macs, so it is a perfect fit for SAS University Edition.

At its heart, SAS Studio is an interface for SAS programmers. It's a very clean user interface for editing code, viewing logs and results, and managing your SAS files.

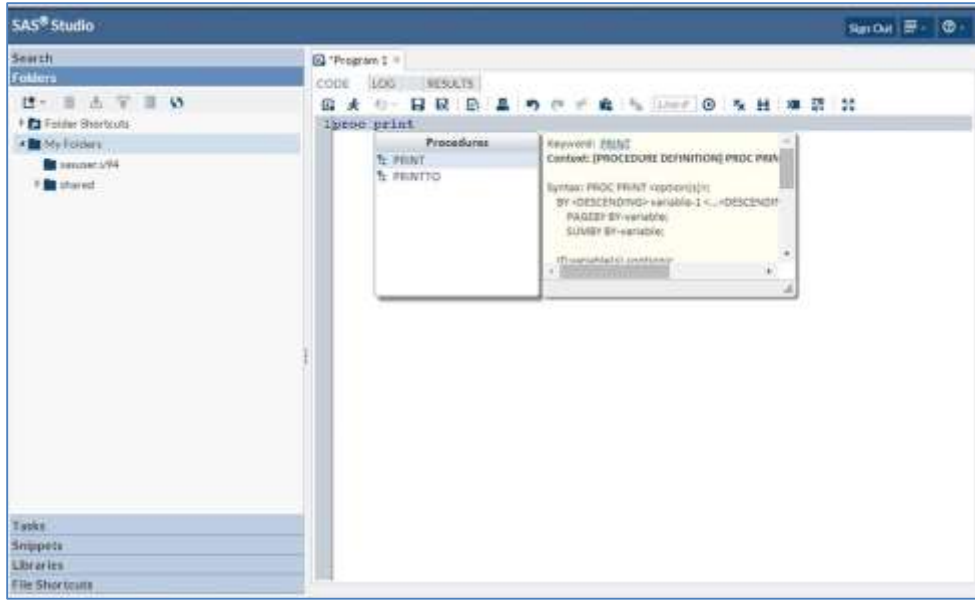


Figure 3: Code Assistance in SAS Studio

If you'd like some help writing SAS code, SAS Studio makes assistance available at several levels. As shown in Figure 3, the code editor offers syntax help and has an auto-completion feature. Code snippets are provided as starting points, and the table viewer gives you access to its generated SQL code. The tasks feature (Figure 4) can help guide you through an analytic process, letting you watch while the SAS code is built for you. You can even create your own tasks. These elements make SAS Studio a great resource for anyone learning SAS, because they can be turned on at the beginning of your journey and turned off as you advance in your knowledge.

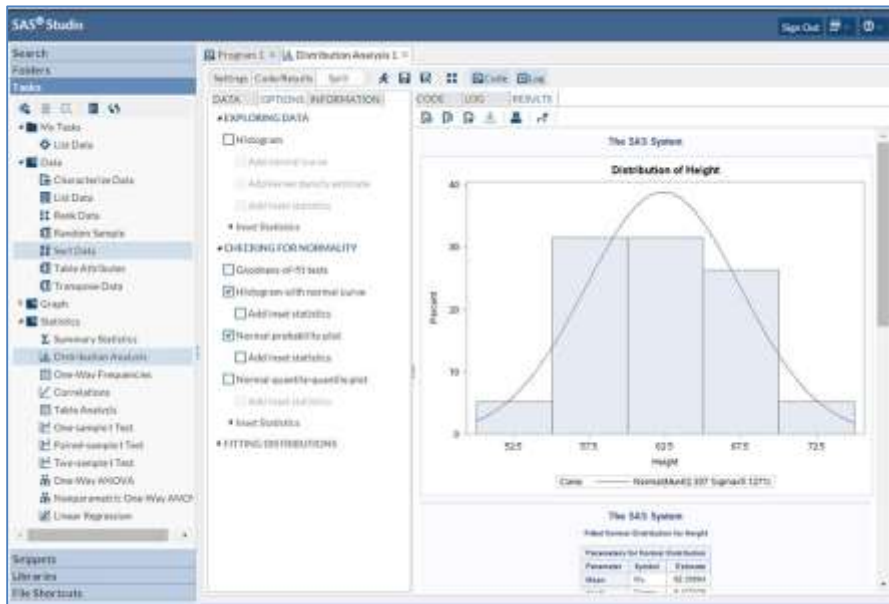


Figure 4: Using SAS Studio Tasks to Generate Results

SAS Studio will continue to add more features to make it an even more robust development environment, as well as more features that will appeal to users familiar with the point-and-click interface of SAS Enterprise Guide. The primary goal is that once you know SAS Studio, you should be able to use it throughout your career. Because it's delivered free with Base SAS and runs in all supported SAS environments—from single-user to enterprise-wide—anyone with access to a SAS license has it. So it

