COLLABORATIVE PROJECTS FOR DEVELOPING TECHNOLOGICAL AND PROFESSIONAL COMPETENCES IN ACTUARIAL SCIENCE

Eduardo Trigo-Martínez¹, Antonio Fernández-Morales²

¹ Departamento de Finanzas y Contabilidad, Universidad de Málaga (SPAIN)
² Departamento de Economía Aplicada, Universidad de Málaga (SPAIN)

Abstract

The actuarial profession requires a specific combination of professional, analytical and technological competences that is in constantly evolving. Changes in insurance -as well as financial- markets demand new analytical tools and associated technological resources to implement them. These facts constitute a challenge for actuarial educators who need to update not only the contents of the courses, but also the mechanisms for developing the required competences. To face this challenge, at the Universidad de Málaga, we are using collaborative projects as an effective instrument for our students of the MSc in Actuarial Science to achieve the adequate level of competence required by the profession. These projects are integrated into a blended coordinated strategy that allows (i) to apply the same project to more than one course, and (ii) to include the assessment into the official grade of the courses involved. The case studied in this paper combines the courses in Stochastic Processes and Models and Methods for Calculus for Actuarial Applications I. Each group of students must complete a proposal for investing in two alternative assets using stochastic simulations by means of programming Visual Basic scripts for Microsoft Excel. Thus, the completion of the projects requires analytical and technological skills as well as organizational and communication competences, since the proposals are presented in a role play simulating a committee in the insurance or financial firm. Finally, the results of this experience are evaluated by means of a survey, that reveals the excellent perception of our students of (i) the contribution of this work to their learning process and (ii) the use of this pedagogical strategy in addition to the general -more conventional- one used in the MSc program.

Keywords: Actuarial, collaborative projects, professional competences, simulation.

1 INTRODUCTION

The actuarial profession requires a specific combination of professional, analytical and technological competences that is constantly evolving [1], [2], [3]. Changes in insurance -as well as financial- markets demand new analytical tools and associated technological resources to implement them. These facts constitute a challenge for actuarial educators who need to update not only the contents of the courses, but also the mechanisms for developing the required competences, in the framework of the European Higher Education Area [4], [5].

To face this challenge, at the Universidad de Málaga, we are using collaborative projects as an effective instrument for our students of the MSc in Actuarial Science to achieve the adequate level of competence required by the profession. These projects are integrated into a blended coordinated strategy that allows (i) to apply the same project to more than one course, and (ii) to include the assessment into the official grade of the courses involved. This strategy is included in a wider Pedagogical Innovation Project that involves nine courses of the MSc study program. The general project is based on previous experiences of the team of lecturers using and developing innovative resources and strategies in the Actuarial study programs at the Universidad de Málaga, like new assessment models [6], technological interactive resources [7], [8], transversality [9] or creativity [10].

One of the main objectives of the collaborative projects is to get closer to the real work of actuaries, that usually requires several competences at a time. The case studied in this paper combines the courses in Stochastic Processes (a methodological course) and Models and Methods for Calculus for Actuarial Applications I (a course on applied computing for actuaries). Each group of students must complete a proposal for investing in two alternative assets using stochastic simulations by means of programming Visual Basic scripts for Microsoft Excel. Thus, the completion of the projects requires analytical and technological skills as well as organizational and communication competences, since the proposals are presented in a role play simulating a committee in the insurance or financial firm. The assessment of the proposals is based not only on the results of the presentations, but also in the
organization of the collaborative work and the management of the compulsory multidisciplinary composition of the students’ groups.

This paper is organised as follows: the main methodological issues are discussed in section 2. The results of a survey conducted in the last academic year to have an assessment of the students’ perception of the pedagogical strategy followed are included in section 3. And, finally, section 4 draws the main conclusions of this study.

2 METHODOLOGY

Both courses involved in this experience (Stochastic Processes and Models and Methods for Calculus for Actuarial Applications I) follow a blended strategy combining face-to-face with online activities, providing a varied set of assignments. Within this set, the collaborative project is the most complex one and, consequently has the highest percentage on the final grade of both courses.

To carry out the collaborative projects, small groups of students are required to develop (and apply) a model in electronic format that provides the necessary elements for choosing between two alternative investment assets. The technical and analytic framework required is:

1. programming Visual Basic scripts for Microsoft Excel and
2. using stochastic simulations with continuous time Markov processes.

The importance of using simulations in our strategy is based on the usefulness of this particular approach to teach especially difficult stochastic concepts. There is a wide literature confirming the efficiency of interactive and ICT resources that enhance Statistics learning [11], [12], [13], [14], [15], many of them based on computer simulations that facilitate experimentation by students themselves. Positive effects on understanding and performance have been observed in learning [16], [17], [18], [19]. Our team has also developed and used this kind of educational resources in the Actuarial and other academic fields [20], [21], [22], [23].

In this work, we wanted to go beyond these previous experiences letting students develop their own models and simulator by means of VBA scripts for Microsoft Excel. VBA scripts are often used in financial calculus [24], [25] including specific actuarial ones [26].

On the other hand, the prevalence of VBA programming as a common tool in the professional activity of actuaries, along with its simplicity and its association with Excel spreadsheets, made us choose this technology to implement the models.

