

Teaching SAS® Using SAS® OnDemand for Academics: Studio

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ABSTRACT

Universities, government agencies, and non-profits all require various levels of data analysis, data manipulation, and data management. This requires a workforce that knows how to use statistical packages. The server-based SAS® OnDemand for Academics: Studio offerings are excellent tools for teaching SAS® in both postsecondary education and in professional continuing education settings. SAS® OnDemand for Academics: Studio can be used to share resources; teach users using Windows, UNIX, and Mac OS computers; and teach in various computing environments. This paper discusses why one might use SAS® OnDemand for Academics: Studio instead of SAS® University Edition, SAS® Enterprise Guide®, or Base SAS® for education and provides examples of how SAS® OnDemand for Academics: Studio has been used for in-person and virtual training.

INTRODUCTION

Educating people in various settings, such as universities, government agencies, and non-profits, to use SAS® for data analysis, data manipulation, and data management is an important part of creating a capable workforce. Though many skills can be self-taught with the use of online help boards, SAS® white papers, email lists such as SAS-L, and course materials posted by instructors, it is important to bring formal SAS® course access to many users and potential users. Often, these courses are taught at the post-secondary education level and in professional continuing education settings. Because there are many places and populations that need this training, it is important to look into avenues that make teaching and learning easier for students and instructors alike.

The SAS Institute Inc. offers SAS® OnDemand for Academics as a free mechanism for teaching, learning, and research. Current SAS® OnDemand for Academics offerings include Enterprise Guide, Enterprise Miner, Forecast Server, and Studio. These offerings rely on an online server for access to the latest SAS® technology. SAS® OnDemand for Academics: Studio is particularly of interest for teaching beginner and intermediate SAS® users because it does not require anything to be installed in order to teach.

While any of these online platforms can be used for teaching, this paper will focus on the use of SAS® OnDemand for Academics: Studio. This paper will primarily discuss teaching SAS® programming. This paper will explore some of the similarities and differences between SAS® OnDemand for Academics: Studio and other options for education including Base SAS®, SAS® Enterprise Guide®, and SAS® University Edition. This paper will also provide examples of how SAS® OnDemand for Academics: Studio has been used for in-person and virtual training.

SIMILARITIES BETWEEN THE PLATFORMS

SAS® OnDemand for Academics: Studio, Base SAS®, SAS® Enterprise Guide®, and SAS® University Edition each allow users to create graphics (including ODS GRAPHICS) and to run many frequently used SAS® procedures, including PROC CONTENTS, PROC DATASETS, PROC FREQ, PROC MEANS, and PROC UNIVARIATE. Each platform allows users to create programs using SAS® code. Each platform also allows users to run the SAS® survey procedures, albeit with differing program execution speeds. Users of SAS® OnDemand for Academics: Studio, SAS® Enterprise Guide®, and SAS® University Edition will be interested in the availability of many menu driven commands.

THE NECESSITY OF THE LIBRARY

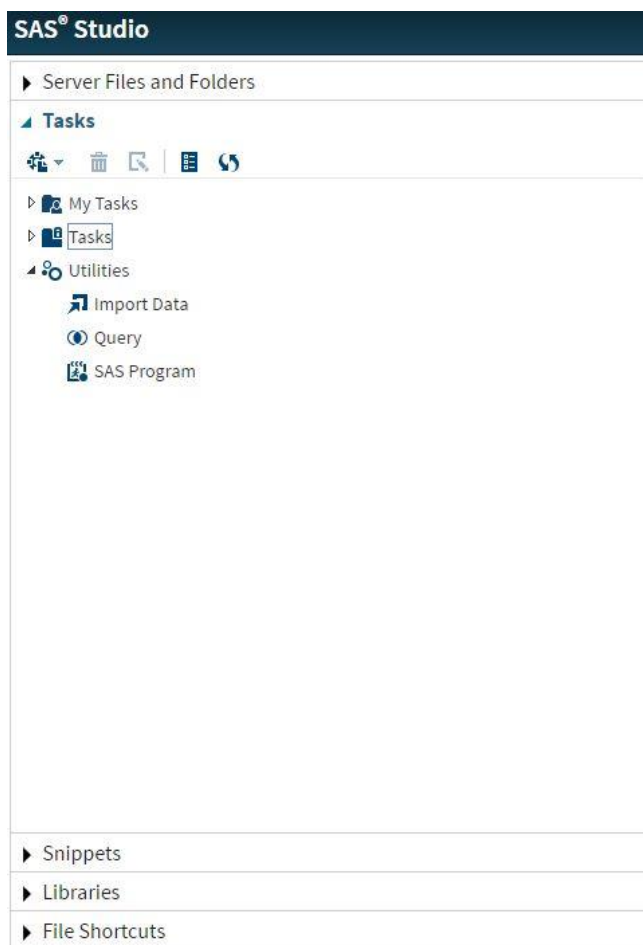
For data management, any work done in SAS® is always within a library. By default, this is the WORK library. To access materials in other libraries or to create a new library, it is necessary to use a LIBNAME statement (or create a permanent library). In SAS® OnDemand for Academics: Studio a LIBNAME statement to access shared materials (between the instructor and students) for courses is provided to the instructor when they register a course and the statement is the same for all courses they create within the platform. An example:

```
LIBNAME class "/courses/d2be3ae5ba27fe300" access = readonly;
```

