

# EDUCATION ISSUES/ ASPECTOS EDUCACIONALES

## NEW METHODOLOGIES IN STATISTICS: A DIFFERENT WAY OF STUDYING SPSS

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### ABSTRACT

A new way of learning statistics with computers is presented. For this purpose an interactive guide, comprising a web site and a SPSS statistics package emulator program, has been developed. These have been prepared for the Biostatistics subject of the 1<sup>st</sup> year of the *University of Granada* BA in Biology, though they might be used by anyone who needs to get started in data managing with SPSS.

The web site includes different cases (based on exercises with SPSS) with a theoretical and practical introduction about them and an exercise solved with a SPSS program emulator. Finally an exercise, to be solved by the student with the SPSS program itself, is proposed.

The program emulator aims a student's approach to the SPSS program, guiding him in the interactive execution of a specific exercise. The emulator has enabled only the needed options in order to properly perform the guided practice, and monitors the user's actions, always informing him with warning pop-up windows in case of wrong actions in particular or even with some hints to help the student to find out what his mistake was and to correct it.

In this project we present the Interactive SPSS Self-learning Guide version 1.3 which comprises five different practices: the first one is an introduction to the program and Data Editor; the second one is about Descriptive Statistics; the third one is about Regression Analysis; the fourth one, about Probability Calculation; and the fifth one focuses on Confidence Intervals. This guide is available in the *University of Granada* web server through this link <http://www.ugr.es/local/bioestad>, where this guide can be browsed online or if you prefer it can be downloaded to view it locally.

**KEY WORDS:** Self-learning, program emulator, Interactive Self-learning

**MSC:** 97U40

### RESUMEN

Se presenta una nueva forma de aprendizaje de Estadística con ordenador. Para ello se ha elaborado una guía interactiva que consta de un portal Web y un programa emulador del paquete estadístico SPSS. Este material se ha realizado para la asignatura Bioestadística de 1º de la Licenciatura de Biología de la Universidad de Granada, aunque puede ser utilizado por cualquier persona que necesite iniciarse en el manejo de datos con SPSS.

El portal Web incluye diferentes supuestos prácticos (basados en ejercicios con SPSS). Cada práctica contiene una introducción teórico-práctica sobre la misma y un ejercicio resuelto con un emulador del programa SPSS. Finalmente se plantea un ejercicio propuesto para que el alumno lo resuelva con el propio programa SPSS.

El emulador del programa tiene como finalidad que el alumno empiece a tomar contacto con el programa SPSS, guiándolo en la realización interactiva de un ejercicio específico. El emulador sólo tiene activas las opciones necesarias para realizar correctamente la práctica guiada y supervisa las acciones del usuario, informándole siempre con ventanas de aviso si hizo una determinada acción de forma incorrecta e incluso proporcionándole algunas pistas para que razone cuál es el fallo que cometió y lo corrija.

En este trabajo presentamos la Guía interactiva de Autoaprendizaje de SPSS versión 1.3 que consta de cinco prácticas: la primera, una introducción al programa y al Editor de datos; la segunda dedicada a Estadística Descriptiva, la tercera a Análisis de Regresión, la cuarta al Cálculo de Probabilidades en distribuciones conocidas y la quinta a Intervalos de Confianza. La guía se encuentra en el Servidor Web de la Universidad de Granada en el siguiente enlace <http://www.ugr.es/local/bioestad>, donde se puede consultar directamente On-line o bien si se prefiere se podrá descargar para visualizarla de forma local.

## 1. INTRODUCTION

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We do hereby present this Interactive Guide which allows the self-learning of the SPSS statistics package. This Guide comprises a web site and a SPSS program emulator. These have been developed for the Biostatistics subject of the 1<sup>st</sup> year of the *University of Granada* BA in Biology, though they might be used online freely by any user through this internet link <http://www.ugr.es/local/bioestad>.

The development of this project, as well as previous ones, was boosted by reform of the Statistics teaching method. This reform was mainly focused on the fact that many of the problems faced by the graduates in the work market have to do with the appliance of different statistical techniques. In an early stage, methodology was modified for the teaching of Statistics and, as a consequence, computers were introduced in the classrooms. Then, the students got involved in an active way. Besides, specific documentation was developed for the students (see references “Introducción a la Estadística para Biología” (2003) and “Técnicas Estadísticas para Investigación en Biología (2003), “Estadística para Biología” (2004); so that the student may have access to all the information and material related to the subject and multimedia methods for troubleshooting or tutorials.

