EDUCATIONAL POLICIES AND INITIATIVES FOR IMPROVED PERFORMANCE

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Abstract:
According to Gartner estimates, due to increased variety, speed and data volume, by 2015 there will be a global demand of 4.4 million professionals for real-time analysis of data from sources with different structures, but only one third of the demand will be met.

The purpose of this research is to identify possible solutions for improved academic results in the IT domain, considering the time management policies, the content and the student motivations, as well as the business strategy tendencies. These proposals are targeted toward meeting the IT specialists demand.

The research is composed of two parts: the first explores the Romanian IT labour market characteristics, while the second investigates the academic education policies that can help mitigate deficiencies and attain higher performance.

The deficiencies are identified through a series of statistical research and analysis based on national level databases, adopting a quantitative approach. The policies proposed are supported by a flow model developed considering the students' activity, motivation, traits and results, measured and analysed quantitatively.

Keywords: labour market, business strategy, business intelligence, academic performance management

JEL Codes: P36, M15, L84

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1. Introduction

This research aims to identify possible solutions in increasing academic results in the IT domain, training future professionals in this area to meet demand for IT specialists, having regard of three main aspects: Time management policies, content and student motivation, business strategy tendencies.

There are studies that indicate a growing worldwide demand for professionals for real-time analysis of data from sources with different structures, reaching in 2015 to 4.4 million a need for such specialists, demand which would be met to the extent of one-third. (Gartner 2012) [11].

We will explore in the first part of the paper the Romanian IT labor market characteristics, following that in the second part to perform an analysis for the academic educational policies which can alleviate the shortcomings and achieve high performance.

In the vast majority of literature, the labour markets are different one from another, not only in outcomes, in the sense of rewards in the form of the wages, conditions and careers, but also in the way in which they are structured and reproduced.

In our study we consider important in the analysis of the labour market in Romania the concepts of flexibility, Europeanization and industrialization. In the European countries it is considered that flexibility, as well as globalization and technological and organizational change, are major drives of accelerated change in the economic environment.

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According to the "Key figures on Europe 2013 digest of the online Eurostat yearbook", with the aim of stimulating economic recovery, the European Commission set up the Europe 2020 strategy for smart, sustainable and inclusive growth. Two of its flagship initiatives concern labour market issues, namely "An agenda for new skills and jobs" and "Youth on the move". These promote a range of actions aimed at education and training institutions, measures for the creation of a (work) environment conductive to higher activity rates and higher labour productivity, and initiatives aimed at facilitating the entry of young people into the labour market. These two initiatives lead to the idea that flexibility in the labour market is thought to drive potential growth at the macro-economic level of each country [2].

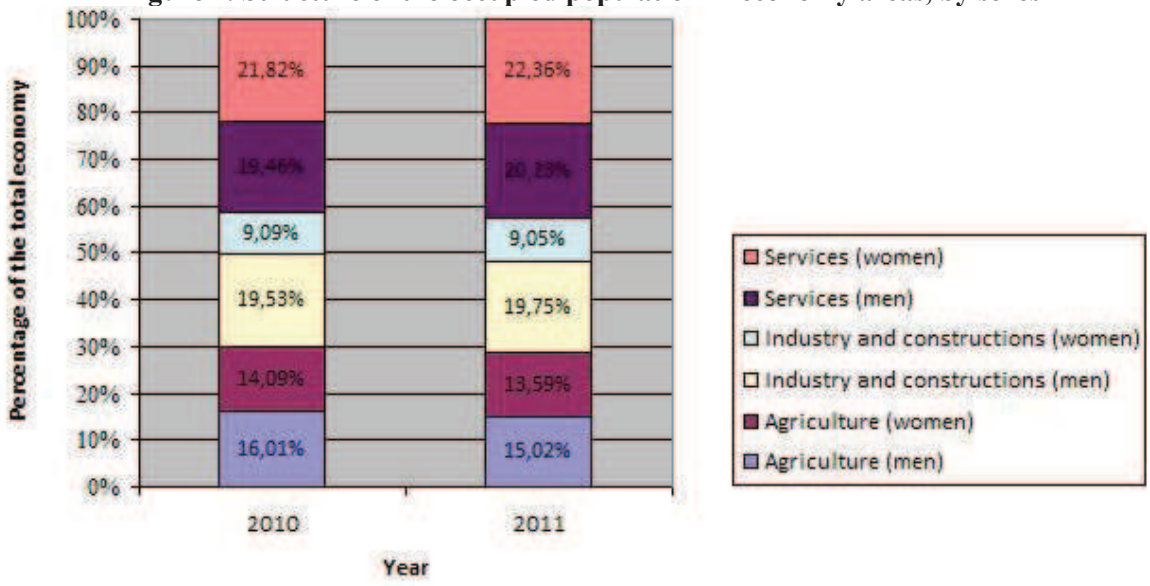
Following the same principle, in the past 20 years the World Bank and other partners of this institution have supported developing and transition countries in building viable educational and research institutions that can help to effectively transform these countries' stagnant economies into more dynamic and forward-looking economies.

