

Comparative Statistical Analysis of the Answers Obtained From the Students of the Economic Engineering Specialization

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Abstract: In February 2005, and November 2006, an evaluation process of the disciplines and teaching staff was carried out at the Engineering Faculty. In this paper, we will present the main aspects that interfere in the evaluation that the students have made for the disciplines and the teaching staff on both semesters, as well as every related question, which the students considered to have relevance with the grade that they have evaluated the lecturer and the discipline. We have used the Pearson chi-square tests, the hypothesis that the row and column variables are independent, and Cramer’s test to see the strength of the relationship.

Key-words: Evaluation, statistical analysis, chi-square test, Cramer’s V test, discipline grade, lecturer grade.

1 Introduction

An evaluation process of the disciplines and teaching staff was carried out at the Engineering Faculty in February 2005 and November 2006. In February, we have evaluated the discipline and the teaching staff for the second semester of the academic year 2003/2004 and in November 2006 was carried out the evaluation for the first semester of the academic year 2004/2005.

This evaluation process used the data collected with the help of the questionnaires distributed to the Economic Engineering students. After a first statistical analysis, where we used means and modes to establish a classification (hierarchy), we made a more detailed analysis to see what aspects influenced the students when they graded the lecturer and the discipline. We have used the Pearson chi-square tests, which test the hypothesis that the row and column variables are independent [4]. The significance value (Asymp. Sig.) has the information we were looking for. The lower the significance value is, the less likely it is that the two variables are independent (unrelated).

In this case, the significance value is so low that it is displayed as .000, which means that it would appear that the two variables are, indeed, related. Typically, a significance value less than 0.05 is considered "significant" [1]. The actual value of the statistics is not very informative, so we used Cramer’s test. Cramer’s V is a measure of association based on the chi-square test. Cramer’s V maximum possible value is always 1.

2 Statistical analysis

We have obtained these values using SPSS software. The Crosstabs procedure offers tests of independence and measures of association and agreement for nominal and ordinal data. Additionally, we can obtain estimates of the relative risk of an event given the presence or absence of a particular characteristic [2].

To run a Crosstabs analysis you have to choose from the menus: Analyze then Descriptive Statistics and at the end Crosstabs. We have selected as row variable the grade that the students gave to the disciplines and to the lecturer. As the column variable, we selected the classification questions and the questions from all 3 objectives. This is the data that we obtained for each year of study.

The Cramer’s test explains the strength of the association determined by chi-square test, they do not, in general, have an intuitive interpretation.

As we can see in table 1, the aspects that influence the student’s grade for the discipline are the answers at the questions 1 and 4. Questions 19, 5, 18 and 20 have a relationship not due to chance but not very strong either. Questions 16, 9, 10, 12, 11, 13, 8 are completely independent. So a lecturer who wants to raise the grade in his/her discipline may considerer some work at the teaching method so that the students’ knowledge can be significantly improved.

Table 1 - Meaningful correlations for 1st year EE– Academic year 2003/04 – 2nd semester

Question number	Observation	Discipline test value	
		Chi square	Cramer's
1. My professional knowledge has been significantly improved by this subject.	Medium	0.000	0.468
4. The teaching method employed was a great help in understanding the subject.	Medium	0.000	0.397
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Weak	0.000	0.371
22. Student's attendance to the course	Weak	0.000	0.361
3. The theoretical aspects of the lecture were reinforced by the laboratory, seminar and project activities.	Weak	0.000	0.338
2. The volume of work was very high for this subject.	Weak	0.000	0.328
17. The lecturer's attendance to the course	Weak	0.000	0.327
21. My last year's average grade was	Weak	0.000	0.325
15. Both the method of evaluation and the grading were correct.	Weak	0.000	0.322
19. My final grade was	Weak	0.001	0.309
5. The bibliography was available.	Weak	0.001	0.307
18. The teachers' attendance to the seminars, laboratories and projects was	Weak	0.000	0.306
20. Please evaluate your knowledge in this field	No	0.005	0.290

Table 2 - Meaningful correlations for 1st year EE– Academic year 2004/05 – 1st semester