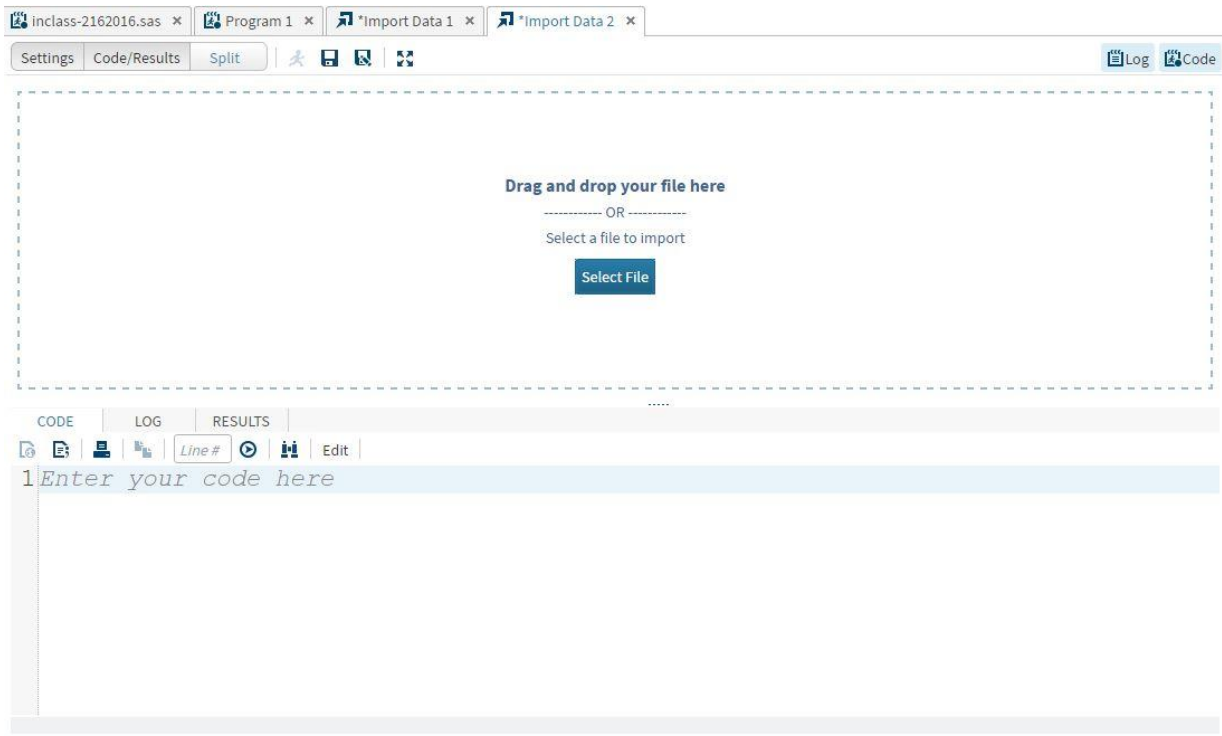
While this has made it easier to remember the LIBNAME statement, it is problematic if you teach several sections of the same course and do not want the material available before the next section starts, if you teach the same class each semester, or if you teach multiple courses at once. There is currently no way around this for the shared data folder.

