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INFORMATION TECHNOLOGY AND EDUCATION DEVELOPMENT

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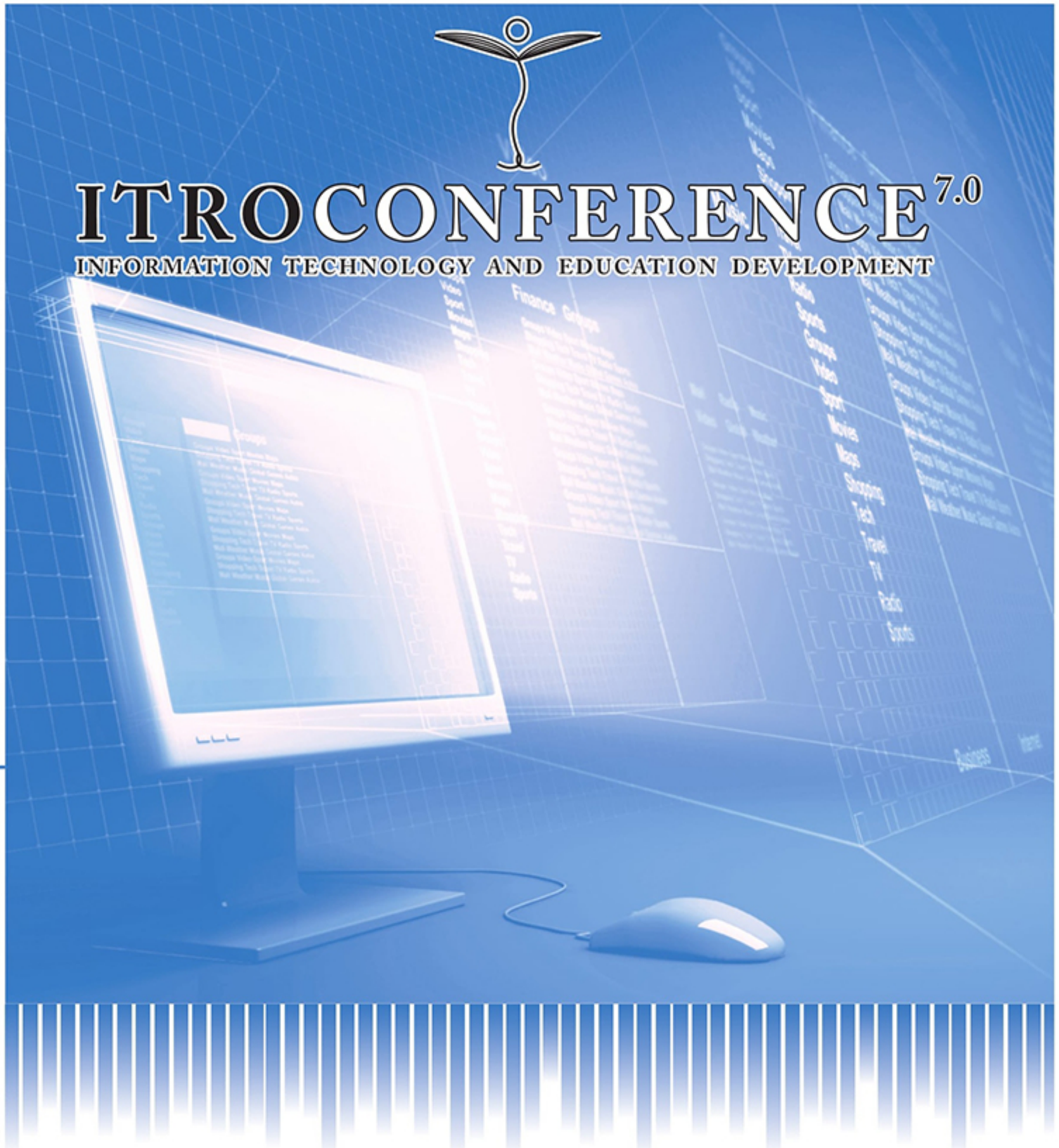

ZRENJANIN, June 2016

UNIVERSITY OF NOVI SAD
TECHNICAL FACULTY "MIHAJLO PUPIN"
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PROCEEDINGS OF PAPERS

VII MEĐUNARODNA KONFERENCIJA

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With this publication, the CD with all papers from the International Conference on Information Technology and Development of Education, ITRO 2016 is also published.

INTRODUCTION

This Proceedings of papers consists from full papers from the International conference "Information technology and development of education" - ITRO 2016, that was held at the Technical Faculty "Mihajlo Pupin" in Zrenjanin on June 10th 2016.

