

Peter Szabo

Constantine the Philosopher University in Nitra
Department of Mass Media Communication and Advertising
pszabo@ukf.sk

Edita Szabová

Constantine the Philosopher University in Nitra
Department of Mass Media Communication and Advertising
edita.szabova@ukf.sk

EXPERIENCE WITH PROJECT DEVELOPMENT IN TEACHING STATISTICS FOR MASS MEDIA STUDIES*

Summary: The contribution deals with project teaching of the subject Statistics for Non-Mathematical Students 1 which is part of the study plan of the Marketing Communication and Advertising Programme (Faculty of Arts, Constantine the Philosopher University in Nitra, Slovakia) in the first year of Bachelor's studies. Students carried out their initial research, using statistical methods for evaluation of their results. The resulting project should have the form of any article consisting of high-quality verbal and visual part and statistical processing of selected issue.

Keywords: didactic of statistics, marketing communication and advertising, project teaching, evaluation.

1. Statistics in the Mass Media Studies

Mathematical and statistical methods are a standard tool for verification of hypotheses in many scientific disciplines. They are used not only in research in natural sciences in order to measure the value of parameters, but all the more frequently in social sciences which explore the level of presence of various kinds of features and their correlation within population.

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We will focus our attention on the position of statistics in the mass media studies (Marketing Communication and Advertising – Bachelor’s and Master’s degree, Mass Media Studies with Integrated French Language Studies – Bachelor’s degree). In the first year’s Winter semester of the Bachelor’s studies, the study plan of the programmes Marketing Communication and Advertising and Mass Media Studies with Integrated French Language Studies contains a mandatory subject called Statistics for Non-Mathematical Students 1 which consists of one lecture and one practical training a week. The purpose of the subject is to provide students with the basics of statistics and the probability theory. For example, it deals with simple, interval and group sorting and the creation of diagrams and it is further focusing on the most commonly used parametric tests (e.g. the two-sample t-test) and correlation analysis. The subject Statistics for Non-Mathematical Students 1 is followed by the subject Statistics for Non-Mathematical Students 2 in the first year’s Winter semester of the Master’s studies. It provides with the basics of regression analysis and non-parametric tests.

Basic aim of the subject Statistics for Non-Mathematical Students 1 is to teach students how to apply the acquired knowledge in practice with the help of the Excel programme. It was important to choose such form of teaching which will not remind the students of traditional learning of formulas and the simple process of filling in such formulas, but will persuade them of the need, helpfulness and advantages of using mathematical and in particular statistical methods in their field. In order to meet these goals, we chose project teaching.

2. Project teaching

One of the most common methods implemented in teaching statistics is project based teaching. In a learning project, students have some influence on the choice, respectively a closer definition of the topic. The process of learning through this aspect is characterised by openness. The program of learning is not fixed in all its details before realisation of the project. The project concerns extra-curricular activities; studied problems are not based on a textbook, but are present in a region they live in. The project is based on a premise that pupils or students are involved, they work on it on their own accord and that they enjoy the work without extrinsic motivation. Learning outcomes lead to actual results, based on which pupils or students may gain the corresponding knowledge and skills, but also the reward resulting from solution.

Clint W. Coakley from Virginia [www 1] suggests several helpful approaches in teaching statistics, ideas for classroom presentations, projects, and student-generated data. He believes that one of the goals of statistics courses is for students to understand the importance and usefulness of statistics and to dis-

