Establishing Online Dialogue in Teaching Statistics

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Abstract. The web page of the course Statistics has been experimentally created and based on the Bologna process requirements with the goal to develop a model of the teaching process which would be supplemented by the Online dialogue. It has been estimated that in order to develop generic skills, the students need a special motivation which was expected to be reached by the development of a students' documentary tool.

The professors use this newly created web page as a joint web space with teaching materials and new communication tools. The web page visits analysis has shown that precisely the documentary tool and the Forum were the most visited notifications that have contributed to remedy the ambiguities in the teaching process communication channel and to the growth in the student motivation for the Statistics course class participation.

Keywords. Online dialogue, Statistics, documentary tool, Bologna process, website visits, forum

1. Introduction

With the establishment of the official website of the Faculty of Economics in Osijek, teachers in charge of the course Statistics (www.efos.hr/nastavnici/jhorvat1) started innovating the teaching process and adapting it to modern trends in web interfaces. Following the structure of web design at the Josip Juraj Strossmayer University, both teachers involved in the course constructed their own website (www.efos.hr/nastavnici/jhorvat/; www.efos.hr/nastavnici/jforjan/). The concept of these websites included presenting both the teacher and the course, and was used to improve the teaching process: “The design of the web page for the course Statistics was aimed at achieving synergy of two teaching methods: the traditional, “face-to-face” teaching, and distance learning.” [2]

Since the University website is organized according to departments, i.e. teachers, it was noticed for the course Statistics that there was frequent doubling of content and notices posted on the two teachers' web pages.

In the course of academic year 2005/2006 the teaching process was becoming increasingly dynamic, primarily by posting teaching material and other educational information on the two teachers' web pages. The efficiency analysis of the web page of the Statistics course convener [3] showed that two positive effects were achieved: a) 24-hour accessibility of teaching material and notifications, b) teaching materials have evolved into an online course book2.

In order to improve teacher-student interaction and to meet the requirements of the Bologna process, in October 2007 the course teachers decided to supplement the existing teacher web pages by renting an additional domain (www.efos-statistika.com) and creating a special course website for Statistics.

This experiment with a course-oriented web page, completed at the end of winter and beginning of summer semester of the academic year 2007/2008, has achieved the posting and updating of information with a clear hierarchy (both teachers are equally entitled to post information and update the Statistics web page). In other words, since two teachers are in charge of the course, this additional website was designed in order to reduce possible discrepancies caused by double postings on teachers' individual websites. As already stated, these pages are the result of the official website structure at the Faculty of Economics in Osijek3.

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1 Within this official Faculty website, every teacher has the same menu (CV, course plan/syllabus, teaching material, required reading, exam terms, teacher's office hours, contact information). A pilot research at the end of academic year 2005/2006 indicated that most communication noise was caused by double postings.

2 By a decision of the Academic Council of 7 February 2006, the web teaching materials for the course Statistics were pronounced to be a course book, following two independent reviews.

3 In further text: EFOS website.
Although the EFOS website of the course convenor continues to be the first step in obtaining information, the Statistics course website is nevertheless the referential source of information, given that notices are posted there by both teachers. Since the alternative course website (www.efos-statistika.com) was the place to experiment with online teaching by several teachers in charge of the same course, and to test its efficiency, this paper will analyze its effects and assess to what extent this course website is justified.

2. Online dialogue as support to the Bologna process

There are some new standards in teaching established by the Bologna process, which include expectations that students not only acquire knowledge, but develop additional generic skills (through logical thinking and concluding, communicating, analysis, etc).