IMPORTING DATA

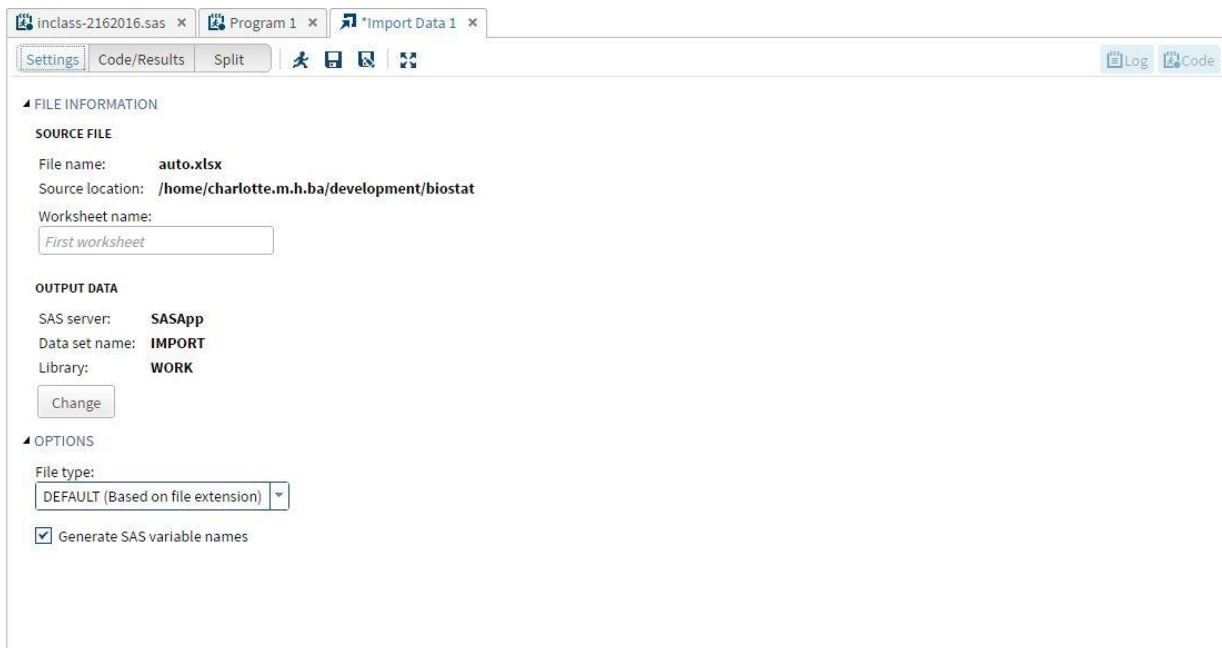
Each platform being compared in this paper (SAS® OnDemand for Academics: Studio, Base SAS®, SAS® Enterprise Guide®, and SAS® University Edition) allows for the use of many types of data. This includes data from Microsoft Excel, Microsoft Access, or SPSS and ASCII, text, or CSV data. Each platform has a version of the SAS® import wizard that makes importing data of any type simple. In SAS® OnDemand for Academics: Studio and SAS® University Edition this can be found by either right-clicking on a program tab and choosing “New Import Data” or choosing the “Tasks” menu to the left side of the screen then maximizing the “Utilities” drop down menu and finally choosing “Import Data”. Data to be imported this way in SAS® OnDemand for Academics: Studio has to have already been placed on the server and needs to be in your local “myfolders” folder to be used in SAS® University Edition.



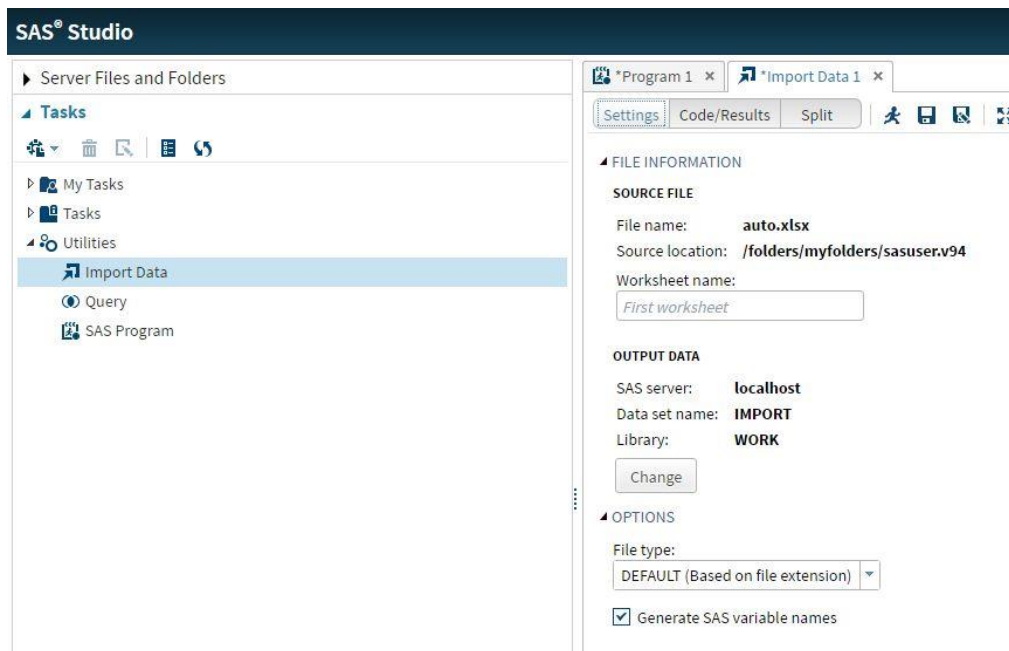
Display 1. SAS® OnDemand for Academics: Studio Import Wizard Step One