The International conference on Information technology and development of education has had a goal to contribute to the development of education in Serbia and the Region, as well as, to gather experts from natural and technical sciences' teaching fields.

The expected scientific-skilled analysis of the accomplishment in the field of the contemporary information and communication technologies, as well as analysis of state, needs and tendencies in education all around the world and in our country has been realized.

The authors and the participants of the Conference have dealt with the following thematic areas:

- Theoretical and methodological questions of contemporary pedagogy
- Personalization and learning styles
- Social networks and their influence on education
- Children security and safety on the Internet
- Curriculum of contemporary teaching
- Methodical questions of natural and technical sciences subject teaching
- Lifelong learning and teachers' professional training
- E-learning
- Education management
- Development and influence of IT on teaching
- Information communication infrastructure in teaching process

All submitted papers have been reviewed by at least two independent members of the Science Committee.

There were total of 163 authors that took part at the Conference from 15 countries, 4 continents: 96 from the Republic of Serbia and 67 from foreign countries such as: Macedonia, Bulgaria, Slovakia, Russia, Montenegro, Albania, Hungary, Italy, India, Rumania, Bosnia and Herzegovina, USA, Egypt and Nigeria. They were presented 82 scientific papers; 42 from Serbia and 40 from the above mentioned countries.

The papers presented at the Conference and published in Proceedings can be useful for teachers while learning and teaching in the fields of informatics, technics and other teaching subjects and activities. Contribution to the science and teaching development in this Region and wider has been achieved in this way.

The Organizing Committee of the Conference

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INVITED LECTURES

SCIENTIFIC PAPERS

METHODICAL QUESTIONS OF NATURAL AND TECHNICAL SCIENCES SUBJECT TEACHING

Analysis of Students' Knowledge for the Topic "Integral"

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Abstract - In this paper will be analyzed and compared the results of the electronic testing (e-testing) for the subject Mathematics 2 within University "Goce Delcev"– Stip using statistical data processing. Electronic testing covers the topic "Integral". This topic is of great importance during the studies and for this topic students have previous knowledge from high school. Testing was conducted on two separated groups of students from technical faculties who have studied this subject in Stip and Kavadarci respectively. The questions were aimed at recognizing the integral as indefinite, definite or improper, as well as, at selecting the method of integration and application of integration in geometry.

I. INTRODUCTION

We live in a world where Mathematics is all over around us, and also presents a base of any natural science. Without mathematical knowledge we can't explain some complex physical and natural phenomena, or solve complex problems of daily life. Mathematics as a subject has been taught from primary school and during years, basic gained knowledge is more and more improved. Mathematics as science field is extensive and covers many topics. The aim of our research is the topic Integral.

In the early period of its development mathematics mainly had dealt with geometric problems, primarily problems related with measurement of surfaces [1], [2]. At that time mathematicians only knew how to calculate surface area of a rectangle and a triangle, but there was a problem in calculating the surface area of a circle. Ancient mathematicians had noticed that the area is measured with a single measure that can be compared. Namely, if we agree that the square with side 1 mm has surface area 1 mm^2, then we can determine the surface area of a circle (or any other figure) with appropriate square grid and count the squares covered inside. Of course, as much as network is smaller, the accuracy is greater (Fig. 1).

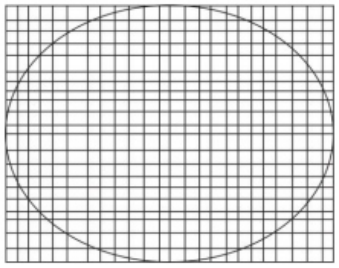

Figure 1 Square grid

II. INTEGRALS

Simplest case is when the surface is limited by the curve $y = f(x)$, lines $x = a, x = b$ and the x-axis. This surface can be calculated by covering with a mesh of rectangles. For that purpose, we separate the interval $[a,b]$ on n parts with points $a = x_0 < x_1 < x_2 < ... < x_n = b$ and from each of those subintervals we choose only one point $\xi_i \in [x_i, x_{i+1}], i = 0,1,...,n-1$. These points x_i and ξ_i defines a separation of the segment, denote with d.