“Students need to acquire basic knowledge in a field, but also to learn how to use references in order to continue independent learning. Furthermore, students should be faced with problem situations that will enable them to develop problem-solving strategies and critical thinking about a problem or situation. This approach encourages university teachers to use modern teaching methods, which will view students as a subject rather than an object of teaching. This again means that the Bologna process encourages teachers to strive for continuous improvement and life-long learning.” (Divjak, 2005, pp. 21–24)

The process of creating a European education area requires educational institutions to harmonize their teaching processes and educational programmes. In creating the additional website (www.efos-statistika.com), the teachers of Statistics have endeavoured to provide online communication with an emphasis on the course, rather than on the teachers. Online communication in the dialogue form was established, which was confirmed in very few objections by the students regarding unstable connection, as well as in exceptionally lively forum discussions about the course. The site had a great number of visits (53,667 visits during the summer semester of the academic year 2007/2008), especially through numerous clicks on the newly established documentary tool (a publicly accessible document containing daily updated reports of students’ success) (20,227) as well as on the link with a web form for regular (weekly!) assignment submission.

Established online dialog contributed to the increased passing rates of Statistics course, as well as increasing the average of students’ final grades on course Statistics (2005, 3,095 vs. 2009, 4,309). Table 1. shows the difference in passing rates of the course, monitored in five academic years starting from 2005: when classical teaching with support of official faculty web site for teachers, was used in teaching process, which was the first phase of applying online dialog.

In the last analyzed academic year (2008/2009), beside classical teaching method and developed online dialog an additional course oriented web page was used. Increased percent of students who successfully passed the course (2005. 16% vs. 2009. 82%) is evident. Data in the table is given only for university studies students at the Faculty of Economics in Osijek for the course Statistics.

Table 1. Teaching technique, passing percent and average grade on course Statistics during 2005. – 2009.

<table>
<thead>
<tr>
<th>Year</th>
<th>Teaching technique</th>
<th>Percent passing</th>
<th>Average grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005. (04/05)</td>
<td>classical teaching <a href="http://www.efos.hr">www.efos.hr</a></td>
<td>16%</td>
<td>3,095</td>
</tr>
<tr>
<td>2006. (05/06)*</td>
<td>classical teaching online dialogue <a href="http://www.efos.hr">www.efos.hr</a></td>
<td>51%</td>
<td>3,274</td>
</tr>
<tr>
<td>2007. (06/07)</td>
<td>classical teaching online dialogue <a href="http://www.efos-statistika.com">www.efos-statistika.com</a></td>
<td>85%</td>
<td>3,799</td>
</tr>
<tr>
<td>2008. (07/08)</td>
<td>classical teaching online dialogue <a href="http://www.efos-statistika.com">www.efos-statistika.com</a></td>
<td>84%</td>
<td>3,917</td>
</tr>
<tr>
<td>2009. (08/09)</td>
<td>classical teaching online dialogue <a href="http://www.efos-statistika.com">www.efos-statistika.com</a></td>
<td>82%</td>
<td>4,309</td>
</tr>
</tbody>
</table>

* First year of implementing Bologna process
Source: Student service – Exame list

3. Evolution of the Statistics course website

The additional course website (www.efos-statistika.com) was designed in order to allow faster and more flexible adaptation of students to new methods of work. Another aim was to establish the efficiency of a web space structured

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according to university courses. The experimental *Statistics* web page has been registered on AboutUs′ portal, which is a kind of address book and virtual guide through Internet sites. Although the *Statistics* web page took over part of the visual identity of the primary source of information (www.efos.hr/nastavnici/jhorvat), it was supplemented with new tools and menus, while remaining visually recognizable.

In addition to more accessible menus, the *Statistics* web page also has new communication tools, namely the forum and student documentary tool. As we analyzed the number of visits to the forum and the student documentary tool (publicly accessible document with daily updates of students' performance), it became obvious that introducing these two elements was more than justified. The forum and the documentary tool have achieved the following effects:

- Continuous dialogue between course teachers/teaching aides and students,
- Guided and supervised student discussions with reference to classes,
- 24-hour communication between students in solving their group problem assignments,
- Daily records of students' efforts and performance analysis in the teaching process,
- Competition in earning points as a motive for final success,
- Transparent grading and possibility to follow one's own rating (initially measured in points, which are then turned into grades).

As can be seen in Fig. 1, the documentary tool plays a central role in the communication space. The documentary tool is updated by both teachers, and the final grade is a result of synergistic perception of teachers regarding student performance, including individual and group assignments, as well as mid-term tests. The forum encourages discussion on the fairness of grading, doubts and uncertainties in assignments, as well as any other pending issues connected with classes or teaching materials.