The Business Intelligence labour market is part of the larger compound of IT labour market increasing at a fast pace since 2007 [6]. The technology is advancing fast, the main tendencies are Natural Analytics, ease of use and concurrency, visual data discovery, mobile and collaborative BI, social media information modelling, and cloud computing and big data [7]. At the same time, the demand for specialists is addressed only by IT and training companies, and less, or with consistent delay, by the universities. Also, many students choose to specialize in software development, while databases and decision support systems are not considered for future careers. Considering this aspect, observed in more generations of students, it was conducted an experiment regarding the learning process and academic performance. We considered the difference between supply and demand is a bottleneck that calls for investigation.

2. Exploratory Research on the Romanian IT Labour Market

In order to reveal the flexibility of the Romanian labor market, we have analyzed the structure of the occupied population on economic areas, by sexes for 2010 and 2011.

Figure 1. Structure of the occupied population in economy areas, by sexes

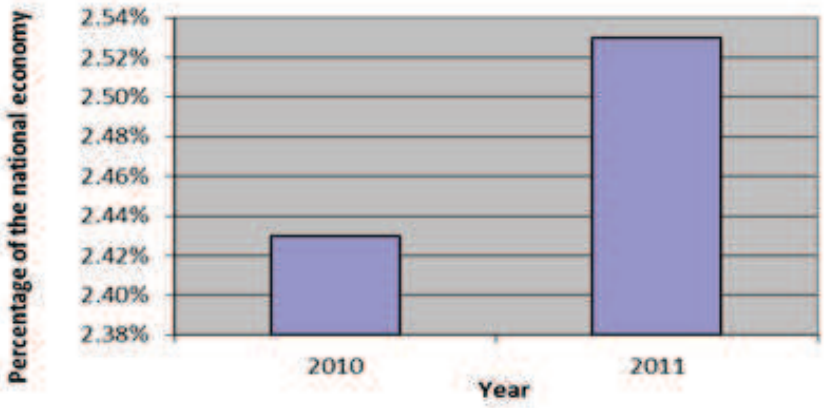


Source of processing data: Romanian National Institute of Statistics (INSSE), 2013

The data above, showing an increase of the occupied population in services and, in the same time, a decrease in the agriculture area, indicates the degree of the adaptability and flexibility of the labor market. (Figure 1)

Also, we analyzed the statistics regarding the medium number of employed persons in IT&C in 2010 and 2011 (Figure 2). As it can be seen, the IT and communications sector is presenting for this period an increasing percentage from 2.42 in 2010 to 2.53 in 2011, from the 100% of the medium number of employed population in Romania.