Display 2. SAS® OnDemand for Academics: Studio Import Wizard Step Two

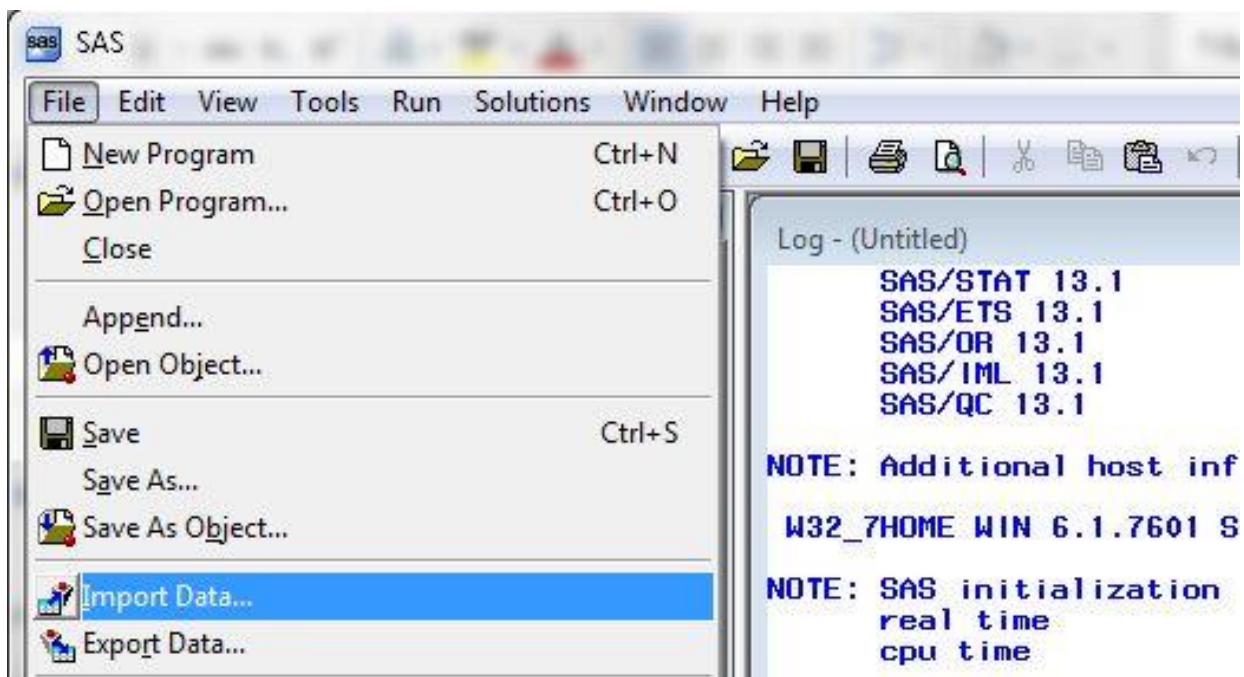


Display 3. SAS® OnDemand for Academics: Studio Import Wizard Step Three

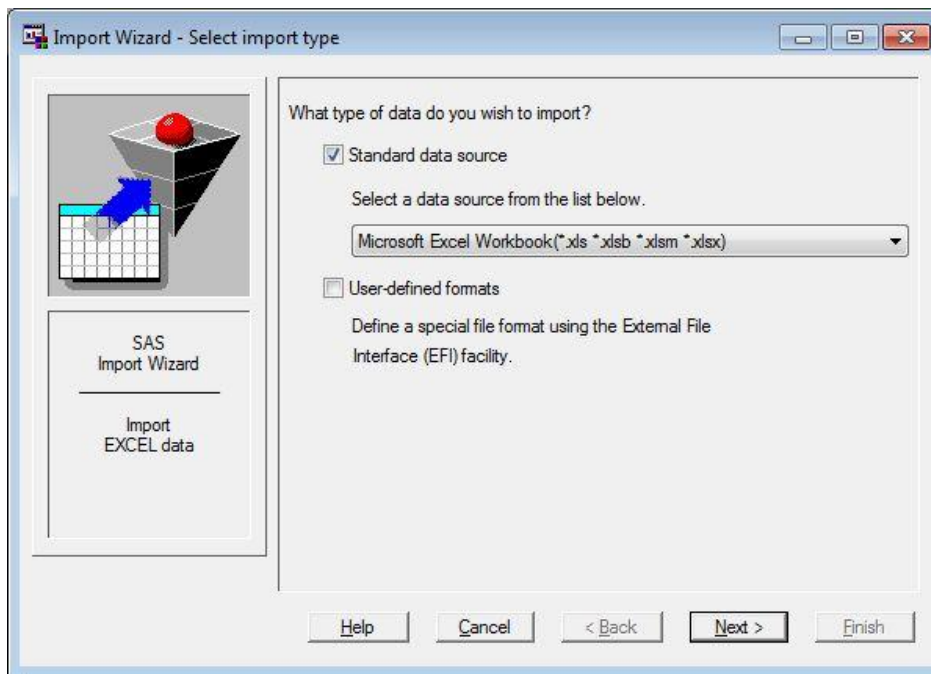


Display 4. SAS® University Edition Import Wizard

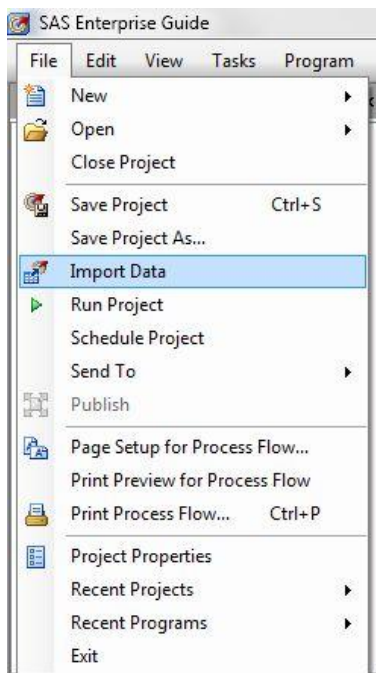
In Base SAS® and in SAS® Enterprise Guide® the Import Wizard can be found by choosing “File” then “Import Data”.



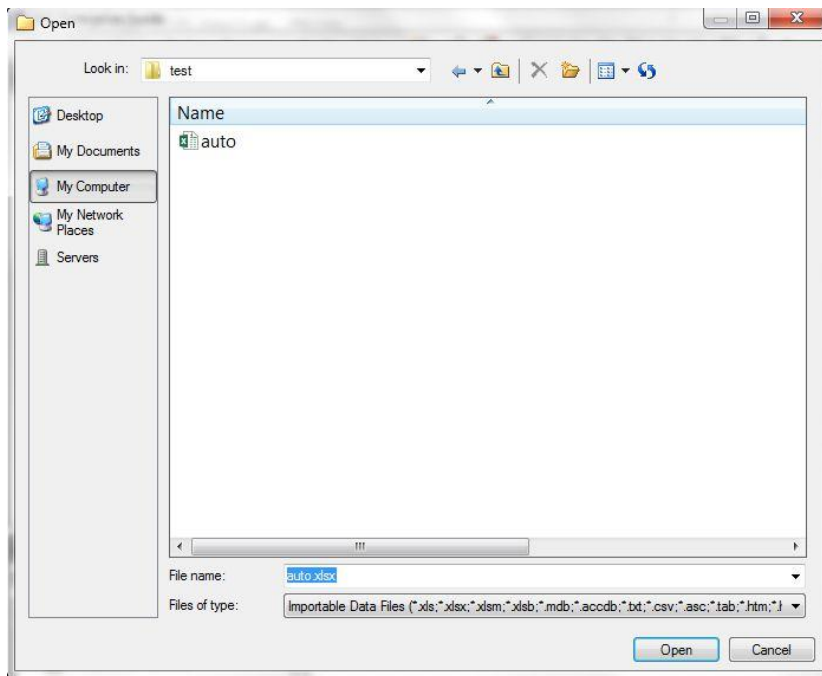
