

# Enhancing Student Satisfaction Based on Course Evaluations at Budapest University of Technology and Economics

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*Abstract: The Department of Management and Corporate Economics ran an extended survey including a questionnaire and various problem solving techniques among students on five different business courses in 2011, in order to acquire deeper knowledge about the factors influencing student (dis)satisfaction and to lay the foundation for long-term course improvement actions. According to PDCA logic, we repeated the student satisfaction measurement process in 2012 to assess the effectiveness of short-run improvement actions. This article summarizes our main results and highlights the improvement actions needed in the long run. Improving student satisfaction is a must for all courses, as the financial issues of the faculty and the departments are strongly affected by student course ratings.*

*Keywords: higher education; student satisfaction; brainstorming; cause and effect diagram; PDCA; quality improvement actions*

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## 1 Introduction

Recent changes in the Hungarian higher education system precipitate structural reorganizations, finance issues of the system and increasing competition among institutions. The fundamental structural changes of the Hungarian higher education system make it imperative to address the issue of quality. In many educational fields students are required to pay tuition fees and this places a greater focus on the value and the quality of the education they receive. Under these circumstances, institutions have to undertake competitive strategies in order to face the strong rivalry from other Hungarian and European universities. In this competitive framework, only those institutions which provide high quality educations and environments for their students can survive. These effects can be measured by assessing overall student satisfaction.

At Budapest University of Technology and Economics (BME) active students have been asked to evaluate each course they have attended during the term since 1999. These measurements are the focus of our research. The main purpose of this study is to better understand the factors influencing student (dis)satisfaction by using a course evaluation questionnaire and various quality management tools. Based on our results, quality improvement actions were set and their effectiveness was evaluated by repeating the same student satisfaction measurement in the following academic year. This work aims to compare and understand the results of these measurements. According to the PDCA logic we end up with a new improvement plan for the forthcoming academic year and summarize the limits of our research.

## 2 Literature Review

The issue of quality in higher education is rather complex, not simply because the interpretation of quality is subjective, but because the educational service is a very complex activity and we do not know all the factors that can influence the outcomes [1]. At the same time, it should be taken into consideration, that various stakeholders are involved in higher education [2], from single students, who are the primary consumers [3], to all students, parents, staff, employers, business and legislators as secondary consumers [4]. In order to improve quality in a higher educational context such institutions should be established which utilize the voice of customers, students and users in the day-to-day operation of higher education.

Higher education institutions are increasingly aware that they need to deal with many competitive pressures, as they are part of a service industry. They have, therefore, put greater emphasis on student satisfaction. Student satisfaction is a short-term attitude that results from evaluating their experience of the education service [5]. As a consequence, institutions have been paying more attention to meeting the expectations and needs of their students [6]. The higher the service quality, the more satisfied the customer [7]. Accordingly, satisfaction is based on customer expectations and perception of service quality [8] [9]. What counts in higher education is the perceived quality of service [10]. Owlia and Aspinwall [11] give a possible explanation of service quality dimensions in higher education. The mechanisms for measuring the service quality of courses and programs depend on the applied research instruments (e.g. student feedback questionnaires). Most institutions apply different variables, questionnaires, evaluation methods, and most of them are developed internally without the consideration of reliability or validity [4] [12] [13].

The issue of quality in higher education has received increased attention in the last decade in Hungary [14]. However, the change is slower than in the rest of Europe. As in other European countries, higher education has become a mass-market

