TEACHING "QUANTITATIVE METHODS OF ANALYSIS IN SOCIAL SCIENCES" AT UNIVERSITY LEVEL

Theodore Chadjipadelis, Marina Sotiroglou, and Eirini Gkouramani
Aristotle University of Thessaloniki, Greece
chadji@polsci.auth.gr

This paper deals with the organization and teaching methods of the compulsory course "Quantitative Methods of Analysis in the Social Sciences" in the department of Political Sciences (A.U.TH) to postgraduate students. Various interactive teaching methods can be put in practice in order to achieve the initial teaching purposes and outcomes which include understanding the meaning of the electoral and the party system, comprehension of quantitative methods and finally the implementation of the given methods. The course's aim is for the students to enhance data analysis capabilities and statistical reasoning applied to Social Sciences, by using a project and assigning team-based learning activities. Thus students, beyond conventional teaching methods, participate in an electoral survey, monitor elections and develop research abilities over official sources.

TEACHING PURPOSES

In order to achieve the didactic purposes towards statistics (Chadjipadelis, 1998a, 1998b) it is crucial to use more innovative methods than conventional teaching. Considering that students might have poor mathematical background (Andreadis & Chadjipadelis, 2006) or even fear mathematics, are exercised upon the discipline of political analysis and therefore motivated thought-out team-based learning (TBL) to learn and implement multivariable techniques by using real data and/or even collect data (Binnie, 2002).

The course's first part deals with the realization of an explanatory survey wherein the formulation of the questionnaire and sampling techniques has been taught. Students conduct the survey for one week before or/and a week after the students' unions elections. The survey records students' opinions about the benefits, services, problems and students' voting behavior. Alongside, students observe elections, analyze candidates' profile, manifestos and record elections results, in order to increase the capacity of understanding policies, to make personal decisions and generally speaking to become more responsible citizens. University is a familiar environment wherein our students can record students' unions, political personnel and manifestos. Recording and analyzing students' unions, monitoring political competition and manifestos are necessary factors to introduce students to political analysis. For the political analysis there are several sources that are used and can provide appropriate instructions and examples to students (i.e. CCS, Manifesto Project Database, T.E.V. etc).

The second part, deals with assigning the project of "Students' elections and Students' Unions in Aristotle University" (Sotiroglou, 2012), which introduces students to multivariable techniques, aims to overcome the "anxiety of mathematics" and develops statistical thinking (Wild & Pfannkuch, 1999; Lovett & Greenhouse, 2000; Pfannkuch & Wild, 2003). Students learn to conduct and analyze biographic narrative interviews (Wengraf, 2001) to candidates and former elected members of students' unions board in order to familiarize with a research project (Chadjipadelis, Ghinis, & Bersimis, 2003) of comparing and recording political personnel characteristics, thoughts and beliefs. Throughout the biographical narrative interpretive method (BNIM) students learn how to record and identify a chronology of objective "life events" from former elected students and validate those "events" by using official documents and/or data, if possible.

The third part introduces students to multivariable techniques by using National and European data. Those data are introduced to students in order to understand and implement methods by using available data so as to provoke students' interest for further research due to the fact that the outcome is tactile in the real world. Moreover, they comprehend the methods and the tools given so as to evaluate data, access methods and generally speaking implement the suitable multivariable techniques.

The following sections describe in more detail the didactic methods that are put in practice in order to provoke and endure students towards multivariable techniques without perceptions, misapprehensions (Chadjipadelis & Gastaris, 1995), fear, or anxiety of complicated and confusing mathematics. The aim is to create an inspiring and interactive teaching environment by combining modern teaching methods.

COURSE DESIGN

This course is taken by students in the 4th semester of the core courses and follows upon "Mathematics in Political Science" and "Statistics for the Social Sciences". The course explores introductory concepts of algorithms, examples from probability theory, combinatorial theory, graph theory and set theory including relations and functions in sets. During course the teaching methods are divided into three parts. First of all, lecturing about the methodological techniques, secondly the implementation of multivariable techniques in terms of qualitative variables (by using existing official data or collecting new ones) and last but not least conducting and analyzing biographic narrative interviews to candidates or even former elected students.

