

# INNOVATION IN THE MATHEMATICS COMPONENT OF THE FUTURE PRIMARY SCHOOL TEACHERS' PREGRADUATE CURRICULUM

**Eva Bártková, Anna Stopenová, Bohumil Novák**

*Department of Mathematics, Faculty of Education  
Palacký University Olomouc  
Žižkovo nám. 5, 77140 Olomouc, Czech Republic  
e-mail: eva.bartkova@upol.cz  
e-mail: anna.stopenova@upol.cz  
e-mail: bohumil.novak@upol.cz*

**Abstract.** The aim of the paper is to present some of the results of an analysis of educational needs which was carried out among students of the Primary school teacher training study programme at Palacký University Olomouc and which was focused on the mathematical and didactical competencies of those students.

## 1. Introduction

Since the beginning of this year, the Department of Mathematics at Palacký University, Faculty of Education has been dealing with an ESF (European Social Fund) project called IMAKOS. The project aim is to enhance the quality of the mathematics component of the future primary school and special school teachers professional training. It is to be achieved by means of the innovation of the educational content of all the subjects, technical, mathematical as well as didactic ones.

To meet the project goals, it was above all necessary to carry out an analysis of the educational needs of Primary school teacher training and Primary school teacher training and special pedagogy study modes students, with respect to

their mathematical and didactic competencies. The data were obtained by means of a non-standardized questionnaire and a didactic test in mathematics assigned to the students.

Along with the analysis of the mathematical subjects educational contents within the abovementioned study programmes taught at our faculty, as well as at other faculties, e.g. at the Faculty of Education of the University of Prešov or at the Faculty of Education of Matej Bel University in Banská Bystrica, we also took a deep look at the situation in the "Mathematics and its applications within the framework of primary education" training area.

At the level of primary education, the training area of "Mathematics and its applications" is mostly based on active learning activities, i.e. the work with mathematical objects and the use of mathematics in real-life situations. This provides students with the knowledge and skills needed in everyday life and thus makes them mathematically literate. Due to the vital role which it plays, mathematics is present at every stage of the primary education and represents a prerequisite for further studies of any kind. Within the training, a deep comprehension of the elementary thinking processes and mathematical notions and the interconnections between them are emphasized. Step by step, the pupils adopt particular notions, algorithms, terminology, symbolics and their applications (see FEP BE [2]).

Students graduated from grammar schools apply and are accepted, above all, for the studies in the abovementioned study programmes, but there are also many fresh students coming from pedagogy institutes as well as from other vocation schools, i.e. nursing, agriculture, technical schools, and apprentice training centers. At the beginning of the studies they are all surprised by the necessity of learning mathematics as well as the didactics of mathematics and one frequently runs across the statement such as "I've never been much keen on or good at mathematics." At start they do not quite grasp the significance of the tasks being a part of their introduction to mathematics at the faculty. That is why we aim at the development of the key competencies which students should dispose of, in compliance with the creation and development of the key competencies set in FEP BE [2].

## **2. Analysis of students' educational needs through an investigation questionnaire**

During the initial attempts to identify the educational needs of the students, we used a questionnaire focused on the usefulness of the professional training within the future teachers pregraduate preparation (compiled by Kalhous and Horak [1]), which we have slightly modified to serve the purposes of our research. The questionnaire was handed out to 54 first-year students and to

44 students in the second year of the Primary school teacher training study programme. It comprised 20 items (statements). On the basis of their personal experiences, assumed knowledge, thoughts and feelings connected with their dealing with mathematics as a school subject, on the one hand, and their being taught mathematics within the framework of the didactic preparation, on the other hand, the students were asked to assess the usefulness of the given skills (knowledge) in their future occupation, i.e. that of a primary school teacher of mathematics. The assessment was carried out by choosing one of the numbers on a 5-degree scale, whereas the number 1 meant topmost quality, the number 2 – quality, 3 – relative quality, 4 – no quality, 5 – absolute lack of quality, N – unable to assess).