### 4. Establishing online dialogue

Establishing a dialogue related to the course *Statistics* required first of all a proper motive that would induce students to communicate. The course teachers decided to make the process of student assessment completely transparent, and estimated that a documentary tool could be a strong enough incentive to develop online dialogue.

#### 4.1. Documentary tool

Student documentary tool for the course *Statistics* is a student database, created in Excel, where all student activities during a semester are recorded. As the documentary tool is posted round-the-clock, this allows students a 24-hour insight into their performance in this particular course. The documentary tool is a record not only of midterm test results, or points achieved through individual or group assignments, but also of any student activity required by the course syllabus. Once a semester is over, the final grade for each student is the result of his/her ranking in comparison to the points acquired by the best student. The best student in a particular semester is the one with the highest number of points. This number is different year-on-year, depending on any group's readiness to participate in different course assignments. This highest number of points achieved by the best student is the basis for a structured division of final passing grades into four groups (excellent, very good, good, sufficient).

![Teaching process (academic year 2007/08)](image)

*Figure 1. The teaching process as a result of communication innovation – online dialogue conducted through the Statistics web page*

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6 Data recorded in the academic year 2007/2008.
7 http://oliver.efos.hr/nastavnici/jhorvat/silabus.pdf
Fig. 2 shows the documentary tool which comprises four worksheets (the first three worksheets keep a record of course units and assignments for the three midterm tests, whereas the last worksheet (TOTAL) is a sum of the points acquired by students as they pass the three midterm tests, as well as the proposed final grade). The documentary tool is accessible to anyone on the course web page. Up-to-date records posted by the course teachers allow students to consider their own advancement. Furthermore, this is a motivational instrument that not only provides each student with information on their performance in comparison to others, but also allows for planning of future overall achievement. During the summer semester of the academic year 2007/2008, there were 20,227 visits to the documentary tool.

Another attractive feature of the documentary tool was the other innovation introduced in this course, namely, a short quiz at the end of each lecture. The prerequisites for success in taking these quizzes are: being familiar with the course material to be covered in a lecture (available online on the same web page), attending the lecture and focussed listening. The quiz has served several purposes: a) records on class attendance, b) knowledge testing, c) preparing for the upcoming midterm test, d) a framework for setting problem assignments.

A simple analysis of the documentary tool for the academic year 2007/2008 can show the attendance dynamics of Statistics classes (expressed as percentage of the total 254 students), as well as student performance in the same course. All this is shown in graph 1.

Graph 1. Attendance dynamics of Statistics classes (expressed as percentage of the total 254 students)

Graph 1 indicates high attendance of lectures given in Statistics, broken down in its eleven units. This high class attendance is another proof how successfully the web space is organized, together with the posted teaching materials. Another confirmation of the teaching process efficiency is the high exam passing rate (80%), as well as the structure of passing grades with predominance of higher grades (excellent – 56%, very good – 22%, good – 19% and sufficient – 2%).

4.2. Forum and other content

Together with the regularly updated documentary tool, the new Statistics web page has offered access to the forum where topics are discussed in reference to the teaching process, weekly and monthly problem assignments, as well as current controversial issues. The web page also contains a special web form which students used to devise their own test questions after every lecture. If the submitted questions were formally and logically correct, the teachers updated the documentary tool each week with the additional points earned in this way, i.e. by doing this online homework.

Online guidance of students through this communication tool can be observed in the high number of visits: during summer semester of the academic year 2007/08 there was 286,147 clicks on the forum.

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8 The quizzes given at the end of lecture last for 5 minutes, and comprise 10 multiple choice questions (students have to choose one correct answer out of four options). The quiz is intended to check recognition and understanding of the course material covered during the lecture.
5. Analysis of Statistics website visits

The analysis of website visits, comments and questions on the forum reveals that the greatest number of them referred to the documentary tool (especially in the period preceding a midterm test), but also to specific parts of the course material to be tested.