The course focuses on advanced multivariate techniques (clustering, MDS, correspondence analysis, PCA and Factor analysis). It includes an introduction to the aforementioned methods, guidelines for their usage and comparative assessments. Special emphasis is laid on the prerequisites of their application, on their relative credibility and on their appropriateness to available data. The software that is used is IBM SPSS Statistics. Students are familiarized to multivariable techniques throughout National and European data, in order to comprehend and implement the methods mentioned above by using real data. Implementing multivariable methods upon real data offers students' the ability to understand that the application of an appropriate method is correlated with data, learn to express and state their point of view by referring to methods and have the responsibility of their actions. Students analyze official data, present and justify their conclusions. Therefore, it is crucial for students to be oriented to search official data and enhance their capacity of evaluating them properly so as to make political decisions and take reasonable actions for the common good.

Additionally, at the Laboratory of the Applied Political Research, tutorials have been held during the semester. The tutorials' aim is students to use the SPSS, learn how to process and analyze the outcomes of given data. In the same time students have access to supplementary educational material. The educational material is available at the Course Management System platform named "Opencourses" (http://opencourses.auth.gr/) wherein students have access to the aforementioned methods and techniques through videotaped lectures, module presentation, extra exercises and guidelines for personal independent studying time and replicate classroom conditions in a dynamic and inspiring teaching environment. The main goal is incorporation and constructive use of the Internet and web technologies in the teaching and learning process.

PROJECT DESCRIPTION

Students' unions elections in Aristotle University of Thessaloniki are held during the spring semester every academic year wherein students elect their representatives to students' committees.

There are 11 Faculties and 42 Schools at the Aristotle University of Thessaloniki, therefore students are divided into teams in order to participate in a survey that is conducted before or/and a week after students' elections. Students observe the electoral competition, examine and analyze candidates' profile, manifestoes, assess parties' dynamics and public opinion.

At this point the Course Management System platform is used wherein students can chose on-line their team and the school that want to work on. Each team, consisting of 4 to 5 students, sets and collects the representative sample according to students' gender and semester by implementing proper sampling process. Students search for official data of students' population which in that case come from schools' administration database or from the Greek Statistical Authority, in order to record students' opinion about benefits, services and issues and voting behavior (Norris, 2004) on the basis of gender and semester representation.

The survey is conducted for one week before or/and after the students' elections by "face-to-face" interview at each school's premises in order to meet the predetermined sample. Knowing

their contribution and the significance of the survey, students develop strong sense of responsibility, motivated to prove themselves and are adjusted to work in groups or even collaborate effectively with colloquies. This survey is in fact, a quality evaluation of studies on school, faculty, institution and on administration level and in long-term, those data could initiate new strategical plan and policy making regarding to University's grading in national and international scales.

Students observe the elections and evaluate the electoral competition between students' parties and candidates throughout electoral materials, debates and interviews (Wengraf, 2001) to candidates. Teams observe voting procedure, monitor elections, and record the electoral results. In the same time, students evaluate each party in terms of gender and age representation, policy making in faculty, school and university level, internal procedures for nominating candidates and correspondence to parliamentary parties and youth associations.

When the survey is completed each team records and analyzes data with the appropriate method and presents the results. Students, during presentation, have the chance to point out the electoral competition of the students' unions, address students' opinions and suggestions about the Institutions services and performance. Also, is considered to be an inspiring and a highly motivated way to allow students (and teams) to discus differences or similarities between students' opinions and schools problems, believes and notions. Discussions are proved to be productive and might initiate further research approaches and provoke students' interest towards methods of analyzing Social Sciences.