makes sense that SAS Studio should be the interface delivered with SAS University Edition, enabling you to learn it in school and take that knowledge with you wherever you go, no matter what kind of SAS environment your employer uses. This commonality also makes it easier for organizations to get their new hires up to speed quickly.

HOW DO I DO MY NORMAL SAS STUFF?

One of the most powerful things about SAS is that your code can run anywhere without your having to make a lot of changes. The main difference between environments is file paths and physical filenames—where your data is stored and how you reference it. When you're reading from or writing to SAS data sets, the SAS naming convention takes care of this for you. SASData.Class works everywhere to access the Class data set, as long as you've assigned the libref SASData to a location. The question is, what file path do you use in your LIBNAME statement? The same basic question applies when you input data and reference the location of the data with an INFILE statement or the DATAFILE= option in PROC IMPORT. The key point to remember when using SAS University Edition is that you're actually running SAS on a virtual machine (VM), but that virtual environment is not where your data is located.

So let's walk through this situation just like the SAS R&D team did. One option was to tell users to "upload" data to the virtual machine, but that option was rejected because it meant the VM was no longer disposable (you need to be able to replace the VM at will, so it can't contain anything that needs to persist). All virtualization packages support shared folders as a way of accessing local files from within a VM, so using this feature was the next thought. Setting up a shared folder is not too hard; the hard part is figuring out what file to reference in your SAS code. SAS is really running in a Linux environment, so the file references must work on Linux—the slashes need to be in the correct direction, and Linux filenames are case-sensitive. But requiring users to learn a lot about shared folders and how they're mapped would be a burden, so logical naming conventions were set up for them in the VM.

By default, if you create a shared folder with the logical name of myfolders, then that name is detected and automatically displayed under My Folders in the navigation pane in SAS Studio. In addition, the VM is designed so that a pathname reference to /folders/myfolders/ in your SAS code points to that location. The setup instructions for SAS University Edition go so far as to specify exactly where the local folder should be—"create a SASUniversityEdition folder with a myfolders subfolder." There's no technical reason for this—you could point myfolders to any folder on your machine. But for beginning users, it's often best to be very prescriptive to make getting started easier.

You can stop with this step and use only myfolders for everything. Of course, this means you have to move any data you want to access into that location on your local machine. Not everyone wants to move their data this way, so the folder shortcut idea that is already in SAS Studio has been customized for SAS University Edition. In this case, you create a shared folder in your usual fashion, just using a logical name other than myfolders. SAS then displays this name under Folder Shortcuts in the navigation pane in SAS Studio and sets up a /folders/myshortcuts/ pathname that you can use in your SAS code.

There's one last thing to explain to those who have used SAS before. The graphics for results are created using statistical graphics (SG) procedures and the SAS Output Delivery System (ODS). SAS/GRAPH® is not part of SAS University Edition. SAS Studio provides some graph tasks, making it easy for those who don't always remember the code for graphics, because these tasks generate the PROC SGPLOT code needed to render the graph. Because not all the features available in the SGPLOT procedure are provided via tasks, you can copy and paste the generated code into the program window and edit it for your specific needs. But if you already know the code for your desired plot, you can just submit it as you usually would.

WHO IS ELIGIBLE TO USE SAS UNIVERSITY EDITION?

Anyone whose purpose is teaching or learning can use SAS University Edition—teachers, students, adult learners, and academic researchers are all allowed to access SAS University Edition as long as they agree to a license that permits it to be used only for learning purposes and not commercial production work.

EVEN IF MY UNIVERSITY DOESN'T LICENSE SAS?

