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Preparing Students to Take the SAS® Base Certification Exam, Training Students to Think Like SAS®.

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ABSTRACT

Preparing students to take the Base SAS® Certification exam is challenging in a formal classroom setting. The diverse backgrounds of the students combined with the unique features of SAS® requires careful planning and insightful examples. The course is part of the core required in the Master of Science in Applied Statistics (MSAS) program at Kennesaw State University. The execution of the course has changed over time due to the experiences of the students and feedback from industry. The topics discussed in this presentation include an overview of the population that takes the class at Kennesaw State University, the technology available to the students, the current organization of the course, the materials provided by KSU, the materials and support provided by SAS®, as well as the pitfalls that were encountered in the past that informed some of the current design decisions. Examples of the materials are incorporated into the presentation, as well as challenges faced by the students. The exam can be proctored as part of the class, which also presents an interesting dynamic. The experience, in general, is very similar to a coach preparing an athlete to compete. Much of the mental preparation is on the student—we can only create an environment that exposes the individual to the challenges that they will face.

INTRODUCTION

SAS® is used in industries such as pharmaceuticals, banking, finance, academics, and many others. There is a large amount of competition for individuals with SAS® skills which also require some sort of external validation of the abilities. The SAS® Certified Base Programmer for SAS®9 is part of a larger certification program offered that provides external validation of specific skills in SAS®. The certification program was started in 1999 (Rai, 2005) and has now grown to include six different certification subject areas: Foundational Tools, Advanced Analytics, BI and Analytics, Data Management, Administration, and Partners. The Certified Base Programmer for SAS®9 is part of the Foundational Tools subject area that also includes SAS® Certified Advanced Programmer for SAS® 9 and SAS® Certified Clinical Trials Programmer Using SAS® 9. Each certification has specified content that is expected to be mastered to pass the exam. The expected content is provided on the website and exam content documents. Kennesaw State University developed two courses, Statistical Computing and Simulation (STAT 7020) and Advanced Programming in SAS (STAT 8020), to prepare graduate students to take the exam.

SAS® TRAINING AT KENNESAW STATE UNIVERSITY

KENNESAW STATE UNIVERSITY

Kennesaw State University (KSU) is the third largest university in University System of Georgia, located about 35 miles north of Atlanta. The university is organized around 13 colleges offering Ph.D., Master, and Undergraduate degrees. KSU offers a Master of Science in Applied Statistics (MSAS®) that prepares students for employment as statisticians or other analytically related fields. It is intended as an applied degree that provides the skills required to walk into an employer space and contribute from the very beginning. The intent of the degree program implied that the curriculum would need input from the employers that would hire the graduates. The Department of Statistics and Analytics Sciences, which houses the degree program, formed an advisory board comprised of executives from companies in the local metro area as well a representative from SAS®. An early decision was made to incorporate SAS® into each course in the program. The preparation for the SAS® Base Exam became part of the curriculum once the value of the external credential was recognized. It is a way to set MSAS graduates apart from other candidates and degree programs in the region.

THE HISTORY

The first analytics program at KSU was an undergraduate minor in statistics. It is very successful for two reasons. First, it combines statistical training with a domain expertise developed in the major area of study. This allows the students to apply the statistical training to a primary domain area such as finance or healthcare. Second, the curriculum is applied which means that the course includes the theory as well as training in a software package to execute the analysis and the appropriate interpretations of the results from that package. SAS® is the preferred statistical programming language in the majority of the classes taught resulting in a huge demand for the students who complete the training. The MSAS program was designed to build off the success of the minor. The admission requirements are tough but are not limited to specific degrees, rather it focuses on analytical ability measured through the GRE and course work in mathematics including calculus II. We have had several very successful students who completed degrees in non-quantitative fields such as communications or history who completed calculus II to meet the admission requirements. SAS® is incorporated into the MSAS curriculum as well. It is the analytical software utilized in nearly every class and there are two classes dedicated solely to programming in SAS®. It was identified as a valuable skill very early in the program's history.

THE PROGRAM

The MSAS program requires completing 36 credit hours. The core is made of Mathematical Statistics I (STAT 7010), Statistical Computing and Simulation (STAT 7020), Statistical Methods (STAT 7100), and Applied Regression Analysis (STAT 8210). Statistical Computing and Simulation changed into preparation for the Base Exam but the course was never renamed. This reflects the input of the advisory board as the program matured. The students are free to select additional courses from a list of courses with some additional requirements. The details are available on the MSAS curriculum website (<http://csm.kennesaw.edu/statistics/mSAS@mSAS@-curriculum.php>). The courses are typically offered in the evening to attract the professional who either wants to cross train or develop additional analytical skills. The students come from a wide variety of undergraduate degree programs such as mathematics, biology, business, and various engineering programs.