The final task is to search for historical events about the Students' Election since 1974 until now regarding elected students, issues and parties that participated to the elections in the past. Interviewing elected students, provides useful information about issues, electoral procedures, voting behavior (Andreadis & Chadjipadelis, 2006), electoral competition about past elections and offers the opportunity to compare those information with present. Utilizing biographical-narrative interpretive method (BNIM), oral history (Bornat, 2004) and narrative analysis, students comprehend and appreciate that qualitative (Hammersley, 1997) and quantitative data and available methods that could be combined in order to record data by focusing on the history of students' unions and students' elections (Sotiroglou, 2012). The election of students' representatives to the schools' board is a simulation of the electoral process and the democratic principle of political representation (Pitkin, 1967). Throughout interviews, observation and recording elections, students are exercised to the democratic process. Consequently, students' communities are suitable to cultivate initiative in observing electoral procedures generally. Currently, the BNIM is used, in order to regenerate students past elections via biographic narrative interviews or even collect data that otherwise would have been lost, considering that there is no other way to restore and record such data due to lack of scientific interest or limited sources on that field.

During all tasks and assignments, students have to record their team's progress and deliver their research outcomes. Students use the teaching platform in order to upload reports so that the professor can observe their progress, note mistakes and gives guidelines. The platform provides more interactive communication abilities between teams via forums and direct mails so as to explore and exchange information with colloquies. Finally, grades are based on teams' productivity, verbal and written examination.

PILOT STUDY

The department of Political Sciences, on a pilot study (project), has collected time sheet of its undergraduate students' workload courses and learning achievements for the academic year 2015-2016. The aim of this study was to evaluate students' workload in order to estimate whether the real course workload corresponds to the European Credit Transfer and Accumulation System credits of the semesters' courses (winter and spring). More specifically, students have recorded, on a standardized time sheet, the hours that have dedicated to their academic responsibilities.
They recorded the date of activity, the course code (according to the study guide), the work-based learning activity and the hours dedicated for every course. The collected data were analyzed with ANOVA for establishing if the ECTS credits correspondence to the department's credits and estimate learning achievements during semesters' exams. Furthermore, all students' grades were used to assess how learning achievements reciprocate to ECTS credits and students' success or

failure at the exams. This study emerges as useful tool for faculties in order to comply with the ECTS, evaluate and if necessary reconsider study programmes.

Especially, for the course of "Quantitative Methods of Analysis in Social Sciences" the results indicate that the didactic methods that were put in practice (TBL and Students' Election project) indeed provoked and endured students towards multivariable techniques. Correlating the hours of activity with this course (lecturing time, survey and monitoring students' elections) with students' performance at the exams, it was established that from 165 students who participated in the pilot study, for the 155 students who successfully passed the exams, the mean is 53.2 hours, in comparison to 10 students who have failed the exams, the mean is 44.2 hours.

In Figure 1 the median, the extreme values, the minimum and maximum value of the ECTS for success (1) and failure (0) for Quantitative Methods' course are given. The median of activity hours for those who have passed exams is 30, 75% percentile is 65 hours, and 25% percentile is 5 hours. Furthermore, it is remarkable that the 75% of students that failed exams had dealt with the course for fewer hours than those who succeeded.
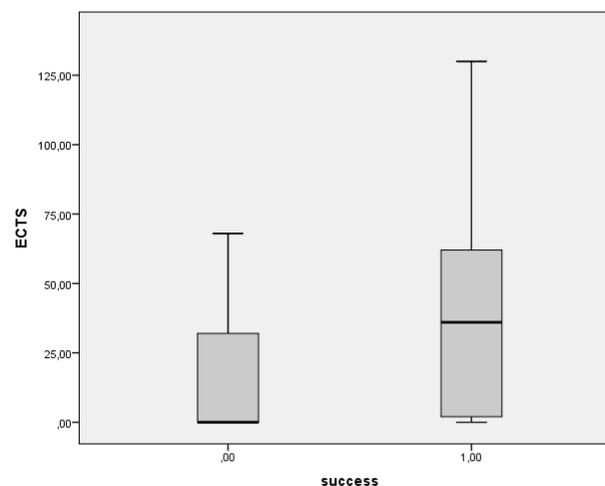