It doesn't matter whether your university licenses SAS or not, because the decision by students or professors to download SAS University Edition is independent of the university's decision to license SAS. More than 4,000 degree-granting institutions around the world license SAS, and the most common purchase is the Education Analytical Suite, a bundle of the most commonly used products. This bundle offers a wider range of products and the fullest functionality available for academic use, which continues to be a significant benefit for our academic customers. But many universities that license SAS also promote SAS University Edition on their software procurement pages, because for many users it offers all the procedures they need, might be the easiest option for Mac users, can be downloaded without invoking the university licensing procedures, and is available at no cost.

EVEN IN AFRICA?

Last year a professor from the University of Lagos in Nigeria shared with SAS that he was eager to have his students use SAS software. Another professor from his department came back from an academic exchange program in the United States with a strong impression that learning SAS was essential to meet market demand. However, because the University of Lagos had a limited budget, it did not feel it could afford to pay for SAS licenses and instead chose alternative options. Upon learning about SAS University Edition, this professor at first couldn't believe that it was really free, and he kept asking questions like "So our students can put it on their laptops? We can put it in our labs? It is available in Africa?" When he was finally convinced that SAS University Edition was no mirage, he said, "I will go home happy. This is a breakthrough for us." He was beaming! So yes, SAS University Edition can be used in Africa—and in all other regions of the world.

EVEN IF YOU'RE NOT A STUDENT?

Paul Allison, a well-known sociology professor at the University of Pennsylvania, called SAS University Edition his "new favorite toy" in a blog post entitled "Free SAS!" and pointed out that it is "essentially free SAS for anybody who wants it, and it has the potential to be a real game changer."¹ Giving adult learners access to SAS University Edition makes it far easier for people to add skills to their toolkit. And certainly the demand is high for those with analytical skills. LinkedIn reported that in 2014, the "hottest skill" on its site was statistical analysis and data mining.² Someone with analytical knowledge who knows how to use SAS is even more valuable on the job market. PayScale.com ranked knowledge of SAS number one in "Job Skills That Lead to Bigger Paychecks."³ People have long known this. As one user commented in an online forum: "I have always wanted to learn SAS because many of the job postings in the health industry require working knowledge of the tool. However, the cost, the...course times, and access to the tool to practice the commands were obstacles. I believe that access...is a huge step toward fulfilling my dream and opening up job opportunities for my career. Thank you!"⁴

NO LIMITATIONS

Not only is SAS University Edition free, available even if you're not a student, and able to run on a Mac, but there are no limits on the number of observations in the data sets you run. While many software editions that are created for learning purposes are "crippled" in some way, SAS does not place these kinds of restrictions on this edition. You can load a full data set and run it through its paces with your favorite procedures.

WHAT ARE THE BENEFITS OF USING SAS UNIVERSITY EDITION?

There are many reasons to use SAS University Edition. Here are some to consider, depending on which economic sector you work in.

BENEFITS FOR INDUSTRY AND GOVERNMENT

If you work in business or government, or if you are transitioning to this world, there are a number of reasons to consider using SAS University Edition.

- Because updates are pushed as soon as they are available, a user has the option to update to the latest available release of the included SAS products. If your organization has not yet migrated to the latest release, you can explore new features before your site's upgrade and help make the case for the move.
- In training new hires, SAS University Edition can come in handy, because trainees can download it onto their personal computers for practice on their own time or even to use if getting new computers takes months in your organization.
- The SAS Studio interface is included with SAS University Edition, as well as all current licenses of SAS, so you can have new hires learn on a common platform that is available to all users in your enterprise.

BENEFITS FOR ACADEMIA

For teaching and learning, SAS University Edition offers many benefits.

- It's free! 'Nuff said!
- Because SAS University Edition runs in Windows, Linux, and Mac environments, it is available for virtually all operating systems used in academia.
- The fact that it requires no Internet connection, since it runs locally after the initial download, can be convenient particularly for students, who are often mobile in their working conditions, moving between the lab and home, and even the coffee shop.
- Students or faculty members can download SAS University Edition anytime, as long as they have an Internet connection, without requiring campus IT involvement either for technical help or for administration of campus site licenses.
- For universities that offer classes online, SAS University Edition makes it easy to provide software for students in those classes, because instructors can simply direct them to download it directly, with no visit to the campus necessary. In fact, SAS and Capella University have partnered in a new Bachelor of Science Degree in Information Technology minor in data analytics, and students are using SAS University Edition in their classes.
- SAS University Edition enables textbook authors to offer access to SAS for use in examples accompanying their text. The OpenIntro website, a popular teaching resource for statistics via its open-source textbook online, was able to add labs for its statistics course when SAS University Edition was released.⁵
- If you are a retired faculty member who no longer has access to your former institution's site-based licenses but you are continuing to do research, SAS University Edition can let you keep up your work using SAS.