Display 5. Base SAS® Import Wizard Step One



Display 6. Base SAS® Import Wizard Step Two



Display 7. SAS® Enterprise Guide® Import Wizard Step One



Display 8. SAS® Enterprise Guide® Import Wizard Step Two

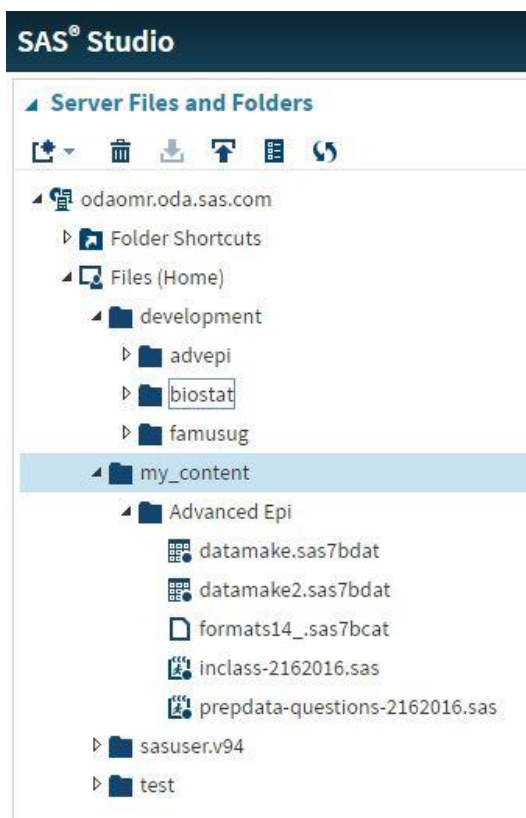
SAS® ONDEMAND FOR ACADEMICS: STUDIO VS BASE SAS®, SAS® ENTERPRISE GUIDE®, AND SAS® UNIVERSITY EDITION

Despite the several similarities the four platforms have with each other, there are some very clear differences in terms of access, usage, and instruction.

