

EVALUATION OF TEACHING OF SUBJECT “MATERIAL SCIENCE”

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Abstract. The paper presents the results of six anonymous inquiries carried out in the academic years from 1996/1997 to 2013/2014 between students of all study programs of the Faculty of Engineering of the Czech University of Life Sciences (CULS) in Prague in the frame of the subject “Material Science” (MS). The inquiry has been filled out anonymously by students after the end of the semester. It is a case of the traditional subject, which is in the contents of the department from its very beginning in 1952. The skilled contents of lectures and practice have been in last years mildly modified – in lectures the actual themes of material science have been included, practice has been modernized by use of newly bought equipment. By the inquiry evaluation valuable information has been acquired concerning many aspects related to the given subject. The aim of the long-term study of the subject “Material Science” teaching was to get knowledge on subjective and objective opinions of our students in the period of 17 years.

Keywords: inquiry; lectures; practice; material science.

Introduction

The Faculty of Engineering of the Czech Agricultural University in Prague offers today eight accredited study programs of the Bachelor and Master Study, namely:

- Agricultural Machinery (ZT);
- Road Transport and City Traffic (SMAD);
- Waste Disposal Technology and Techniques (TTZO);
- Technological Equipment of Constructions (TZS);
- Trade and Business Dealing with Machinery (OPT);
- Information and Control Technology in Agri-Food Complex (IRT);
- Machinery for Landscape Reclamation and Maintenance (TOUK);
- Maintenance Engineering (IU).

And one program of reassuming Master Study:

- Technology and Environmental Engineering (TEE).

For students of all above mentioned programs our department ensures teaching of compulsory and optional courses related to the subjects “Material Science” and “Manufacturing Technologies”. But the extent and depth of single subjects are for various programs different and they depend on the student profile. The inquiries were assigned and evaluated in the course of the long period of 17 years, from 1996 to 2013. This made it possible to study trends of single answers.

Materials and methods

Pedagogical and other members of our department offer the long-termed care on the course and quality of lectures and practice according to the opinions of students. These opinions are acquired by regular anonymous inquiries [1-3], which have been carried out already since the academic year 1989/1990 [4]. For inquiries two types of inquiry are provided – more simply (brief) for subjects which end by a credit and more complex (more extensive) for subjects which end by a credit and an examination [5; 6].

This paper presents the results of six anonymous inquiries carried out between students of all programs of our faculty in the academic years from 1996/1997 to 2013/2014. For these students the compulsory subject “Material Science” is determined. For all students it proceeds in the 2nd semester, in the extent of 2/2 (2 hours of lectures and 2 hours of practice a week).

In single academic years the student number varies. In the pursued term the number of the returned and evaluated inquiries ranged from 116 to 202. Therefore, all results are presented in per cents.

The lectures of the subject “Material Science” include all basic areas of material science, namely ferrous and non-ferrous alloys [7; 8], mechanical testing of materials [9-11], metallography [12], equilibrium diagrams [13; 14], heat treatment, powder metallurgy [15], sintered carbides [16-18], polymeric materials and composites.

Lectures are completed by the next themes carried out in practice, e.g., tensile test, fatigue test, impact test, hardness tests, testing of plastics and rubber [19].

For study the students have at disposal besides their own notes from lectures the mimeographed texts. The next sources for study are at disposal in electronic form in the university web.

The inquiry contains 17 questions and is arranged on one page of A4 size. The students declare their opinions and standpoints on the following questions and thematic circles.