Question number	Observation	Discipline test value	
		Chi square	Cramer's
10. The lecturer stimulated the students' interest for the discipline.	Strong	0.000	0.564
4. The teaching method employed was a great help in understanding the subject.	Strong	0.000	0.526
20. Please evaluate your knowledge in this field	Strong	0.000	0.513
13. I would like to attend another of this professor's lectures.	Strong	0.000	0.512
1. My professional knowledge has been significantly improved by this subject.	Strong	0.000	0.504
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Strong	0.000	0.500
8. The lecturer proved an excellent grasp of the discipline they taught.	Strong	0.000	0.498
12. The time allotted to this discipline was efficiently used by the lecturer.	Medium	0.000	0.484
3. The theoretical part of the lecture was well doubled by the laboratory, seminar and project activity.	Medium	0.000	0.470
11. The lecturer readily agreed to discuss problems regarding the discipline.	Medium	0.000	0.462
9. The lecture was delivered in a clear and well-structured manner.	Medium	0.000	0.449
2. The volume of work was very high for this subject.	Medium	0.000	0.413
19. My final grade was	Week	0.000	0.381
5. The bibliography was easily procurable.	Week	0.000	0.378
15. Both the method of evaluation and the grading were correct.	Week	0.000	0.347
16. The exam was promoted only by professional criteria	Week	0.000	0.339

In table 2, the aspects that influence the student's grade for the discipline are the answers at the questions 10, 4, 20, 13, 1, 6 and 8. Questions 19, 5, 15 and 16 have a relationship not due to chance but not very strong either. Questions 22, 17 and 18 are completely independent.

So a lecturer who wants to raise the grade in his/her discipline may consider some work at the

teaching method so that the students' knowledge can be significantly improved. The documentation and/or the bibliography have a very strong influence on the way that the students have evaluated the discipline. The lecturer must improve the documentation so that it can be useful and of good quality.

Table 3- Meaningful correlations for 1st year EE– Academic year 2003/04 – 2nd semester

Question number	Observation	Lecturer test value	
		Chi square	Cramer's
9. The lecture was delivered in a clear and well-structured manner.	Strong	0.000	0.551
10. The lecturer stimulated the students' interest in the discipline.	Strong	0.000	0.532
12. The time allotted to this discipline was efficiently used by the lecturer.	Strong	0.000	0.524
15. Both the method of evaluation and the grading were correct.	Medium	0.000	0.461
11. The lecturer readily agreed to discuss problems regarding the discipline.	Medium	0.000	0.455
13. I would like to attend another of this professor's lectures.	Medium	0.000	0.434
8. The lecturer proved an excellent grasp of the discipline he/she taught.	Medium	0.000	0.420
16. The exam was promoted only by professional criteria	Medium	0.000	0.407
17. The lecturer's attendance to the course was:	Weak	0.000	0.338
18. The teachers' attendance to the seminars, laboratories and projects was:	Weak	0.000	0.324
20. Please evaluate your knowledge in this field	Weak	0.001	0.314

In table 3 and 4, we attempted to focus on the aspects that have most influence on the student's grading of the lecturer. In both tables we notice that questions 12, 10, 9 and 8 have the strongest influence when they evaluate a lecturer. So the students appreciate a lecturer who uses the time allocated to that discipline efficiently and is willing to discuss the problems related to the discipline. A good lecturer masters the discipline that he/she

teaches and delivers it in a clear and well-structured manner.

In table 3 questions 17, 18 and 20 have a relationship not due to chance but not very strong either. Questions 19, 22, 21, 1, 4, 6, 3, 2 and 5 are completely independent. As we can see, the students were not influenced by the grade that they have received at the exam.