The development of the Interactive Guide is the result of the implementation of the European Higher Education Space. The enforcement of the ECTS credit system has revealed the need to introduce innovating and improving changes in the teaching-learning process focused on the student’s self-performance in which work initiative and student’s active incorporation to his learning process will be gradually more valuable.

New Information and Communication Technologies (ICT) have been used as a complement to class attendance and virtual learning space. Therefore, we do approach the scope of distributed learning which is an approach to teaching, focused on the student, which with the help of ICT enables the development of the activities both in real time and in asynchronous learning.

The initial version of the Interactive Guide (Lara-Porras *et al.*, 2006) developed in the academic year 2005/2006 for the reform and improvement of teaching, included three practices about one-dimensional and two-dimensional Descriptive Statistics: the first one was an introduction to the program and Data Editor; the second one focused on Descriptive Statistics and the third one on Regression Analysis. The experience gained in the development of the first version of the Interactive Guide, the communication with the students, as well as the continuous exchange of experiences between the lecturers involved, has led us to an assessment of the project carried out, correcting misprints, improving and extending the said Guide.

A second version of the Guide (Lara-Porras *et al.*, 2007) includes a module about Probability Calculation in known distributions. In particular, values of the probability mass function or density function, distribution function as well as several quintiles. Besides, random results of each model will be generated and the current version of the Guide, (Lara-Porras *et al.*, 2008), extends its previous versions with a module of Confidence Intervals. In this module, different intervals of confidence are obtained: for the mean of a normal population, for the difference of means between two normal independent populations and for the difference of means of two normal related populations.

Each of the sections contains a suitable introduction to the use of the program, a step by step resolution of an exercise by means of the SPSS program emulator and it ends with a proposed exercise that can easily be solved with SPSS.

## **2. CONTENT OF THE INTERACTIVE GUIDE**

The Guide consists of two parts:

1. The Web Site: includes different cases (based on exercises with SPSS) (see Figure 1). Each practice has a theoretical and practical introduction about it and an exercise solved with a SPSS program emulator. Finally, an exercise, to be solved by the student with the SPSS program itself, is proposed.

This Web Site has been implemented in HTML + JavaScript in order to make its use easier. It is a mark-up language which allows an easy access to information and can be viewed from any user’s web browser (Internet Explorer, Mozilla Firefox, etc), since any person with an internet access will be able to access the site, which is intended to be the base or the environment on which to carry out the all the practices.

2. The SPSS program emulator: aims a student's approach to the aforesaid program, guiding him in the interactive execution of a specific exercise (see Figure 2). With the use of the emulator, the student will be able to solve any other similar exercise with the program. These are the main SPSS program emulator's characteristics:
  - It proposes different explained exercises the student should execute step by step as if in a real SPSS environment.
  - The application will supervise the student's actions, always informing him with warning pop-up windows about whether he carried out a particular action wrongly, or even providing him with some hints to make him find out what his mistake was and correct it.
  - The execution of a guided exercise under SPSS emulator is always divided in two steps. Each of them is explained interactively and sequentially, thereafter the student will not go to the following step unless the previous one is completely and correctly taken.



Figure 1: Web Site

The implemented emulator does not have the same functionality as the SPSS, it is more simplified. The needed options to properly perform the guided practice are the only enabled ones. The said guided practice should be carried out following the orders given in each step. With this, copying the said program is not intended but an execution of a parallel and simplified application which shows a graphic interface similar to SPSS's towards the user so that when the student begins to use the said program, he becomes familiar with its environment and with part of its functionality. We could say that the computer becomes a student's virtual practice lecturer, and it will guide him throughout his learning telling him when he is wrong.

In order to implement this emulator we have used Java program language, one of the most widely used nowadays, due to its characteristics since it works in any operating system (Windows, Linux, Mac,...).

### 3. PROVISION OF TEACHING MATERIALS

This Guide is available to users on the Internet thanks to the web site, which connects to the *University of Granada* web server.

From this web site: (<http://www.ugr.es/local/bioestad>), the user can check the practices documentation online and execute the guided exercises with the SPSS emulator in Java or download the Guide and view it locally. The only requirement to execute the said exercises is to have installed the pertinent Java virtual machine (also available from the web site).

The teaching materials are also available in a CD-ROM called "*SPSS Self-learning Interactive Guide version 1.3*" including the web site, the SPSS emulator, additional software such as the Java virtual machine and some freeware web browsers. Through the Web Portal, the student will be able to consult the documentation relevant to assignments and complete the guided exercise with the SPSS emulator.

