The Impact of Alba Regia Information Technology Competition for Alba Regia Technical Faculty's Enrollment

Dezső Hatalyák and Éva Hajnal

Óbuda University, Alba Regia Technical Faculty
Budai Str 45, Székesfehérvár, Hungary (H-8000)
hatalyak.dezso@amk.uni-obuda.hu
hajnal.eva@amk.uni-obuda.hu

***ABSTRACT* – An applied information technology competition was organized fifth time last year by the Alba Regia Technical Faculty's teacher and students. This competition is organized for regional students, who are potentially continuing their studies in our faculty. We compared the educational results of two groups with ten-ten students. The first group members are our university students, who were participants in the final few years earlier, and the second group members are randomly chosen from university students' sample. Our question is if the education of applied information technology is capable for developing intellectual abilities, that are required for further studies, and if the applied information knowledge is correlating with informatics thinking and capability, what we are expecting from our students. We compared the educational results of the two groups of students form different aspects. We used statistical hypothesis testing. It was found, that the progress of study, the results of programming course, and the grade point averages were significantly better in the group of competition participant students.**

I. INTRODUCTION

An applied information technology competition for secondary school students was organized by Óbuda University's Alba Regia Technical Faculty for the fifth time [1][2]. For this jubilee anniversary raised an idea that we may reached enough information during this period for investigate the question, if this competition helped our faculty in the enrollment of students or not.

In the history of the Hungarian information technology education dominated two very different trends. In the first few years the information technology education was equal to teach programming. This fact was not accepted neither the parents nor the students, and this curriculum was not representative to the assembled IT knowledge. After that came a reform that had a wider social acceptance, but it made teaching windows applications into the center of information technology education. It get much criticism, that in the secondary school the teachers are forming secretaries, and this way of the information technology education is not capable to deliver the mentality and the ability development. We were obliged to organize our competition with respecting of the fact, that the information technology education in the secondary schools means applications only[2]. This fact posed some questions for us. First question is that the applier information technology skill is enough for developing intellectual ability? The second is if the competition mending our enrollment or not? It can help us to answer both questions, when we analyze the educational results of the students, who took part in this competition earlier, and after that chose our university. In our research the results of these students were examined, statistical analyses were executed, and explanations were searched onto the reasons of the differences.

II. DATA BASE AND CALCULATIONS

For the inspection we chose ten students, who took part in our competition earlier, when they were students in a secondary school, and after that they chose our university to their further education. Another ten students were chosen from our other students; they are taking part in engineering information technology BSc course or in information technology engineer course. We pick the members of the control group absolutely randomly. We analyzed the study outcome of the two groups each with ten persons. The data-base of the inspection was queried from the Neptun United Education System and from the competition results data base.

Table 1: Results of the students in our competition

Results of competitors			
Student	Result (points)	Maximum point	%
1st	89	120	74,17%
2nd	63	120	52,50%
3rd	70	120	58,33%
4th	51	110	46,36%
5th	39	110	35,45%
6th	51	110	46,36%
7th	36	110	32,73%
8th	48	120	40,00%
9th	50	113	44,25%
10th	45	120	37,50%

Table 2: Grades of the students who took part in the Alba Regia Information Technology competition

„md" means missing data that the student doesn't have that subject, because on the assistant of engineering of information technology training there is no Analysis I.

Student	Programming I.	Analysis I.	Average of all grades
1st	4	4	3,84
2nd	4	2	2,2632
3rd	4	5	4,3
4th	2	2	2,48
5th	2	4	3,5167
6th	5	5	4,8868
7th	3	2	2,4118
8th	3	3	3,2
9th	3	4	3,7692
10th	4	na	4,2

First the average grades in the two groups were calculated. For this we collated the marks of the students in both groups from the next subjects: Analysis I. and Programming I. You can ask, why these? In all training, which is related to information technology, the most difficult subjects are these, by our opinion. It is a real challenge when the students first time meet with programming, and mathematics at university level. Unfortunately, in the secondary school teachers teach generally neither the basics of programming. That's a very sad thing, because the students have to envisage that they have much deficiency in these areas of their knowledge. For the further calculations it was supposed, that the marks of the students in our university have got a normal distribution.

Some idea for the interpretation of the results: „md" means that the student doesn't have that subject, because in information technology engineer course there is no Analysis I. By the technical manager BSc training there is no Programming I. We used instead Information technology lab subject, because these students first time in this subject meet with a programming language.

