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WHAT ARE 14 WEEKS ENOUGH FOR? THE EFFICIENCY OF TEACHING MATHEMATICS AT THE PRIMARY SCHOOL AND KINDERGARTEN TEACHER TRAINING COLLEGE, THE SATU MARE DEPARTMENT OF BABEŞ-BOLYAI UNIVERSITY

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Abstract: The number of mathematics and other major subjects to be taught at the Primary School and Kindergarten Teacher Training Colleges in Romania has decreased significantly since the implementation of the Bologna process in the higher education system. There are now only 14 weeks in which students could acquire all the knowledge that is necessary for them to be able to teach mathematics at an appropriate level. The present paper analyses the results of a comparative research done with the regular and distance learning third year students.

Key words: didactics of mathematics**,** higher education, arithmetic

1. Introduction

'We tend to forget that the classrooms consist of real children who expect from their teachers to show them the wonders of the world, without ever asking whether what is interesting is useful at the same time. Our material world values our possessions much more than our deeds.' (Dienes, 1999, 24)
Although most of the students of the primary school and kindergarten teacher training college consider mathematics a difficult subject to teach, they will have to do that at both levels. We use mathematics in our everyday lives and one of its main characteristics is that it develops logical thinking and problem solving. (Olosz & Olosz, 1999; Pólya, 1971; Skemp, 2005)

The number of mathematics classes has been significantly reduced since the adoption of the Bologna system. While in the first year of the college's existence (1999 - 2000) there were 140 hours of mathematics in the curriculum, starting from the year 2005-2006 that number has decreased to 56.

Starting with the year 2011-2012 the Satu Mare Department became part of the Teacher Training Institute from Cluj Napoca, together with other four departments (those from Cluj Napoca, Odorheiu Secuiesc, Târgu Mureş, Târgu Secuiesc). The first task the Institute accomplished was to change the curriculum and replace the subjects of arithmetic and the methodology of teaching arithmetic with the new subjects of 'mathematics and the teaching of mathematics in the kindergarten' and 'mathematics and the teaching of mathematics in primary school', to be taught in the fifth and sixth semesters. That does not mean that there are more teaching hours of mathematics, nevertheless teaching it in two semesters may mean that its knowledge could be acquired more deeply.

2. Research

Research design

The main questions of the research concern the efficiency of the teaching of mathematics at the primary school and kindergarten teacher training college, as well as whether one semester consisting of 14 weeks is enough for acquiring the knowledge of mathematics.

The research was based on the following hypotheses:

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1. Students do not have the appropriate mathematical knowledge necessary for its teaching;

2. Time allotted in the curriculum for the teaching of mathematical knowledge is not enough for its acquisition;

3. Third year regular students do better at the post tests than third year distance learning students;

4. Significant improvement can be found with respect to the operation with fractions.

The research population consisted of 28 students of the primary school and kindergarten teacher training college, out of which 18 were regular and 10 were distance learning students.

Preliminary to the present research, we had measured the mathematical knowledge of the students in a previous one, done in October 2011, at the beginning of the school year. The present research is looking for the progress both regular and distance learning students have made as compared to the previously mentioned pre-test. Thus, the research consisted of a pre-test and a post test. The pre-test consisted of a questionnaire and a knowledge level measuring test. The students were asked to assess their own knowledge of mathematics, the way in which they are able to use mathematical knowledge in everyday life, as well as whether the knowledge of the primary school mathematics syllabus is enough for a kindergarten and primary school teacher to be able to teach mathematics.

The knowledge tests used for the pre-test, as well as for the post test consisted of series of operations. In the pre-test students had to recognise the right order of the operations, to solve a simple string of operations with natural numbers and another one with fractions, preceded by the recognition of a fraction of a plane figure.

Results and discussion

As far as the results of the task of operations order recognition are concerned the regular students obtained a ratio of good to bad answers of 72.2% to 27.8%, while the same ratio obtained by the distance learning students was of 80% to 20%. Thus, there were no significant differences between the results of the two groups. After deciding on the right order of the operations, the students were asked to perform the operations. 16.7% of the students in the regular group obtained 0 points, while 66.7% (12 students) obtained the maximum number of points. As far as the distance learning students are concerned 30% received 0 points, while 70% received the maximum number of points. Looking at the overall results of both groups 21.4% of the students received 0 points, while 67.45% received the maximum number of points.