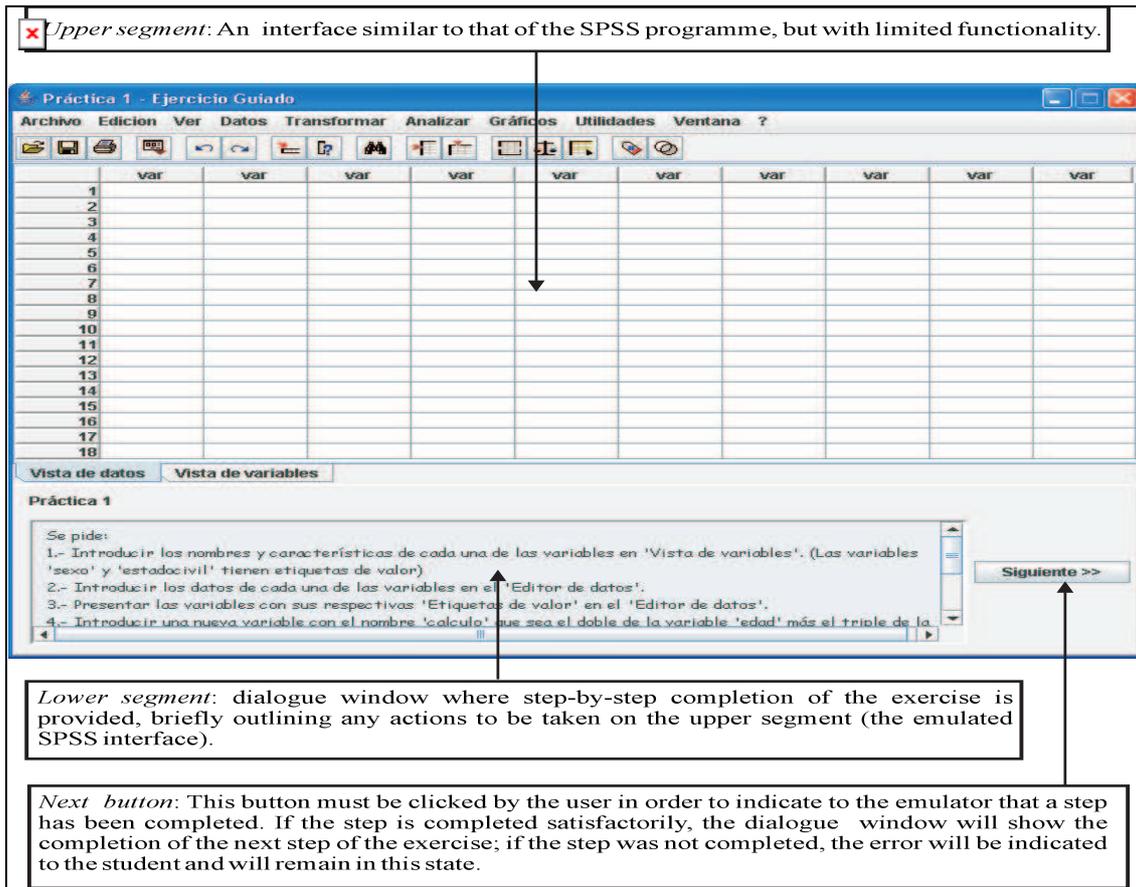


Figure 2: View of the SPSS program emulator

#### 4. CONCLUSIONS

The development of this project has shown us how useful the Guide is, due to the progresses achieved by the students both in their statistics knowledge and in their growing interest for statistics. They take good advantage of the time they spend doing practices on the computer. Furthermore, we have heard of people interested in the learning of SPSS using this guide, due to the difficulties of assisting to a SPSS course. Methodological changes in the teaching of some subjects such as Statistics in experimental degrees are a necessity and a challenge for academic staff. Without losing course content and importance, the introduction of the computer to the classroom, in a bid to involve less theory and more practical work, allows the student to understand and assimilate the contents of the subject in a more efficient way. The development of new technologies and their incorporation into society encourages its use in education. It is already that a student may access, from any location, part of the teaching material and be in touch with teaching staff for any queries that may arise. This new way of teaching Statistics has yielded optimum results during the time it has been implemented. As it has been said throughout this paper, we wanted to be more ambitious and we have created an interactive computer programme for self-tutoring of the SPSS programme.

This Guide might be useful in other environments in which practical teaching of statistics is required. Besides, it might be helpful as well for other professionals who may need statistics using the proper statistics software.

We also think this experience can be very helpful and useful for the future implementation of the European Credit in Higher Education, since not only it encourages the students' self learning but also makes it possible.

RECEIVED APRIL 2008  
REVISED FEBRUARY 2009

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