After we have collected data, first we calculated the averages, after that we used F-test for checking if the variances are equal or not. The T-test has to make in different way depending on if the variances are equal or not. With T-test we searched the answer, if there is a difference between the study result average, Programming I. and Analysis I. result of the two groups of students. Our null hypothesis was that there is no significant difference between the study result averages of the two groups[3].

Table 3*: The grades of the students in the control group (randomly chose students)*

Number of the student	Programming I.	Analysis I.	Average of all grades
1st	2	3	2,6667
2nd	4	5	3,746
3rd	2	2	2,6667
4th	2	2	2,6761
5th	2	2	2,4643
6th	2	2	2,2857
7th	3	3	3,3846
8th	3	3	2,2667
9th	3	2	2,8387
10th	2	2	1,5385

We investigated if there is a connection between the resulting points of the competition participant students and the posterior study-average, Programming I. and Analysis I. exam mark of these students. We made correlation calculation[3].

We collected how many times made a student a subject-repetition altogether and how many different subject had they to repeat. Table 4 shows this dataset.

Table 4: The subject-repeat statistic of the student who took part in our competition

Number of the student	Different subject-repeats count	Count of total subject repeats	Count of total put on subjects	Total accomplished credit	Calculated rate
1.	0	0	76	213	2,8026
2.	1	1	16	74	4,6250
3.	0	0	81	223	2,7531
4.	3	5	26	85	3,2692
5.	0	0	60	191	3,1833
6.	0	0	55	195	3,5455
7.	2	3	36	83	2,3056
8.	1	1	33	118	3,5758
9.	0	0	13	58	4,4615
10.	1	1	26	120	4,6154

Table 5: The subject-repeat statistic of the randomly chosen students

Number of the student	Different subject-repeats count	Count of total subject repeats	Count of total put on subjects	Total accomplished credit	Calculated rate
1.	2	2	41	140	3,4146
2.	6	7	76	183	2,4079
3.	7	7	64	157	2,4531
4.	13	17	80	178	2,2250
5.	18	30	98	176	1,7959
6.	4	4	40	130	3,2500
7.	3	3	65	168	2,5846
8.	0	0	13	58	4,4615
9.	1	1	32	116	3,6250
10.	0	0	11	53	4,8182

In the last column the calculated average came from the quotient of the total accomplished credit and the total put on subject count.

We made all calculation with the built in Analysis ToolPak of Microsoft Excel 2010 and 2013. You can install this addon in the File/Set up/Addons menu on the bottom of the opening window, clicking to the Jump button. After that you have to choose on the Data tab Data analyzing menu item[4].

III. Results and Discussion

At the beginning the averages were compared (figure 1). On the first chart we can see, that the competition participant students' entire three cases that means average grade, grade of Programming I. and Analysis I, are much better, than that of the other ten randomly chosen students.

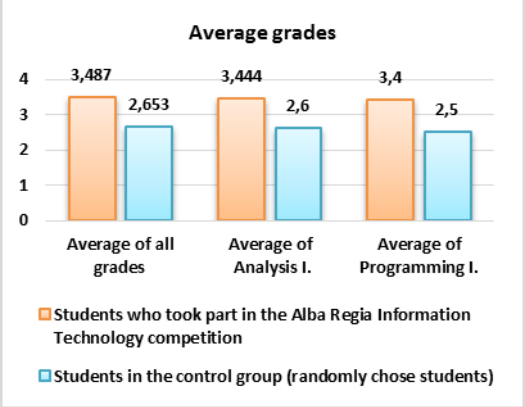

Figure 1: The compare of the averages

It seems to be nice, that the averages indicated differences in the results of the two student-groups, but we decided to make statistical test to support our hypothesis.

First we made an F-test to see, if the variances are equal or not in the two group. It is important, because according to the result of F-tests we had to choose the corresponding T-test. The result was at the total study average of the two groups: F=2,129 and $F_{critical}$=3,178. By the Analysis I. exam mark came F=1,636 and $F_{critical}$=3,229. And at last the Programming I. subject exam mark showed F=1,866 and $F_{critical}$=3,178. We can mark in all three cases, that F is smaller than $F_{critical}$. It signs that the variances are equal. We had to choose T-test for further calculations in the case if the variances are equal.

For null hypothesis we chose in all three cases, that there is no significant difference between the results of the two groups of students.

Let's see the results of the two sampled T-test. In the first case (study average) the result is: t=2,450 and $t_{two\text{-}edged\ critical}$=2,100, at Analysis I. exam mark T-test gave us t=1,668 and $t_{two\text{-}edged\ critical}$=2,109 and at last Programming I. exam marks T-test result: t=2,377 and $t_{two\text{-}edged\ critical}$=2,100.

