

Updating the teaching methods in animal and plant biology. Adapting to the EHEA

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Abstract

Until academic year 2004-05 the courses in the first cycle of Animal and Plant Biology (APB) in the Veterinary Medicine program, Biology III: Animal Life from the Environmental Sciences degree programme, and APB from the Biotechnology degree programme were taught using a methodology based primarily on teacher-led classes. Teaching these classes was considered complicated because of the size of the classes (the number of students per class oscillated between 90 and 120). Starting in academic years 2005-06 and 2006-07, a project got underway to improve the learning conditions and students' performance by updating the teaching methods, applying a new teaching model for APB and developing new teaching and audiovisual materials. The results show that the goals were amply reached, the students have very highly rated this new approach, and the number of students who both sat for and passed the courses has also risen considerably.

General area of interest of this innovation

The innovation presented in this article can be applied for teaching undergraduate courses that require students to memorise a great many concepts and that are taught in large groups. In particular, it might be of interest for any course related to the fields of Zoology and Botany, based on the success of the new materials and the virtual tools.

1. Objectives

The purpose of this project was to improve the learning conditions and students' performance by updating the teaching methods, applying a new teaching model for Animal

and Plant Biology and developing new teaching and audiovisual materials. The goal was to motivate students in the subject of APB and encourage their autonomy by developing the tools needed to improve the learning conditions in APB. In this way, the students could attain the skills needed for training in Animal and Plant Biology, namely:

- Getting to know the structure and organisation of the main groups of animals and plants and their diversity from the evolutionary standpoint, as well as the zoological and botanical taxonomy needed in the training of a veterinarian, and environmentalist or a biotechnologist.
- Applying this zoological and botanical knowledge in other courses in the degree programme by properly applying the taxonomical nomenclature learned and developing the manual skill of dissecting both invertebrates and vertebrates, and by recognising the different anatomical structures in the different animal groups.

2. Description of the project

The Zoology and Botany Units teach the courses on Animal and Plant Biology (APB) in the Veterinary Medicine program, Biology III: Animal Life in the Environmental Sciences degree programme, and APB in the Biotechnology degree programme, using a teaching methodology primarily based on teacher-led classes. Teaching these classes was further complicated by the large number of students (in teacher-led classes the number oscillated between 90 and 120). The students' largest stumbling block consists of the need to memorise a vast number of concepts and specific terminology. Until academic year 2004-05, the academic performance for the APB course in the Veterinary Medicine programme was that 40% of the students FAILED the course (20% of them did not sit for the final exam); for the Biology III course in the Environmental Sciences degree programme 54% did NOT pass (18% of them did not sit for the final exam); and for the APB course in the Biotechnology degree programme, 13% of students failed.

With large groups, only a careful selection of guided activities for students to do, solid virtual support and an evaluation system backed by IT can help to overcome these stumbling blocks.

The need to achieve certain educational goals that involve acquiring not just knowledge but also academic and professional skills (Dochy and Moerkerke, 1977; Segers et al., 1999) led to the need to create new documents and teaching materials that could complement the ones that already existed. To this end, innovative APB teaching material was developed to foster independent learning processes and self-directed management of one's studies, which in turn involved implementing new methodological resources. However, the need to improve students' performance also meant that new learning tools and new teaching strategies applied to teaching APB had to be developed.

3. Methodology

During academic years 2005-06 and 2006-07, the following actions were taken:

1. Drawing up and purchasing audiovisual teaching materials that could be associated in a remote network: 14 DVDs on animal and plant groups transcribed in English and translated into Catalan (in classes, seminars and practices).
2. Using the virtual campus in the course to make specific teaching materials available to the students (calendar, bibliography, syllabus, specific information on specific topics, etc.). Updating the documentation handed out with new audiovisual material. Using the forum.
3. Planning ten theoretical-practical seminars on Animal and Plant biology for the Veterinary Science programme in order to set up active discussion sessions in the class: eight one-hour Animal Biology seminars and two two-hour Plant Biology seminars. Planning four theoretical-practical seminars on Biology III for the Environmental Sciences programme with questions and other activities to be done in groups and individually.
4. Developing a database of multiple choice questions to evaluate each subject or unit independently, as well as a final exam (Boud and Falchikov, 1989, Boud, 1995). The self-evaluation questionnaire was uploaded onto the virtual campus, and it consists of two types of 952 closed questions: true/false and multiple choice (10 %), in which only one option is correct. The questions were activated after the subject was taught and the corresponding seminar had been held (to ensure that they were used as a reinforcement and revision tool once the entire subject had been covered in class). They were offered as a reinforcement tool for students' knowledge acquisition.
5. Drawing up specific materials that have made guided teamwork possible (preparing basic material, guide to how to find information, supervision of the teamwork process, etc.): a glossary of 300 scientific terms was developed, the scripts of the videos and DVDs were transcribed to Catalan and/or English, as were the questionnaires for revising the videos; questions were drawn up to stimulate students' interest in each topic.
6. Fostering cooperative work in small groups under the guidance of the professor by performing a group task and helping each other. In each classroom practice session or seminar, the students worked in groups of four, bringing and handing out the glossary of scientific terms corresponding to the subject being examined in that session. The topics had previously been explained in the theoretical classes. The list of the terms for each topic was available from the start of the class on Virtual Veterinary Medicine Campus and/or the university-wide virtual campus. Likewise, the videos/DVDs were shown along with questions on the topics.

4. Results

The assessment of the results included a measurement of student performance as well as comparison systems between different methodologies and students' degree of satisfaction, which is revealed through surveys and other tools.

The results were:

1. The quality of the teaching materials improved, mainly due to a better use of IT, but also due to the adaptation and improvement of the traditional resources. Likewise, these materials were given a common use for both professors and students.
2. New teaching materials to support the courses were created:
 - a) DVDs on animal and plant groups (14 lasting 45') transcribed in English and translated into Catalan (in classes, seminars and practices).
 - b) Re-edition of the topics with the inclusion of the new digital materials acquired.
 - c) Subject-based glossary for the AB part (300 terms in Catalan/Spanish to be defined by students in groups of four).
 - d) 952 closed questions (true/false and 10% multiple choice) on 32 topics, to be self-administered and self-evaluated.
3. A major impetus was given to teamwork techniques in the course by designing collective projects, guided activities and seminars. The collective activities which were alternated in the classroom practices/seminars included:
 - a) Each group (four students) had to draw up a list of ten T/F questions on the topic or topics that were explained in the theoretical class with the correct answer circled. Time needed: 20 minutes. Each group's work was collected.
 - b) Video screening: Each student was given a list of T/F questions on the video, which they had to answer as it was being shown. Time needed: fluctuated depending on video, calculating at most 30 minutes.
 - c) In-class discussion on the glossary items, the questions drawn up by the other groups and/or the questions on the videos. Time needed: 20 minutes.
 - d) The last part of the class was used for an individual evaluative test: students had to define two terms chosen randomly and respond to 10-12 T/F questions which the students had written or coming from the videos (one question per group chosen randomly).
4. Higher student motivation with regard to the contents and better understanding of the goals and methods of Animal and Plant Biology were confirmed.
5. The students' study environment was improved through digital self-evaluation materials and more personalised attention.
6. Sound independent learning practices were encouraged. Thanks to the self-evaluation questionnaire on the virtual campus, the students were able to practice and check on their knowledge in the subject, as well as revise the areas that needed more work. The students' ratings of the digital independent learning materials

were VERY POSITIVE (96 % of the 161 students surveyed gave them this rating).

7. Ongoing assessment of all the teaching activities was conducted. For example, for the APB class in the Veterinary Medicine programme, assessment was conducted as follows: (1) Assessment of lab and field practices: attendance at the lab and field practices and performance (the last 20 minutes of each practice the students had to individually answer a questionnaire about the practice which was used to continually assess their performance in the practice sessions) which accounted for 15 % of the final mark in the course. (2) Assessment of the seminars/classroom practices: assessment of attendance at the classroom practices and performance (individual assessments of each and classroom practice session), which accounted for 10 % of the final mark in the course. (3) Performance in the theoretical classes (evaluations on all three thematic sections of the course), which accounted for 75 % of the final mark in the course (each part accounting for 25 % of the final mark).