cuss the suitability or unsuitability of the used statistic methods. According to Coakley, the most effective way to help student realize the value of statistic methods is through examples – prospects or pamphlets, web pages often include data which can students analyse using statistical methods, e.g. comparison of home prices for two residential areas. As a part of a project, students may carry out a comprehensive statistical analysis of selected problem including introduction, discussion about the used methods, criticism of presumption, data and conclusions analysis. Projects can be carried out individually or in groups. According to Smith [www 3], students often remain only passive participants in statistics classroom and do not gain experience with problems that may arise in real data collection. Hogg [1991] states that better than using in the classroom old but real data is to leave the choice up to students – whether it is searching for available data or creating data of their own. Creating projects provides students with experience in asking questions, problem definition, formulation of hypotheses, designing of experiments and surveys; students collect data, work with errors in measurements, analyse data, and communicate their findings. Snee [1993] writes that collection and analysis of data is ‘the heart’ of statistical thinking. Data collection supports learning based on experience and connects the learning process with reality. T.E. Bradstreet [1996] recommends teaching statistics on a basis of lab seminars. The output of projects in classroom led by G. Smith [www 3] was a final report ranging from 3 to 5 pages that included explanation of project’s objectives, the procedure for obtaining data, charts, graphs and formulation of conclusions. He also places an emphasis on writing style of the report – students could use conversational tune, but had to avoid slang, typographical and grammatical errors, redundancy. After submission of reports students presented their results also orally, using visual aids. This way, students also develop their rhetorical skills. Smith [www 3] also compared study results of groups he taught in the past in a traditional way and groups he taught through project based teaching, and observed a significant improvement in the success rate during exams.

S. Fillebrow [www 1] also considers the method of project based teaching as a very suitable method in teaching statistics for non-mathematical study programs – sociology and psychology. During the project based teaching, students choose their own topic and collected data, conducted a survey or an experiment, or they used the available data. It was only a basic course in statistics which did not cover testing of hypotheses, but students were guided to look at a problem from the view of factors which can affect values of variables. Data were subsequently analysed using methods of descriptive statistics, tables and graphs. S. Fillebrow states that her students often asked for feedback. Some students used data available on the internet – monthly average temperature and homicide rate, motor

vehicle accidents. In terms of conventional understanding of the teaching process, the end products of students implementing the project are different, e.g. presentations of results using various supporting materials such as a ppt (Microsoft Office Power Point) presentation, poster, report or article in school magazine [Németh, 2011]. In terms of didactics, the ability to use knowledge in practice is becoming the decisive didactic principle in particular when preparing a curriculum. This was also applied to the conditions of our school subject. Another goal is to motivate to work using investigative solving of a certain problem by a student [Zelina, 2000, p. 89]. A considerable motivation in a school setting is also when a student has the opportunity of doing something else than he/she usually does at school. Natural science subjects are very suitable for project teaching and project form of work during classes. Inter-subject relations not only between natural science subjects, but also between natural science and human science subjects are its basic feature [www 4].

In general, implementation of projects teaches students research and discovering activities and the students experience adventures associated with learning and solving problems which leads to positive relations and interest in knowledge and learning. Students work with actual data they obtained [Orbánová & Velichová, 2013]. It is advisable to enable students and teachers present results achieved at school and outside of school in connection with the implementation of project, organize exhibitions, publish project bulletins, produce posters, submit articles to expert press and participate in discussion clubs created for example on the Infovek portal or websites [Petrašková, 2002].

Basic principles and ideas of project teaching – taking into account the interests of students, taking into account current situation relation, interdisciplinarity, self-regulation while learning, focus on the product and social relevance – with relation to the subject Statistics for Non-Mathematical Students 1 may be summarised as follows. Statistics provides tools for quantitative analysis of the problem that is in the process of solving, e.g. for data sorting and analysis in the form of diagrams and tables; methods of statistical inference enable drawing conclusions on confirmation or non-confirmation of a hypothesis based on test results. While working on the projects, students will practise and master the statistical methods and work procedures they had learnt in the Excel programme and they will take advantage of these methods when preparing various types of work in their future career. Moreover, the work on the project is correlated with the student's study field, since the final product should have the form of a magazine article dealing with optional topic. As the project topic is not specified more closely, students chose the topics in which they were interested. Although it was recommended to them that they deal with marketing or mass media issues, many students (53.57%) decided to take a different course and chose simpler or more