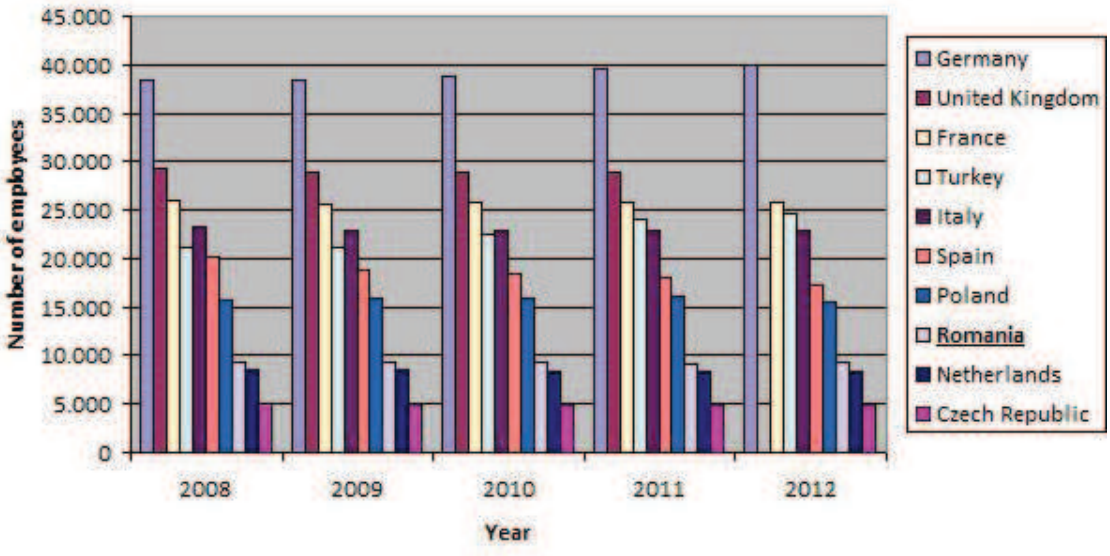
Figure 2. Variation of the average number of employees in the area of IT&C in 2010-2011, as percentage of the national economy



Source of processing data: Romanian National Institute of Statistics, 2013

Looking at the below statistics reported by Eurostat related to the persons employed in technology and knowledge intensive sectors in the EU-28 we must note that Romania is placed in top ten countries by number of employees yet with a relatively small number comparing to the first five countries. (Figure 3)

Figure 3: Top 10 countries in the EU by the number of employees in technology and knowledge-intensive sectors, 2008 – 2012



Source of the processing data: http://epp.eurostat.ec.europa.eu/portal/page/portal/science_technology_innovation/introduction

In 2012, the share of scientists and engineers among those employed in science and technology occupations (HRSTO) was 22% in the EU-28 as a whole. Ireland (31.6%) and Romania (29.3%) topped the list, well ahead of the other Member States.

In absolute numbers, the largest group of scientists and engineers was found in Germany with approximately 3 million, followed by the United Kingdom, France, Spain, Poland and Italy. These Member States together employed 71.0% of all the scientists and engineers in the European Union.

Within the professionals group, Ireland (47.5%), Finland (45.2%) and Germany (44.6%) had the highest shares of scientists and engineers. However, many other countries also recorded shares of 40% or more, including Sweden, the United Kingdom, Switzerland, Romania**,** France and Spain.

According to latest estimates in the IT&C market, in Romania the unemployment rate in of IT graduates is near 0%, programmers having the highest demand.

Although the industry was shacked in 2008 by the crisis, the market registered an increase from 2012, and in 2013 this industry was the top sector in reporting positive commercial balance. In 2013 it was reported a 20% growth of commercial balance comparative to 2012.

In 2012, a study of the Institute of Computer Technology (ICI) from Romania, mentioned that the increasing of the IT&C sector is related to the substantial increases in hardware and software sectors that exceeded the repeated decreases from telecommunications. Although demand for IT professionals intensifies, does not reach pre-crisis levels and the labor market remains controlled mainly by employers [4].

Among the companies that have significantly increased the number of employees in Romania recently are Oracle, IBM, HP, GeBOC, Ubisoft, Endava, Gameloft, MGI Metro IT, iQuest, E.ON IT, Fortech, Computaris, Misys, Pentalog and Siveco.

