

## EVALUATION OF TEACHING THE SUBJECT “BASIC ENGINEERING TECHNOLOGIES”

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**Abstract.** The paper presents the results of eight anonymous inquiries carried out in the academic years from 1999/2000 to 2009/2010 between the students of the programs “Trading and Dealing in Machinery and Equipment” (TDME) and “Information and Management Technologies in Agri-Food Complex” (IMT) concerning the subject “Basic Engineering Technologies” (BET). This subject has been newly established in the connection with the study programs in the year 1998. Within the whole time it is guaranteed by the same pedagogue, namely by the author. All students have been also examined by this pedagogue. The skilled contents of lectures and practice has been in the last 11 years mildly modified – in lectures the actual themes of engineering technology have been included, practice has been modernized by use of newly bought equipments and measuring instruments. By the inquiry evaluation valuable information has been acquired concerning many aspects related to the given subject.

**Keywords:** inquiry, lectures, practice, manufacturing technology.

### Introduction

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

- Farm Machinery and Equipment,
- Road and City Automobile Transport,
- Waste Management Methods and Technologies,
- Building Construction Technologies and Equipment,
- Trading and Dealing in Machinery and Equipment,
- Information and Management Technologies in Agri-Food Complex,
- Machinery and Landscape Reclamation and Maintenance,

And one program of reassuming Master Study:

- Technology and Environmental Engineering.

For students of all above mentioned programs our department ensures the teaching of compulsory and optional courses related to the subjects “Material Science” and “Engineering Technologies”. But the extent and depth of single subjects are for various programs different and they depend on the student profile.

### 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, which have been carried out already since the academic year 1989/1990. For inquiries two types of inquiry are provided – more simply (brief) for subjects which end with a credit and more complex (more extensive) for subjects which end by a credit and an examination [1-4].

This paper presents the results of eight anonymous inquiries carried out between the 3 students of the programs “Trading and Dealing in Machinery and Equipment” (TDME) and “Information and Management Technologies in Agri-Food Complex” (IMT) in the academic years from 1999/2000 to 2009/2010. For these students the compulsory subject “Basic Engineering Technologies” is determined. For TDME students it proceeds in the 5<sup>th</sup> semester, for IMT students in the 3<sup>rd</sup> 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. Therefore, all results are presented in per cents. For the information it is suitable to add that in several last years the subject was taken by 3 study groups of TDME and 1 study group of IMT, in the whole of 80 students.

The lectures of the subject “Basic Engineering Technologies” include all basic engineering technologies, namely foundry work, forming operations [5-7], welding [8; 9], soldering [10], brazing, adhesive bonding [11; 12], surface protection [13], plastics processing, engineering metrology and cutting operations [14-18]. Lectures are completed by the themes carried out in practice, namely the technological process of casting products, non-destructive testing, technological tests, metal hot working, metal cold working, spot welding, bonding of metallic and nonmetallic materials, length and angle measuring, control of gearings and threads, measuring of cutting edge temperature at turning etc. For study the students have at disposal besides the own notes from lectures the mimeographed texts. 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 these questions and thematic circles:

- Question 1: The secondary education I have completed in a secondary school a) economical, b) grammar, c) electrical, d) transport, e) machinery, f) agricultural, g) apprentice with leaving examination, g) other (write what kind),
- Question 2: I visited lectures of BET: regularly, b) irregularly, c) not at all,
- Question 3: I exploited the knowledge acquired in practice by experiments: a) at the teaching for the examination and I presuppose its use in future studies and also later, b) only at the examination, c) I did not exploit, d) no knowledge was acquired,
- Question 4: Teaching 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 5: Teaching for the examination of BET required: a) less than 1 day, b) over 1 to 3 days, c) over 3 to 5 days, d) more than 5 days,
- Question 6: I passed the examination of BET: a) in a regular term, b) at the 1<sup>st</sup> reparative term, c) at the 2<sup>nd</sup> reparative term, d) I did not pass it till this time,
- Question 7: In the 2<sup>nd</sup> (1<sup>st</sup>) academic year I reached the average mark: a) less than 1.5, b) over 1.5 to 2.0, c) over 2.0 to 2.5, d) over 2.5,
- Question 8: Teaching the BET the previous knowledge of the subject “Material Science” a) helped, b) helped partially, c) did not help,
- Question 9: The problems of the BET subject: a) I met in the secondary school, b) I did not meet till this time,
- Question 10: Teaching of BET in the frame of TF I consider as: a) important, b) marginal, c) unnecessary,
- Question 11: For practice of BET I was preparing: a) regularly, b) irregularly, c) not at all,
- Question 12: For the examination of BET 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 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 further explanation and I did not answered,
- Question 14: I assume that my knowledge of BET 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 BED I was classified: a) excellent, b) very good, c) good,
- Question 16: In teaching of BET I propose these themes,
- Question 17: My topics and suggestions to BET.

### 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 2. The other time courses will be presented at the conference speech.

From the answers (question 1) it follows that the programs TDME and IMT are chosen by students of economical secondary schools (29.1 %) and of grammar schools (24.1 %), if need be of

electrical (16.0) and machinery schools (14.5 %). The remaining part of students (16.2 %) is from other types of secondary schools, e.g., transport, agricultural, apprentice with leaving examination etc. (Fig. 1).

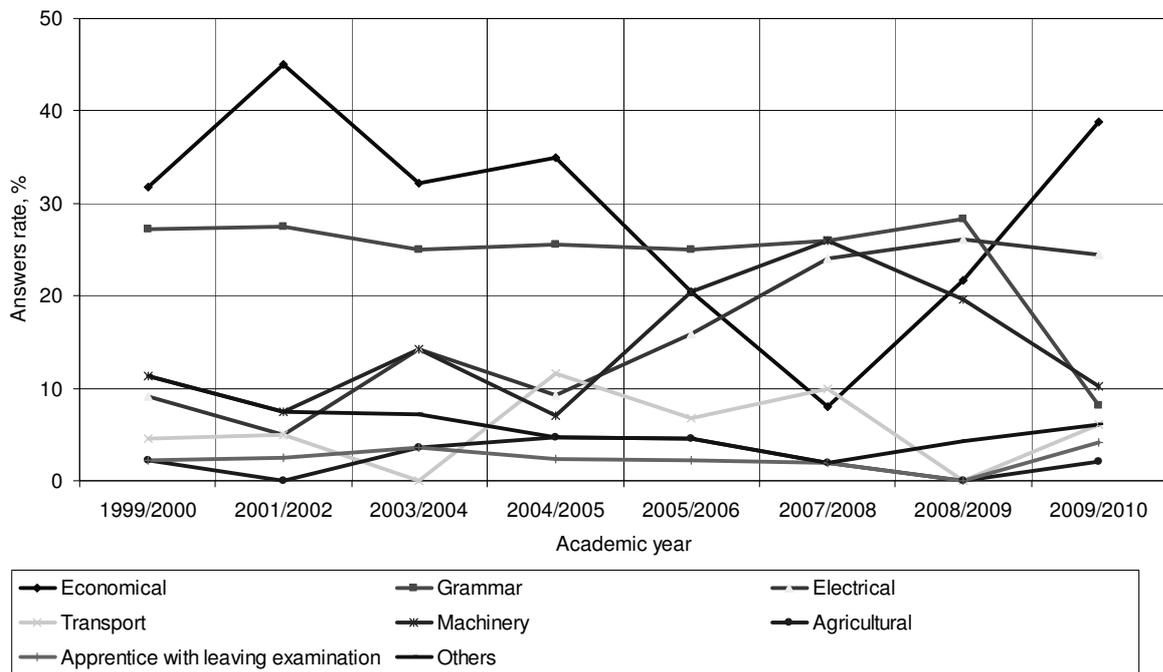


Fig. 1 Types of secondary schools of our students

Most of students (48.8 %) answered (question 2) that they visited lectures regularly, next part (36.3 %) irregularly. The rest (14.9 %) 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 student number is small, the attendance is regularly taken and therefore it is almost 100 %.