COURSE CREATION AND SHARED SERVER SPACE

It is very easy for instructors to register for a SAS® OnDemand account and create new courses. Documentation explaining how to register and how to create a new course is available and very detailed. Once an instructor has created a course, they can use the resources of SAS® OnDemand even if they have no active courses. For example, you may want to create a new data set or subset existing data for eventual use in a course using SAS® OnDemand. Each user, teacher and student, is given personal space on the SAS® server. Because no one else can access this space it is well suited for an instructor to manipulate data and code before making either available for students or for students to save their own in-progress work. Users can import data and code to this personal space, create a library for this space, and export both data and code from this personal space.

The ability of an instructor to move files from the personal space to the shared space and back quickly without the need for a third party space or program is a major benefit of using SAS® OnDemand for Academics: Studio instead of using Base SAS®, SAS® Enterprise Guide®, and SAS® University Edition for education. Students cannot delete data from the shared course server space but instructors can. As long as students have registered in SAS® OnDemand for Academics for your course, they can access the shared materials anywhere and anytime without needing to take an additional 10-15 minutes at the beginning of a training or class to download from the internet or pass around a flash drive. This extra time can be spent on teaching and the inevitable troubleshooting time needed to help students learn.



Display 9. SAS® OnDemand for Academics: Studio Shared Course Server Space

In Display 9, the highlighted folder “my_content” is the shared folder on the server. Anything in that folder is accessible to everyone registered for every course you are the instructor for in the SAS® OnDemand for Academics system. The folders “Development”, “sasuser.v94”, and “test” are personal folders only the instructor can see. Students see “my_courses” instead of “my_content” in their menu.

Using SAS® OnDemand for Academics: Studio saved us several hours that would have been needed to go computer by computer to install code and data prior to workshops in a large 100-system computer lab because the computers in that lab were not networked to a common system for installations. It is possible to recreate the course connectivity environment to allow sharing between the instructor and the student in Base SAS®, SAS® Enterprise Guide®, and SAS® University Edition but it is more difficult and requires a server or other internet space that can be easily accessed by students at the instructor’s or institution’s expense. Some institutions may have this type of access built into their learning management system (e.g. Blackboard Learn). This can be complicated (or expensive) and off-putting particularly for beginning users and busy instructors who need to make time to learn how to make this happen. It is more advantageous to utilize networked computers or have an online repository on a personal or business server where students can access files. We have utilized both Blackboard Learn and the combination of Dropbox and the goo.gl URL shortener to make information accessible when not using SAS® OnDemand for Academics: Studio as the teaching tool.

PLATFORM ACCESS

SAS® OnDemand for Academics: Studio is web-based platform that can run on almost any computing platform that has a browser installed and an internet connection. We noticed no differences using the platform in Microsoft Internet Explorer, Google Chrome, Mozilla Firefox, or Apple Safari. Students with Mac computers were very excited that they could use a SAS® program on their computer without a virtual machine. This means that they were not required to be on campus to finish assignments and could still access material from the instructor on the server. Base SAS® and SAS® Enterprise Guide® can be

purchased for Windows or UNIX. SAS® University Edition is free and can be downloaded for Windows, Mac, and Linux. It requires a SAS.com account to download and a virtual machine to run. While it does need a web browser to operate, it does not require internet connectivity and the files are saved on your computer (or connected drives). Rarely have we run into an issue with the virtual machine but when we have, it has been related to the use of the virtual machine on a Mac system. Users should be careful to install the free virtual machine that is the first one recommended on the download page if they are not willing to pay for the alternatives. SAS® University Edition also can be run using Amazon Web Services for a fee based on time used. This version of SAS® University Edition requires an internet connection and a web browser.

For training purposes, we sometimes need to travel to locations that belong to our community partners (example: government offices) and do not have access to their internet for security reasons and they are not able to access certain websites including the website for SAS® OnDemand for Academics: Studio for the same security reasons. The use of Base SAS®, SAS® Enterprise Guide®, or sometimes even SAS® University Edition (download version) is more useful for training in these situations. Due to the SAS® OnDemand for Academics: Studio being an internet product it is also good to remember that it has regular update days and times when it is not available and sometimes the server is overloaded due to a great number of users. SAS® has been very responsive in terms of letting users know when updates or connection issues may be a concern. If the server is down during your class or training, especially if you do not have a system with Base SAS®, SAS® Enterprise Guide®, or SAS® University Edition as a backup for instruction, your course is going to be difficult or impossible that day. We have had occasional outages that were unannounced, not lab wide, or not system wide but these have occurred less frequently over time. For these reasons, we try our due diligence to hold trainings or classes in rooms where we can connect our laptops with Base SAS® or SAS® Enterprise Guide® to projector screens. While Base SAS®, SAS® OnDemand for Academics: Studio, SAS® Enterprise Guide®, and SAS® University Edition all have warnings to save your files before exiting, if the server blinks or goes out for SAS® OnDemand for Academics: Studio, the user will usually lose their work. It is of utmost importance to remind students to save quite frequently.