Analyzing the numbers, we can realize, that only by Analysis I. the absolute value of t is smaller than $t_{two\text{-}edged\ critical}$. So in the subject Analysis I. there is no significant difference between the two groups at 95% significance level. We kept our null hypothesis in this case[3].

In the other two cases we had to drop our null hypothesis. We are concluding from these statistical results, that those students, who earlier took part in

our competition, they have significantly better performance in the global average and Programming I. subject at the Óbuda University in Székesfehérvár.

Now we are concentrating only for the earlier on our competition part taken people. We are interested in, if there is any connection between the result on the competition and the further study-outcome.

We made correlation analysis. The correlation coefficient value was by examining the global study averages r= 0,215. Count of the items was 10, so $r_{critical}$ was 0,632.

The absolute value of r is smaller than $r_{critical}$. That's why the hypothesized association rejected[3].

The same result was found by analyzing the Programming I. and Analysis I. exam results. The small difference is only, that by the Analysis I. marks we have a total item count nine, so $r_{critical}$ would be 0,666. By Analysis I. is the value of linear correlation coefficient r=0,323, and by Programming I. r is 0,453.

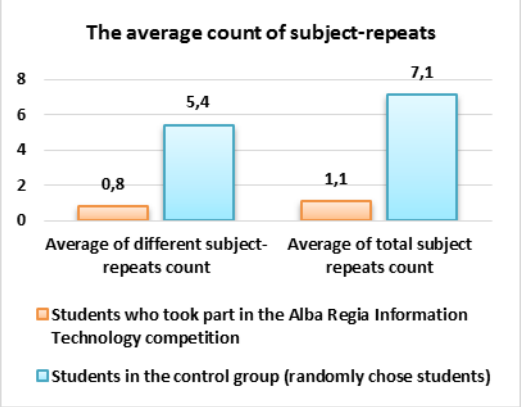

Figure 2: The comparison of count of the subject-repeats

After looking at figure 2 we can unambiguously say that our competing students are much better in proceeding of studies. They had to repeat a subject more rarely.

For the further evaluation of the data base we made a calculated rate of the division of the next two values: total accomplished credits and the count of total put on subjects. With this rate we would like to make more expressive how successful a student is. Here we can found only a little difference between the two averages. The average of the competing students for this calculated rate is 3,513, and the control group's average is 3,103.

Examined how many subjects need a student to repeat, we can realize the next. We made an F-test and T-test with the data of the different repeated subject counts. The variances were found equal, because F=0,030 and $F_{critical}$=0,314.

The T-test ended with the values t=-2,416 and $t_{two\text{-}edged\ critical}$=2,100. The absolute value of t is not smaller than t critical two-edged. That means that we have to drop our null hypothesis. We can say that there is significant difference between the two groups of students by the count of repeated subjects.

Finally the calculated rates were investigated too. The result of the F-test displayed different variances. With the corresponding T-test we got the value for t=1,008 and for $t_{two\text{-}edged\ critical}$=2,109. The calculated rate is not significant different by the two groups.

IV. CONCLUSION

In this paper we compared two groups of students, each containing 10 persons. One group was the students, who took part earlier in the final of competition at our university, and the other group contained randomly picked out ten students from our study database. We searched the answer, if the teaching of applied information technology is able to develop general information technology capabilities, and the applied information skills are correlating with the mentality of this subject. Further we had a question if this competition is mending the enrollment of our faculty, and how. We displayed, that statistically the Programming I. exam results and the global study average was better by the competing students then the randomly chosen people. The applied information technology skill is thought can be capable for the selection. The information technology competition unambiguously mends the enrollment of our faculty. Further task can be, interpreting, if the competition is attractive for the students.

Interesting is, that by Analysis I. we didn't found significant difference by the two groups in contrast of our prejudice. It raises questions concerning the connection between analysis and programming teaching.

There is no correlation between the result of the competition and the further study outcome. Our opinion is that main factor is getting into the final competition. The study progress is significantly much better by the competing students. So we displayed, that the earlier competing students are going to learn better in the high education. But this is not valid for every subject.

What can be the reason? Our opinion is that the students, who were concerned with information technology in their free time, are more motivated.

The results of the statistical tests strengthened our hypothesis. But we have to handle them with criticism, because the small count of people in the groups.

This outcome of the examination is satisfying for us. It's a good idea and worth to organize this competition, because it gives a plus to the participant students. We can say decidedly that this year we'll organize this competition for secondary school students at Óbuda University Alba Regia Technical Faculty again, and we are waiting students too.

V. ACKOWLEDGMENT

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VI. REFERENCES

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