Table 4 - Meaningful correlations for 1st year EE– Academic year 2004/05 – 1st semester

Question number	Observation	Lecturer test value	
		Chi square	Cramer's
8. The lecturer proved an excellent grasp of the discipline they taught.	Strong	0.000	0.596
10. The lecturer stimulated the students' interest for the discipline.	Strong	0.000	0.578
4. The teaching method employed was a great help in understanding the subject.	Strong	0.000	0.568
9. The lecture was delivered in a clear and well-structured manner.	Strong	0.000	0.568

12. The time allotted to this discipline was efficiently used by the lecturer.	Strong	0.000	0.554
20. Please evaluate your knowledge in this field	Strong	0.000	0.534
21. My last year's average grade was	Strong	0.005	0.525
11. The lecturer readily agreed to discuss problems regarding the discipline.	Strong	0.000	0.524
13. I would like to attend another of this professor's lectures.	Strong	0.000	0.509
3. The theoretical part of the lecture was well doubled by the laboratory, seminar and project activity.	Medium	0.000	0.466
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Medium	0.000	0.466
15. Both the method of evaluation and the grading were correct.	Medium	0.000	0.462
16. The exam was promoted only by professional criteria	Medium	0.000	0.456
19. My final grade was	Medium	0.000	0.442
1. My professional knowledge has been significantly improved by this subject.	Medium	0.000	0.401
5. The bibliography was easily procurable.	Medium	0.000	0.391

In table 4 the answers to questions 8, 10, 4, 9, 12, 20, 21, 11 and 13 have very strong influences. Questions 17, 18 and 22 are independent. The answers to question 19 have a medium influence on the way that the student evaluated the lecturer in the first semester.

Due to a lack of space we will present the results of the evaluation process for the second, third and fourth year of study only for the data collected from the questionnaires distributed in the second semester of academic year 2003/2004.

Table 5 - Meaningful correlations for 2nd year EE – Academic year 2003/04 – 2nd semester

Question number	Observation	Discipline test value	
		Chi square	Cramer's
18. The seminar, laboratory and project teachers' attendance was:	Strong	0.000	0.671
1. My professional knowledge has been significantly improved by this subject.	Strong	0.000	0.549
9. The lecture was delivered in a clear and well-structured manner.	Strong	0.000	0.511
12. The time allotted to this discipline was efficiently used by the lecturer.	Strong	0.000	0.504
8. The lecturer proved an excellent grasp of the discipline he/she taught.	Strong	0.000	0.491
4. The teaching method employed was a great help in understanding the subject.	Medium	0.000	0.474
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Medium	0.000	0.458
11. The lecturer readily agreed to discuss problems related to the discipline.	Medium	0.000	0.446
3. The theoretical aspects of the lecture were reinforced by the laboratory, seminar and project activities.	Medium	0.000	0.445
10. The lecturer stimulated the students' interest in the discipline.	Medium	0.000	0.393
5. The bibliography was easily available.	Weak	0.000	0.389
19. My final grade was	Weak	0.000	0.378
2. The volume of work was very high for this subject.	Weak	0.000	0.366
17. The lecturer's attendance to the course was:	Weak	0.000	0.359

21. My last year's average grade was	Weak	0.000	0.336
20. Please evaluate your knowledge in this field	Weak	0.000	0.332

As we can see in tables 5 and 6, 2nd year students didn't make a very clear distinction between the teacher and the subject evaluated. This affirmation is sustained by the fact questions 9 and 12 appear to have a very strong influence on both evaluations.

We also noticed that teachers' attendance to the seminars influenced the grade given to the subjects. Like first year students, 2nd year students evaluated the lecturer being influenced by questions 12, 11, 9 and 8.

Table 6 - Meaningful correlations for 2nd year EE – Academic year 2003/04 – 2nd semester

Question number	Observation	Lecturer test value	
		Chi square	Cramer's
12. The time allotted to this discipline was efficiently used by the lecturer.	Strong	0.000	0.545
11. The lecturer readily agreed to discuss problems related to the discipline.	Strong	0.000	0.544
9. The lecture was delivered in a clear and well-structured manner.	Strong	0.000	0.542
8. The lecturer proved an excellent grasp of the discipline he/she taught.	Strong	0.000	0.534
10. The lecturer stimulated the students' interest for the discipline.	Medium	0.000	0.456
13. I would like to attend another of this professor's lectures.	Medium	0.000	0.452
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Medium	0.000	0.446
4. The teaching method employed was a great help in understanding the subject.	Medium	0.000	0.438
18. The teachers' attendance to the seminars, laboratories and projects was:	Medium	0.000	0.438
3. The theoretical aspects of the lecture were reinforced by the laboratory, seminar and project activities.	Medium	0.000	0.433
1. My professional knowledge has been significantly improved by this subject.	Medium	0.000	0.395
19. My final grade was	Weak	0.000	0.370
15. Both the method of evaluation and the grading were correct.	Weak	0.000	0.359
5. The bibliography was available.	Weak	0.000	0.340
17. The lecturer's attendance to the course was:	Weak	0.000	0.330
16. The exam was promoted only by professional criteria.	Weak	0.000	0.312
21. My last year's average grade was	Weak	0.000	0.308
20. Please evaluate your knowledge in this field	Weak	0.000	0.297

