



Article from  
***Expanding Horizons***  
December 2019  
Issue 59

## ACTUARIAL TEACHING CONFERENCE

# Launching a New Actuarial Science Program

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The Department of Mathematics and Statistics at Austin Peay State University (APSU) launched its actuarial science program in the fall semester of 2017. Developing a new such program at a small state university presented a series of challenges. In this article we would like to share our experiences while developing the new program, challenges we faced, and the successes we have realized within this short period of time. Our aim is to share our experience with educators at other small schools who are considering implementing a new actuarial science program. Maybe your school has never had actuarial science courses, or perhaps you want to extend your curriculum beyond a few courses that cover select exams to offering a minor or major. In either case, by sharing our experiences, we hope you will avoid the same pitfalls we faced and develop your new programs efficiently and effectively.

When implementing an actuarial science program, there are many elements to be considered. In the sections that follow, we will discuss considerations related to the program's administration and curriculum. We will also discuss considerations of how to ensure the program meets students' needs.

### ADMINISTRATION

When developing a new program, it is important to think about the following:

- Determine the mission and vision of the program
- Identify the department to house the program
- Create an advisory board
- Determine the type of program to be offered
- Establish short- and long-term program goals

#### Determine the Mission and Vision

The first question about the program to be answered is, why is it needed? Does this new program align with the university's

overall mission and vision statement? For example, APSU's mission statement specifically states

Developing programs and services that address regional needs, and providing collaborative opportunities that connect university expertise with private and public resources. Collectively, these endeavors contribute significantly to the intellectual, economic, social, physical, and cultural development of the region ...

In our state, Tennessee, there is only one institution with an actuarial science program that covers more than two preliminary actuarial exams and only three universities (including APSU) that cover at least one actuarial exam.<sup>1</sup> Nashville, the capital of Tennessee, is a regional hub for actuarial firms. Thus, an actuarial science program was a regional need that came under the APSU mission statement.

#### Identify the Department to House the Program

Once development of a new program is justified, you must determine which department will host it. Actuarial science programs are generally hosted in either a department of mathematics and statistics or a department of business and finance. Students taking actuarial science in a department of business or finance will take a larger variety of business and finance courses. However, these students must still take the full calculus sequence and one or two probability and statistics courses to obtain the knowledge needed to sit for the preliminary exams—perhaps earning a minor in mathematics. Students taking actuarial science in a mathematics or statistics department will develop a strong mathematical background and will take business and finance courses as a minor or as electives—obtaining VEE credit to demonstrate their knowledge of business operations. Either department will serve students well on their pathway to membership in the Society of Actuaries (SOA). At APSU, our recently developed graduate programs in predictive analytics and mathematical finance are managed jointly by the Mathematics and Statistics Department and the Computer Science and Information Technology Department. We strategically chose to house the undergraduate actuarial science program in the department of mathematics and statistics.

#### Create an Advisory Board

An advisory board will guide you as you make important decisions related to the implementation of the program. It should include professionals with industry experience in a variety of fields in which actuaries work, such as life and health insurance, property and casualty insurance, and pensions and retirement funds. It is possible that some of your alumni have pursued additional education or employment in the field of actuarial science after leaving your institution. If so, these individuals would also make excellent board members. An educator from a noncompeting

college or university with an established actuarial science program would also bring valuable experience to the table.

A challenge we faced in forming an advisory board was our lack of contacts with professionals in the actuarial science industry. We are working to establish those connections, but the SOA and the Casualty Actuarial Society (CAS) have programs that can help. Both organizations will connect you with a liaison who is a professional actuary.<sup>2</sup> At APSU, we also use an existing board for our financial mathematics program with two additional actuarial science professionals.

### Determine the Type of Program to Be Offered

Once the department housing the program is identified and an advisory board is in place, the next step is to decide what type of program will be offered. You can offer either a major, a concentration or a minor in actuarial science. This decision needs to be made in conjunction with choices regarding the amount of exam coverage to be offered and how many courses will be developed. You should also consider the accreditation requirements at your school when deciding the type of program to be offered. To meet accreditation requirements at our university, a program major must graduate a certain number of students each year. Since our program is new, we don't expect to reach that level for a few years. So we first decided that a concentration would best fit our needs. However, as interest in the program increased, we realized that students in majors other than mathematics could be served by offering a minor in actuarial science. Starting in fall 2019, APSU began offering either a concentration or a minor in this subject.<sup>3</sup>

### Establish Short- and Long-Term Goals

After the type of program to be offered is established, you next need to identify the short- and long-term goals for the program. Educators need to understand that current job trends require students to pass at least one or two exams held by the SOA or CAS to be considered for internships or employment. Students will be looking for a college or university with a comprehensive program. Thus, being designated as an SOA Center of Actuarial Excellence (CAE) school<sup>4</sup> or winning a CAS University Award<sup>5</sup> may be considered long-term goals. Both designations will identify your institution as one with a program of excellence and will serve as a recruitment tool for potential candidates.