approachable problems. Here are some examples of problems they dealt with in their projects: favourite season of the year or transport to school, number of cell phones in a dormitory room, prices of tea, prices of accessories in the H&M network, height of skyscrapers, number of male and female friends on Facebook, dependence of the number of advertisement pages on the number of magazine pages and so on. The school or a study group is opening to a wider environment which was reflected for example in the conduct of public opinion polls in the student's surroundings. Due to the nature of issues dealt with by students, school is connected with life, work, society and practice. Project teaching provides room for exercising interdisciplinary relationships; our case involved connection of mass media and marketing communication with statistics and depending on the project topic also with economy, sociology, etc. Students are planning and implementing their projects and learning to learn. They are personally involved in the project, proposing solutions to a problem, taking decisions and dealing with investigative activities. The teacher's role is weakened. While working on the projects, students contacted their teacher for the most part when they experienced problems with the Excel programme or when they wanted to verify the correctness of the procedure used while assessing data. Communication took place during office hours, but in the first place by e-mail. In our case, the project output brought about meaningfulness of learning and the work as such and thus was highly motivational for students. The work did not result in a mathematical calculation, but a finished article. One of the attributes of project teaching is the fact that it is implemented in groups. When working in teams, students learn cooperation and communication; they learn tolerance and problem solving. Students preferred individual work because they did not yet know one another well or since they would find it bothering to agree on meeting and working outside classes.

2.1. Project assignment

“Produce an article on any topic, like the ones you find on the Internet, in the newspapers or magazines, in which you will research a particular issue using statistical methods. Obtain data for you to analyze. Process data in the form of tables and diagrams and if suitable, also use some of the more challenging statistical methods. Interpret and verbally describe your findings. When preparing the article, use your creativity”.

When assigning the form of processing, the starting point was a wider definition of an article. According to Mistrík [1997, p. 439], an article is primarily a genre of popular and educational style. “It is a contextual whole which is smaller in size and which explains, applies and popularizes the results of scientific observations in a generally approachable style. While dissertation works and studies deal with and analyze new, heretofore unknown issues, there are no

such demands put on the article. As opposed to completely scientific genres, an article puts more stress on the didactic aspect of means of expression. The term 'article' is used metonymically to denominate journalistic compositions as such. In editorial and press slang, a study and a review as well as a reflection or an extended report are all considered articles" [Mistrík, 1997, p. 439].

In connection with articles in the area of advertising and PR, "in addition to this the editor's offices use the terms promotional article or advertising article and most recently in connection with public relations and other associated activities also the term public relations article, usually as a PR article. All of them are working (slang) names for an article and highlight its area of focus (promotion, advertising and public relations). In terms of the text, it is nothing else than a general denomination of a text carrying formal signs of some journalistic genre or a genre of some other style, for example expert, administrative, etc. On the other hand, advertising texts in text ads on expert topics which are intended for wide public are popular and educational descriptive genres, for example a description of an advertised item with enumeration of its useful and other qualities, a description of a work procedure such as instructions for handling the product being promoted. In such texts, a secondary, so-called recipe style (cooking recipes and similar texts) is also often used" [Tvrdoň, 1999, p. 98].

Within this terminology, there was a wide scope of possible variations of the text part of the project and this was associated with freedom to choose whatever topic, of course, provided that the student used his/her invention and applied some of the acquired statistical methods. A wider space for formal processing of the project was also provided due to the fact that first-grade students had not yet completed studies of linguistic subjects which teach the typology of text communications in the context of mass media and marketing communication. However, each of them had come across articles in magazines, newspapers, on the Internet, etc. and therefore they had some idea as to what the text and image aspect of the final product should look like.

2.2. Reflection on goals and meeting goals in project teaching

Taking into account the primary goal of the subject which was to teach students using statistical methods in practice and assess data by means of statistical methods in the Excel programme, we chose the method of project teaching. At the same time, it should serve as a factor motivating students to learn. Since we only used this method of teaching several times and in the subject Statistics for Non-Mathematical Students I only once, we wanted to obtain information on suitability of this method and subsequently also on the students' attitude towards the subject after the students completed it. Therefore, in connection with the assignment of tasks for project teaching, we will try to answer the following problem questions: Is pro-

ject teaching of mathematical statistics motivating for the students of the Faculty of Arts? Are students showing interest in this form of teaching? Would working on the project help with obtaining deeper knowledge and skills in statistics?