service, characterized by an increasing number of students and an increasingly diverse number of institutions. Due to the recent reform in Hungary, tuition-free state institutions have been rapidly raising tuition charges, as state student aid has dropped significantly. In this context, the issue of quality has become more important. The follow-up of European trends since the 1990's has resulted in continuous changes in the Hungarian higher education sector, which has been unprepared [15]. Although legislation has existed for almost 20 years, Hungarian higher education reveals very few substantive results. From time to time, individual and isolated improvement actions come to light in order to break through institutional and individual disinterest and demotivation [15]. Polónyi's [1] research suggests that according to the labor market the quality of higher education embeds in the practice-orientation of education, lecturers, notes and students, rather than in academic criteria. The feedback of employers regarding graduate students' skills should be taken into consideration as well [16]. Higher education institutions have a responsibility to its students, to equip them with practical knowledge. According to Topár [17], the philosophy of TQM could lay the foundation for well-functioning quality management systems, in the long run, as TQM encourages universities to concentrate on their core activity and inspires educational institutions to embed quality into the institutional culture [18]. The approach of addressing quality and continuous improvements has also been motivated by the launch of the Hungarian Quality Award of Higher Education in 2007. However, only a few institutions performed well, which was due to the immaturity of institutions in self-assessment, to the lack of a "quality culture" and a missing set of quality management tools/techniques. In recent years, the HEFOP 3.1.1 program aimed at special issues of quality improvement in the higher education sector. Several consortiums worked on adopting the EFQM Model in higher education, which resulted in the proposal of UNI EFQM and UNI CAF models [19]. The recent TÁMOP 4.1.4 08/1-2009-0002 Program – titled Quality Improvement in Higher Education – launched a number of projects to fulfill quality improvement targets. Although the program has finished, most of the results are still to be disseminated.

The concept of the student as a customer is now commonplace in higher education [3]. Yorke [20] argues that this supplier/customer relationship is not as clear as in the case of other service relationships, because students are also "partners" in the learning process. Sirvanci [21] identified four different roles for students: product-in-process, internal customers for facilities, laborers in the learning process and internal customers for the delivery of course materials. From this multiple role of students model it is clear why customer identification is a complicated and confusing issue in the case of higher education. As students are the customers of the educational service they should measure the quality of the output and be the judge of quality, similarly to the customers in the industrial context [22].

Student satisfaction is about evaluating the educational services provided by institutions that frame their academic life [23]. Student satisfaction surveys are

commonly used as feedback to determine the delivery of education. A number of studies have been conducted to measure student satisfaction at university level all over Europe [23]. Rowley [24] summarized four reasons for collecting student feedback: to provide students with the opportunity to offer their opinion regarding the courses in order to lay the foundation for improvements; to express their level of satisfaction with teaching and learning; to encourage students to give feedback and to use the results as benchmarks; and to provide indicators that have an impact on the reputation of the institution in the marketplace and in the labor market.

The student is now recognized as the principal ‘stakeholder’ of the Hungarian higher education as well. Student feedback of some sort is usually collected by most institutions, though there is little standardization on how this is collected and what is done with it. There is still little understanding of how to use and to act upon the collected data. As market forces grow, attracting and keeping students satisfied, becomes increasingly important in Hungary too. Therefore, student satisfaction surveys can serve two purposes. First, they can serve as a tool for planning and implementing continuous improvement activities. Second, they can be considered as managerial tools, guiding higher education institutions to adapt to the changing circumstances of this market [23].

### 3 Understanding the Voice of Students at BME

During our research we followed the steps for a TQM-based course evaluation process as proposed by Venkatraman [25]. Table 1 shows the alignment of the course evaluation process with the phases of the PDCA cycle, needed to understand the opinion of students and to enhance their satisfaction (see Table 1).

Table 1  
Course evaluations steps reflecting the PDCA logic [25] [26]

PDCA Cycle	Steps of the course evaluation process
Plan	1. Select the courses to be evaluated.
	2. Describe the purpose and structure of course evaluations.
	3. Conduct course evaluations to obtain primary student inputs.
	4. Prepare an evaluation report of the findings based on the questionnaire.
	5. Conduct brainstorming sessions and construct cause and effect diagrams with student involvement to obtain secondary student inputs.
	6. Conduct an improvement action plan based on primary and secondary student inputs.
Do	7. Implement improvement actions dedicated for the forthcoming semester.
Check	8. Check the effectiveness of improvement actions with repeated course evaluations at the end of the semester.
Act	9. Act upon the results regarding the courses.