Let the function $y = f(x)$ is positive and we are considering a rectangles with sides $x_{i+1} - x_i$ and $f(\xi_i)$. The surface area of that rectangle is $f(\xi_i) * (x_{i+1} - x_i)$. The sum of all rectangles is named integral sum of the function $y = f(x)$ on interval $[a,b]$ during the division d:

$$S(f,d,a,b) = \sum_{i=0}^{n-1} f(\xi_i) * (x_{i+1} - x_i).$$

Let $f(x)$ be a function defined on the interval $[a,b]$. If there is definitive limes, independent of division d, on interval $[a,b]$,

$$\lim_{\|d\|\to 0} S(f,d,a,b) = \lim_{\|d\|\to 0} \sum_{i=0}^{n-1} f(\xi_i) * (x_{i+1} - x_i) = I$$

i.e. if $(\forall \varepsilon > 0)(\exists \delta > 0)(\forall d) \| d \| < \delta \Rightarrow$

$| S(f,d,a,b) - I | < \varepsilon$, then for the real number I we can say that is definite integral or Riemann integral of the function f on $[a,b]$, and we can denote $I = \int_a^b f(x)dx$. For the function for which there is a definite integral on $[a,b]$ we can say that is integrabile on $[a,b]$. The numbers a and b are limits of the integral. The procedure for finding the integral is named integration, and the function $f(x)$ is subintegrand function.

Let f be a function defined on the interval (a,b). If there is a function F, with options for each $F'(x) = f(x)$, then the F is called primitive function of f on (a,b). Let F e arbitrary primitive function of f on (a,b). Indefinite integral of the function f, denoted by $\int f(x)dx$, is $\int f(x)dx = F(x) + C$ (where C is constant of integration). Therefore, this concept may be understood as set of all primitive functions of f.

Let the function f is defined on interval $[a,+\infty)$ and is an integral function of any finite interval $[a,b]$. If $\lim_{b\to\infty} \int_a^b f(x)dx$ exists, then this value is defined as improper integral of function f on interval $[a,+\infty)$. Therefore,

$$\int_a^{+\infty} f(x)dx \overset{def.}{=} \lim_{b\to\infty} \int_a^b f(x)dx = \lim_{b\to\infty} F(b) - F(a)$$

where F is arbitrary primitive function of f.

Basic methods of integrating are: method of direct integration, method of decomposition, method of integration by parts (partial integration) and method of replacement.

Students get to know the topic Integral during the high school and when they are enrolling in college they have some basic knowledge about it. Also they learn this topic in the first year of their studies at the Faculty of Computer Science and at the Faculty of Natural and Technical Sciences in subject named Mathematics 2.

III. RESEARCH AND RESULTS

The aim of our research is using electronic testing to analyze students in Stip and Kavadarci to determine whether and how much is their previous knowledge of the subject Integral. The topic of e-test includes questions about the type of integral, methods of integration and application of integration in geometry. The questions were grouped into three categories: questions with choice, true / false and matching.

Testing was conducted in February this year (2016) on Moodle - platform for e-learning and consisted of 9 questions. The time given for answer these questions was 15 minutes and the total number of points that can be gained was 90. It is also important to note that the test was conducted at the beginning of the semester before the classes start. Research and analysis were conducted on 48 students in Stip and Kavadarci and the following results were obtained.

The total number of students in Stip who learned Mathematics 2 and were involved in testing is 25. From 90 - the maximum number of points that can be gained, we can see that the mean obtained is 40.67 i.e. very low. Satisfactory results are results with mean at least 56 or 60% of the total number of points. The maximum number of gained points is 66.7 points and only one student has 66.7 points, while the minimum number of gained points is 23.3. Six students have achieved a 23.3 points. Most of the students or 36% of them have gained 40 to 50 points. These results are shown in Table 1 and Table 2.

Table 1 Descriptive Statistics (Stip)

	Descriptive Statistics (Spreadsheet2)				
Variable	Valid N	Mean	Minimum	Maximum	Std.Dev.
Stip	25	40,67200	23,30000	66,70000	11,71810

Table 2 Frequency table (Stip)

	Frequency table: Stip (Spreadsheet2) K-S d=,10873, p> .20; Lilliefors p> .20					
Category	Count	Cumulative Count	Percent of Valid	Cumul % of Valid	% of all Cases	Cumulative % of All
10,00000<x<=20,00000	0	0	0,00000	0,0000	0,00000	0,0000
20,00000<x<=30,00000	6	6	24,00000	24,0000	24,00000	24,0000
30,00000<x<=40,00000	6	12	24,00000	48,0000	24,00000	48,0000
40,00000<x<=50,00000	9	21	36,00000	84,0000	36,00000	84,0000
50,00000<x<=60,00000	3	24	12,00000	96,0000	12,00000	96,0000
60,00000<x<=70,00000	1	25	4,00000	100,0000	4,00000	100,0000
Missing	0	25	0,00000		0,00000	100,0000

In Kavadarci there are 23 students who learned the subject Mathematics 2 and were involved in e-testing. Here the mean is 39.56 from 90 i.e. as in Stip we can say that the main value is very low. The maximum number of gained points is 63.3 and is less than the maximum number of gained points in Stip, also the minimum number of gained points 16.7 is less than the minimum number of gained points in Stip. From this we can conclude that students in Stip have higher previous knowledge than students in Kavadarci. Most of the students or 39.13% of them have gained between 30 and 40 points, and only two students have gained over than 60 points. Results for Kavadarci are shown in Table 3 and Table 4.