At the same time, we observed the extent to which the criteria for project evaluation were met:

1. The student is able to work with information and communication technologies – with the Excel programme (a maximum of 5 points): The student is able to fill Excel cells with a required formula (1 point). The student is able to copy the formula into the required cells (1 point). The student is able to format the cell in a required form – number – number of decimal places, date, wrap the text in the cell, etc. (1 point). The student is able to edit a table – framing, background colour (1 point). The student is able to edit a diagram – name of the diagram, axle tags, editing legend entries, axle scope, column colour (1 point). These items were evaluated based on continuous fulfilment of project tasks with students sending us their files for checking.
2. The student demonstrated his creative skills when implementing the project (a maximum of 3 points): The student chose a striking or eye-catching caption (1 point). The student processed his/her project output in a visually well-arranged manner (1 point). The student used a visual item in the project output (1 point).
3. Submitted outputs meet the criteria for the article (a maximum of 5 points): The student introduced the issue to the potential reader well (1 point). The student expressed the aim of his/her research (1 point). The student explained, applied and popularised the result of his/her exploration using a generally approachable style (1 point). The student's text was written in a grammatically correct manner (1 point). The student selected a suitable interaction between the text and image (1 point).
4. The student analysed his/her own data suitably and correctly (a maximum of 5 points): The student chose a method suitable for sorting his/her data (1 point). The student correctly prepared a table of frequency distribution (1 point). The student correctly calculated cumulative or cumulative relative frequencies (1 point). The student correctly calculated basic characteristics of position and variability (1 point). The student correctly prepared a diagram (1 point).
5. The student used a wide scope of statistical methods (a maximum of 2 points): In his/her analysis, the student used all of the acquired methods out of those which were suitable for his/her data (1 point). The student correctly used more challenging statistical methods (correlation, linear regression, parametric test), if suitable (1 point).
6. The student interpreted results of the statistical analysis and results of his/her findings (a maximum of 5 points): The student correctly interpreted the distribution of frequencies, e.g. by indicating the percentage (%) (1 point). The student correctly interpreted cumulative frequencies or cumulative relative

frequencies (%). The student correctly interpreted basic characteristics of position and variability (1 point). The student interpreted results of graphic data visualisation (1 point). The student formulated results of his/her findings with relation to the goals he/she had set (1 point).

A total score of 25 points (100%) could be obtained for the preparation of the project.

Classes were attended by 37 1st grade students in the study programme Marketing Communication and Advertising and Mass Media Studies with Integrated French Language Studies. Projects and their outputs in their final form were submitted by 28 students. 9 students only submitted the Excel file with assignment and computation, but lacking the form of an article.

In graph 1 we present the overall evaluation of projects which were submitted in the form of an article, meeting all criteria for successful completion of the project.

When implementing the projects, students demonstrated a good ability to gather own data and process such data in terms of statistics, using the Excel programme. Problems with the Excel programme were rather of technical nature and not due to unfamiliarity with statistical methods and therefore were easily and simply resolved. In spite of the fact that at the beginning of the semester students were shown examples of suitable data types (for example observation of one attribute in two different populations, observation of two attributes on the same sample), some students chose data, using which they failed to demonstrate a wide scope of knowledge of statistical methods, for example they only conducted a single opinion poll with a single closed question and evaluated the poll on the basis of the number of answers to each possibility. Only few students used some of the more challenging statistical methods, among which we count e.g. testing of statistical hypotheses, correlation, and regression.