- Question 1: I have completed secondary education in a secondary school a) agricultural, b) machinery, c) electrical, d) transport, e) grammar, f) other, write what kind, g) apprentice with leaving examination.
- Question 2: My field of study: a) agricultural machinery, b) road transport and city traffic, c) waste disposal technology and techniques, d) technological equipment of constructions, e) trade and business dealing with machinery, f) information and control technology in agri-food complex, g) maintenance engineering.
- Question 3: I visited lectures of MS: regularly, b) irregularly, c) not at all.
- Question 4: I exploited the knowledge acquired in practice by experiments: a) at learning for the examination and I presuppose its use in next study and also later, b) only at the examination, c) I did not exploit, d) no knowledge was acquired.
- Question 5: The problems of the MS subject: a) I met in the secondary school, b) I did not meet till this time.
- Question 6: Teaching of MS in the frame of the Faculty of Engineering I consider as: a) important, b) marginal, c) unnecessary.
- Question 7: For practice of MS I prepared myself: a) regularly, b) irregularly, c) not at all.
- Question 8: For the examination of MS I prepared myself: a) by study of the notes from lectures, b) by study of mimeographed texts for lectures and practice, c) by study of further special literature, d) not at all.
- Question 9: Learning for the examination usually requires the time a) less than 1 day, b) over 1 to 3 days, c) over 3 to 5 days, d) more than 5 days.
- Question 10: Learning for the examination of MS required: a) less than 1 day, b) over 1 to 3 days, c) over 3 to 5 days, d) more than 5 days.
- Question 11: I passed the examination of MS: a) in a regular term, b) at the 1st resit, c) at the 2nd resit, d) I have not passed it till this time.
- Question 12: In the 1st academic year I reached the average mark: a) up to 1.5, b) over 1.5 to 2.0, c) over 2.0 to 2.5, d) over 2.5.
- Question 13: At the examination: a) I understood and answered the given question, b) I did not understand before the explanation and then I answered, c) I did not understand before the additional explanation and I did not answer.
- Question 14: I assume that my knowledge of MS is a) very good, I see the connection between single phenomena, b) good, rather encyclopedic, without deeper understanding, c) slight.
- Question 15: At the classification of MS I was classified: a) excellent, b) good, c) sufficient, d) failed.
- Question 16: Requirements of the credit obtaining, I find to be: a) disproportionate high, b) adequate, c) disproportionate low.
- Question 17: My topics and suggestions to MS.

Results and discussion

The inquiry results were evaluated for each academic year separately. In the conformity with the presumptions it was found that the answers differ in different years. With regard to the possible extent of this paper the time courses of the inquiry results are presented only for questions 1 and 3.

From the respondents' answers it follows (question 1) that our students have predominantly completed secondary schools concentrated on machinery (in the academic year 2013/2014 21.3 %) and electro technology (20.7 %) and also grammar schools (20.9 %). At the same time it was determined that the percentage of students from grammar schools and schools concentrated on electro technology gradually increases, while the percentage of students from schools concentrated on machinery remains practically the same. The percentage of students from secondary schools concentrated on agriculture (8.5 %), transport (10.0 %) and apprentices with leaving examination (4.0 %) decreases. The percentage of students of not above mentioned branches is practically the same. It is a case of students from secondary schools concentrated on building constructions, economy and informative technology, see Fig. 1.

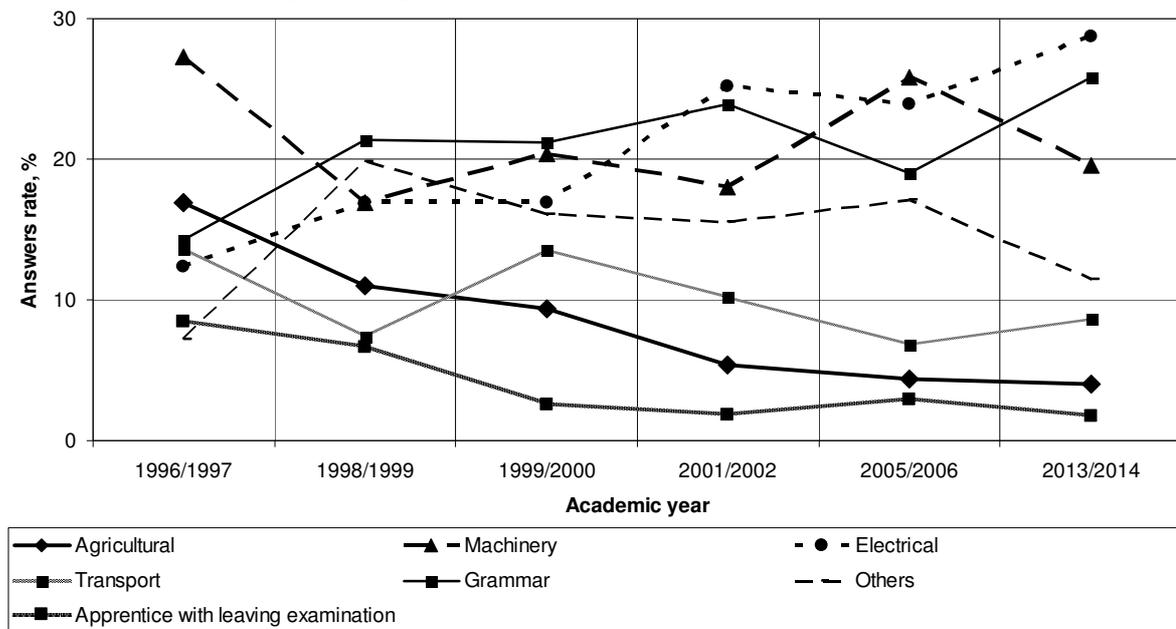


Fig. 1. Types of secondary schools of our students

The majority of the students chose (data of the academic year 2013/2014) the program SMAD (41.0 %), next IRT (17.3 %), OPT (15.6%), TZS (11.0 %). Less than 10 % students chose each of the remaining programs.