Pieces of knowledge acquired by experiments at practice (question 3) were utilized at the examination by most of students (85.7 %). 36.9 % from these students presuppose that these pieces of knowledge will be utilized later in their profession. 12.4 % of students answered that these pieces of knowledge were at the examination not utilized. 1.9 % of students said the experiments did not bring any knowledge.

The answers of questions 4 and 5 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 Basic Engineering Technologies the students need on average of 22.2 % longer time (3.92 days) than for other examinations (3.21 days). While for other subjects the most mentioned time was from 1 to 3 days, for the subject BET it was more than 5 days.

Most of students (55.8 %) passed the examination in the regular term (question 6), 18.5 % at the 1<sup>st</sup> reparative term, 15 % at the 2<sup>nd</sup> reparative term. At the day of filling in the inquiry the rest (10.7 %) did not pass the examination.

From the viewpoint of the study results (question 7) in the previous year our students were only average: only 2.8 % of students reached the mark with in 1.5, 30.1 % in the range from 1.5 to 2.0, most students (54.9 % in the range from 2.0 to 2.5 and the rest (12.1 %) over 2.5.

The subject BET continues relatively closely the foregoing subject Material Science. From this viewpoint the answers of the question 8 were interesting. Only 17.3 % of students assume that knowledge acquired in this foregoing subject were useful. The most of students (59.0 %) answered that this knowledge helped only partially. The rest of students (23.6 %) answered that the knowledge of this subject was not useful.