APSU applied for and obtained UCAP-IC (Universities and Colleges with Actuarial Science Programs—Introductory Curriculum) status, which is the first step on the pathway to the CAE designation. The UCAP review process can take a few months, so plan on completing this goal as soon as possible. We are currently in the process of applying for UCAP-AC (Advanced Curriculum) status. The criteria for both designations require evidence of coverage of specific exam topics, so your course syllabi must be in good order before applying for

these designations. Additionally, the Validation by Education Experience (VEE) courses must be offered before you can apply for UCAP status (one course for IC and all three for AC), so plan to obtain VEE approval before applying for either designation. (VEE approval is discussed more in the next section.)

## CURRICULUM

While there are many important decisions to be made regarding the curriculum that your institution will offer, the following are three main decisions you must make immediately:

- Determine which courses to offer
- Establish VEE Credit
- Identify program faculty

### Determine Which Courses to Offer

The type of program you will offer—major, concentration or minor—will constrain your choices regarding the number of courses or credit hours offered in actuarial science. You should examine your existing courses to determine if any may serve in the actuarial science program. For either existing or new courses, you will have to decide what content to cover. The SOA and CAS provide syllabi for each exam, and you can design courses that cover exactly those requirements, or you might choose to add some general subject knowledge to your courses. Keep in mind that the topics covered and texts listed on your syllabi will be scrutinized for compliance if you apply for UCAP-IC or UCAP-AC designations. It might benefit your students if you create a one-credit-hour course for exam preparation. A challenge related to curriculum is that you must continue to monitor changes made to the SOA and CAS syllabi or exam structure and adjust your course descriptions and syllabi accordingly to retain UCAP designations if they have been granted. At APSU, the course creation process took about one year to complete, so allow yourself adequate time for new courses or changes to be approved.



For example, when we first created a financial derivative (IFM) class, we were targeting the now-retired Models for Financial Economics (MFE) exam. This exam didn't contain topics such as the capital asset pricing model. Our course bulletin says, "This course covers introductory financial derivatives, general properties of options, the binomial option pricing model, the Black-Scholes option pricing model, Greeks, risk management, and interest rate derivatives. This course prepares students for actuarial exam 3F/MFE." With the new IFM syllabus, we now need to change the wording in the course bulletin, but that won't be possible at our school without changing the course number. That means we need to create a new course. The best way to avoid this situation is by not adding the exam name to the course description in the bulletin.

### **Establish Validation by Educational Experience Credit**

Both the SOA and the CAS have a syllabus of essential basic education of which candidates must show evidence when applying for membership in the societies. These experiences are called Validation by Educational Experience and include education related to accounting, economics, finance and mathematical statistics. While VEE credit is applied for by individuals, a high-quality college or university program should provide these experiences to students so they will later be eligible for admission to the societies without needing further education. You should carefully choose courses for your major, concentration or minor that address the specific topics required.<sup>6</sup> If your program is housed in the Department of Mathematics or Statistics, then you will need the cooperation of faculty in other departments that offer these courses to ensure that the corresponding syllabi show that the appropriate topics are covered. Once approved, your college or university will be listed in the VEE directory. Students looking for an actuarial science program know that a program with approved VEE courses will provide them with the education needed to successfully apply for admission to the societies once they pass the relevant exams. APSU has received approval for all of the VEE courses. This is another area that is subject to change, and administrators of an actuarial science program must continually monitor the requirements to remain in compliance.

### **Identify Program Faculty**

Naturally you will need faculty to teach the actuarial science courses. You should first examine existing faculty to determine if they can meet the needs of the program. Once qualified faculty are identified, your department must consider the ways in which they will be involved in the design of curriculum for courses in the program. Furthermore, you must decide how you will support faculty who may need to sit for actuarial exams or pursue additional designations. Support could take the form of release time to study for exams or funds to pay for exam preparation

materials and covering the cost of exams. The department should also consider adding the attainment of society designations to faculty requirements for retention, tenure and promotion. This move may encourage more faculty to show interest in teaching the actuarial science courses.