Anyone can access SAS® OnDemand for Academics for noncommercial purposes without being registered for a course. Because it is open to those in a non-university setting, the benefits of SAS® OnDemand for Academics: Studio can be used for trainings for working professionals in many settings. This is extremely important because of cost limitations for otherwise accessing SAS® if one does not have a license for Base SAS® or SAS® Enterprise Guide®. The platform closest to SAS® OnDemand for Academics: Studio that can be used for training partners with limited budgets is SAS® University Edition. Both are free and accessible to most people who want to learn SAS (the license for SAS® University Edition specifies that it is for academic purposes only). The primary concern in this situation (training) is to be able to easily share files with users that are accessing the training in person or in a virtual setting. The easiest way is to use SAS® OnDemand for Academics: Studio for all of the reasons listed above.

Sometimes the easiest way to teach SAS® is not the best way. As an example, we are currently planning a training course for analysis using SAS® for non-profit academic partners with limited funds. They provide training opportunities for our graduate students but do not have access to Base SAS® or SAS® Enterprise Guide® and have data that cannot be placed in the cloud or put on student's computers with Base SAS®. In order to give our students the best chance to serve them and to give them some knowledge to help troubleshoot the academic projects, training them with SAS® University Edition is the best option. The limitation is that each attendee has to register for their own SAS.com account and access their own SAS® University Edition license. In our on-campus SAS® user group, it has proven most advantageous to use Base SAS® and SAS® Enterprise Guide for instruction as we a) have a campus license; b) wanted to provide workshops in a version that most users across many disciplines were using for everyday purposes; and c) had difficulty getting users to create and use accounts just for workshops.

A drawback of using SAS® OnDemand for Academics: Studio if one is registered as a student is that if the account has not been used for several months, the account may be deleted from the server and the user will need to create a new account to regain access. Users had issues on occasion and were temporarily unable to access their accounts (not a password issue). This is not the case with Base SAS®, SAS® Enterprise Guide®, and SAS® University Edition. These problems required the addition to

materials for our courses that users test their accounts well before the course began so that there were not any delays in sharing material or teaching especially on the first day. It also required that we remind students to download anything they wanted to save after the completion of a course just in case their account was deleted so there would not be any surprises or lost material.

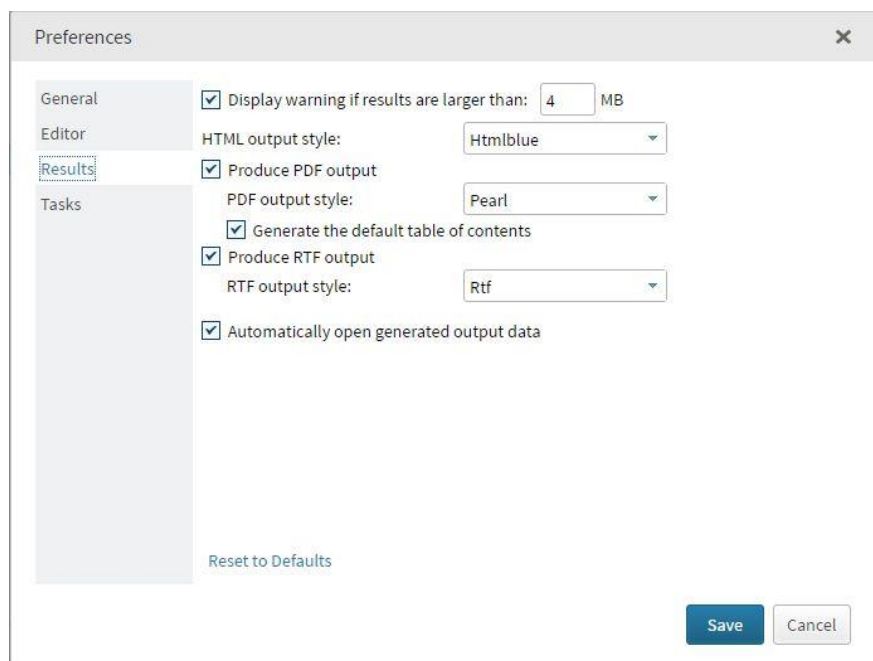
IN CLASS OR TRAINING USAGE

SAS® OnDemand for Academics: Studio, SAS® Enterprise Guide®, and SAS® University Edition all have the capability to autocomplete and show users prompts to learn SAS® code or to provide hints as to what statements or options are available in different procedures or data steps. This is a powerful assistant in SAS® education and is widely utilized by students in both our postsecondary education courses and professional development courses. It allows students to go beyond the examples given by the instructor and do a lookup of meanings and uses from within the program.