BENEFITS FOR INDIVIDUALS

If you are not classified as an employee, a teacher, or a student with access to licenses through your institution, you can still use SAS via SAS University Edition. There are several reasons you might want to do so.

- If you are preparing for SAS certification, SAS University Edition provides access to all the procedures you'll need to study.
- As noted earlier, many people have expressed great enthusiasm at the chance to do their own continuing education and enhance their job skills by using SAS University Edition. The free e-learning, videos, and tutorials available on the SAS Analytics U online forum make this easier than ever.
- Perhaps you have learned SAS in the past but need to refresh your knowledge for new projects, or maybe you want to try out the latest features. SAS University Edition is the perfect way to refresh and explore and play around with features you might not have the time to use in your job.

- Whether you have access through an institution or not, you might enjoy taking part in competitions like the ones sponsored by Kaggle. SAS University Edition can be a great option for you. In fact, the Statskom website offers a series of tutorials on using SAS University Edition with Kaggle data as a way to prepare for a Kaggle competition.⁶

HOW HAS IT GONE SO FAR?

As of this writing, SAS University Edition has been downloaded over 232,000 times, which includes at least 284 different universities, 10,192 professors, and 123,173 students using it. The response has been incredibly enthusiastic. SAS employees have been hugged when describing SAS University Edition in the SAS booth at conferences and offered virtual hugs via our call center. One woman told an employee on the phone: “I really feel like jumping and giving you a big hug! I am a SAS addict for many years and have been fighting for using SAS in spite of other software being offered out there. Thank you for finally allowing the free access for my students!”

WHAT ELSE IS SAS DOING TO FILL THE PIPELINE FOR SAS TALENT?

SAS University Edition is part of SAS Analytics U, a comprehensive global program that offers professors, students, academic researchers, and independent learners access to the following:

- free SAS software, including not only SAS University Edition but also SAS[®] OnDemand for Academics, a cloud-based offering that makes additional SAS products available, such as SAS/ETS[®], SAS/OR[®], SAS/QC[®], SAS[®] Enterprise Miner[™], SAS[®] Forecast Server, and SAS Enterprise Guide
- helpful resources to install, learn, and use SAS
- free online classes, including the popular SAS courses “SAS Programming 1” and “Statistics 1”
- interactive, online SAS Analytics U Community

Around the world, SAS has employees dedicated to supporting academic users by sharing these resources and making connections between academia and industry. The SAS Global Academic Program, in conjunction with SAS Analytics U, is helping build a pipeline of professional candidates for the new information economy by integrating SAS into university curricula worldwide. Options include creating a single activity, a for-credit course, a sequence of courses building toward a degree, a certificate program, an entirely new program, or some combination. In all cases, expert analytical and curriculum consultants from SAS are available to help universities develop the SAS curriculum needed to accomplish their goals. In addition to support of teaching, programs from SAS help academics conduct research, acquire analytical skills, and network with other SAS users, including employers seeking graduates with SAS experience.

CONCLUSION

SAS created SAS University Edition to make it easier than ever to use SAS software for teaching and learning. Because SAS software is now available as a download, anyone who wants to teach or learn using SAS can get access any time there is a good Internet connection, without requiring signoff from IT or any other authority. Features like the fact that SAS University Edition runs on a Mac, is free, has no limit on the number of observations, and is available even if you’re not a student remove many of the previous restrictions to learning and using SAS. The browser-based SAS Studio interface, which now ships with all SAS licenses, makes a common user interface available, regardless of whether you are in academia, business, or government, so transitioning between organizations should be easier. The delivery of SAS University Edition as a vApp makes updates a snap, easing the ability to use the latest SAS product releases. And SAS backs up this software with a wealth of programs and resources to support teaching and learning SAS. SAS Analytics U and the SAS Global Academic Program are powerful efforts worldwide to increase the pipeline of users with SAS skills. Join with SAS in growing the pool of analytical talent by trying out SAS University Edition yourself and spreading the word.

NOTES

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5. OpenIntro, “Labs for SAS,” accessed November 12, 2015, https://www.openintro.org/stat/labs.php?stat_lab_software=SAS.
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