With the objective of understanding students' opinions concerning the quality of an educational service, we surveyed students on five courses in 2011, using a survey that was built for this particular purpose. The survey consists of a questionnaire containing 11 questions. Students were asked to express their opinions in two dimensions, namely, scoring the importance and the performance related to each question using the ordinal scale from 1 to 6 – a score of 1 being the lowest, and 6 the highest value, both in terms of the importance and performance dimensions (see Table 2).

Table 2  
The survey questionnaire

Importance (1: Not important at all, 6: Very important)						Question	Performance (1: Minimum, 6: Maximum)					
1	2	3	4	5	6	1. How much do you find the topic highlighted in title of subject needful to establish your management and business knowledge?	1	2	3	4	5	6
1	2	3	4	5	6	2. How much do you feel so that the subject – considering the time frame given to the course – discussed the related sub-topics at appropriate level with appropriate importance?	1	2	3	4	5	6
1	2	3	4	5	6	3. In general, how much do you find the subject recommendable and fitting to the syllabus?	1	2	3	4	5	6
1	2	3	4	5	6	4. How much did the academic (lecturer) seem well-prepared?	1	2	3	4	5	6
1	2	3	4	5	6	5. How much did you find the teacher's lectures understandable and logical?	1	2	3	4	5	6
1	2	3	4	5	6	6. How much did you feel – considering the nature of subject – the teacher being vivid and thrilling?	1	2	3	4	5	6
1	2	3	4	5	6	7. How much did you find the supplementary materials and teaching aids prepared by the lecturer appropriately comprehensive and substantial?	1	2	3	4	5	6
1	2	3	4	5	6	8. How much did you feel the supplementary materials and teaching aids prepared by the lecturers well structured and easy to follow?	1	2	3	4	5	6
1	2	3	4	5	6	9. How much did the supplementary materials and teaching aids prepared by the lecturers help you following the lectures, making notes, and learning the subject?	1	2	3	4	5	6
1	2	3	4	5	6	10. How much were the examining circumstances correct and fair?	1	2	3	4	5	6
1	2	3	4	5	6	11. How much did you find the lecturer's examining method suitable to measure your real knowledge?	1	2	3	4	5	6

The performance dimension of a question reflects how much the students are satisfied with the educational performance in the particular field addressed, while the importance category is used to express the importance of a particular topic. The measurement was repeated with the same questionnaire in 2012, in the case of the Business Statistics course. The evaluated courses and the level of education for each course are summarized in Table 3.

Table 3

The evaluated courses, the level of education, response rates and Cronbach's Alpha coefficients (2011)

Course	Level	Questionnaires handed out	Filled questionnaires	Response rate	Cronbach's Alpha for Performance	Cronbach's Alpha for Importance *
Business Statistics	B.Sc.	253	104	41%	0.8826	0.8747
Innovative Enterprises	B.Sc.	215	91	42%	0.8140	0.8758
Quantitative Methods	MBA	95	45	47%	0.8396	0.9067
Quantitative Methods	M.Sc.	210	111	53%	0.8813	0.8634
Quality Management	B.Sc.	205	101	49%	0.8175	0.7693

Each question of our questionnaire was defined with the purpose of measuring educational performance. Therefore, the internal consistency of survey items is expected based on performance scores. Every student who answered the survey had the opportunity to assign an importance score to each question based on his or her personal perceptions. In comparison with the performance score, whose sum represents the student's aggregate perception of the educational performance, the importance score does not have such an interpretation. On the other hand, the product of importance and performance scores assigned by a student to a survey question expresses his or her individually weighted perception of performance for the survey item.

### 3.1 Survey Results from 2011

The two-dimensional survey approach is built on the consideration that topics having higher importance scores should have higher performance values as students rightly expect higher service level in the areas which they consider more important. The average importance and average performance scores were calculated for each survey question with the purpose of determining how the importance and performance categories relate to each other. Figure 1 shows the total sum of importance scores and the total sum of performance scores for each question.