Most of the students (48.8 %) answered (question 3) that they visited lectures regularly, the next part (46.2 %) irregularly. The rest (23.9 %) visited none of lectures. But according to the study and examination rule the visit of lectures is in our faculty obligatory. Students probably abuse the fact that with regard to their large number their attendance in lecture halls cannot be easy taken. In the contrary, in practice the students' number is small, the attendance is regularly taken and therefore it is almost 100 %, see Fig. 2.

Pieces of knowledge acquired by experiments at practice (question 4) were utilized at the examination by most of the students (from 77.3 to 87.2 %). 37.2 % from these students presuppose that these pieces of knowledge will be utilized later in their profession. 19.2 % of students answered that these pieces of knowledge were not utilized at the examination. 3.5 % of students said the experiments did not bring any knowledge. The number of answers 4a) gradually decreases while the number of answers 4b) gradually increases.

In studies at secondary school most of the students (in the academic year 2013/2014 68.0 %) did not meet with the problems (question 5) of material science. Their percentage gradually increases, in the academic year 1996/1997 it was only 30.5 %. The presentation of relevant themes must be therefore adapted not only at lectures but at practice, too.

Teaching of MS in the frame of the Faculty of Engineering (question 6) 55.9 % of students consider as important, 34.7 % as marginal, the rest (9.8 %) as unnecessary.

At the same time it is possible to say that the percentage of answers 6a) gradually decreases while the percentage of answers 6b) and 6c) increases. In the academic year 1996/1997 the teaching of the

subject was considered as important by 81.6 % of students, as marginal by 17.1 % and as unnecessary only by 1.3 % of students.

44.3 % of students prepare themselves for practice regularly, 49.4 % irregularly (question 7). Only 6.3 % of respondents answered that not at all.