Figure 1: ECTS and Success Rate

OUTCOMES

Developing and enhancing statistical thinking to students can be achieved by using modern teaching methods. The TBL have familiarized students with the methods used in the discipline of political analysis. Students have learned to coordinate team members, have successfully recorded, processed and analyzed data. Additionally, TBL seems to be more efficient than conventional methods which cultivated interest in multivariable techniques and motivated students to explore the field. Therefore, multivariable techniques are more attractive to students who comprehend and implement quantitative methods at a higher rate than before (Chadjipadelis, Sotiroglou & Gkouramani, 2016; Chadjipadelis & Andreadis, 2006). Thus, students can evaluate data, access methods and implement suitable multivariable techniques.

In order to investigate the teaching outcomes, apart from the success rates and the workload that was analyzed at the pilot study, during the same academic year, data have been collected by students' evaluation over the core courses of the department of Political Sciences regarding learning difficulties, comprehension, teaching purposes, instructors' abilities, motivations etc. The evaluation was based on a questionnaire that was given to students before the courses' examination procedures (verbal or written).

At the evaluation of "Quantitative Methods of Analysis in Social Sciences" the results indicate that the didactic methods that were put in practice (TBL and Students' Unions Election project) are more effective that convictional teaching methods. Consequently, in a scale from 1: not at all to 5: completely, the 65 students that had evaluated the course's module stated that the course was efficient (mean 3.88), indicated that the teaching materials were satisfying (mean 3.62), that comprehend the teaching purposes (mean 3.60) and provoked their interest over multivariable

techniques (mean 3.50). Also, they stated that was encouraged to make questions (mean 3.18) and understood the criteria of students correspond to the course's outcomes (mean 3.12).

Moreover, 55% of the students confirmed that they have attended more than 6 classes at the particular course, 30% 4-5 classes, and 15% less than 4 classes. Half of the students attributed learning difficulties to this module and a 11% to the instructor.

Factor Analysis, indicated that course efficiency and organization over the course's module are correlated to interest cultivation and the course's correspondence criteria. And that, teaching materials are correlated to raise questions about the field.

Students, for the first time, learn to conduct and analyze biographic narrative interviews to candidates or even elected ones and exercised to a research project of comparing and recording personal experiences throughout the biographical narrative interpretive method (BNIM). In the same time, students learn how to monitor elections, study and analyze candidates' profile, manifestos, parties and record elections results, in order to understand governmental policies, comprehend the electoral law, election proceedings, evaluate candidates' profile, record manifestos so as to make personal decisions and generally speaking to become more efficient scientists and responsible and citizens.

Furthermore, using mixed methods and implementing real data is in other words what seems to hold students interest. The teaching tools that are used, besides lectures, are focused on the simulation of the general elections into students' communities. Therefore, students of Political Science can understand and interact with the concept of elections and procedures related to them. Students seem to be more confident about statistical reasoning applied to Social Sciences and can use more effectively SPSS, because through the given tasks, acknowledge the meaning of using multivariable techniques and appreciate the unlimited applications of them in many aspects of Social Sciences. The teaching outcome is verified by students' success rates (Chadjipadelis, Sotiroglou, & Gkouramani, 2016) on the grounds of team-based learning assignments and students' attitude towards statistics (Chadjipadelis, 1998b).

Apart from that, the project incorporation and TBL (Chadjipadelis & Andreadis, 2006) allows a considerable and an effective management of a large number of students. Via the Course Management platform instructors can organize more effectively the teaching materials, provide instructions, information and solve problems occurred from time limiting factors of conventional teaching environment and offer more freedom of choice to students about the subject of their research (Ledolter, 1995).

To conclude, giving students a real problem that needs to be solved with statistical treatment, offering the appropriate tools and creating an inspiring teaching environment is more effective and can help students to develop statistical thinking and use multivariable techniques properly.

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