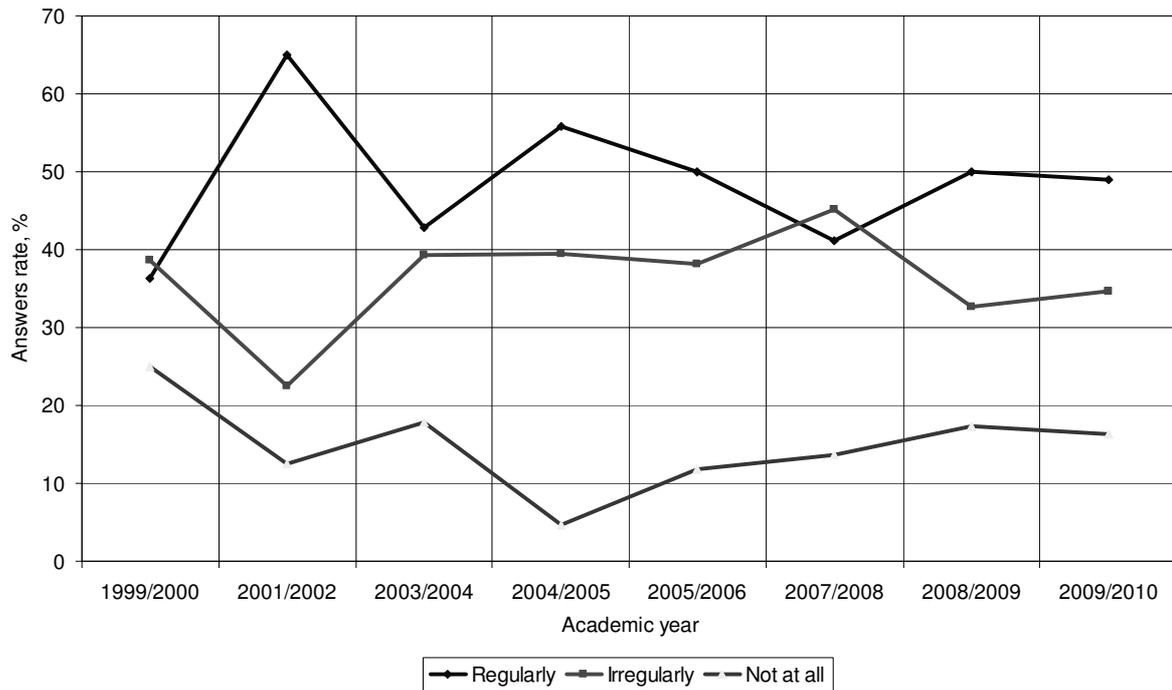


Fig. 2 Attendance at lessons

At the study of secondary school most of students (71.5 %) did not meet with the problems (question 9) of engineering technology. The presentation of relevant themes must be therefore adapted not only at lectures but at practice, too. Probably this fact influences the student attendance at lectures (question 2).

The teaching of BET in the frame of TF (question 10) 54.9 % of students consider as important, 42.0 % as marginal, the rest (3.1 %) as unnecessary.

More than a half of students (53.5 %) prepare themselves for practice regularly, 40.3 % irregularly (question 11). Only 6.2 % of respondents answered that not at all.

Absolute majority of students (91.1 %) prepare themselves for the examination of BET (question 12), namely 42.5 % by the study of notes from lectures and 48.6 % by the study of mimeographed texts for lectures and practice. Relatively a small part (8.3 %) prepares by the use of next technical literature, too. 0.6 % of students prepare themselves not at all.

The absolute majority of students (92.2 %) judged their appearance on the oral examination (question 13) optimistically. 63.3 % of students answered that they understood and answered the given question, 29 % did not understand before the explanation and then answered. Only 7.8 % of students understood after explanation but did not achieve to answer.

The majority of our students assume (question 14) that their knowledge is very good with connections understanding (34.2 %), or good, but rather encyclopedic without connections understanding (56.4 %). Only 9.4 % of students admitted that their knowledge is slight.

From the viewpoint of the examination marks (question 15) it is possible to say that the marking degrees are almost equable spread out. 32.4 % of students were classified by the mark excellent, 36.4 % very good and 31.4 good. The classification "unsatisfactory" was not in this evaluation included. The average classification mark is 1.99.

In the question 16 the students had the possibility to propose themes which could enlarge the contents of Basic Engineering Technology. It is necessary to emphasize that these suggestions were:

- Realizable and by now realized, e.g., the prolongation of the time for the examination written part, the inclusion of some passages in lectures or practice etc.,
- Unrealizable or at today's financial conditions unrealizable, e.g., to lower the examination demands, to organize free of charge the welding courses for students, to organize for students excursions in firms (in our department the excursions are in the program only in the 5<sup>th</sup>

academic year, in other years they are not organized), in lectures to include more information about new materials (it is in the foregoing subject Material Science), in lectures to include unconventional machining (it is in the optional subject Special Engineering Technology), to include the practical teaching of milling and used cutters (it is in the foregoing subject Practice in Workshop) etc.

In the question 17 the students had the possibility to present their themes and suggestions to the subject BET. Their viewpoints were spread in the whole spectrum from the viewpoint that the teachers should lower the demands to the inverse ones. Several suggestions were answered to the unsuitable lecture time, which is traditionally on Friday from 07:50 to 09:20. Certainly it is pleasant that none of suggestions concerns the negative evaluation of teachers, who ensure lectures and practice. On the contrary, the positive evaluation as of the subject contents and of the teachers access to students appeared.

At the same time it is necessary to accentuate that the answers of questions 16 and 17 were very sporadic, most of 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 eight times in the years 1999/2000 till 2009/2010 among students of the 3<sup>rd</sup> respectively 2<sup>nd</sup> years of TF CULS in Prague, concerning the subject Basic Engineering Technologies.

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. For example, 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 which concerning, for example, the rate of running preparation for the teaching and for the examination, their course, evaluation of knowledge acquired in the course of the foregoing study, judgment upon 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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