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# Student Attitudes toward Teaching Mathematics at the Masaryk Institute of Advanced Studies in Prague

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***Abstract***

Two main attitudes are currently being discussed at the Czech Technical University in Prague regarded teaching mathematics: theoretical approach and on the other hand, approach stressing practical orientation of mathematics. The discussion is being proceeded especially among academic and research workers. However, in order to gain additional information not only from the teaching personnel, but also students, a quantitative research focused on student attitudes towards teaching mathematics was conducted. In the research we concentrated especially on student opinions regarded usefulness and utility of mathematics for economic studies, student emotional attitude to mathematics and student preferences with regard to didactic principals and teaching aids. The result of the survey revealed the students preference towards solving real economic problems during the courses rather than focusing on theoretical mathematics.

*Keywords:*
Student attitudes
Didactic principals
Teaching aids

## 1 Introduction

The Czech Technical University in Prague, similarly to other universities worldwide (Cardella, 2008) is currently facing two main attitudes in teaching mathematics: theoretical approach, stressing the theoretical base of the subject and its necessity of being mastered in order to learn mathematical and strategic way of thinking, directly supporting decision making process and solution of problems in general. And, on the other hand the practical approach, that supports the idea of teaching mostly practical knowledge and skills. Moreover, nowadays it is important to attract students for studies and professions including technical fields and requiring exact way of thinking as demand for these professions among students is in decline. Thus, what are student attitudes toward their studies, especially toward mathematics? The answers to this question may be found in our survey where we focused mostly on student attitudes regarded three dominant features: usefulness and utility of mathematics for economic studies, students' emotional attitude to mathematics and importance of didactic principals in teaching mathematics. The summary of the survey results can be found below.

## 2 Student Attitudes toward Mathematics

In general, attitude may be treated as a concept connected with a way of thinking, acting and behaving (Mensah, Okyere and Kuranchie, 2013, p. 132-134). Attitudes are formed as a result of student learning experiences, which influences how an individual views situations, objects or people, and how he responds to them. The response may be positive or negative, favourable or unfavourable, neutral or ambivalent. We can investigate three different components of attitude: the cognitive component, the affective component and the

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behavioural component. The cognitive component is what the individual thinks or believes about the attitude object, the affective component represents the emotions of the individual in relation to the attitude object, and the behavioural component is explained as a tendency to respond in a certain way to the object. Formation of the attitude may have different sources: people form attitudes through their experiences, as a form of learning process, or e.g. through observation people around them.

Attitude toward mathematics may refer to one of the three types described below (Zan, Di Martino, 2007, p.158-159).

1/ a definition of attitude to mathematics describing it as a positive or negative degree of affect only. The attitude towards mathematics is at this point of view only an emotional disposition toward mathematics.

2/ a multidimensional definition, which recognizes three components in the attitude: emotional response associated with mathematics, the individuals beliefs toward mathematics and the behaviour related to mathematics.

3/ a bi-dimensional definition, where attitude toward mathematics is seen as a pattern of beliefs and emotions associated with mathematics.

Therefore, some authorities may regard attitude towards mathematics as just a like or dislike for mathematics, while others may broaden the meaning to include beliefs, abilities, skills and usefulness of mathematics.

# 3 A Pilot Study – Student Attitudes to Teaching Mathematics

## 3.1 Basic Information on the Survey

The survey on student attitudes to teaching mathematics was conducted among 2nd and 3rd year students of a bachelor study field Economy and Management at the Masaryk Institute of Advanced Studies at the Czech technical University in Prague during academic year 2014-2015. Mathematics at this study field is taught during the 1st year of study only, therefore 1st year students for their lack of experience and not finishing the course yet were omitted from the survey. Quantitative methodology was used for the survey. A total number of 105 questionnaires were distributed, which represents a half of all students of the both years of the study field. A number of 94 questionnaires were properly filled and returned.

In the questionnaire, closed ended questions including response options were used. The range included endorsement, influence or intensity ordinal mostly 5 scales questions with the exception of several identifiers.

