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Statmedia projects in Statistical Education

Antoni Arcas, Antonio Miñarro and Miguel Calvo

Department of Statistics
Universitat de Barcelona

✉ aarcas@ub.edu, aminarro@ub.edu, mcalvo@ub.edu

Abstract

The aim of the *Statmedia group* is to develop new tools to help in the teaching of applied statistics, hence improving the academic performance of our students and their motivation towards statistics. We consider that learning should be based on practical cases to motivate and encourage student participation. It was this consideration that prompted us to develop our first project, *Statmedia I*, a multimedia text of statistics. In order to make adaptation to the ESHE (European Space of Higher Education) smoother, we have also been working on an Internet-based design, publication and management system comprised of different sets of practical sessions on statistics, with specific data sets for each student in the course. The system provides for a wide variety of questions and also automated student-specific answer correction.

In our present project, *Statmedia III*, we focus on activities rather than on isolated sessions in order to allow teachers to design an specific path for continuous assessment.

All the projects are based on HTML and Java technology and are independent of any commercial software.

In recent years, over 700 students per year, in different first and second cycle studies, have used our projects with a good overall satisfaction index as confirmed by different surveys. Students, teachers and Statmedia group members firmly agree on the convenience of case-based learning with student-specific data.

Keywords: multimedia statistics, case learning, Internet, continuous assessment.
AMS Subject classifications: 97D80, 97U50, 97U60, 97U70.

1. Introduction

Statistics is a compulsory subject included in the syllabus of most degree courses in Experimental Sciences, Life Sciences, Engineering, Economics, Business, etc. This situation is unlikely to change substantially, despite the amendments to be made in the next two years in the syllabus for adaptation to the European Space for Higher Education.

In general, the common goal of learning these subjects in the different studies embraces elements of Descriptive Statistics and, most importantly, elements of Statistical Inference, necessary to conduct rigorous scientific analysis of the data. In this regard, Statistics provides a set of tools that helps make decisions and draw conclusions from the data obtained through experimentation in the above mentioned courses.

One way to highlight the usefulness of Statistics as a basic tool, within the various academic disciplines that we are addressing, is to show why research projects thought to be of interest a priori are not accepted by the scientific community due to a poor statistical approach: poorly planned design, wrong sampling, inappropriate data analysis, misinterpreted statistical results...

Obviously, the study of even the most basic of these techniques requires the inclusion of different concepts in the core program or academic planning of the subject necessary to ensure their proper learning. We share the view of many current professors in our area who consider the theoretical and conceptual basis that underpins statistics non-renounceable, refusing to turn the subject into a succession of recipes to be implemented. But our experience tells us that with the classic behaviorist method upon which statistical education has been traditionally based, the student finds it extremely difficult to really understand the concepts introduced. For instance, it is often the case that the student comes to dominate the mechanical approach and the resolution of a hypothesis test, but is not aware of the effect that factors such as sample size or the population variance have on the outcome. Therefore, how can the student solve the experimental situation without knowing what sample size to choose or what power the test should have? As mentioned earlier, the student will most likely make errors that could lead to the invalidation of the study.

From the standpoint of academic planning, it should be borne in mind that the imminent introduction of new degrees will mean in practice a decrease in the number of in-classroom classes and an increase in the number of part-time attendance or non-attendance distance learning activities. Likewise, the use of continuous assessment is going to become widespread in numerous universities, along with all other aspects that involve transversal knowledge. The biannual structure of the subjects often becomes, in practice, only four months. In summary, we believe that the actual time of exposure and in-classroom work will hamper the rigorous integration of the concepts with their implementation if

traditional approaches and methodologies are only used. (see also [5]).

At the beginning of this decade the context of academic teaching already pointed to the one described above. Thus, the teachers who founded the group *Statmedia* asked ourselves at some point the question "how can we ensure that pupils get a detailed knowledge of the concepts without losing sight of the resolution of the situations applied?"

In a first approximation, we considered the benefit that having interesting and easy-to-use additional material, to be used in conjunction with traditional in-classroom learning, could provide to the students. As a result, the first draft outline of *Statmedia* was prepared at the beginning of the year 2000, with the aim of improving concept learning from the student's own experimentation, trying to significantly increase student interaction and interest in the subject. Subsequently, the group has focused its efforts on the design of applications that automate the monitoring and evaluation of various activities proposed to students through online forms.