Taking the five analyzed courses together into consideration, the biggest disconnects between the importance and performance dimensions are in the areas addressed by Question 5, 8, 9, 10 and 11.

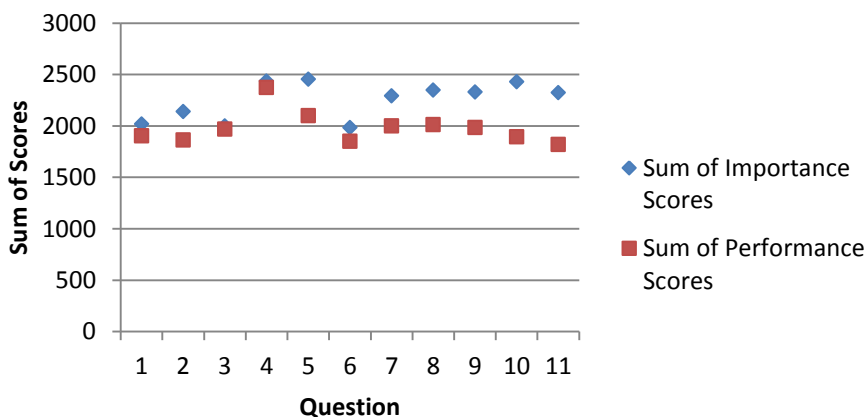


Figure 1  
Total scores for importance and performance of questions

### 3.2 Brainstorming

Based on these five questions of course evaluation, the following three questions were raised for the brainstorming session.

1. How do you think the professor could develop the comprehension and logical structure of his/her classes? (Q5)
2. What ideas come to your mind as regards the notes and educational supplementary material? (Q8, Q9)
3. In your opinion, what would be the best exam system and conditions that could be used to assess realistically and fairly the students' knowledge about a given subject? (Q10, Q11)

Six groups of students were asked to brainstorm as many ideas as they could to respond to our three questions. The two groups involved, each of which consisted of 7 to 9 students, collected their answers separately from their own brainstorming sessions. After combining and harmonizing the answers for the three questions, the answers were divided into four categories according to the type of skill needed to be developed by the lecturer. Table 4 shows the definition of the skills.

It should be noted that the areas wherein improvements are needed cannot always be clearly assigned to one category. Nevertheless, students suggested some development ideas which would require the improvement of several areas. For example, some issues could be realized, partly, by developing the pedagogical and methodological abilities and partly by improving the technical and organizational conditions.

In regard to ideas emerging from the first brainstorming question, students listed mainly the pedagogical/didactical preparedness and methods used by lecturers as problems. The inaccurate didactical, education technological and methodological knowledge of lecturers is mainly due to their lack of teaching qualifications and inappropriate teaching techniques. The intensification of this knowledge would be an important aspect while improving the quality of courses. The development of pedagogical skills could also contribute to resolve noted problems concerning human.

Table 4  
Definition of skills and their relation to service quality dimensions [11]

Type of skill	Definition	Related service quality dimensions proposed by Owlia and Aspinwall [11]
S: subject knowledge	It is the specific professional knowledge of the lecturer which refers to the fundamental knowledge of the taught discipline and to the up-to-datedness of the lecturer on the specific topic. This kind of knowledge enables the lecturer to transfer the essential knowledge to students and familiarize them with the specific field of study.	Reliability, Performance, Completeness, Flexibility
H: human skills	Human skills are the human attributes of the lecturer which depend on the lecturer himself/herself and consistent with the generally expected norms. These skills enable the lecturer to endear a specific discipline to students.	Responsiveness, Access, Competence, Courtesy, Communication
P: pedagogical / didactic skills	It covers the professional teaching knowledge and the relating practical skills which enables the lecturer to plan and structure the lectures during the semester. This includes grabbing the attention of students, motivating them, keeping their interest and curiosity, motivating students. The appropriate compilation of exams and homework belong to this skill as well.	Responsiveness, Access, Competence, Courtesy, Performance, Flexibility, Redress, Communication
T: technical / organizational skills	These are education-related technical and organizational conditions including e.g. the appropriate technical equipment of classrooms (projector, computer, sound system, etc.), ergonomics of rooms and their equipment (chairs, tables and their placement, heating-cooling and shading system, etc.), or even the service quality of administrative departments (Dean's offices, offices of academic affairs etc.).	Communication, Tangibles, Redress