THE CLASS

The class is offered one night per week from 6:30 to 9:15, usually Tuesday or Thursday evening. The timing of the class created some issues resulting in some modifications to the delivery of the content. The meetings are in a computer lab with approximately 40 seats but we limit enrollment to 35 students. We do allow some exceptional undergraduate students to also take the graduate level class. We also allow faculty members and other individuals from the university to sit in on the class resulting in an average class size of approximately 38 students. PC SAS® is installed on the machines in the class room and is used for instruction. The students can now access SAS® through one of three different ways. The University System of Georgia offers PC SAS® through an online book store for approximately \$35 per year. It is a full install that is provided to the student. We also have PC SAS® installed in a Citrix environment that students can access from anywhere with an internet connection. It is an expensive solution that requires constant maintenance and still has connectivity issues. Recently, I have provided access to SAS Studio through SAS on Demand for the students as well. This also creates some interesting conversations about the differences between SAS Studio and PC SAS. It generates very good discussion points about the differences and forces the students to research what was said in class to ensure it was accurate. For instance, SAS Studio now allows spaces in the variable name while PC SAS® does not. The Base Exam assumes PC SAS® which requires the students to verify the statements and observations made during the lecture.

THE DELIVERY

The lectures are delivered one night a week for 2 hours and 45 minutes. The time block has some benefits while also creating some opportunities for creative classroom management. The benefit of such a long meeting is that most chapters in the SAS® Certification Prep Guide can be covered in that time. The drawback to the lengthy class time is the attention span of the students and the endurance of the instructor. The first attempt was a traditional lecture with a 15 minute break in the middle. This failed for several reasons including the time of the class, the fatigue of the students, and the relatively dry material.

In order to create continuity from one week to the next and maintain the classes' attention, several important modifications were made.

First, homework was always discussed at the beginning of the class. The assignment from the previous week's material was discussed at the beginning of class which creates a really nice review. If the assignment was reviewed by the instructor before the class meeting, then the misconceptions are easily identified and can be discussed. If the assignment was not reviewed, then students are likely to ask questions revealing weaknesses in mastering the material or misconceptions. The review usually takes 10 to 20 minutes depending on the length of the assignment and the ensuing discussion. The assignments are now tailored to ensure that the discussion takes no more than 20 to 25 minutes.

The second modification was the actual presentation of the material. As time went on, the discussion relied less on the prepared power points provided. The lecture evolved into a discussion using prewritten SAS® code that was interactively modified as part of the lesson. The intent is to switch the way students perceive the lecture and engage in the materials. The traditional lecture format is very passive for the students which makes it difficult to learn SAS® and pass the base exam since the examinee is expected to predict the results from SAS® code. The conversation starts by explaining the current version of the SAS® code and executing it as it is written. Then, based on the specific concept to be emphasized, the code will be modified and not executed until the class makes predictions about the results. Then the code will be executed and the results examined while also addressing any misconceptions that may have led to the incorrect prediction. This style of teaching also forces the students to interact with the lecture which makes it more interesting. They also become comfortable with each other and making mistakes.

The final modification is the incorporation of 'class work.' Instead of the traditional 15 minute break, the students work on class work for 30 to 45 minutes with the option to take a break at any time. The students are encouraged to work together to complete the assignment. This breaks up the long lecture into four distinct sections: review, lecture, classwork, and lecture. The final section includes discussing the classwork to ensure the students were able to create and execute the code required to complete the task. Then we finish up any remaining content to be discussed.

THE MATERIALS

There are two text books suggested for the class: the SAS® Certification Prep Guide (SAS®, 2011) and The Little SAS® Book, A Primer (Delwiche and Slaughter, 2008). The class is designed to prepare students for the Base Exam, so the majority of the content is directly from the Prep Guide. For each chapter, the students will get a power point with many of the details in the text as well as examples, the SAS® code that was designed to support the lecture, the classwork that provides additional examples, and a homework assignment. The homework solution from the previous assignment is also provided as part of the content. All of the content is packaged into a lecture folder and distributed through an online course management system. This is repeated for each of the 21 chapters, except some of the chapters are combined with similar topics to fit the content into a traditional 15 week semester. For instance, lectures two, three, and four discuss importing and exporting data using information from chapters 2, 4, 16 and 17. In addition, the students get access to quizzes similar to the certification test as well as other assessments. There are also in class quizzes designed to mimic the certification test both in length and difficulty. The preparation is similar to preparing any athlete for competition. It requires a combination of drills to develop the specific skills and then game like situations to get comfortable applying the skills. All of the materials discussed above developed by the instructor responsible for the course.

THE MATERIALS PROVIDED BY SAS®

SAS® also provides many wonderful resources for the instructors. This was not always the case or at least it was not advertised well. The resources are available on the SAS Academic Program's website (https://www.SAS.com/en_us/learn/academic-programs/resources/free-teaching-materials.html). The zip files contain lecture notes in power point and in word, the SAS® programs, as well as the data. It is well organized and follows the chapters in the Prep Guide. It is also possible to request copies of the practice certification exam for the class. In addition, you can proctor the exam on campus as part of the class. SAS® established some regulations to proctor the exams.

CONCLUSION

The structure of the class has not changed in the past few years. The pass rate is approximately 60% but the vast majority of the learning is on the students. The instructor can prepare or use the best materials, provide the most intellectually stimulating lectures, and create an environment for learning but the student still has to learn to think like SAS® in order to pass the exam. It requires learning outside of class and a shift from passive learning to actively thinking. The students who put in the time and learn to take the exam often pass with high scores.

REFERENCES

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