Chart No 1 for the 1<sup>st</sup> and 2<sup>nd</sup> year students

t1	Mastery of technical elements of mathematics
t2	Appropriate use of the mathematical terminology and symbolics
t3	Ability to solve a learning task in mathematics
t4	Ability to manage pupils' activities connected with solving a learning task in mathematics
t5	Ability to formulate (create) learning tasks in mathematics in compliance with the teaching goals
t6	Ability to compile a quality didactic test in mathematics
t7	Ability to set the educational goals
t8	Ability to motivate a pupil in an appropriate way
t9	Ability to work with the material didactic instruments (teaching aids, computers)
t10	Ability to assess a textbook used in teaching mathematics
t11	Acquaintance with and ability to use adequate teaching methods
t12	Ability to asses pupil's performance
t13	Ability to identify the internal as well as the external conditions making for effective learning mathematics on the side of the pupil
t14	Understanding the necessity of a permanent self-education in mathematics and its realisation in practice
t15	Awareness of the most wide-spread learning disabilities (dyscalculia) and ability to deal with them
t16	Ability to recognize a mathematically-gifted pupil and to develop his/her gift
t17	Ability to make on the spot decisions regarding typical as well as unusual pedagogical situations
t18	Ability to project (plan) one's own pedagogical activities
t19	Awareness of the alternative didactic procedures and ability to apply them
t20	Ability to communicate with the pupils

To illustrate the selected sample of students, we attached hereunder a chart demonstrating the response rate across the sample. In the first line, labelled valid, the number of the students having answered the particular question is stated. In the missing line, on the other hand, the number of the students who, for one reason or another, did not respond to the particular item of the

questionnaire or did not feel competent to assess the extent to which a certain ability might be important for their future job, is stated.

Chart No 2: Response rate across the sample

$\Sigma$	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10	t11	t12	t13	t14	t15	t16	t17	t18	t19	t20
<i>Valid</i>	97	98	97	93	94	95	95	96	98	91	95	96	92	98	92	96	95	95	96	98
<i>Missing</i>	1	0	1	5	4	3	3	2	0	7	3	2	6	0	6	2	3	3	2	0

The chart makes it obvious that with some items students had no difficulties considering the level of necessity of the given abilities for their future job. This is true for the following abilities: t2, t9, t14, t20; possibly also: t1, t3. All of them may be regarded as the premises for the basic abilities and competencies every teacher should possess. However, coming to other premises, a large number of the students found it impossible to respond. They were as follows: t10, t13, t15. In our opinion, the reason why some students chose the *N* answer in response to these premises probably was connected with their limited professional experience, i.e. limited knowledge in the given area of interest, which is demonstrated by the chart below showing the response rate in particular years of study.

Chart No 3: Response rate across the whole sample

1 <sup>st</sup> year	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10	t11	t12	t13	t14	t15	t16	t17	t18	t19	t20
<i>Valid</i>	54	54	53	50	51	52	52	53	54	47	51	52	48	54	48	52	51	51	52	54
<i>Missing</i>	0	0	1	4	3	2	2	1	0	7	3	2	6	0	6	2	3	3	2	0

Chart No 4: Response rate across the whole sample

2 <sup>nd</sup> year	t1	t2	t3	t4	t5	t6	t7	t8	t9	t10	t11	t12	t13	t14	t15	t16	t17	t18	t19	t20
<i>Valid</i>	43	44	44	43	43	43	43	43	44	44	44	44	44	44	44	44	44	44	44	44
<i>Missing</i>	1	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0

The results show that with increasing age, which brings about more knowledge from the studies, the ability to shape one's opinion grows.

Let us have a more detailed look at the structure of the responses.

The table shows that with all items (except items 1 and 14) students of higher years tend to prefer new skills and knowledge which they acquired in the course of their studies and which they had not run across before.