In answering the second brainstorming question ideas regarding technical skills had to be taken into consideration. Some of the deficiencies could be resolved by developing the computer skills of lecturers. The other group of listed ideas (video records, audio books) would require a bigger financial investment from the university. Based on students' feedback lecturers should improve their presentation skills and put greater emphasis on demonstrating practical examples and case studies.

The third brainstorming question addressed the issue of evaluation. Most of the ideas can be associated with pedagogical and technical skills. Students require more stringency at exams and consistent penalties for cheating. Students would need written, richly explained evaluations, more practical examples, more consultations, trial exams, etc. They also want more precise and more thorough evaluations.



### 3.3 Survey Results from 2011 – Business Statistics Course

Figure 2 shows a considerable gap between averages of importance and performance scores in the case of some questions. The conclusion that there is a lack of an expected strong positive correlation between the average scores of the two survey dimensions is also supported by the correlation coefficient of 0.1328 calculated for averages of importance and performance scores. Based on these initial results, we focused on the questions with the largest gaps between averages of their importance and performance scores. Table 5 shows the numerical results of the initial analysis.

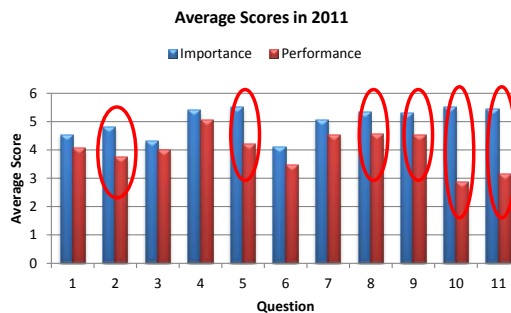


Figure 2

Averages of importance and performance scores in 2011

In order to narrow the scope of improvement activities, we focused on survey questions representing top 80% of sum of importance-performance differences. The rows highlighted in Table 5 and the bars marked in Figure 2 indicate these questions (see Table 2).

Based on the ideas of the brainstorming session and on the survey results of Business Statistics in 2011, we constructed a cause and effect matrix (Table 6) with the involvement of a group of Business Statistics students in order to set immediate goals. In the matrix Y stands for the outputs (effects) and X for the inputs (causes). Students ranked the outputs by giving importance values to the questions in the questionnaire. The ranking of inputs were determined with student involvement.

The results of the cause and effect analysis confirm the conclusions of the brainstorming session. The three fields addressed by the questions are strongly interrelated, as a number of problems raised by the students, can be solved easily by the lecturer and the department responsible for the courses.

Table 5

Difference between the importance and performance average scores for each question

Question	Average Importance	Average Performance	Average Importance - Average Performance
1	4.5294	4.0784	0.4510
2	4.8137	3.7549	1.0588
3	4.3235	3.9902	0.3333
4	5.4216	5.0784	0.3431
5	5.5098	4.2255	1.2843
6	4.1188	3.4608	0.6580
7	5.0490	4.5294	0.5196
8	5.3333	4.5490	0.7843
9	5.3137	4.5196	0.7941
10	5.5196	2.8725	2.6471
11	5.4554	3.1471	2.3084

### 3.4 Actions Defined

Based on the initial statistical analyses of survey data from 2011 and on the results of brainstorming and the cause and effect matrix, the following actions were defined and implemented on the Business Statistics course in 2012 in the spirit of the PDCA logic.

