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Preface

This volume contains the papers presented at CIIT 2017: the 14th International Conference on Informatics and Information Technologies held on April 07-09, 2017 in Mavrovo, Macedonia. The conference was organized by the Faculty of Computer Science and Engineering (FCSE), within the Ss. Cyril and Methodius University in Skopje, Republic of Macedonia.

In the fourteenth edition, the key CIIT conference mission remained to provide an opportunity for young researchers to present their work to a wider research community, but also facilitate multidisciplinary and regional colaboration. Building on the success of the past thirteen conferences, this year conference attracted a large number of submissions resulting in presentations of 48 short and full papers. The conference was comprised of nine sessions. Traditionally, the conference included two student sessions presenting the work of the best undergraduate students, selected on the basis of their submitted projects, prepared during the previous year. The format of the conference allowed the participants to attend most of the talks that covered a diverse spectrum of research areas.

Three distinguished key note lecturers gave plenary sessions covering the different areas of the conference. Prof. Smile Markovski, retired professor at the Faculty of Computer Science and Engineering, UKIM, Skopje, gave a talk on Probabilistic Quasigroups, Vesna Prchkovska, PhD, co-founder & CSO of Mint Labs, Barcelona, Spain, gave a talk on Seeing the brain: How neuroimaging transforms the diagnosis and treatment of patients with brain disorders, and Ognjen eki, PhD, postdoc researcher at the Distributed Systems Group, Institute of Information Systems, TU Wien, gave a talk on Cyber-Human Smart Cities: The Internet of Things, People and Systems. The conference also welcomed a guest student speaker, Ana Tanevska, MSc, PhD student at the Robotics, Brain and Cognitive Sciences Unit, Istituto Italiano di Tecnologia (IIT), Italy, on the topic of Autonomous and cognitive human-robot interaction.

Part of the conference success is owed to the support received from partners and sponsors: Ss. Cyril and Methodius University, Makedonski Telekom, Nextsense, Sorsix, Software4Insurance, Macedonian Winemakers and Pivara Skopje.

All in all, this year the CIIT conference has outgrown the role of being an excellent opportunity for young researchers to present their scientific growth, to a more premier role, that is to bring researchers together for establishing collaborative links between disciplines, for testing the ground for innovative ideas and for engaging the wider academic community.

September, 2017
Skopje

Aleksandra Popovska Mitrovikj
Biljana Tojtovska
Kire Trivodaliev

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Students' attitude towards learning

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***Abstract*—Education is an important segment in every society. Today we are witness of growing number of students at universities across the country. However, more important than the number of students is the question of how those students are committed and how much time they spend for learning. Sometimes because students have more than one partial exams in one session they are not sufficiently prepared for the exams. So our goal as teaching staff is to discover whether students achieve better results if we allow them to make corrective partial exam or not? For this purpose, we chose the subject Digital logic and we analyzed the results of partial exam and corrective partial exam in the academic year 2016/2017.**

Keywords—education; students' exam; statistical analysis

I. INTRODUCTION

Education is a process of acquiring knowledge and individual development. Education is acquired in educational institutions like schools and colleges. The process of education starts in primary schools then goes on in high schools and ending with colleges. The process of education is arduous and long, but after completing, a particular trade individual is able to find a job and to apply the gained knowledge.

There are two types of education: formal and informal. Formal education is classroom based and is implemented by teachers and this type of education is conducted every day from Monday to Friday. Otherwise, informal education is education outside the classroom without teachers. This kind of education can be provided at every place (home, library…) and can last from one to seven days per week at every time of day. Informal education is also known as electronic learning or e learning.

Education is one of the most important priorities as in every society also in our country. For this purpose the number of universities in the country increase, thereby the number of students who enroll in them also increase. Today education is available for all those who want to gain greater knowledge throughout life. More important than the number of students is the question of how those students are committed and how much time they spend for learning.

II. SUBJECT OF RESEARCH

Sometimes because students have more than one partial exams in one session they are not sufficiently prepared for the exams. So our goal as teaching staff at "Goce Delcev" University (UGD) is to discover whether students achieve better results if we allow them to make corrective partial exam or not? For this purpose, we chose the subject Digital logic and we analyzed the results of partial exam and corrective partial exam in the academic year 2016/2017. The maximum score for partial exam is 25 points [1], [2], [3], [4].

The subject Digital logic is one of the mandatory courses in II semester. The aims of this course are introduction to basic concepts of Boolean algebra and logic circuits that are an integral part of computer systems. This course is also the basis for learning subjects in the coming years.