In the next section we describe in more detail the evolution of our projects has progressed over these last nine years. The third section explains how we manage to *individualize* the activities proposed to the students, a concept by which we obey in the daily teaching practice of our subjects. The fourth section briefly indicates how these ideas have been implemented in practice sessions that are backed up by four years of consolidated experience. The fifth section presents some quantitative and qualitative results, which, in our opinion, confirm the correctness of the path taken.

2. Description of the main projects

The projects developed so far bear the shorthand acronym *Statmedia I*, *Statmedia II*, and *Statmedia II Pi*. The *Statmedia III* project is currently under development. In this section we would like to outline the progress made since we started, from the first phase dedicated to elaborating material relating solely to the conceptual part of the subjects to the current situation, which focuses on the design of activity proposals.

Despite the academic progression of our education projects, the technological basis and the proposed interface have been two characteristics that have remained invariant in our path. From the outset we decided to use web browsers (Internet Explorer, Firefox, etc.) as a student front-end tool and to develop in Java language the different components added. In the first stage, Java programs only carried out the statistical calculations and associated charts. Then, as the complexity of the *Statmedia* platforms became more advanced, Java programs also handled transactions between server and database, automated correction as well as report generation. Our group has succeeded in gradually producing a series of products fully compatible with any current operating system (MS-

Windows, Linux, Mac-OS, ...) both at the server and at the *client's* computer, be it a member of the academic staff or a student. The latter only requires a more or less modern browser and a Java virtual machine of which there are several *freeware* distributions, perhaps the best known being the one from Sun Microsystems. With regard to the use of forms and software in general, we have implemented a common format at the interface of applets (programs embedded in HTML pages) in order to make the interaction among the different program elements easier (the same kind of buttons, sliders, input boxes, ...). This is an added value that we believe important to note, given that other software with a sharper learning curve would probably make students more reluctant to use it independently. It is also noteworthy that because these applications have entirely been developed by our team they do not need campus or off-campus licenses from any commercial package, providing zero cost activities inside and outside practicum classrooms for the institution.

2.1. Statmedia I

The group's first project is a first-cycle complete course of Statistics originally published as a CD in 2003 and reedited recently [1]. The aim was to improve the classical texts, providing dynamism and interaction to the contents shown. The most important contribution of this project is, from our point of view, the collection of more than 100 original calculation programs. We specifically designed these programs for the academic purpose of illustrating the most important concepts in an introductory statistics course, in such a way that the student could experiment and visualize in a flexible and convenient manner situations that might otherwise be impossible to replicate in a book. Another interaction path available to the reader is to take self-assessment tests, which consist of about 500 original issues, at the end of each topic. *Statmedia I* was designed to supplement regular academic teaching and its flexibility allows for the presentation of topics or problems and also to illustrate different situations, which we call *cases*, in a semi-attendance or non-attendance basis at the scholar's discretion.

It is possible to follow the course from a guided visit that combines theory and case studies. It is also possible to just do the practical cases, or only the theory, or even surf freely using the links integrated. Therefore *Statmedia* is a very useful tool for presenting the subject in ECTS format (*European Credit Transfer System*, a system to measure the time spent by a student in a learning process) and, at the same time, an additional resource for the teacher to use as support during class sessions. Currently a freely available version of *Statmedia I* can be accessed directly from the link [2], or through the teams's website at [3]. All contents accessible via the Internet are subject to the Creative Commons license *Attribution-NonCommercial-ShareAlike*. In other words, in compliance with the terms of the license, all these contents are free for use and/or may be

modified in any educational activity, including the above mentioned Java programs available in three languages (Spanish, Catalan and English). *Statmedia I* has been used regularly in the teaching of different subjects by the Department of Statistics at the Universitat de Barcelona since the 2002-03 academic year with very satisfactory results.

2.2. Statmedia II

Stamedia II was designed to have a system of practice classes web-server-based that allowed students to take part in the classes partially or totally outside the classroom setting or even outside the campus. The answers are dynamically stored in a database hosted in the server whilst the system carries out continuous assessment of the student as it automatically corrects answers at the educator's request.