## 3.2 Usefulness of Mathematics for Economic Studies

The usefulness of mathematics for students of economy represented one of the dominant features of the survey. Mathematic courses at the Masaryk Institute of Advanced Studies are being taught in mostly theoretical way, Mathematics represents the theoretical base for further courses taught subsequently, as microeconomics, macroeconomics or statistics. However, during the course students are not aware very much about exploitation in continuing courses, and in addition, students may even doubt about usefulness of these courses.

| | Very useful | Useful | Neutral | Useless | Very useless |
|---|---|---|---|---|---|
| Absolute frequency | 6 | 5 | 25 | 47 | 11 |
| Relative frequency | 6% | 5% | 27% | 50% | 12% |

**Table 1:** Usefulness of Mathematics for Economic Studies – frequency of responses

The numbers in Table 1 reflect the dissatisfaction with the utility and usefulness of the course of mathematics. Most students graduated from vocational secondary schools (e.g. business schools), i.e. they are not used to theoretical subjects, which may be one of the reasons of their response.

Moreover, it might be recommendable to form closer relationship between mathematical theory and its practical application, and immediately practice examples from real economic situations. Further courses using mathematics are usually taught in the following terms and not simultaneously which may be advisable.

## 3.3 Emotional Attitude to Mathematics

Emotional attitude towards mathematics is another crucial topic for the students responding in the survey. In a certain extension, it may have an origin in the previous section on utility of mathematics – students who do not see the usefulness of mathematics can hardly have a strong positive emotional attitude towards mathematics. A significant correlation of 0.89 (Pearson correlation coefficient) can be found in the relationship between attitude to usefulness of mathematics and emotional attitude to mathematics.

| | Very positive | Positive | Neutral | Negative | Very negative |
|---|---|---|---|---|---|
| Absolute frequency | 3 | 6 | 35 | 36 | 14 |
| Relative frequency | 3% | 6% | 37% | 38% | 16% |

**Table 2:** Emotional Attitude to Mathematics – frequency of responses

In addition, relatively negative emotional attitude to mathematics may be a result of the fact, that mathematics is one of the most difficult courses during students' studies at the Masaryk Institute of Advanced Studies (as follows from students' study results). Nevertheless, it may be connected with a broader issue of decreasing the mathematical knowledge of students during their previous secondary level studies (Matějů, 2013).

## 3.4 Importance of Didactic Principals in Teaching Mathematics

In the survey two main topics related to didactic principals were questioned: the management of the courses and teaching aids. Regarded management and lecture/seminars organization students were asked at their preferences related to the type of lessons during the course, the number of lessons per week and other teaching and learning activities.
Most students (total of 82) preferred practical exercises, seminars and tutorials to lectures; moreover 45 students would welcome additional homework.

Regarded the extent of lectures and practical exercises most students (total of 91) would strengthen practical exercises, students even suggested to double the number of lessons of practical exercises.

Regarded teaching aids students expressed their favourite teaching aids choosing the least and the most attractive. As most useful teaching aids were found textbooks focused on examples, esp. with its application in practical life (82 students), software applications (54 students) or handouts (42 students). Textbooks focused mostly on mathematical theory were found the least useful (82 students).

The results correspond with the most students' orientation towards practical life and interest in solving practical issues.

# 4 Conclusion

Should we discuss the basic two attitudes that are currently under discussion not only at the Czech Technical University, i.e. the theoretical approach versus practical approach, the survey conducted at the Masaryk Institute of Advanced Studies among students of bachelor study programme Economy and Management revealed that these students prefer in general the practical attitude. Students did not find the theoretical knowledge of mathematics very useful and needed for their further studies and professional career. Students would welcome decline in theoretical studies and prefer studies supporting practical exercises with the orientation on real life. Students seem to prefer teaching mathematics when practical exercises are included straight in the mathematical courses, so they can see immediately the importance of mathematics for solving real economic problems. To shortly summarize the results of the survey, practically oriented attitudes prevail among the students.

Nevertheless, it would be interesting to broaden the survey, and to include the students from other faculties of the Czech Technical University in Prague in the survey, as well. The faculties are technically oriented, and students of non-economic fields may have different attitudes toward mathematics coming from different kind of their studies and different requirements of their study fields (i.e. civil engineering, architecture, transportation sciences, mechanical engineering, electrical engineering, nuclear sciences and physical engineering, information technologies, biomedical engineering). Therefore, further research will follow in order

to map not only economic fields, but also technical fields that represent the main substance of the studies at the Czech Technical University.

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