In this paper, research is aimed at considering the knowledge of students in the subject Digital logic. For statistical analysis and data processing we used MegaStat. MegaStat is Excel add-in that performs statistical analyses with an Excel workbook. It performs basic functions, such as descriptive statistics, frequency distributions, and probability calculations as well as hypothesis testing, ANOVA, regression, and more [5].

The number of tested students is 63 (46 male and 17 female). Corrective partial exam is aimed for students with less than 11 points. On the partial exam from 17 female there are 4 with better results, and after the partial exam and corrective exam the number increase to 7, or from 23.53% the number increase to 41.18%. From the column for male can be seen that also the number for students with better results increase from 4 to 12 or from 8.7% to 26.09%. (Table 1)

TABLE I. OBTAINED RESULTS

Results	Score	Number of male	Percent of male	Number of female	Percent of female
Partial exam (63)	From 0 to 10	42	91.3 %	13	76.47 %
	From 11 to 25	4	8.7 %	4	23.53 %
Corrective partial exam (42)	From 0 to 10	34	80.95 %	10	76.92 %
	From 11 to 25	8	19.05 %	3	23.08 %
After partial exam and corrective partial exam	From 0 to 10	34	73.91 %	10	58.82 %
	From 11 to 25	12	26.09%	7	41.18 %

III. Analysis of results gained of partial exam and corrective partial exam

The results obtained from the partial and corrective partial exams will be processed with statistical data analysis. Statistical data analysis will be performed by

a. Descriptive Statistics,

b. Frequency Distribution and

c. Probability.

A. Descriptive Statistics

Descriptive statistics give us information about count, mean, sample standard deviation, sample variance, minimum and maximum grade and range for population. Also give details about population variance, population standard deviation and standard error of the mean. (Count is the number of students who have this subject. Mean represent the mean score for the students, or average score. Range means distance between the largest and the smallest score.) A description of population is within 1st and 3st quartiles (quartiles split the data into four sections). In addition, information for a median, mode, extremes and outliers are given. (The median is the middle number of a set of data and the mode is the most frequently occurring number, or score in our example. Outlier is a number that is not close to the other numbers in a sample.) Descriptive statistics for our tested students before and after the corrective partial exam is presented in Table 2.

TABLE II. Descriptive Statistics

Descriptive statistics	Partial exam	Corrective partial exam
count	63	63
mean	6,437	8,302
sample standard deviation	4,000	4,466
sample variance	16,004	19,948
minimum	0	0
maximum	16	23
range	16	23
population variance	15,750	19,631
population standard deviation	3,969	4,431
standard error of the mean	0,504	0,563
1st quartile	3,250	6,000
median	6,000	8,500
3rd quartile	8,750	10,750
interquartile range	5,500	4,750
mode	3,000	10,000
low extremes	0	0
low outliers	0	0
high outliers	0	2
high extremes	0	0

The number of tested students is 63. Each student can get the minimum score 0 and the maximum score 25 in depends of their knowledge. The mean of their grades is 6.437 after the partial exam and 8.302 after the corrective partial exam. The range between a maximum and a minimum grade is 16 after the partial exam and 23 after the corrective partial exam. This means that there is a big difference between the students, or there are students who learn a lot, and students who do not know anything. The sample variance as average square deviation from mean is 16.004/19.948 with the sample standard deviation of 4/4.466. That means that the standard deviation is very low and that is good because there are no big deviations from the mean score.

For 1st quartile for partial exam, the grade is 3.250 and for 3rd quartile the grade is 8.750. For partial exam the median is 6 with mode 3. For 1st quartile for corrective partial exam, the grade is 6 and for 3rd quartile the grade is 10.750. The median value is 8.5 and the mode is 10. The interquartile ranges are 5.5 and 4.750 respectively. The interquartile range is distance between first and third quartile. The low and high extremes are zeros. This shows that we did not have extreme. The low and high outliers are zeros when we do partial exam, but when we do corrective partial exam we have high outliers 2.