Practice classes forms incorporate the same statistical package as the *Statmedia I* (a specialized *calculator* written in Java), which the client's browser transparently downloads at the beginning of each practice session. Therefore, the student knows about and is provided beforehand with the tool that will allow him or her to technically resolve the calculations involved in the practice session. In subjects with a limited number of practice hours, the economic advantage of not being dependent on any proprietary software is further complemented by the time savings involved in learning the basics of a commercial package. In one word, the student is given the means to concentrate on the resolution and interpretation of the results.

The technological basis of *Stamedia II* is the use of *servlets* to allow the flow of information between the client and the server. A servlet is a Java program that runs in the context of a service network within the server, which receives and responds to requests from one or more clients. The typical response is the dynamic creation of a HTML code page that is downloaded to the client's browser. The design of dynamic pages is facilitated by the use of JSP pages, in reality a special type of servlets. The exploitation of the results stored in the database by the educators is also carried out by means of servlets and JSPs. Our team has developed a query interface that allows the educator to receive a series of reports ranging from detailed monitoring of each student's individual performance to summaries of the group's overall performance.

Such information is essential if we are to employ an educational approach based on ECTS philosophy and self-learning. The determination in real time of the collective performance of an individual group or set of groups allows an overall assessment of the development of the curricula and the teaching techniques employed.

The material that students review in the course is organised into sessions that are guided by a case study which includes applied real wording and is appropriate for the degree or graduate course in which the student is enrolled.

The documents, in addition to hypertext, diagrams and pictures, contain the following essential elements (see Figure 1):

- Questions that the student must answer in numeric fields or by clicking a selection button.
- Applets embedded in the document: allow interaction, facilitate understanding, and display certain statistical properties of data and models.
- Data load buttons that prevent mistakes and wasted time associated with manual data entry.
- A button to enable the calculator. This is displayed in a separate browser window.

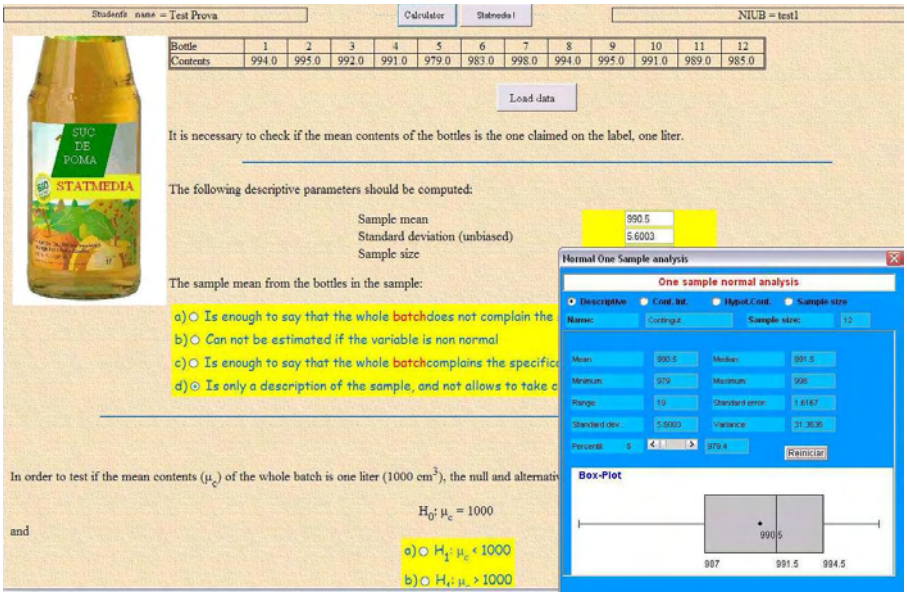

Figure 1: Appearance of a page for a practice session with the statistical calculator open. Different types of topics and dynamic elements are shown in the window.

The implementation of *Statmedia II* was a noticeable improvement with regard to previous utilization and assistance, when classes were based on the traditional practicum approach of solving problems by computer. This real case study approach was further encouraged by the need to better control all concepts that had been worked on in the classroom theory or master classes.

However, a problem was found in the classroom setting regarding the day to day use of the system by the students: since in the practice sessions all the students were working on the same set of data, the correct answers were identical

for all of them. This constituted a serious handicap when planning activities that could be fulfilled on a semi-attendance basis, especially when such activity was associated with a certification note providing credit of the undertaking of the activity. This situation prompted us to design a program that would ensure that each student worked with his or her own data set.