Third year students (table 7) start to place the importance of a subject on the way in which the theoretical aspects of the lecture are reinforced by the laboratory activities. We also notice that the grade received at the exams starts to have a medium / weak influence on their evaluation. Only question number 2 is completely independent. We

notice that the students start to have a more complex image when they evaluate a discipline. They want a lecturer who agrees to discuss problems related to the discipline and who knows how to manage time and tries to improve their knowledge on the subject (table 8).

Table 7 - Meaningful correlations for 3rd year EE – Academic year 2003/04 – 2nd semester

Question number	Observation	Discipline test value	
		Chi square	Cramer's
1. My professional knowledge has been significantly improved by this subject.	Strong	0.000	0.594
5. The bibliography was available.	Strong	0.000	0.538
3. The theoretical aspects of the lecture were reinforced by the laboratory, seminar and project activities.	Strong	0.000	0.524
11. The lecturer readily agreed to discuss problems related to the discipline.	Strong	0.000	0.510
4. The teaching method employed was a great help in understanding the subject.	Medium	0.000	0.486
10. The lecturer stimulated the students' interest in the discipline.	Medium	0.000	0.438
16. The exam was promoted only by professional criteria	Medium	0.000	0.427
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Medium	0.000	0.422
17. The lecturer's attendance to the course was:	Medium	0.000	0.399
19. My final grade was	Medium	0.000	0.394
13. I would like to attend another of this professor's lectures.	Weak	0.000	0.385
20. Please evaluate your knowledge in this field	Weak	0.000	0.380
18. The teachers' attendance to the seminars, laboratories and projects was:	Weak	0.000	0.373
8. The lecturer proved an excellent grasp of the discipline he/she taught.	Weak	0.000	0.366
12. The time allotted to this discipline was efficiently used by the lecturer.	Weak	0.000	0.361
9. The lecture was delivered in a clear and well-structured manner.	Weak	0.000	0.337
15. Both the method of evaluation and the grading were correct.	Weak	0.000	0.325
21. My last year's average grade was	No	0.000	0.257

Table 8 - Meaningful correlations for 3rd year EE – Academic year 2003/04 – 2nd semester

Question number	Observation	Lecturer test value	
		Chi square	Cramer's
11. The lecturer readily agreed to discuss problems related to the discipline.	Strong	0.000	0.543
1. My professional knowledge has been significantly improved by this subject.	Strong	0.000	0.517
12. The time allotted to this discipline was efficiently used by the lecturer.	Strong	0.000	0.516
10. The lecturer stimulated the students' interest in the discipline.	Strong	0.000	0.496
3. The theoretical aspects of the lecture were reinforced by the laboratory, seminar and project activities.	Medium	0.000	0.481
13. I would like to attend another of this professor's lectures.	Medium	0.000	0.465
8. The lecturer proved an excellent grasp of the discipline he/she taught.	Medium	0.000	0.447
4. The teaching method employed was a great help in understanding the subject.	Medium	0.000	0.436
17. The lecturer's attendance to the course was:	Medium	0.000	0.416

9. The lecture was delivered in a clear and well-structured manner.	Medium	0.000	0.407
18. The teachers' attendance to the seminars, laboratories and projects was:	Medium	0.000	0.403
16. The exam was promoted only by professional criteria	Medium	0.000	0.391
5. The bibliography was available.	Weak	0.000	0.386
15. Both the method of evaluation and the grading were correct.	Weak	0.000	0.374
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Weak	0.000	0.369
20. Please evaluate your knowledge in this field	Weak	0.000	0.346
19. My final grade was	Weak	0.000	0.319
22. Student's attendance at the course	Weak	0.000	0.311

Forth year students (table 9, 10) are more reserved when they evaluate a discipline and have strong opinions about the lecturers evaluated. Questions 4, 1, 3 and 6 have a medium influence on the subject evaluation and the students' attendance at the course and final grade at the exams are completely

independent aspects. Questions 9, 12 and 11 have a strong influence on student's evaluation for the lecturer. The final grade exams and lecturer attendance have a weak influence and questions 22, 20, 18, 21 are completely independents regarding the aspects of the student's grading of the lecturer.