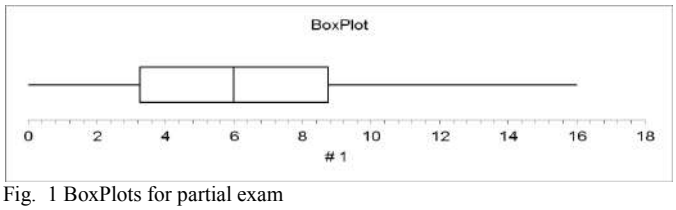

Fig. 1 BoxPlots for partial exam

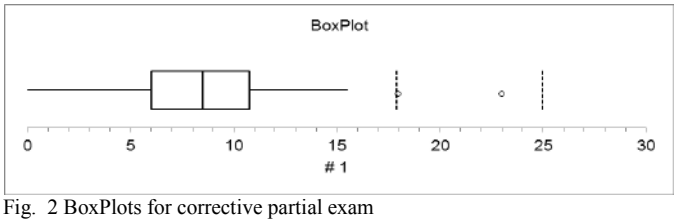

Fig. 2 BoxPlots for corrective partial exam

BoxPlots present a graphical means of summarizing data. In Fig.1 and Fig.2 are presented BoxPlots before and after the corrective exam. It shows the minimum and maximum score, 1st and 3rd quartile points and the median score. In Fig.2 for corrective partial exam besides minimum and maximum score, 1st and 3rd quartile points and the median score are presented also the two outliers in the point 18 and 23 (marked with ° on the graphic).

B. Frequency Distribution

Frequency distribution of a particular observation is the number of times the observation occurs in a set of data. Frequency distribution can be represented in a graphical or tabular format. Distribution displays the number of observations within a given interval. The interval size depends on the data being analyzed and the goals of the analyst and the intervals must be mutually exclusive and exhaustive. Some of the graphs that can be used with frequency distributions are histograms, line charts, bar charts and pie charts. Frequency distributions are used for both qualitative and quantitative data. Frequency distributions are typically used within a statistical context [6], [7].

In the paper, we use histograms (Fig. 3 and Fig. 4) to present frequency distribution for both partial exam and corrective partial exam separately.

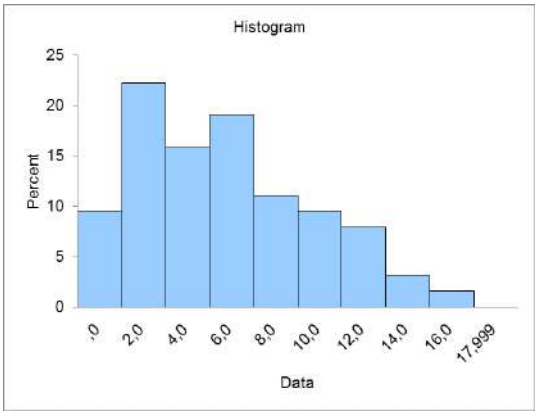

Fig. 3 Histogram for partial exam

The results from Fig. 3 show that the smallest percent we have for the students who obtained more than 16 points. Students have not obtained the score greater than 18. The high percent or over 20% of student have between 2 and 4 points. These results are not good because we have maximum score 25, but we do not have many students with more than 12.5 points (one-half from 25).

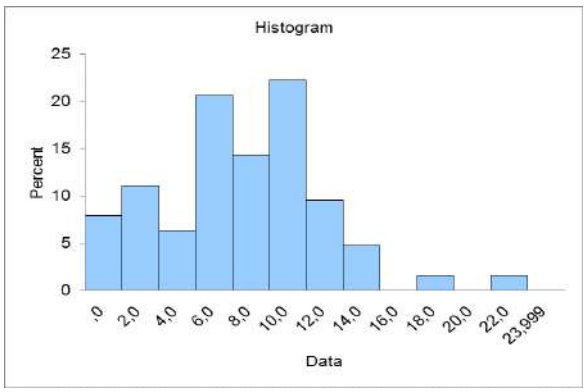

Fig. 4 Histogram for corrective partial exam

From Fig. 4 we can see that the smallest percent we have for the students who obtained between 18 and 20 points and between 22 and 24 points. The high percent or over 20% of student have between 10 and 12 points. There are not students who obtained between 16 and 18 points and between 20 and 22 points. These results are better than the results obtained for partial exam (Fig. 3).

From Table 3 we can conclude that when we talk about partial exam we have a negative growth, or there are larger number of students with fewer points and fewer students with more points. Respectively, we have 51 student with score from 0 to 10, and only 12 with score greater than 11. There is no student that have more than 20 points. In case when we have corrective partial exam we can see that the large number of student have between 6 and 10 points and between 0 to 5 and 11 to 15 we have almost the same number of students. Not so good thing here is the score greater than 16 points. The number of students is too small. We have only two students with score greater than 16, and only one student with score greater than 20 after the corrective exam. This fact is worrisome.

