

Experience of Teaching Computer Architecture in Higher Education

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Abstract

The experiences show the students can not acquire easily the learning material of Computer Architecture subject without laboratory where they could to build, test, repair computers. The goal of this research was an analysis of the paper results in two groups. In the first group of lectures I made just the presentation while the lectures for the second group were complement with training in computer laboratory. My starting hypothesis was that the group where we used the computer laboratory to build, test, repair computers would achieve better results in the papers. After the evaluation of the paper results the correctness of the original presumption emerged. I used by the compare of the paper results the Independent Samples test. Significance level was 5% through the analysis. Significant divergence in knowledge of students took part on training in laboratory and students visited just the presentation was found. The students could get a one mark better paper results when they could see really work a computer, how they could test it, repair it. We can say the using of computer laboratory like training place is productive, and the students visit the laboratory and the presentation with more motivation, and get better result when writing papers.

Keywords: computer laboratory, better paper results, measuring, compare, Computer Architecture

1. Introduction

I teach Computer Architecture for the mechanical engineering freshmen students in the first semester at the Óbuda University and I teach same learning material for the economics information technology students at the King Sigismund College in two classes per week.

The experiences show the students can not acquire easily the learning material of Computer Architecture subject without laboratory where they could to build, test, repair computers. It is not possible to use a computer laboratory to training the learning materials of presentation at Óbuda University, but I could use a computer room with used computers to show the parts of computers for the students at King Sigismund College and they could learn to build own computer from these component (Fig. 1.). The students in this College were more motivated to take part on presentation too.



Fig. 1: Computer laboratory at King Sigismund College

I tried to use the practical way in a laboratory to make the learning of Computer Architecture easier for the students, because I have seen that it is working by ladies too [1]. Some papers shows other ways [2] or simulation [3], but I find the learning over handmade building is profitable.

We could see in my earlier publication is not difference in computer science knowledge level between the freshmen students in Higher Education [4],[5],[6],[7]. It means if we find difference in knowledge level of this students we can say the using the computer laboratory in part of Computer Architecture lecture has influence on the paper results.

My starting hypothesis was that the group where we used the computer laboratory to build, test, repair computers would achieve better results in the papers of theoretical learning material of Computer Architecture.

2. Analyzing the paper results

2.1. The Number of Participants in the Two Groups and the Values of Mean and Std. Deviation

I analysed the paper results of the students after the semester and made two groups. The students who used computer laboratory to build computers from components from week to week were in the first group (group A, the students from the King Sigismund College) while the students who could not get same experience in this topic at the University were in the second group (group B, the students from the Óbuda University).

According to the table (Table 1.) the mean of the results of papers of group A is higher. It means this group wrote the papers with a better result. It does not give enough information to say using of computer laboratory results in better written tests because this can happen acci-

dentally, too. So, we needed more analyzing to keep the chance of accident low.

Table 1: Group statistics of paper results

Group	N. of students	Mean	StDev
A	110	2,43	0,93
B	320	1,61	0,76

Table 2: Pass the test and the exam

Group	N. of students	Pass the test	Pass the exam
A	110	67,9%	96,5%
B	320	45,9%	76,9%

If we spend more time to look at this table, we can see the students who had the opportunity to use computer laboratory to take in hand the components could pass the test (~68%) and the exam (~96%) in higher percent, but we still do not know if it is an accident or not (Table 2.).

2.2. Independent Samples test of Papers

The null hypothesis was that the results of the paper written by the two groups of students would not differ significantly. Since we have two independent samples, we can use the T-test to tell if the means of the paper of these groups differ or not. An analysis of the results of the students showed, the variance of two groups are different, because the value of Levene's test is significant $F=4,24$; $\text{sig.}=0,04$; ($p<0,05$) [8].

In this case the means could be compared with Welch's d-test, which showed up a difference between the means [9], because the value of Welch's d-test is significant $d=-8,30$; $\text{sig.}=0,00$; ($p<0,05$). It means the use of the computer laboratory to build, test and repair computers from components had influence on the results of papers of the students.

2.3. Measures of Association by the Paper Results

We could detect significant differences

between the means of the papers by students from different groups. It means we can reveal the influence of the training in computer laboratory on the calculated means with the calculation of the Eta-squared (η^2). The calculated value in percentage shows how much grouping influences the difference between means and the square root from the Eta-squared (η) shows the measures of association, i.e. how strong the connection between grouping and the achieved result is [10]. The higher the value is, the stronger the connection is. In the next table we can see the calculated values and the strength of the connection (Table 3.)

Table 3: Group statistics of paper results

η^2	η	Strength of the association
16,5%	0,41	middle weak connection

According to the table (Table 2.) the calculated value of Eta-squared shows the effect of the using of computer laboratory on the result of the papers is percentable. The value of Eta-squared is 16,5%, this means a middle weak correlation exists between the using computer laboratory and the results of the papers written by the students from the King Sigismund College.

This means these students have learned to take advantage of using the computer laboratory with connection in Computer Architecture lessons.

3. Conclusion

After the analysing process we can say my starting hypothesis is correct; students get better paper results by using a computer laboratory to build, test computer elements as learning the theoretical material without practical knowledge. The students from King Sigismund College could take advantage of the laboratory before the test and the students could get

a ~one mark better paper. The second advantage is the students who had the opportunity to use computer laboratory to take in hand the components could pass the test (~68%) and the exam (~96%) in higher percent. We can say the learning of the Computer Architecture subject is easier and effective for the students if they can see the computer elements and build, test a working machine out of them. This practice has influence on the paper results and successful exams from the theoretical knowledge.

4. References

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