In the area of software and services, gross annual average salary was 11,910 euros in 2011, up with 10% from a year earlier and more than 20% compared to 2008. A sub-analysis shows that the average is substantially higher in software development and publishing of software. Annual average gross wage in the hardware last year was about 6330 euros, up 5% from 2010 and up 12% from 2008. On the other hand, average gross annual salary in communications was 11,304 euros in 2011, up 2% compared to 2010 and more than 5% compared to 2008.

Considering the information mentioned above, we must refer also to the figures available in the draft of the National Strategy on Digital Agenda for Romania, issued by the Ministry for Information Society; according to this document, *"a full implementation of the strategic vision for the IT & C in Romania that will meet the objectives set for Romania will require a total investment of over 3.9 billion euros. Direct and indirect impact on the economy, calculated in accordance with good practice in other European countries have made similar investments, can be translated into a 13% GDP growth, increasing employment by 11%, and reduce management costs by 12% between 2014-2020*" [5].

Also according to the document, in the IT & C sector in Romania will work 250,000 employees in 2020 comparative to 128,000 in 2011*: "If in recent years the IT&C sector recorded a slower growth in the development and employment, this is due to the average growth rate of employment of labor in the IT&C sector in Romania (7% per year) before economic crisis and projected as a future investment target for 2014 – 2020*" [5].

The above mentioned factors and Gartner estimates lead us to the premise that academic education policies can and must help attain higher performance in IT&C sector in order to deliver as tangible target the strategic objectives mentioned in National Strategy on Digital Agenda for Romania in the period of 2014-2020.

3. Educational Policies – Concepts and Social Impact

The educational policy can be equated with plans and educational programs (policies), designed and implemented at sectorial level or globally, including the policies at the university, the school, the class level (Cretu, C. et al. apud Dye, 1975, Jones, 1977) [9].

In this matter the national legislation regarding educational policies is still respecting the definition of Girod for the educational policy, being a "coherent set of decisions and the means by which the power (and especially government power) ensure data compatibility, for a period, between options, fundamental educational and social constraints characteristic to the field in which they are applied" (Cretu, C. et al. apud Girod R., 1981 by Landsheere, V. & Landsheere, G., 1992, p. 23) [9].

In Romania, for the period 2007-2011 was reported a pronounced downward trend in the rate of enrollment in higher education compared with the period 2003-2007 as it is reveled below:

Table 1. Gross enrollment rate in higher education by location and gender (2003-2012)

	2003/ 2004	2004/ 2005	2005/ 2006	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	Change 2012/2013
Total	37,9	40,2	44,8	47,2	53,6	51,7	45	40,8	33	-4,9
Urban	-	-	-	-	68	62,8	56	53,9	43,8	-24,2
Rural	-	-	-	-	30,9	33,9	27,2	20,8	18,7	-12,2
Feminine	42,6	45,1	50,8	54,1	61,7	58,4	50,7	45,7	36	-6,6
Masculine	33,5	35,4	39	40,6	45,9	45,3	39,5	36,2	30,1	-3,4

Source: http://vechi.cnfis.ro/Raport%20CNFIS%202012%20-%20Starea%20finantarii%20invatamantului%20superior.pdf

The indicator revels significant diminish from 53.6 % in the school year 2007 to 33 % in the school year 2011-2012 [9]. Taking into consideration the trend reveled above (Table 1), the universities and other institutions with a role in this matter, as the Institute of Education Sciences, conducted studies on the risk factors negatively impacting the development of school dropout and limited enrollment, and for the individual issues were identified the following three factors:

- Low motivation for school activities;
- High absenteeism;
- Learning difficulties.

The issue regarding low motivations for school activities and learning difficulties are presented also by other studies as the report prepared in 2011 by the Romanian Agency for Quality Assurance in school education, related to the graduation rate of less than 30 % at baccalaureate, were one of the most important reasons for poor performance of students was insufficient motivation, inadequate attitude of students towards learning.