2.3. Statmedia II Pi

The third project shared characteristics with *Statmedia II* , both in terms of its educational objectives (practical classes in different university degrees) and the submission of forms and interface in general as well as in terms of its technological basis. But *Statmedia II Pi* (the two letters of the acronym, stand for *individualized practice classes*) also has the ambitious goal of providing every student with his or her own set of data, in a scenario common to the whole group. In this way, each case study may have, depending on the student making the query, different statistical techniques associated to it, possibly different correct answers for the same questions, and even direct different questions, all of it subject to each customised data set. The challenge is to get the system to conduct an automated but also *individualized* correction taking into account the fact that correct answers may vary depending on the student being evaluated. The complexity of the correction system grows even larger when we consider questions which we call *combined*, referring to more than one field.

This improvement also partially corrects a problem identified in students assessed using *Statmedia II*, and that also probably appears in other projects that involve mechanized computer automated activities: some students just limit themselves to mechanically reproduce the answers of their fellow classmates. The validity of associating the answers given (in the setting of practice sessions in our case) with a continuous assessment for academic purposes is then called into question. We believe that by individualizing practice sessions with *Statmedia II Pi*, the students genuine efforts to achieve the level of knowledge and the pace set by the academic curricula are much better reflected.

In fact, the implementation of similar ideas has been tested independently by different national and international educational innovation groups, which in recent years have made convergent progress in the projects, by introducing elements that identify the activities proposed for the students. The way in which the individualized material affects the different proposals varies, depending on the experience of each innovation group. In this regard, some of the projects that have come to our attention are aimed at self-assessment problems, others are aimed at practice session systems, whilst the rest are aimed at work or exams. The computerization of each of these systems adopts different degrees of automation, and, of course, different technologies. As an illustration, please refer to [6] and to the interesting *e-status* project [4] undertaken nationally by the Universitat Politècnica de Catalunya, which was presented in past SEIO

congresses.

The study of statistics favours no doubt this kind of approach, for ultimately, the object of learning requires some sort of underlying model. This model can be simulated by computer, and therefore it is possible to introduce variability by changing the parameters that specify the model according to each particular student.

2.4. Statmedia III

The *Statmedia III* project is currently under development. Unlike previous projects in which the main focus was on the subjects, and within each subject, on the set of practice sessions, in *Statmedia III*, emphasis is given to activities. The experience with the subjects taught in our department shows that subjects of statistics in the syllabus of various degree graduate courses can easily share teaching materials. This new approach of the platform allows the educator to plan the activity schedule as deemed appropriate for the student's continuous assessment by selecting files and documents in a shared library, ticking at the same time the date by which the said activity is to be completed on the activity schedule, its weight on the overall assessment score and student compliance with the required minimum attendance to in-classroom sessions.

In the current phase of development, the activity library is a repository that contains practice sessions adapted to the context of each teaching protocol, problems, tests, on-line case studies, and self-evaluation tests. Practice sessions are similar to those of previous projects, to which we are gradually adding other newly created materials. Problems and testing activities resemble traditional problem lists or exams, which have been formatted to allow automated and invidualised correction. On-line case activities are more elaborate than the problems that the student solves outside scheduled activities to reinforce cross learning.

In terms of technology, the main innovation will be the integration of the *R package* into the correction engine, which will allow us to extend the list of possible subjects that *Statmedia* can manage, most of which will be part of the future degree of Statistics. Mechanisms for the exchange of information between the *Statmedia* system and the platform of the virtual campus of the Universitat de Barcelona (Moodle) are also being developed to standardize, among other things, the presentation of the activity schedule as well assessment and associated listings, for the benefit of both students and educators alike.

3. Technical aspects and benefits of data customisation

As mentioned in the previous section, data customisation requires each student to analyse a different set of data within a single case study, problem or test. In the *II Pi* and *III* projects this is achieved through the definition of

what we have called datasets (dts). A dts is a vector of values generated by a Java method from a set of parameters that characterize it. Since the *Statmedia II Pi* project was implemented, we have been using a dataset generator which, by means of a wizard, allows the teacher to specify these parameters in order to present different statistical scenarios. Ultimately, it is the use of random seed, based on student identification, that retrieves customised data. The educator planning the activity, or *activity designer*, can control the overall distribution of the data for a group of students by using dts parameters. If so required, the designer may modulate such parameters so that the data of certain percentages of students come from different distributions, thus achieving variability in the statistical results under the same overall wording.