The regularly updated documentary tool, individual and team assignments, exchanging information on the forum – all this required students to participate in the dynamic development of this web page, and to develop their own technological skills. “Constant interaction with information technology identifies the habit of active learning, increases efficiency and the quality of learning.” (Bregar et al., 2000. p. 240) Such a dynamic approach, supported by a high degree of online communication, has achieved a large number of visits, as shown in graph 2.

Graph 2. Visiting frequency for the most popular menus of the Statistics web page (academic year 2007/08, summer semester)

According to graph 2, the most intensive online communication took place on the forum. If we compare the visits to home page and the forum – the two most visited parts of the web space – we can notice that the number of forum visits is twice as high. Out of the total number of forum clicks, the observed period for the months of March, April and May accounted for 85.19% (243,781 clicks) of the total number (286,147). The reason for such high forum visiting frequency lies probably in the concentrated discussion of Statistics teachers and students, where teachers assumed the role of web administrators and moderators, thus personally guiding and supervising web communication. The established dialogue made it easier to discuss course topics, issues and controversies for students and teachers alike.

The total number of clicks on the Statistics website in the observed period amounted to 2,646,308. The months with the greatest visiting frequency are those when teaching takes place (not during exam terms!), i.e. March, April and May, with cumulative 87.85% of clicks.

During the teaching process in the academic year 2007/08, 254 students were attending the classes, and average visit rate for course oriented web page was 163 times per student, with average of 42,820 clicks per student.

In spite of the innovative undertaking of the additional web page for the course Statistics, previously existing EFOS web pages of individual teachers (primarily the web page of Professor Jasna Horvat, which has been a long-standing source of information for the course Statistics) have maintained a certain number of visits. The visiting dynamics for both pages related to the course Statistics is shown in Table 2.

Table 2. The number of visits to the course web page and course convenor’s web page during summer semester of the academic year 2007/08

<table>
<thead>
<tr>
<th>Time period</th>
<th>Web page visits*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Web page of the course Statistics</td>
</tr>
<tr>
<td>II</td>
<td>2,680</td>
</tr>
<tr>
<td>III</td>
<td>13,443</td>
</tr>
<tr>
<td>IV</td>
<td>15,174</td>
</tr>
<tr>
<td>V</td>
<td>12,754</td>
</tr>
<tr>
<td>VI</td>
<td>6,845</td>
</tr>
<tr>
<td>VII</td>
<td>2,581</td>
</tr>
<tr>
<td>Total</td>
<td>53,477</td>
</tr>
</tbody>
</table>

* only „unique visitors“ were recorded

As can be seen from the table, during summer semester the number of visits to the Statistics web space was steadily increasing (the visits in March, April and May accounted for 77.36% of the overall number, i.e. there were 43,371 visits).

Despite a great number of visits to the Statistics web page, the course convenor’s web page (www.efos.hr/nastavnici/jhorvat/) remained quite popular with the total frequency of 9,698 visits.
6. Discussion

The innovative undertaking of constructing an additional web page for the course Statistics was aimed at bringing the notices posted by the two teachers to a place that would hierarchically be oriented towards the course rather than teachers themselves. Such a course-oriented web organization was expected to facilitate learning for students, and make it more efficient. Synergistic presentation of a multiple teacher course in a single web space, together with systematic reporting on student performance achieved the following positive results:

- Facilitated communication with students (both at the central institution and its satellite colleges),
- up-to-date information in the documentary tool, which is an important motivational instrument for students,
- 24-hour online tutorial,
- eliminating noise and vagueness in the communication channel,
- transparent process of grading,
- simple and safe submitting of homework and problem assignments,
- guided and supervised forum discussions related to course issues.

The analysis of visits to the Statistics web page indicates that the documentary tool and the forum are the most popular items, with the number of visits significantly higher compared to the time before these two elements had been introduced.

Organizing the new web space according to the course proved to be justified and successful, with minimum resistance from communication noise. Improved student performance is the result of enhanced motivation achieved by the posted communication tools, especially the documentary tool and the forum - a dialogue and discussion venue.

7. Literature and sources

[8] www.efos.hr