In this matter, in one of the studies performed by the National Authority for Qualifications, in partnership with National Commission for Professional Qualifications (CNCP (France), Polytechnic University of Bucharest and one of the four universities from Romania ranked in QS World University Rankings 2012, University of Bucharest, from the EU funded project "Developing an operational qualification from higher education in Romania – DOCIS") was presented as a conclusion that in order to increase the level of participation in the academic studies, it is necessary to analyze the perception of direct and indirect beneficiaries of university education on how the studies will meet their expectations.

The study also presented that, for the employers and graduates, higher education system fails to provide graduates the theoretical knowledge, and that only 33% of the practical skills through the curriculum followed. The graduates and the employers consider that practical skills are important to find the first job.

This hypothesis seems to be well presented in the Europe 2020 Romania Report where it is considered that in Romania the matching of education with employment is an important issue. The report is highlighting the skills for technological innovation and the absorption of the new technologies as important skills that the employers in Romania are looking for.

So, the education system must be improved with targeting techniques, during the time of the studies to obtain the product (the graduates) that the industries need, according to Valeriu Nistor, General Manager of a large company, IBM Romania.

4. Research Methodology

The objective of this research is to help fill the gap between supply and demand on the IT labor market, especially in the databases and decision support systems areas and increase the graduation rates and academic results. In the academic curriculum, the decision support systems area is based on advanced database systems subject, and in the advanced level course it includes the topic of business intelligence. For this experiment, the Advances Database Systems (ADS) discipline was chosen as it was noticed that students were not motivated to study it.

The approach was to conduct a quantitative research, the chosen method was a two-step experiment, consisting of a combination with psychological semi-structured interview and counseling according to the results, and an academic performance evaluation conducted at the end of the semester.

In order to calculate correlations it was used the following formula:

$$Correl(X,Y) = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2 \sum (y-\bar{y})^2}} \quad (1)$$

Following a discussion with the students, the conclusion was that they have a very low motivation because they think that the discipline will not be necessary, and in addition, it is difficult to adapt their studying style in order to better manage the materials. Most of them just want to promote this discipline, but are interested in solutions that would help them learn more easily and quickly, and get better results.

Increased self-awareness allows individuals to analyze their habits from the learning perspective, and facilitates the selection and application of various learning styles and strategies. Pupils, students and adults will become more motivated to learn if they find out more about their own strengths and weaknesses as learners [8].

The research question is: Considering the theoretical framework that many pupils/students/adults are not aware of their own learning style and do not adapt their learning activities according to their strengths and weaknesses, when teaching method is standard, can motivational counseling and setting the context of a professional activity impact students' results and approach of the discipline?

The experiment includes two groups of students, each consisting of 26 students with very similar results in the previous year.

As part of the experiment during the first laboratory one of groups (805) of students was given a test, in order to find out their learning style, and was counseled on their learning style, addressing specific aspects of the activities and assessments that will be encountered. During the semester, students organized their study activities according to their own learning style and counselor recommendations. Teaching was standard for both groups.

The hypothesis is those students' motivation increases, and as a result, each laboratory they solved assessments faster, performed better and, consequently, improved their self-esteem, neural plasticity and the activities were much more enjoyable and required less effort.

The limitations of this experiment results from the fact that the students are all enrolled at the same faculty and series, gender was not taken into account and only one study discipline was considered.

5. Experimental Results

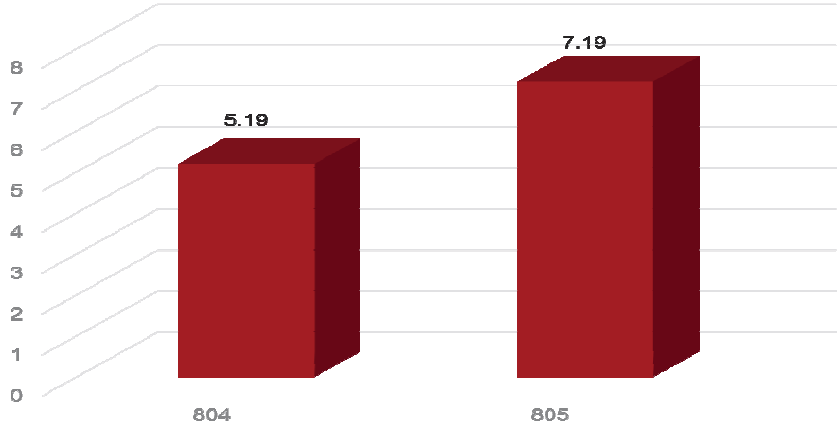
At the end of the semester, the academic results of the two groups were analyzed:

a) Control group (804) who studied as usually, without incentives, counseling or testing learning style;

b) Exercise group (805), which during the first laboratory took the learning style questionnaire (http://www.ldpride.net/learning-style-test.html) and received counseling.

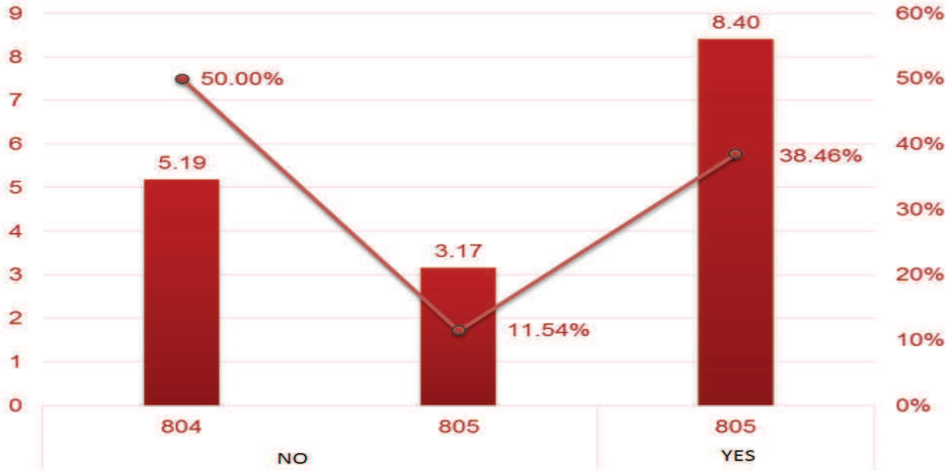
As represented in the chart below, following the experiment, the exercise group had results with 38.54% higher than the control group. The latter kept the objective of promoting the discipline and its average grade is 5.19, while the exercise group adopted the most suitable learning methods and obtained average results of 7.19 (Chart 1).

Chart 1. The Average of Final Grades by Group in Ads



At the same time, there is a significant difference between the group of students 805 who attended the first lab and those who did not attend. Thus, out of 26 students in the exercise group, six students (11.54% of all students in the experiment), who did not attend the first laboratory, and hence the counselling session, had an average result of 3.17 and most failed to promote this discipline. If we exclude them from the calculation, the average result of the exercise group is 8.40, which is a very good result at this discipline. According to this split, the exercise group represents 38.4% of the students in the experiment and it achieved a score 4.22 points higher, and in percentage terms, 100.96% higher than the control group (Chart 2).

Chart 2. Limitations – The Average Grades by Group, differentiated by the participation in the Counseling Session