- Lecturers took part in the Lecturers' programme organized by the Institute of Continuing Engineers Education at BME in order to improve their pedagogical skills (related survey questions: 5, 8, 9, 10, 11)
- Regular consultations emphasising the most important theoretical topics and their relations, as well as, discussing the critical steps of the taught calculation methods, were held one day before each midterm exam (related survey questions: 10, 11)
- Additional, comprehensive consultation materials were prepared for each consultation. The consultation materials were made available for students in presentation slides (related survey questions: 8, 9, 10, 11)
- Well-defined theoretical topics with outlines of required answers were prepared for each midterm exam consultation (Related survey questions: 8, 9, 10, 11)
- The typical calculation exercises required in the midterm exams were summarised and overviewed during the consultations (related survey questions: 5, 8, 9)

- The weights of different sub-topics in the midterm exams were deliberately harmonized with the time spent on discussing and lecturing the corresponding sub-topic (related survey questions: 2)
- The entire course was taught by one lecturer, instead of two or three lecturers teaching, dedicated blocks of the course (related survey questions: 2, 8, 9)

Table 6  
Cause and effect matrix

Output (Variable Y)	The subjects discuss the related sub-topics at appropriate level with appropriate importance (Q2)	The lectures are understandable and the logic of the teacher is clear (Q5)	The supplementary materials and teaching aids are well-structured and easy to follow (Q8)	The supplementary materials and teaching aids support the understanding of lectures and the preparation for exams (Q9)	The examining circumstances are correct and fair (Q10)	The chosen examining method is suitable to measure the knowledge (Q11)		
Output ranking	3	4	1	2	6	5		
Input (Variable X)							Rank	Rank %
Classroom teaching materials	3	10	5	10	1	4	100	14,75%
Supplementary teaching materials (e.g. notes, materials for consultation, sample tests, case studies, theses)	4	9	7	9	1	4	92	13,57%
Student motivation in classrooms (extra points, homework, team assignments)	1	6	1	7	0	2	51	7,52%
Lecturer skills and motivation	2	4	2	3	2	3	55	8,11%
Classroom equipment	0	3	1	4	5	2	60	8,85%
Curriculum	8	6	3	4	1	1	67	9,88%
Structure of a lecture	7	8	5	4	1	1	72	10,62%
IT background of lectures (e-learning, multimedia techniques, up to date software, servers, learning sites)	3	6	3	6	1	4	71	10,47%
Evaluation/Examination (type (i.e. oral or written), equipment, supervision)	0	0	0	0	10	10	110	16,22%

## 4 Impact of Improvement Actions

After implementation of the improvement actions discussed above, we conducted the same survey at the end of the Business Statistics course in 2012, to see how the actions taken impacted students' satisfaction. The response rate was 43%. The Cronbach's alpha coefficient was, based on performance scores, 0.8482 and based on product of importance and performance scores it was 0.8722. These two figures support the consistency of the survey used in 2012.

### 4.1 Comparison of Survey Results from 2011 and 2012

Figure 3 shows the average scores for each survey question in 2011 and 2012.

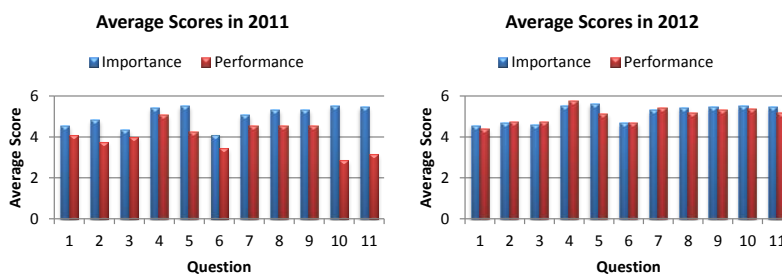


Figure 3  
Average scores in 2011 and 2012

The importance and performance scores can be considered as random variables, and so their averages can be taken as point estimates of their expected values. The graphs in Figure suggest two hypotheses. On the one hand, we may assume that the gaps between expected values of importance and performance scores significantly decreased from 2011 to 2012 especially in the case of questions that the actions taken are related to. On the other hand, the average importance scores suggest that there was no significant change in the means of importance scores, that is, students' opinion about importance of topics addressed by survey questions did not change significantly. The graphs in Figure 4 – which show the year-to-year importance and performance averages – also support the idea of setting the hypotheses above.