Table 3 Descriptive Statistics (Kavadarci)

	Descriptive Statistics (Spreadsheet3)				
Variable	Valid N	Mean	Minimum	Maximum	Std.Dev.
Kavadarci	23	39,56087	16,70000	63,30000	12,47710

Table 4 Frequency table (Kavadarci)

	Frequency table: Kavadarci (Spreadsheet3) K-S d=,09466, p> .20; Lilliefors p> .20					
Category	Count	Cumulative Count	Percent of Valid	Cumul % of Valid	% of all Cases	Cumulative % of All
10,00000<x<=20,00000	2	2	8,69565	8,6957	8,69565	8,6957
20,00000<x<=30,00000	3	5	13,04348	21,7391	13,04348	21,7391
30,00000<x<=40,00000	9	14	39,13043	60,8696	39,13043	60,8696
40,00000<x<=50,00000	6	20	26,08696	86,9565	26,08696	86,9565
50,00000<x<=60,00000	1	21	4,34783	91,3043	4,34783	91,3043
60,00000<x<=70,00000	2	23	8,69565	100,0000	8,69565	100,0000
Missing	0	23	0,00000		0,00000	100,0000

In Fig. 1 is shown a histogram aimed for students from Stip. This histogram gives us a clear view of the points gained from testing. We can also say that the histogram is good because in the middle in the range from 30 to 50 points we have some solid results and we don't have students with less than 20 points, but on the other side is not so good because we don't have students with 80 or 90 points.

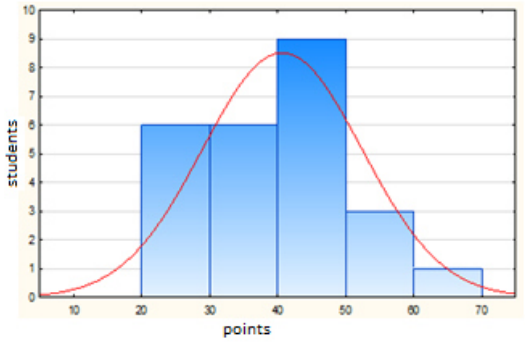

Figure 2 Overall number of students achieving grade ranges (Stip)

From the histogram aimed for Kavadarci (shown in Fig. 3) we see that again these is a symmetrical histogram because in the middle in the range from 30 to 50 points the results are pretty good, but here the number of students with less than 40 points is greater compared to Stip (14 students from 23) and we have two students with less than 20 points. And unfortunately this histogram shows that just as in Stip and here we don't have students with more than 70 points.

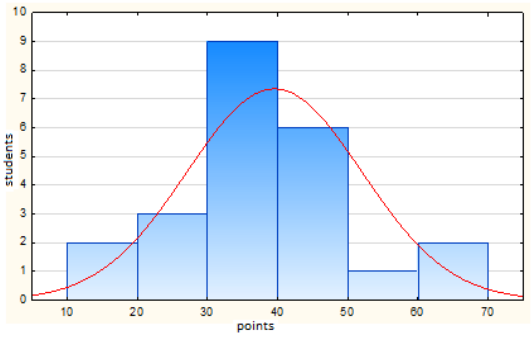

Figure 3 Overall number of students achieving grade ranges (Kavadarci)

Fig. 4 and Fig. 5 represent the curve points per student. The first curve (Fig. 4) is for Stip and the second one (Fig. 5) is for Kavadarci, respectively. From the curves we can see that only a few students are better and have more than 45 points out of 90 points or that only this few students have won over than 50% out of 100%.

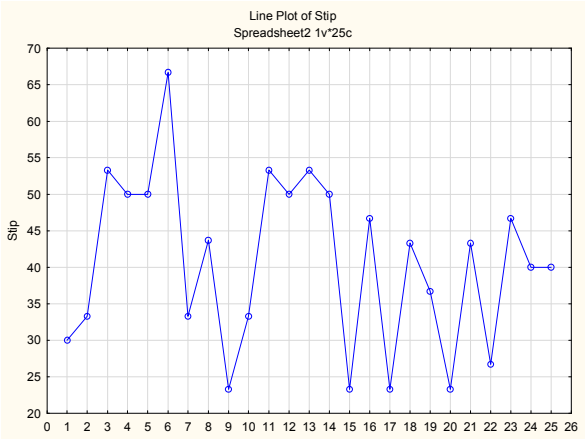

Figure 4 Curve points per student (Stip)