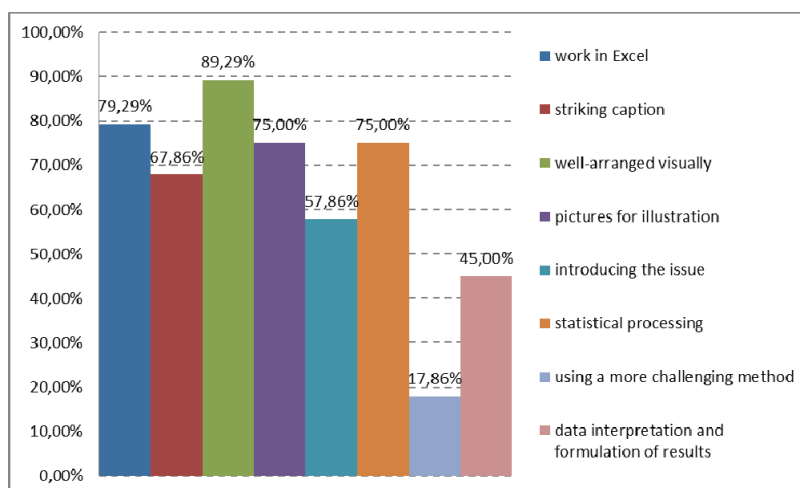


Fig. 1. Evaluation – students who submitted the project in final form (28 students)

2.3. Example of students' works

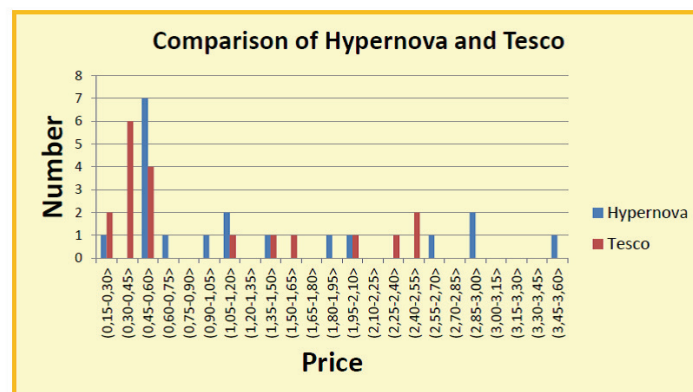
Project in Figure 2 has been chosen as an example of a project with average level of creativity and average quality of statistical processing.

The caption is coloured and eye-catching, consisting of the chain stores logos separated by the abbreviation "vs." which suggests that a comparison of the chain stores will follow. Underneath, there is a sub-caption which has the form of a question "Where can you buy school things?" So, the article has a practical focus and the potential to attract a reader who has school-age kids at home. The text part is written quite well; although it is not extensive, it introduces the issue to the reader. The author is continuously communicating with the reader, which is obvious from his/her writing style; he/she uses questions with many verbs having the form of second person plural.



Have you already shopped all school things for your kids? No? If that is the case, you are holding the right magazine in your hands and it's time for us to solve the dilemma instead of you.

We decided to compare prices in the Tesco and Hypernova hypermarkets, as these are the hypermarkets all of you definitely know and we needn't introduce them to you. They can be found in the whole of Slovakia, usually in larger towns. Some consumers are regular customers of Tesco, others are regular customers of Hypernova, contradicting each other and saying that shopping in the hypermarket they prefer is cheaper. What's the real truth in this case, when it comes to school things? We have taken the trouble and gathered these data for you. We looked for prices of things from pencils, through exercise-books and colouring brushes to school folders. We obtained the results which are presented in the following diagram.



The results show that lower prices of school things are offered by the Tesco hypermarket. Therefore, we recommend that you visit Tesco even in case you are loyal customers of Hypernova. We wish you a happy shopping!

Fig. 2. Student work

The results of the research with 20 school things and investigation of their prices in the Hypernova and Tesco chains with the prices of school things being assigned to one of twenty-four intervals are listed in the diagram. The number of intervals (24) is excessive and does not correspond with the recommendations. Some intervals have a zero frequency and in most cases the frequency in the interval equals to one. Moreover, the intervals are unduly narrow – EUR 0.15. However, the statistical processing was relevant; using the diagram the author determined which chain store has cheaper school things and formulated his/her findings in the end of the text which is situated under the table. In the future, similar comparison of prices of the same goods in two chain stores might be performed using the results of a t-test or its non-parametric analogy.