As an example of how to individualize a certain scenario, we will consider the case of statistical hypothesis tests, specifically the test to contrast that the mean values for two independent normal populations are equal. Simplifying somewhat the process so as not to extend this section unnecessarily, the designer of the activity specifies the ratio of pupils for whom the null hypothesis of equal mean values ought to be true. Each student is randomly assigned to one of the two possible categories as per the outcome of a Bernoulli model (the outcome remains constant between different sessions for the same student). This second step can be accomplished in several ways depending on the outcome of the Bernoulli model, either by modulating the distance between the two population means, the variance of the populations, or with both at the same time. In a third step, and as a result of randomly generating values for the two independent normal populations within each subset of students, the sample values that each student will receive, and hence the statistics associated with the test, will be different.

This seemingly complex classroom scenario is, however, extremely interesting and enables the educator to include in the discussions regarding the method under study why changes are introduced in previously taken decisions. Not only student-educator interaction is promoted in this way, but also among students themselves. JSPs pages allow to customize not only data but also the actual text of the form according to each student's specific dts. It is thus possible to program the page to change the wording of a question, or the text of alternative answers to a test-type question, or even a paragraph or an entire page. In the above example, any of these possibilities could be introduced depending on whether or not the contrast will be statistically significant in the particular data set of each student. When the server sends the HTML page of the form, the form will be tailored to the particular situation of that particular student.

It is important to note that the database does not store the data directly but only the parameters that define each dts. The different data sets are generated automatically at the time the student logs on and the server receives the request to load the first page of JSP activity. Customised data are kept constant re-

gardless of the machine used or the number of sessions the activity is accessed. In short, we have consistency of the data generated dynamically at the different sessions initiated by the same student whether such activity is started at the university and then, for example, continued and completed at home. Figure 2 shows an example of some datasets definitions for practical session number 1 of the Biostatistics subject (Biology degree).

Data Set	Procedure	Par1	Par2	Par3
1	Generate.Uniforme	1	120	180
2	Generate.Uniforme	1	dts[1][1]-20	dts[1][1]-10
3	Generate.Uniforme	1	20	40
4	Probabilist.DNormal	dts[2][1]	dts[3][1]	dts[1][1]
5	Probabilist.DBinomial	9	1-dts[4][1]	0
6	Probabilist.DNormal	dts[2][1]	dts[3][1]/3	dts[1][1]
7	Probabilist.DPoisson	1.26	dts[6][1] -1	

Figure 2: Parameters of some *datasets*

Activities are corrected automatically using the same Java methods in the calculator that students use to obtain their results. This ensures *consistency* between the results obtained by *students* and the *correction system* hosted in the *server*.

4. Functioning of Statmedia II Pi in the classroom setting

This section briefly outlines how the *Statmedia II Pi* has been used in recent years in the practice sessions of the subjects of Biostatistics (Biology), Statistics (Geology), Data Analysis (Environmental Sciences) and Statistics II (Statistics Degree), all from the Universitat de Barcelona.

Students gain access to the system using their personal identification number and log onto the practice selector (see Figure 3). The teachers responsible for teaching the different subjects have opted for most practice sessions to be carried out in IT labs in a real classroom setting. Each practice session is further divided into sections that are activated in accordance with the schedule agreed upon at the start of classes. According to the statistics generated automatically by *Statmedia II Pi*, approximately 80% of the students conduct their non-classroom practice sessions and complete unfinished in-classroom sessions off-campus.