Chart No 5: Response rate in per cents

		of topmost quality	of quality	of relative quality	of no quality	absolute lack of quality	unable to assess
t1	1st year	40.74	37.04	20.37	1.85	0	0
	2nd year	22.73	43.18	29.55	2.27	0	2.27
t2	1st year	25.93	50	18.52	5.56	0	0
	2nd year	29.55	40.91	25	4.55	0	0
t3	1st year	44.44	37.04	12.96	3.7	0	1.85
	2nd year	47.73	40.91	11.36	0	0	0
t4	1st year	40.74	33.33	16.67	1.85	0	7.41
	2nd year	68.18	20.45	6.82	2.27	0	2.27
t5	1st year	22.22	35.19	27.78	9.26	0	5.56
	2nd year	40.91	38.64	13.64	4.55	0	2.27
t6	1st year	27.78	44.44	22.22	1.85	0	3.7
	2nd year	63.64	25	6.82	2.27	0	2.27
t7	1st year	35.19	31.48	25.93	3.7	0	3.7
	2nd year	43.18	34.09	13.64	6.82	0	2.27
t8	1st year	64.81	22.22	9.26	1.85	0	1.85
	2nd year	79.55	13.64	2.27	2.27	0	2.27
t9	1st year	38.89	40.74	18.52	1.85	0	0
	2nd year	63.64	27.27	9.09	0	0	0
t10	1st year	9.26	50	22.22	5.56	0	12.96
	2nd year	13.64	43.18	36.36	6.82	0	0
t11	1st year	35.19	37.04	18.52	3.7	0	5.56
	2nd year	43.18	52.27	4.55	0	0	0
t12	1st year	61.11	27.78	7.41	0	0	3.7
	2nd year	81.82	18.18	0	0	0	0
t13	1st year	22.22	44.44	20.37	1.85	0	11.11
	2nd year	36.36	47.73	11.36	4.55	0	0
t14	1st year	11.11	53.7	31.48	3.7	0	0
	2nd year	6.82	54.55	34.09	4.55	0	0
t15	1st year	37.04	25.93	18.52	5.56	1.85	11.11
	2nd year	68.18	13.64	15.91	2.27	0	0
t16	1st year	35.19	33.33	24.07	3.7	0	3.7
	2nd year	50	36.36	13.64	0	0	0
t17	1st year	38.89	37.04	16.67	1.85	0	5.56
	2nd year	52.27	43.18	4.55	0	0	0
t18	1st year	40.74	40.74	12.96	0	0	5.56
	2nd year	56.82	34.09	9.09	0	0	0
t19	1st year	12.96	57.41	16.67	9.26	0	3.7
	2nd year	29.55	45.45	25	0	0	0
t20	1st year	77.78	16.67	5.56	0	0	0
	2nd year	95.45	4.55	0	0	0	0

A very interesting phenomenon is also the increase in the number of respondents who do not believe that it is absolutely necessary to possess technical knowledge. This illustrates quite precisely the current situation in education. Students do not require any deepening of the existing technical knowledge which, according to them, will be of no use in their job and which they consider as sufficient for them. At the same time, they emphasize deficiencies in other areas. They also regard further progress in mathematics coming with every year of studies as less important.

### 3. Conclusion

Another basis for the analysis of the educational needs was a didactic test, again assigned to the 1<sup>st</sup> and 2<sup>nd</sup> year students of Primary school teacher training study programme. Our aim was to get the students acquainted with some tasks which primary school pupils solve in the 5<sup>th</sup> grade, right from the start of their studies. Their own performance should help the students realize the necessity of self-training, of an independent logical thinking, and of developing confidence in one's own abilities, etc.

Through the analysis of investigation questionnaires and of tests results we acquire valuable information which, along with the analysis of the content of curricula documents, conceptual and methodical materials (i.e. current syllabi of the particular study modes) relating to the teaching mathematical subjects, enable us to identify the educational needs of the survey group.

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