2.4. Evaluation of own work on the project

We asked the students to evaluate their own work on the project using a questionnaire with two open questions: How do you evaluate the importance of statistics for the present times? How do you evaluate the statistics classes and work on the project?

We abstracted some claims from free answers. We are also presenting a percentage of students whose answer was the same or similar.

Students had fun working on the project and considered it beneficial (90%).

Statistics was a subject they felt comfortable about (50%).

Statistics is practical and useful (77%). Statistics is connected to their study programme, as they processed their research in the form of an article in which they were able to exercise their creative skills. They appreciated that during the semester they were not solving tasks from textbooks, but evaluating their own data.

Excel is simple (24%), sometimes complicated (8%), useful (65%).

Their criticism aimed at slow and obsolete computers in the computer classroom at Department of Mathematics, Faculty of Natural Sciences, CPU (12%).

Based on the responses, we may say that the work on the project attracted students and was beneficial for them. They appreciated that during the semester they were not solving tasks from textbook, but evaluating their own data. At the same time, statistics was connected to their own study programme, as they processed their research in the form of an article in which they were able to exercise their creative skills. At first, they were afraid of mathematics, but since mathematic classes were of practical nature, their concerns vanished. Criticism aimed at slow and obsolete computers in the computer classroom at the Department of Mathematics of the Faculty of Natural Sciences of the Constantine the Philosopher University which is ensuring classes of this subject. Technical background

is inevitable for the students not only to see what their teacher is doing, but also to try working with the programme on their own, thus developing their skills. It provides an overview of the prices of school items in two selected chain stores.

Conclusions

In our contribution we were dealing with statistics in the study field Mass Media Studies, in the study programmes Marketing Communication and Advertising and Mass Media Studies with Integrated French Language Studies. We described the course of project teaching of Statistics for Non-Mathematical Students 1 and its evaluation. Students did not have serious problems processing a certain issue, which was statistically analysed, into the form of an article. Their creative skills had been already verified during admission tests.

Approximately half of students submitted their projects in the form of a collage, getting high scores for colour processing and using pictures for illustration. For the most part, students chose striking captions; some used a metaphor, exclamation or apostrophe. They had not finished their text disciplines, but we assumed that each of them had already come across an article in the past and created a text for example as part of their secondary school leaving exam. However, we found shortcomings with relation to introduction of the issue and formulation of the results. Students sometimes introduced the issue in the form of a conventional mathematical task which was exactly what we wanted to avoid. Students were inconsistent when interpreting statistical analyses and formulating their results which was caused either by them not attaching importance to it (e.g. compared to visual objects – figure, diagram) or not wanting to. During seminars, they were always led to thorough interpretation, since the goal of statistical analysis is not the creation of a table or diagram or performance of a significance test, but discovery of the laws in the real world.

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NAUCZANIE STATYSTYKI NA STUDIACH Z ZAKRESU KOMUNIKOWANIA MASOWEGO POPRZEZ PROJEKTY

Streszczenie: Artykuł porusza zagadnienia związane z uczeniem poprzez projekty przedmiotu „Statystyka dla studentów przedmiotów niematematycznych”. Przedmiot ten ujęty jest w programie studiów „Komunikacja marketingowa i reklama” (na Wydziale Sztuki Uniwersytetu Konstantyna Filozofa w Nitrze, Słowacja). Studenci przeprowadzili wstępne projekty korzystając z metod statystycznych do oceny osiągniętych wyników. Efektem końcowym powinien być artykuł składający się z wysokiej jakości części wizualno-słownej oraz analizy statystycznej wybranego zagadnienia.

Słowa kluczowe: dydaktyka statystyki, komunikacja marketingowa i reklama, uczenie poprzez projekty, ewaluacja.