The hypothesis that the means of importance scores did not change significantly can be formally stated in the following hypotheses pairs.

$H_0(i)$ : for question  $i$ , mean of importance score in 2011 is equal to mean of importance score in 2012 ( $i=1, \dots, 11$ )

$H_a(i)$ : for question  $i$ , mean of importance score in 2011 is different from mean of importance score in 2012 ( $i=1, \dots, 11$ )

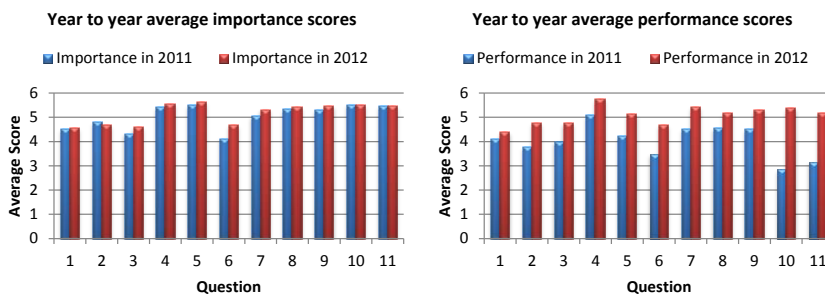


Figure 4

Year-to-year average importance and performance scores

As the sample size in 2011 and 2012 was 102 and 97, respectively, based on the central limit theorem, each  $H_0(i)$  hypothesis was tested against the  $H_a(i)$  hypothesis by applying the two samples z-test as an approximate statistical test at significance level of 0.05. The inputs and results of conducted tests are summarized in Table 7. We can see from Table 7, that except for question 6, the calculated p-values are greater than the set significance level of 0.05. Hence, except for question 6, the null-hypothesis for each question can be accepted vs. the alternative hypothesis. In other words, the change from 2011 to 2012 in students' opinion about the importance of topics addressed by survey questions is statistically insignificant; the only one exception is question 6.

Table 7

Inputs and p-values of tests on equality of importance score means in 2011 and 2012

Question	Average in 2011	Average in 2012	Standard Deviation in 2011	Standard Deviation in 2012	z-value	p-value
1	4.5294	4.5567	1.3402	1.3147	0.1450	0.8847
2	4.8137	4.6701	1.1234	1.1701	0.8825	0.3775
3	4.3235	4.5979	1.1954	1.3437	1.5193	0.1287
4	5.4216	5.5361	0.8837	0.7914	0.9639	0.3351
5	5.5098	5.6186	0.8052	0.7136	1.0094	0.3128
6	4.1188	4.6701	1.1983	1.2806	3.1319	0.0017
7	5.0490	5.3196	1.0843	0.9077	1.9122	0.0559
8	5.3333	5.4330	0.9047	0.8024	0.8230	0.4105
9	5.3137	5.4639	0.9008	0.8424	1.2154	0.2242
10	5.5196	5.4948	0.8870	1.0320	0.1811	0.8563
11	5.4554	5.4742	0.8963	0.8303	0.1534	0.8781

From the year-to-year average performance scores visible in Figure 4, we may assume that there was a significant increase from 2011 to 2012 in mean of performance score for each question. Based on this assumption, we can set the following  $H_0^{(i)}$  null- and  $H_a^{(i)}$  alternative hypotheses pairs:

$H_0^{(i)}$ : for question  $i$ , mean of performance score in 2011 is equal to mean of performance score in 2012 ( $i=1, \dots, 11$ ).

$H_a^{(i)}$ : for question  $i$ , mean of performance score in 2011 is less than mean of performance score in 2012 ( $i=1, \dots, 11$ ).