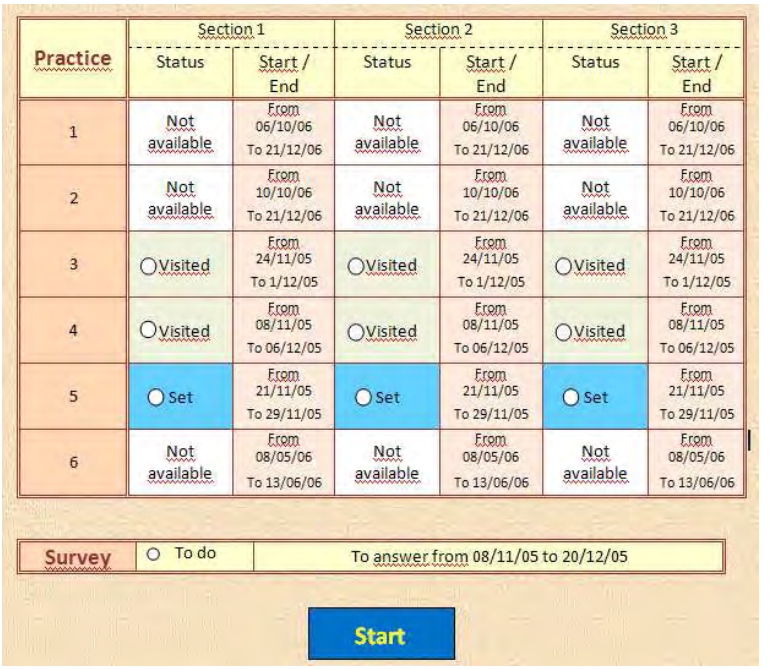

Figure 3: Practice selector

In the selector, specifically designed sections are displayed according to the planned schedule and the last activity carried out by the student. For example, a *set notice* is displayed on the screen if the time period by which the student should have entered or modified the answers has elapsed, coinciding with the phase of automatic correction. Although the section is set, the student can still review the practice sessions if he or she wishes to do so. The case study, together with all the indications of the supporting theoretical background, is presented in the first section of all practice sessions.

Also included is a brief help section on the calculator programs needed to resolve the issues raised by each case. This first section also includes some questions which the student can check if he or she has gained sufficient mastery of issues presented in the practice session, before attempting to actually resolve the problems. At master classes, students are adviced beforehand of the need to visit this first section in order to keep correct track of the practice session. As the student answers all the questions on the practice forms, the answers are automatically stored in an Oracle database. If the section is still enabled, the student can go back and change the answers as many times as needed. The system saves the total number of visits and modifications, distinguishing between access from IP addresses from within the university or from outside it.

As we have already mentioned, the educator can make use of several tools to monitor the activity and performance of the students and to get information

on the percentages of correct answers to each question as well as information concerning the time and place when the practice session was taken and whether it was conducted in or off-campus. The automated correction system also provides an average score for the different activities carried out. It is interesting to note that the monitoring and control of visits outside in-classroom hours would be the hardest part of the ECTS credit to quantify, that is the part of the credit intended to serve as an indicator of the students' dedication outside in-classroom hours. This information is supplemented by a survey to be answered by students where they are asked regarding their dedication. All these elements, together with others outlined in previous sections, show the teachers of subjects being currently amended for adaptation to the ECTS the usefulness and reliability of practice classes planned with Statmedia II Pi.

5. Achievements

In the past four years, nearly 700 students per year in four different degrees have used *Statmedia II Pi*. These 700 students have been followed up in order to determine their degree of academic satisfaction and performance. There follows some of the results with data from the last academic year (on a scale of 0 to 10):

- The desirability of basing practice sessions on the resolution of case studies has been valued at 9.32.
- The improvement that having customised data represents for the discussion of the techniques studied has been valued as positive (6.94).
- Those practices that allow for some of the work to be conducted outside the classroom setting have also been valued positively (9.16).
- Finally, it should be noted that the overall satisfaction rate was 7.4.

On the other hand, there has been a substantial increase in the number of students who have attended practice classes when compared to traditional practice classes based on a commercial package. Also the fact of being able to customize data for each student has resulted in greater student participation.

At the same time, teacher teams in charge of different courses have also acknowledged our contribution as a key element for the improvement of the overall running of the subjects. The proposed system has been considered as a useful, dynamic, flexible and very suitable tool for convergence to the European Higher Education Area. We want to emphasize that the members of *Statmedia* are a minority within the team of professors of our department. It may also be the case that no member of the *Statmedia* staff might have direct teaching responsibility over a particular course where our platform is already used.