Table 9 - Meaningful correlations for 4th year EE – Academic year 2003/04 – 2nd semester

Question number	Observation	Discipline test value	
		Chi square	Cramer's
4. The teaching method employed was a great help in understanding the subject.	Medium	0.000	0.444
1. My professional knowledge has been significantly improved by this subject.	Medium	0.000	0.443
3. The theoretical aspects of the lecture were reinforced by the laboratory, seminar and project activities.	Medium	0.000	0.436
6. The documentation that was distributed and/or the bibliography was up-to-date, useful and of good quality.	Medium	0.000	0.422
5. The bibliography was available.	Weak	0.000	0.381
15. Both the method of evaluation and the grading were correct.	Weak	0.000	0.344
16. The exam was promoted only by professional criteria	Weak	0.000	0.329
17. The lecturer's attendance to the course was:	Weak	0.000	0.322
20. Please evaluate your knowledge in this field	Weak	0.000	0.316
18. The teachers' attendance to the seminars, laboratories and projects was:	Weak	0.000	0.312
2. The volume of work was very high for this subject.	Weak	0.000	0.304
21. My last year's average grade was	Weak	0.000	0.301

Table 10 - Meaningful correlations for 4th year EE – Academic year 2003/04 – 2nd semester

Question number	Observation	Lecturer test value	
		Chi square	Cramer's
9. The lecture was delivered in a clear and well-structured manner.	Strong	0.000	0.556
12. The time allotted to this discipline was efficiently used by the lecturer.	Strong	0.000	0.525
11. The lecturer readily agreed to discuss problems related to the discipline.	Strong	0.000	0.513

13. I would like to attend another of this professor's lectures.	Medium	0.000	0.472
8. The lecturer proved an excellent grasp of the discipline they taught.	Medium	0.000	0.466
10. The lecturer stimulated the students' interest in the discipline.	Medium	0.000	0.451
16. The exam was promoted only by professional criteria	Medium	0.000	0.414
15. Both the method of evaluation and the grading were correct.	Medium	0.000	0.399
19. My final grade was	Weak	0.000	0.375
17. The lecturer's attendance to the course was:	Weak	0.000	0.365

the first time in academic year 2003/2004 and is now a continuous process.

3 Conclusions

As we can notice, all the students have evaluated the discipline regarding the aspects of the knowledge improved by the subject (question 1). The teaching method used to make the subject more understandable (question 4) is an important factor in students discipline evaluation. The final year students consider that an important aspect is the way in which the theoretical aspects are reinforced by laboratory activities. When they evaluated the lecturer, all the students agreed that the lecturer must be a good time manager; he/she must agree to discuss problems related to the discipline and present the lecture in a clear and well-structured manner.

In both semesters student answers to questions 1.4 and 8 influence their discipline evaluation. The answers to the questions 9, 11, 10 and 8 influence their lecturer evaluation. We notice that the answers at question 8 influence both evaluations.

Assuring the quality of higher education – in the context of increasing competition, market expansion and of globalization in the long run – is a major objective of the “Lucian Blaga” University. The evaluation questionnaires addressed to the students are an important instrument through which information concerning the content of the course and the quality of teaching is obtained. The student rating of the lecturer and the quality of courses can serve three categories of people: the professors use the student ratings in order to have feedback on the teaching with the purpose of improving the teaching and the teaching methods. The students use the information in the rating in order to help them choose the courses more efficiently. The university and the faculties' administration need comparative information in order to make personnel decisions.

The evaluation process of disciplines and lecturers presented above has been applied in our school for

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