In the first sub task of the second task of the pre-test the students were asked to write down the equivalent of the part in hatching of a plane figure in the form of a fraction. Three of the students (10.7%) solved the problem without errors, eight (28.6%) received 7 to 9 points, while twelve of them (42.9%) received 0 points for the task.

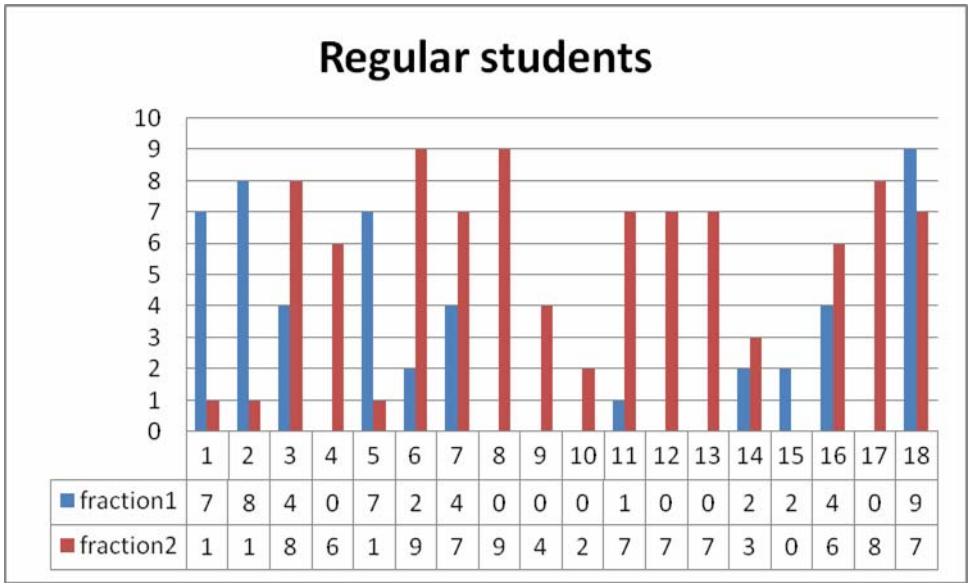
In the second sub task the students were asked to solve a string of operations with fractions. Twelve students (42.9%) received 0 points for the task, no student received the maximum number of points, and three students (10.7%) received 9 points.

The intervention, in the case of the regular students consisted of the afore mentioned 14 weeks of 4 hours per week teaching of mathematics, while in the case of the distance learning students it meant 6 contact hours in a semester in two sessions. During the lectures, seminars and contact hours the students were presented not only with theoretical points but also with practical knowledge. (Klein, 1980) From the point of view of the teaching techniques, frontal, group and pair work tasks, as well as individual work were used during the teaching practice (Baranyai & Tempfli, 2010; Ambrus 2004, 2007). The students had the opportunity to get to know the mathematical concepts through different, alternative methods. Thus the fractions, for example were presented through experiential learning, while plane figures were made of various teaching aids (matches, Geomag, wires).

The tasks of the post test were chosen to match the structure of the pre-test. As far as the level of difficulty is concerned that of the latter was higher, assuming the application of the mathematical knowledge students could have acquired during the semester.

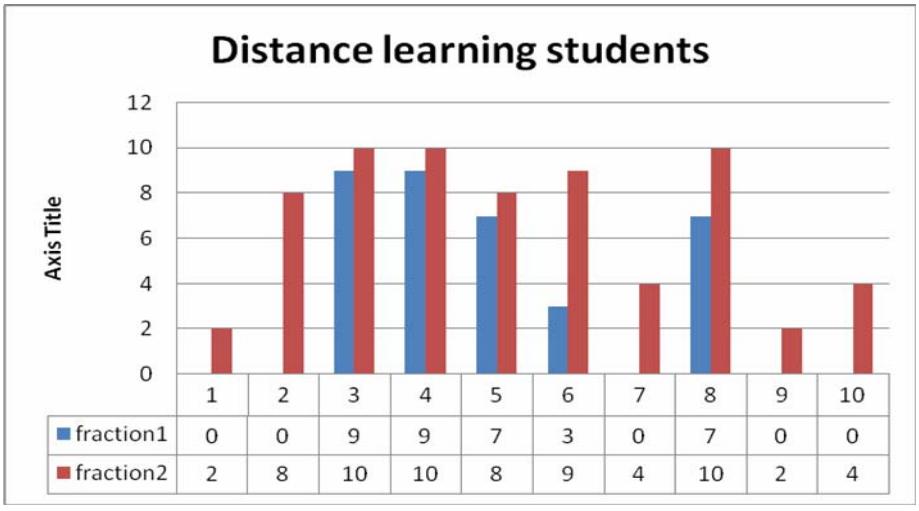
The first string of operations was solved without errors by 41.2% of the regular students and no one received 0 points. 30% of the distance learning students solved the task without errors, 10% received no points at all. If averages are calculated for the results of the corresponding tasks of the pre-test and post test the following results occur: with regular students the average has changed from 8.05 to 8.11, while with distance learning students the average has changed from 7 to 6.7. The conclusion can be drawn that there is no significant change with either group, though a slight decrease of the average with the distance learners' group can be stated.