TABLE III. FREQUENCY DISTRIBUTION

		number of students	
group	score	Partial exam	Corrective partial exam
1	from 0 to 5	26	15
2	from 6 to 10	25	29
3	from 11 to 15	11	16
4	from 16 to 20	1	2
5	from 20 to 25	0	1

C. *Probability*

In this section we use probability as part of statistic. Probability is the measure of the likelihood of a given event's occurrence. Probability is always a number between 0 and 1. The higher the probability of an event, the more certain that the event will occur. P (A) represents the probability of event A.

Our goal is to calculate following conditional probability:

1. Probability for student to pass, if the student is female
2. Probability for student to pass, if the student is male

For that purpose we define the events

A – the student is female

B – the student is male

C – the student pass the exam

The probability of events A, B and C are:

$$P(A) = \frac{17}{63} = 0.267$$

$$P(B) = \frac{46}{63} = 0.73$$

AC present the event – student is female and student pass the exam. The probability is

$$P(AC) = \frac{7}{63} = 0.111$$

BC present the event – student is male and student pass the exam. The probability is

$$P(BC) = \frac{12}{63} = 0.19$$

Hence, a conditional probability for student to pass the exam if the student is female, i.e. male are:

$$P(C/A) = \frac{P(AC)}{P(A)} = \frac{0.11}{0.267} = 0.412$$

$$P(C/B) = \frac{P(BC)}{P(B)} = \frac{0.19}{0.73} = 0.26$$

From these can be concluded that the probability to pass the exam is bigger for female.

For the subject Digital logic two partial exams are conducted. Each exam maximum score is 25 points and consist of 25 questions. For the student to pass the exam he or she must to have minimum 10 points from one exam, or 20 from the both. Also after the partial exam, there is a final exam, which defines the grade.

Student does not pass the subject when he/she receive grade 5 (five). If the student receive grade more then 5, then the student passed the exam. The lowest grade for student's to pass the exam is 6 (six) and the highest grade is 10 (ten). The grade depends of students' desire for learning and demonstration of gained knowledge.

For one exam to be passed minimum 10 points are needed. To be able to answer the question whether according to points gained from the first partial exam student has a chance to pass the subject Digital logic, we review the results of the corrective partial exam. From Table 3 we have that the chances for students to pass is 30% (19/63=0.3) or probability of 0.3, and the chances for students not to pass is 70% (44/63=0.7) or 0.7.

IV. CONCLUSION

From data statistical analysis we can conclude that better results are obtained when we have a corrective partial exam. The mean points when we have a corrective partial exam is 8.302 and is bigger than 6.437 gained for partial exam. This mean that corrective exams are good for those students who want to correct their points and to have a high grade for the subject. Basic challenge for teaching staff is and will be finding the new methods and the new ways for better motivation of the students, in order for acquisition of more knowledge and skills.

REFERENCES

[1] M. Kocaleva, B. Zlatanovska, A. Stojanova, A. Krstev, Z. Zdravev, E. Karamazova, "Analysis of Students' Knowledge for the Topic Integral", International Conference on Information Technology and Development of Education – ITRO 2016, Zrenjanin, Republic of Serbia, ISBN: 978-86-7672-285-3, pp.155-158, June, 2016.

[2] B. Zlatanovska, M. Kocaleva, A. Krstev, Z. Zdravev, "E - testing against classical testing in subject Mathematics". Yearbook of the Faculty of Computer Science, 4 (4). pp. 29-32. ISSN 1857- 8691, 2015.

[3] A. Stojanova, B. Zlatanovska, M. Kocaleva, V. Gicev, "On the Use of Mathematica in Engineering Education", International Conference on Information Technology and Development of Education – ITRO 2015, June, Zrenjanin, Republic of Serbia, ISBN: 978-86-7672-258-7 pp.103-108, 2015.

[4] M. Kocaleva, N. Stojkovikj, A. Stojanova, A. Krstev, B. Zlatanovska "Improving on teaching curriculum of Calculus 2 at technical faculties", IEEE EDUCON 2017, April 26-28, 2017. (In press)

[5] J. B. Orris, "MegaStat for Microsoft Excel, Windows and Mac", 2017.

[6] "Frequency Distribution", available online at http://www.investopedia.com/terms/f/frequencydistribution.asp

[7] "Frequency distribution" , available online at https://en.wikipedia.org/wiki/Frequency_distribution