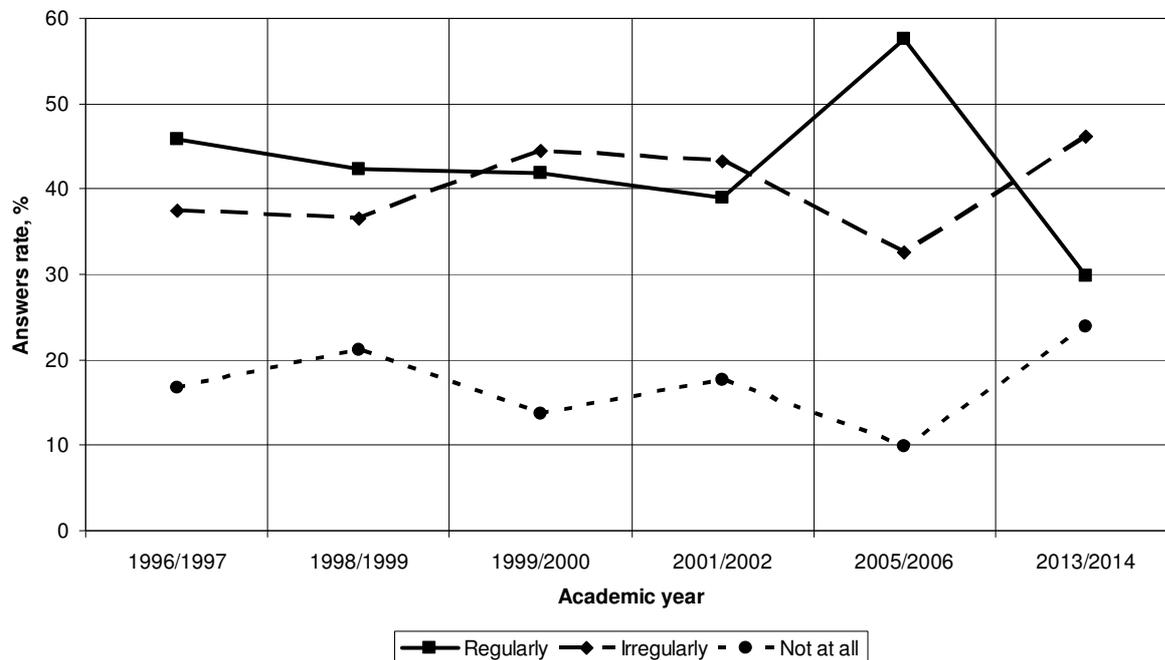


Fig. 2. Attendance at lessons

Absolute majority of students (91.3 %) prepare them for the examination of MS (question 8), namely 23.7 % by the study of notes from lectures and 67.6 % by the study of mimeographed texts for lectures and practice. Relatively a small part (7.5 %) prepare themselves by the use of the next technical literature, too. 1.3 % of students prepare themselves not at all.

The answers of questions 9 and 10 which concern the time required for the study for the examination were very interesting. From these answers it follows that for the examination of the subject Material Science the students need on average of 8.4 % longer time (3.75 days) than for other examinations (3.46 days).

In the academic year 1996/1997 the majority of students (81.3 %) passed the examination in the regular term (question 11), in the 1st resit 16.1 % and in the 2nd resit 2.6 %. In the meantime the exchange of the subject guarantor (lecturer) and of teachers ensuring practice occurred. In the academic year 2013/2014 only 11.7 % of students passed the examination in the regular term, in the 1st resit 18.1 % and in the 2nd resit 19.9 %. At the day of the inquiry still 50.3 % of students did not pass the examination.

From the viewpoint of the study results (question 12) in the previous year our students were only average: 1.8 % of students reached the mark up to 1.5, 21.0 % in the range from 1.5 to 2.0, most students (65.3 %) in the range from 2.0 to 2.5 and the rest (12.0 %) over 2.5.

The noticeable change can be seen in the answers to the question 13. In the academic year 1996/1997 the opinions of the students were compared to the contemporary ones very optimistic – 72.5 % of students answered that at the examination they understood and answered the given question, 25.6 % did not understand before the explanation and then answered. Only 1.9 % of students understood after explanation but they did not achieve to answer. In the course of 17 years, which passed from the first inquiry to the last one, the answers show a trend of progressive decreasing of the answers a), while answers b) and c) show the increasing trend. In the academic year 2013/2014 the answer a) was chosen only by 34.5 % of respondents, the answer b) by 38.7 % and the answer c) by 25.9 % of respondents. The reason for this change failed to establish, maybe the present students judge their knowledge more critically.

The answers to the question 14 are in good conformity with the previous answers. The answer 14a) – my knowledge is very good, I see the connection between single phenomena – gradually are on the decrease, the answers 14b) – my knowledge is rather encyclopedic, without deeper understanding – are practically in equal number, but the percentage of the answers 14c) – my knowledge is slight – increases.

From the point of view of the classification (question 15) radical changes occurred. Probably it is connected with the change of lecturers in lectures as well as in practice. In the academic year 1996/1997 15.5 % of respondents gave the classification excellent, 50.3 % good and 34.2 % sufficient. The classification failed was not included. The average classification is 2.19. In the academic year 2013/2014 only 0.6 % of respondents gave the classification excellent, 10.7 % good and 40.9 % sufficient. 48.3 % of respondents gave the classification failed. The average classification is 1.44; the classification failed is not included.

The majority of students (92.5 %) rate the requirements of the credit obtaining (question 16) to be adequate. Only 6.4 % mark them as disproportionate high, 1.2 % as disproportionate low.

In the question 17 the students had the possibility to present their themes and suggestions to the subject Material Science. It is necessary to accentuate that the answers of the question 17 were very sporadic; most of the students did not answer them.

Conclusions

In the paper the results of anonymous inquiry evaluation are presented. The inquiry was carried out on the whole six times in the years 1996/1997 till 2013/2014 among the students of the 2nd year of the Faculty of Engineering CULS in Prague, concerning the subject Material Science.

From the viewpoint not only of the guarantor, but also of the whole department, valuable data were acquired, even with the exceptions that many answers declare the subjective viewpoint of the concrete respondent. E.g., that the student structure is important from the viewpoint of the previous education – according to this circumstance it is necessary to adapt the teaching. But the acquired data are also interesting concerning, e.g., the attendance at lectures, evaluation of the sense of the experiments carried out in practice, the rate of running preparation for the learning and for the examination, their course, evaluation of the knowledge acquired in the course of the foregoing study, evaluation of the own knowledge, evaluation of the subject importance etc. Theses and suggestions mentioned by several respondents are for us important, too.

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