All four platforms being compared here can handle large datasets (datasets with a great number of observations). SAS® OnDemand for Academics: Studio does give a popup warning window about large size result files indicating that the server may be slow for processing but this warning can be disabled. On occasion this processing time can be several minutes even for smaller datasets with weights, strata, and/or clusters that are using the SAS® survey procedures. Despite its ability to handle a large number of observations, SAS® OnDemand for Academics: Studio cannot be used with data files that are more than 1024MB as they cannot be uploaded to the server. This is not an issue with Base SAS®, SAS® University Edition, or SAS® Enterprise Guide®.

The file size was an issue in SAS® OnDemand for Academics: Studio when we wanted to teach students how to download large public health public use data (such as the Behavioral Risk Factor Surveillance System (BRFSS) data from the Centers for Disease Control and Prevention) to learn how to subset data or appropriately use the SAS® survey procedures. The file was much too big and therefore instead of students getting a hands-on experience, they needed to watch as we did the actions using Base SAS® and SAS® Enterprise Guide® before they could join us several steps in with a reduced data set that we could upload to the SAS® OnDemand for Academics: Studio server. This does not result in the same experience and therefore reduces the benefit of hands-on learning for mastering SAS®. If they had had personal computers (or lab computers) in front of them with Base SAS®, SAS® University Edition, or SAS® Enterprise Guide® this would not have been a problem.

For instruction purposes, especially in large rooms, it is necessary to make the font size for the program, log, and results a larger size. SAS® OnDemand for Academics: Studio and SAS® University Edition have far fewer customization options than Base SAS® or SAS® Enterprise Guide® for changing the size of the results – it must be completed by changing the results template and this is not readily apparent or easy to do. The platforms offer through a menu the option for resizing the text in the program window and this works well. Students sitting far from the screen have a difficult time reading the output from SAS® OnDemand for Academics: Studio. We found it was easier to export some results to PDF and then show them larger in a screen with highlights calling attention to the important areas.



Display 10. SAS® OnDemand for Academics: Studio and SAS® University Edition Preferences Menu

The visual differences between the platforms can be troublesome when participants in a class or in a training need to put their new skills to work but only have access to a different platform. For example, several students found it difficult to change from using SAS® OnDemand for Academics: Studio to Base SAS® and SAS® Enterprise Guide® when doing internships and other external research. It was a learning curve to adjust to changes in menus, options available (such as autocomplete), and especially how the libraries, LIBNAME statements, and file locations were different. This is the same situation encountered when moving from SAS® University Edition to Base SAS® or SAS® Enterprise Guide®. The difficult transition can be a drawback but can be remedied with additional workshops or course time.

CONCLUSION

SAS® OnDemand for Academics: Studio has proven to be a great substitute for Base SAS® and SAS® Enterprise Guide for teaching beginning and intermediate SAS® skills but it is not without limitations. The best benefits of SAS® OnDemand for Academics: Studio are a) saving time by not needing to install software or share data through a third party; b) being able to easily share data files and coding examples; c) having support for multiple operating systems; and d) being able to use SAS® in a non-networked environment. For users that need low-cost options for teaching and learning, SAS® University Edition (the download version) is an excellent alternative. Base SAS®, SAS® Enterprise Guide®, and SAS® University Edition are preferable for education if one is in a situation where there may be issues with internet connectivity or the lab being used have a way to easily install the programs on many machines at once. Base SAS® or SAS® Enterprise Guide® can be preferable for education when a) it is affordable, b) it would be cumbersome to make participants create accounts, or c) there are security issues with downloading anything from the internet or accessing cloud based platforms. In our situation, a combination of all four of these platforms (with SAS® OnDemand for Academics: Studio being the primary platform) has worked best for teaching in both the postsecondary education and the professional continuing education realms to accommodate for most possible computing situations. We recommend that instructors take the time to test each platform to make the best decision for their purposes.

RECOMMENDED READING

- SAS Institute Inc. 2015. SAS® OnDemand for Academics: User's Guide. Cary, NC: SAS Institute Inc.
- *SAS® University Edition: QuickStart Guide for Oracle VirtualBox*. Available at

<http://support.sas.com/software/products/university-edition/docs/en/SASUniversityEditionQuickStartVirtualBox.pdf>

- *An Introduction to SAS® University Edition* by Ron Cody

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