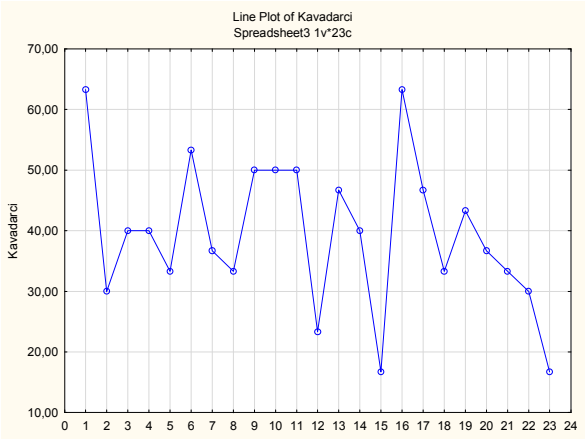

Figure 5 Curve points per student (Kavadarci)

Table 5 shows the overall average points out of 90 and the average points received for each question

individually. Of a possible 10 points per question we have received up to 5.6 average points, which means that there is no question which correct answer are known by all students. And from the table we can also can see that the question 7 at least known question by students. These points are related to the overall results obtained from e-testing conducted in Stip and Kavadarci.

Table 5 Overall average

Points /90	Q1 /10	Q2 /10	Q3 /10	Q4 /10	Q5 /10	Q6 /10	Q7 /10	Q8 /10	Q9 /10
40,2	5,4	4,8	5,6	5,3	4,9	4,2	2,8	3,3	3,9

IV. DISCUSSION AND CONCLUSION

From conducted research we can conclude that all students (without any matter from what high school they are coming - basic or professional) have a little knowledge of Mathematics, in particular for the topic Integral. We concluded this from analyzes for Stip and Kavadarci, and the fact that the overall average number of points obtained out of 90 is only 40.2 points. The average value per question is in range from minimum 2.8 to maximum 5.6 points out of 10 which is also a small percentage.

Our next goal is to make a comparison of these results which shows the previous knowledge of students with the results obtained after the study of the topic i.e. the results obtained after the implementation of a colloquium. Also, this research can be extended to a large number of tested students. Actually, in this e-test may be included students of second and third cycle of studies that have learned Mathematics 2 during previous studies. Then we will compare the previous results with the results obtained of the examination of a large number of respondents. Comparison will bring a conclusion about which results are better, whether the future generations have more previous knowledge or not, and so on.

Our personal conclusion that we got by analyzing the results of the e-test is that students have to show greater interest in Mathematics, because Mathematics is the base of all other sciences and its application is extended in every life field.

REFERENCES

[1] Л. Горачинова-Илиева, Б. Златановска and Л. Лазарова, “Скрипта со предавања и вежби по МАТЕМАТИКА 1 за студентите од техничките факултети”, 2014.

[2] Б. Трпеновски, Н. Целакоски and Ѓ. Чупона, "Виша математика", pp.245–321, 1995.

[3] J.M. Gutierrez, A. Iglesias “Mathematica package for analysis and control of chaos in nonlinear systems”, University of Cantabria, Spain, 1998.

[4] Б. Златановска “Анализа на едно квадратно пресликување како дискретен динамички систем”, Годишен зборник на Факултетот за Информатика, УГД, Vol.4, 2015 (in press) .

[5] Б. Златановска, М. Коцалева, З. Здравев and А. Кстев, “Електронско тестирање наспроти класичен начин на тестирање по универзитетскиот предмет Математика”, Годишен зборник на Факултетот за Информатика, УГД, Vol.4, 2015 (in press) .

[6] M. Tricarico, F.Visentin “Logistic map: from order to chaos”, Applied mathematical sciences Vol.8, Italy, 2014.

[7] J.A. de Oliveira, E.R. Papesso, E.D.Leonel “Relaxation to fixed points in the logistic and cubic maps: analytical and numerical investigation”, Entropy, ISSN 1099-4300, www.mdpi.com/journal/entropy, 2013.

[8] Sal Mangano , “Mathematica Cookbook”, pp. 237-275, 413-422, ISBN: 978-0-596-52099-1, USA , 2010.

[9] Prof.R.Sorbello Dept of Physics, University of Wisconsin-Milwaukee, “Caution on Mathematica's evaluation of integrals containing symbolic parameters”,June 5, 2007.

[10] Sadri Hassani, “Mathematical Methods Using Mathematica®: For Students of Physics and Related Fields”, Springer , 2003.