The results of each group’s work must be included in a written report to the lecturers, but also discussed in a role play session that simulates an investment committee of a firm in the insurance or financial sector. Furthermore, students have to make available their models in digital format to the lecturers. These are the three outcomes of each project that are evaluated (Figure 1).

Therefore, our students have to combine skills and contents from the courses in stochastic processes and insurance models and applications to undertake the projects. But, in addition, the requirements of the final outcomes demand general competences like oral and written skills as well. Moreover, our approach also depends on work-based competences that are a key element in the assessment model we follow.

The general strategy developed for this project was designed with the aims of:

- allowing the acquisition of skills and competences for several courses, facilitating an integrated perception of contents,
- encouraging group working and developing transversal competences, like oral and writing skills, and
- simulating a real professional environment, to achieve a greater “authenticity” of the learning process.
Regarding the assessment model, as the basic conceptual requirements are related to two different courses, the assessment is performed jointly by the lecturers of both courses and included in their final grades. The three “outputs” of each group (written report, oral presentation and electronic model) are evaluated.

3 RESULTS

Students involved in the collaborative projects were asked to complete a survey at the end of the course, in the academic year 2016-2017. The analysis of the survey provides a valuable information about the results of the experience form the point of view of our students.

Table 1 shows the main results (sample means and standard deviations) related to four general dimensions of the students’ perceptions about the usefulness of the collaborative projects for their learning process. All the items in the survey were coded with a Likert scale in the interval (1,5).

The opinion about the contribution to the learning process, by means of making it easier, is valued with a sample mean of 4.25. We consider this a very good indicator of the efficiency of our strategy, since this dimension is on the base one of the aims of the development of this educational resource. However, the dimension related to transversal competences reached an even higher valuation (sample mean 4.38). The explanation of this result reveal that our students value positively the interdisciplinary nature of the projects, considering that it significantly contributes to their learning process.

Moreover, there are two additional dimensions, both with sample means above 4 as well. The perception of including current professional issues in the projects was valued with a sample mean of 4.25. And, accordingly with the previous results, our students found that carrying out the collaborative projects resulted in a broader view of the courses involved, as the mean score of 4.13 seems to corroborate.
Table 1. Opinions about usefulness for the learning process.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Standard deviation</th>
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<tbody>
<tr>
<td>Eases the learning process</td>
<td>4.25</td>
<td>0.71</td>
</tr>
<tr>
<td>Allows a broader view of the courses</td>
<td>4.13</td>
<td>0.64</td>
</tr>
<tr>
<td>Related to current issues in the profession</td>
<td>4.25</td>
<td>0.72</td>
</tr>
<tr>
<td>Enhance developing transversal competences</td>
<td>4.38</td>
<td>0.74</td>
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The central part of the survey is dedicated to the assessment of the effort, usefulness and satisfaction with four elements of the projects: the written report, the oral presentation, group working and looking for information (documentation). The results (sample means) are shown in Fig. 2.

Regarding the assessment of effort, there is little variation amongst the four elements, being the least valued the written report and the process of documentation. In contrast, group working shows the highest mean score (3.89).

Usefulness of the four elements has also been assessed in the survey. These results show greater variation than those corresponding to effort. The oral presentation is viewed by our students as the least useful, with a sample mean score of 3.5, followed by the written report (sample mean 3.89). On the opposite side, group working is highly valued with a sample mean score of 4.78. As a consequence, there is a clear perception amongst our students of group working as a highly-valued resource for its usefulness.

Finally, satisfaction is also evaluated in the survey. While the oral presentation receives the smallest satisfaction indicator as perceived by our students (sample mean score 3.75), group working exhibit the greatest mean score (4.67). These results are consistent with the previous analysis, that indicate a very high perception of group working usefulness, contrasting with a less useful evaluation of the oral presentation. Documentation and written report are located in intermediate position, regarding satisfaction, with mean scores of 3.78 and 3.75.

Figure 2. Satisfaction, usefulness and effort indicators (means).
4 CONCLUSIONS

Teaching and learning resources required for actuarial education must be in a constant process of renovation due to frequent changes in the insurance and finance sectors as well as in the technological environment where the profession is exercised. In order to promote an efficient learning process adapted to these professional circumstances, we have developed a strategy based on collaborative projects at the MSc in Actuarial Science at the Universidad de Málaga.

Professional competences in this specialised sector involve a varied set of technological and analytical contents, from which we chose for the collaborative projects some of the most commonly used, VBA scripts for Microsoft Excel and stochastic simulation of processes in continuous time. According to previous experiences and the body of literature, using simulations has a positive effect on the learning process by means of increasing the interest of students as they have the possibility of experimenting by their selves. But instead of using predefined simulators, our students were asked to develop their own simulation tools in an attempt to enhance the competence in this highly-valued area.

In addition, contextualisation has played a key role in the experience, asking students to elaborate professional ‘products’ like a written report and a presentation of the results to a simulated committee of a firm.

The results of the experience in the last academic year have been evaluated by means of a survey, that reveals a quite good perception of our students of (i) the contribution of this work to their learning process and (ii) the use of this pedagogical strategy in addition to the general -more conventional- one used in the MSc program. The best valued elements of the experience have been working in groups, from the usefulness and satisfaction points of view, and the transversality of the projects resulting from the combination of contents and competences of two courses, which allowed to have a broader view of the courses and to incorporate current issues in the profession.

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REFERENCES