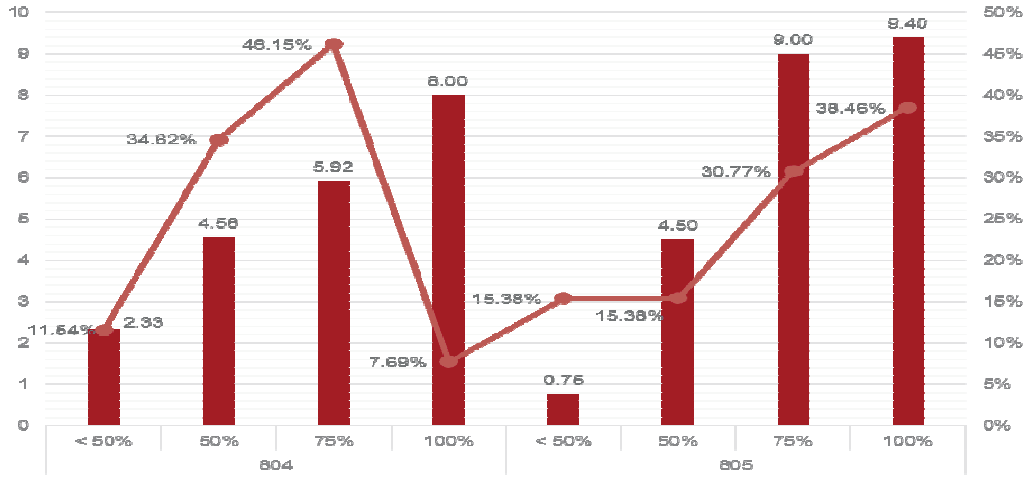


However, there are several main factors that can impact student achievement, such as the attendance at laboratory activities, the profile of previous studies, the availability of studying, etc. Of these, it was observed that the most important factor is attendance, as it is an applied discipline and demonstrations and instructions greatly facilitate understanding and assimilation of information and developing a specific way of thinking.

Between the final results and the participation in the counselling session there is a positive correlation of 0.754182239. This figure shows a direct, substantial, strong enough relation between the results improvement of the exercise group compared to the control group, and the participation in the counselling session.

The chart below shows the average results at Advanced Database Systems of the students in the two groups, correlated to the presence at the laboratories. Columns indicate average results; the line indicates the percentage of students in each group present in different proportions in laboratory activities.

Chart 3. Attendance versus Average Grades, by Group



Again, the percentage of participation in the laboratory activities and the academic results emphasize the interest of students in the control group to promote discipline with minimum grades. The motivation to get better results was shown only by 2 students, representing 7.69% of the group 804, who got marks above 6. The number of students with the highest marks in group 805 is 61.54% higher than in group 804, and the average results of those with 100% attendance is 9.40, while the maximum grade is 10.

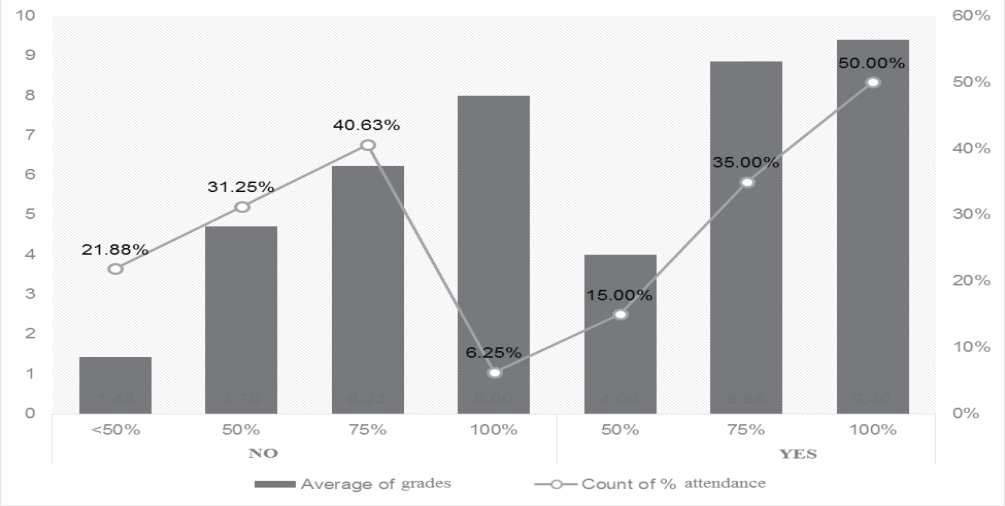
In contrast, those who did not attend even 50% of laboratory activities did not promote the discipline. Only one student from group 805, who attended the testing and counselling session, has not passed. The number of students who failed to pass is 60% (5:8) higher in the control group.

The chart above shows the correlation between average grades and attendance at laboratory activities of students who participated at the testing and counselling session (YES) and of those who did not participate (NO), with no regard to the group they are part of (Chart 4).