The department's academic team has always considered student participation in practice sessions a very important goal so that students are presented with the challenge of having to solve real cases as an integral part of their training. One of the classic problems posed by the teaching of the subject was the lack of connection between the contents of the subject and the reality of the degree it was part of. Students were often limited to solving exercises that were similar in content to those that were supposedly going to be raised in the exams, without going any further into their study. To run practice classes based on larger case studies has meant a significant improvement in the academic performance of the students and how they perceive the need for the subject to be included in their degree course.

6. Conclusions

The academic use of the materials developed by the *Statmedia* team at the Department of Statistics has rivolutionazed the way in which practice classes are taught in the computer classroom. The set up of practical classes using customised data for each student, along with the development of the technical procedures necessary to carry out an automated evaluation, has provided an important impetus to new approaches of continuous assessment. The flexibility and ease of use of the tool has been key key in convincing teachers of its true usefulness. This experience suggests that the technology developed will easily allow for the incorporation of other subjects to the extent that teachers from our department or from other departments show an interest for the project. Once practice sessions are designed, some basic editing of HTML pages is all that is needed. The system then customizes the data, stores the answers, controls class attendance, and generates reports and satisfaction surveys. Finally, it is important to note that students have very positively valued the new case-based approach. In this regard, it is necessary to highlight the creation of practice sessions relating to aspects of other subjects that are specific to each different degree course, achieving transversal contents to be shared and taught across all degree courses and not just limited to our own field. Content transversality across the different degree studies represents a significant opportunity for subjects of applied statistics. The possibility to present joint activities that involve different topics from different subjects is currently under study in our university as a result of the immediate introduction of new degree curricula in the next 2009-10 academic year.

To our regret, it is not as easy as with *Statmedia I* to offer the statistical community the possibility to try *Statmedia II Pi* (or *III* in due course) for incorporation in whole or in part into their own courses. The important transfer of information between the server and the clients, apart from the use of priviledged academic student information, prevents, among other practical

reasons, to use our servers directly. On the group's website [3] you can view a static version of some documents that illustrate in more detailed what has been discussed in this paper. On the other hand, the standard platforms used in virtual campuses (Moodle, WebCT ...) do not include at present the possibility to customise activities. Of course we would welcome working with any faculty group who is interested in testing their own infrastructure with the technical solution we have established. However, regardless of the technology choosen, our recommendation for the teaching of applied statistics is to design activities that contain specific data for each individual student.

Acknowledgements

Finally, we want to dedicate this publication to the memory of our deared colleague Dr. Angel Villarroya, co-founder of the group, whom contributed to the end with his ideas and his work to the development of our projects.

References

[1] Calvo, M., Arcas, A., Miñarro, A., Villarroya del Campo, A., (2008). *STATMEDIA: UN CURSO MULTIMEDIA DE ESTADÍSTICA* (2nd edition), Publicacions i Edicions de la Universitat de Barcelona, España.

[2] Link to free version of *Statmedia* `http://www.ub.es/stat/GrupsInnovacio/Statmedia/demo/Statmedia.htm`.

[3] Group's website, with expanded information on the projects *Statmedia* `http://www.ub.es/stat/GrupsInnovacio/Statmedia/esp/indexes.htm`

[4] González, J.A., Muñoz, P. (2006) E-status: An automatic web-based problem generator - Applications to statistics. *Computer Applications in Engineering Education*, **14**, Num.2, 151-159.

[5] Johnson, H.D.; Dasgupta N. (2005). Traditional versus Non-traditional Teaching: Perspectives of Students in Introductory Statistics Classes. *Journal Statistics Education*, **13**, Num.2

[6] Timothy S., Vaughan T.S. (2003). Teaching Statistical Concepts With Student-Specific Datasets. *Journal Statistics Education*, **11**, Num.1.

About the Statmedia group

The authors are three of the founders in 1999 of the *Statmedia group*, originally a team of professors from the Department of Statistics at the Universitat de Barcelona (UB). Currently eight professors, mainly from UB, contribute to develop several simultaneous projects. The most important are *Stamedia III*,

whose details are exposed in precedents paragraphs, and a research project conducted jointly with the *JavaOptics* group of the Department of Applied Physics and Optics of the UB. In this second project, the global work group has the purpose to analyze the traces generated by the students when they use on-line applications, in order to recognize common patterns of knowledge acquisition.

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