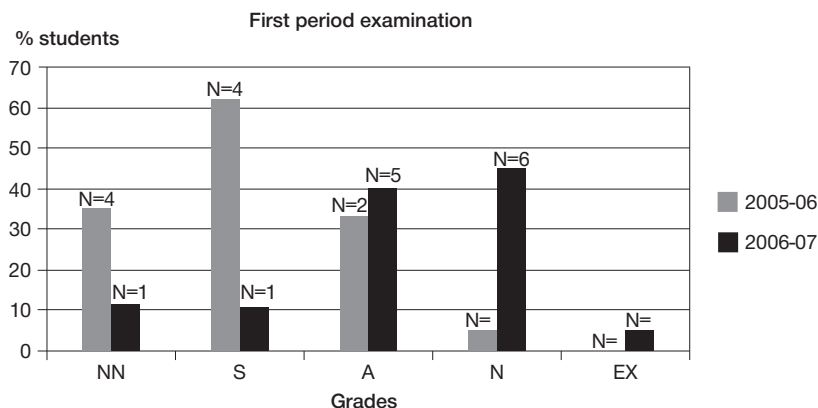
We managed to see a substantial improvement in academic performance in the APB courses in Veterinary Medicine and Biology III in Environmental Sciences. For APB, the percentage of students passing the course was 84 % for academic year 2005-06 and 93 % for academic year 2006-07, almost 24 % higher than in the previous three years. The percentage of students who did not sit for the exams also dropped considerably (from an average of 20 % in the previous three years to 13 % in academic year 2005-06) (Table 1). For the Biology III class in Environmental Sciences, the innovative experiment conducted in 2006-07 also yielded many fewer students who did not sit for the exams or who failed the class, and a significant rise in the number of students passing (Figure 1).

The coordination and fluidity of contact among the professors in charge of teaching Animal and Plant Biology also improved (from the fields of Zoology and Botany).

Table 1. Academic performance in the course on Animal and Plan Biology in the Veterinary Medicine programme during the last five academic years (2002-03 to 2006-07)

Grade	2002-03 %	2003-04 %	2004-05 %	2005-06 %	2006-07 %
MH (Distinction)	0.8	1.2	1.9	4.4	4.7
EX (Excellent)	2.4	2.5	4.7	9.8	5.4
N (Good)	13.5	11.5	14.4	37.6	58.1
Ap (Pass)	39.4	46.9	40.9	32.21	25
Superen assignatura	56.2	62.1	61.9	84	93.2
SS (Fail)	25.9	14.8	18.1	2.9	3.4
NP (Absent)	17.9	23	20	13.1	3.4

Figure. 1. Academic performance in the Biology III course taught in the Environmental Sciences degree programme during academic year 2005-06 using the methodology of teacher-led classes and in academic year 2006-07 using an innovative teaching methodology



The students' degree of satisfaction rose. The survey conducted to assess the teaching activities used in the course and the students' degree of satisfaction showed a VERY HIGH degree of satisfaction with the organisation and methodology of the course in 89 % of the students surveyed (169). Ninety-four percent of the students in both degree programmes surveyed stated that the ongoing evaluation enabled them to assimilate the knowledge and acquire the skills in the course much more effectively.

5. Conclusions

From these results, we can draw the following conclusions:

1. The real results far exceeded the expected results.
2. Students very positively rated the organisation and methodology used in the course.
3. The professors had a higher workload throughout the entire correction process in continuous assessment.

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Keywords

New teaching methodologies, independent learning, Animal and Plant Biology.

Financing

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Supplementary materials on the CD-ROM

Demonstration of the Virtual Campus self-assessment tool applied to Animal and Plant Biology courses.

Project leader

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Presentation of the project leader and the working group

All of the members of the group have extensive university teaching experience for more than 15 years (and up to 30 years in some cases). Maite Carrassón has participated in activities aimed at improving the quality of teaching since 1996 and has extensive experience coordinating teachers for both practices and theoretical classes. She has also organised activities on new teaching methodologies targeted to professors in her department. Fernando García del Pino, Sílvia Crespo and Sergi Santamaria have extensive experience in coordinating the Bachelor's and Master's programmes and developing virtual teaching materials in zoology and botany, among other fields.

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