If the current faculty do not meet the program needs, you must search for new faculty. You should decide what combination of education and expertise you are looking for in a candidate. Attracting a quality candidate to a small school can be challenging. At APSU, we used existing faculty to cover most courses, and we secured a one-year visiting professor to meet our needs temporarily.

### **MEETING STUDENTS' NEEDS**

The first goal of a program must be to meet the needs of its students. Students with the best chance of securing a job in actuarial science are those who have passed exams, experienced real world-connections to actuarial science and have developed excellent professional skills.

### **Success on Exams**

Most employers expect newly hired actuaries to have passed two or more exams. The pass rate for preliminary exams P and FM in spring 2019 were 47 percent and 49.3 percent, respectively. Your administration must be patient if you initially have very low pass rates. You have created courses that cover the SOA and CAS syllabi, and students are passing those courses, but you may wonder why few students are passing the exams. In our experience, students at small schools are often impeded by financial barriers related to the cost of exam preparation materials and the cost of exams. At APSU, we proposed and received a grant from the Casualty Actuaries of the Southeast.<sup>7</sup> One purpose of the grant was to fund a materials library for students to use when preparing for preliminary exams. The grant will also reimburse a limited number of students who pass preliminary exams. Your program may seek other internal or external sources of funds to help students overcome expenses incurred when preparing and taking exams.

### **Real-World Connections to Actuarial Science**

Employers may be faced with stacks of résumés from qualified candidates. Students who have some real-world experience will stand above the rest. Your program can provide some limited experience by using case studies in the curriculum, but the best source of real-world experience is through an internship. Program administrators should use connections formed between the college or university and industry professionals to establish internship opportunities. Faculty should also guide students toward seeking such opportunities. Students may need faculty support in the creation of résumés and the application process. At APSU, we successfully placed two students in internships at

the State of Tennessee Department of Treasury in the 2018–2019 academic year.

Another way to engage students in real-world actuarial science is through research or competitions. The SOA and CAS both have many opportunities that faculty can use to enhance their students' knowledge of real-world actuarial activities. For example, the SOA offers a Student Research Case Study Challenge, which students can complete and submit in competition with other schools for a chance to be awarded grants.<sup>8</sup> Faculty who engage in consulting work may also utilize students in supporting roles and thus increase their students' exposure to practical work experience.

### Excellent Professional Skills

In addition to passing exams and gaining real-world experience, students must demonstrate excellent professional skills. The employer panel at the 2019 SOA Actuarial Teaching Conference was an excellent source of information regarding what skills employers are looking for in new hires. Companies expect people to communicate effectively in writing and speaking. Newly hired employees must possess advanced skills in Microsoft Excel and Word, as well as some experience with programming or the use of statistical software packages such as R and SAS. Students can attain this expertise if they are engaged in a carefully planned curriculum where these skills are developed and the presentation of high-quality work is expected. At APSU, we are developing a new course that includes experiences with Excel and requires students to write and communicate solutions to small cases through presentations. The course will also explore the ethics that professional actuaries must exhibit.

Two presentations at the 2019 SOA Actuarial Teaching Conference provided excellent guidance in adding these experiences to your curriculum. Joanna Mitro, University of Cincinnati, described an introduction to actuarial science course that was developed for students to take early in their program of study.<sup>9</sup> Heather S. Clemens and Sue Vagts, University of Nebraska–Lincoln, shared details of their course designed to develop young professionals.<sup>10</sup>

### SUMMARY

Launching a new program is a daunting task, and many things must be considered. Decisions based on careful planning and thought will lead to a successful program. This careful planning will also eliminate much of the stress and frustration that can accompany the implementation of a new program. We hope this article will provide some insight into the process and allow you to create your new program effectively and efficiently. Some of the ideas here were developed by us as the process evolved, and some were gained through collaboration with colleagues at the 2017 and 2019 SOA Actuarial Teaching Conferences. We

encourage you to join the SOA and CAS online forums and to attend conferences where the sharing of ideas is a valuable resource. We would also be happy to communicate with anyone who has questions or would like more information concerning the implementation of a new program. ■

*The authors wish to thank Haseeb Kazi at Trine University for contributions to “Challenges and Successes of Launching a New Actuarial Science Program,” a presentation made at the Actuarial Teaching Conference 2019.*



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### ENDNOTES

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