The results of the operation string with fractions are presented in the following diagrams. (see Figure 1 and Figure 2)



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
fraction1	7	8	4	0	7	2	4	0	0	0	1	0	0	2	2	4	0	9
fraction2	1	1	8	6	1	9	7	9	4	2	7	7	7	3	0	6	8	7

Figure. 1 *Operations with fractions – regular students*



	1	2	3	4	5	6	7	8	9	10
fraction1	0	0	9	9	7	3	0	7	0	0
fraction2	2	8	10	10	8	9	4	10	2	4

Figure. 2 *Operations with fractions – distance learning students*

Based on the two diagrams the conclusion can be drawn that with the string of operations with fractions there is significant change. The results of the post test are higher than those of the pre-test. The averages are significantly higher with both groups tested: with the regular students the average has increased from 2.77 to 7.06, while with the distance learners the average has increased from 3.5 to 6.7.

In order to find out the relationship between student's performances in mathematics used anova test. The findings were in Table 1, 2.

Table 1. *Report*

		operations with natural numbers	operations with fractions
pretest	Mean	7,59	3,00
	N	27	27
	Std. Deviation	4,181	3,475
post test	Mean	7,59	6,93
	N	27	27
	Std. Deviation	2,650	2,702
Total	Mean	7,59	4,96
	N	54	54
	Std. Deviation	3,467	3,665

Table 2. *Anova Table*

			Sum of Squares	df	Mean Square	F	Sig.
operations with natural numbers	Between Groups	(Combined)	,000	1	,000	,000	1,000
	Within Groups		637,037	52	12,251		
	Total		637,037	53			
operations with fractions	Between Groups	(Combined)	208,074	1	208,074	21,474	,000
	Within Groups		503,852	52	9,689		
	Total		711,926	53			

The data indicates that, there is a significant difference between the pretest and posttest in operations with fractions. ($P<0,05$).

The typical error of students was: most error was in problems with fractions, in multiplication and division operations, some students do not know the right order of operations.

3. Conclusion

The first hypothesis stating that the students do not have the appropriate mathematical knowledge necessary for its teaching has gained support. Unfortunately, many students are unaware of the right sequence of the operations and are not able to appreciate the fraction of a plane figure, many make errors while solving the strings of operations and there are only a few who can solve the tasks totally correctly.

It has also been proved that the time limit allotted in the curriculum for the acquisition of mathematical knowledge is not enough, although the results of the students have improved no real knowledge acquisition is possible in such a short time.

Third year regular students do better at the post tests than third year distance learning students. The research group did better at both tasks, but the control group had worse results, or improved at a lesser extent, which means that our third hypothesis has gained support, as well.

There has been a slight improvement in the solving of the problem with natural numbers in the case of the research group, from an 8.05 average to an 8.11 one, but the average of the control group has decreased from 7 to 6.7. In the case of the problem with fractional numbers the research group has achieved significant improvement, from 2.77 to 7.06 of the average. The average of the control group has also improved from 3.5 to 6.7, though to a lesser extent. In conclusion our fourth hypothesis has also been proved as the average of the regular students has improved with 4.29 points and with 3.2 points in the case of the students of the distance learning group.

The research has proved instructive as it has shed light on the flaws of the mathematical knowledge of the students. Furthermore, we can draw the conclusion that more time should be allotted to the teaching of mathematics to our students.

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