As we discussed, the sample sizes allow us to use the two samples z-test as an approximate method to test the hypotheses stated above. The inputs and results of statistical tests are summarized in Table 8.

Table 8  
Inputs and p-values of tests on equality of performance score means in 2011 and 2012

Question	Average in 2011	Average in 2012	Standard Deviation in 2011	Standard Deviation in 2012	z-value	p-value
1	4.0784	4.3918	1.2483	1.2124	-1.7961	0.0362
2	3.7549	4.7526	1.3456	0.9686	-6.0247	0.0000
3	3.9902	4.7423	1.3679	0.9712	-4.4889	0.0000
4	5.0784	5.7629	1.1831	0.5357	-5.2995	0.0000
5	4.2255	5.1340	1.2341	0.9961	-5.7277	0.0000
6	3.4608	4.6701	1.1576	1.2806	-6.9768	0.0000
7	4.5294	5.4021	1.0873	0.8498	-6.3250	0.0000
8	4.5490	5.1546	1.0775	1.0035	-4.1052	0.0000
9	4.5196	5.2990	1.3105	1.0425	-4.6541	0.0000
10	2.8725	5.3711	1.4534	0.8935	-14.6876	0.0000
11	3.1471	5.1546	1.4240	0.9280	-11.8384	0.0000

Each p-value in Table 8 is less than 0.05 and so for each survey question the null-hypothesis is rejected and the alternative hypothesis is accepted at significance level of 0.05. It means that the mean of performance score for each survey question increased significantly from 2011 to 2012.

We have previously seen in Table 7, that changes in mean of importance score can be considered significant only in the case of Question 6. We do not know the exact reasons for the observed increase in mean of this score, but taking the nature of this question into account, we may assume that the increase in educational performance has positively impacted students' opinion about importance of topic addressed by the question. We plan to investigate this phenomenon more deeply in future research activities.

The correlation coefficient between the average importance and performance score for 2012 is 0.8669. The same correlation coefficient for 2011 was 0.1328, that is, the stochastic relationship between the importance and performance categories is much stronger in 2012 than in 2011.

## 4.2 Further Actions Planned

In the light of our continuous improvement philosophy and following the PDCA cycle of course evaluation (see Table 1), the following actions are considered as having the potential to improve the educational performance of the Business Statistics subject in the future.

The entire curriculum is large and comprehensive; indeed, the lecture notes provided to students contain close to 200, A4 pages. We need to review the structure of the curriculum and the lecture notes to ensure that the consecutive topics are in a logical and consistent order so that there is no topic which requires knowledge that is introduced later on. Calculation exercises are part of the lectures. Based on feedback from students and their representatives, it would be definitely more effective if the calculation exercises were discussed in smaller groups within seminars. Defining optional project exercises based on cases from different companies would challenge the students to solve some real-life problems using the tools and techniques learnt during the course. These changes are to come in the forthcoming term (in the academic year 2013/2014), now that we are in the phase of revising the whole course based on the aforementioned ideas. The applied pedagogical methods need a thorough review [27], as the brainstorming sessions highlighted these skills as urgent issues.

### Conclusions

In our research, we studied the quality of teaching and learning at BME, that led to student (dis)satisfaction. Student satisfaction is of high importance in our faculty, as the average student satisfaction, with courses taught, serves as an influential factor when planning the budget of a department. The results could also serve as inputs, when evaluating the performance [28] and enhancing the loyalty and satisfaction of the academic staff [29].

This kind of questionnaire structure and the validation of the presented dual approach would not only highlight the areas that need to be improved, but also students' involvement in improvement actions could have more impact. The feedback students provide is also useful to the Chairperson of the course or the Dean, allowing comparisons to be made between the courses and arrangements to improve teaching performance. The results may have implications for management responsible for resource allocations to various areas of the University services and infrastructure. Our aim is to take the necessary steps towards long term improvements and analyzes, regularly, as to whether the actions have solved the most critical problems. This approach ensures that the voice of students is fully integrated into quality improvement efforts and contributes to a better understanding of the students' requirements.

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