If no account is taken of the group to which they belong, only of the participation in the testing and counselling session, then the differences in performance are highlighted more clearly. Only one student that has participated in the testing and counselling session did not pass the discipline, and this is due to very low attendance during the semester.

As seen in the previous chart (Chart 3), the distribution shows that students who have not attended the counselling and testing sessions only intended to promote the discipline, and the majority have grades of 5 or 6, while most students in the exercise group had grades of 8 or 9.

Chart 4. Correlation between Attendance and Average Grades, by participation in the Counseling Session

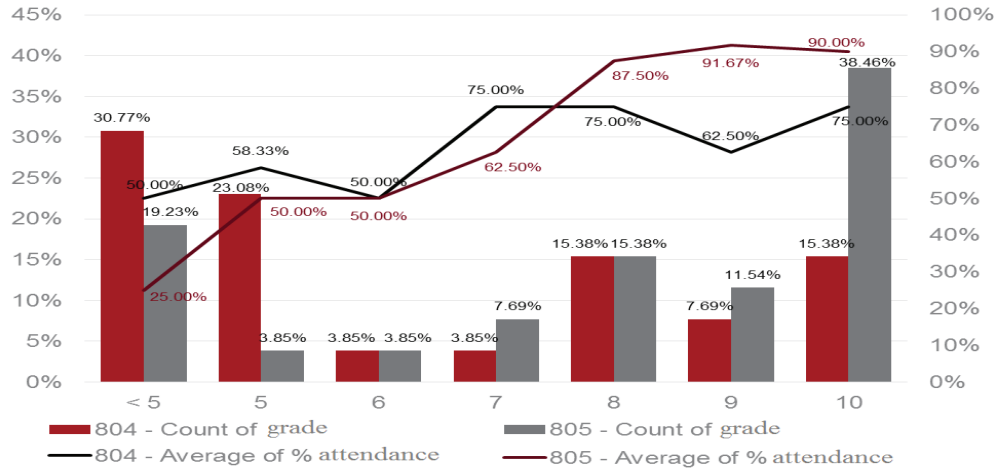


The effect of knowing the individual learning style is observed when students have a good attendance in laboratory activities. Hence, attendance conditioned the success of learning methods, but it does not stimulate intrinsic motivation.

The chart below illustrates the relationship between the percentage of students who had different levels of grades and attendance at activities, depending on the group they belong to, from where it can be observed that there is a poor correlation between attendance and academic achievement in this discipline.

However, in order to have the best results, to have at least 75% attendance in laboratory, in order to get grades above 7, it is necessary to attend a minimum of 62.5% of labs, and to promote it is necessary to attend at least half of the laboratories (Chart 5).

Chart 5. Correlation between Average Grades and Attendance, by Group



The correlation between final grades and attendance in labs is 0.64100688. This represents a moderate positive correlation between the variables analysed. The main reason for which the result does not indicate a stronger connection is that some of the students, although they participated in several laboratory activities, had not completed their assessments and had no activity during the laboratories in order to be assessed and promote the discipline.

The correlation between attendance and participation in the testing and counselling session is 0.50917264. This positive value indicates a moderate relationship between the two variables and shows that the methods adapted to the individual learning style helped and motivated the students to achieve better results, but did not determine them to participate in more laboratory activities.

6. Conclusions

According to latest estimates in the IT&C market, in Romania the unemployment rate in of IT graduates is near 0%, programmers having the highest demand.

In the last years, in Romania, the total number of professionals employed, scientists and engineers employed in science and technology, remained high and kept Romania at the top of the EU-28 list as a whole, which signals a shortage in supply on the market.

Studies on the risk factors negatively impacting the development of school dropout and limited enrolment, and for the individual issues were finalized with identifying the following determinants factors: low motivation for school activities, high absenteeism and learning difficulties.

In order to increase the level of participation in the academic studies, it is necessary to analyse the perception of direct and indirect beneficiaries of university education on how the studies will meet their expectations.

As a result of the experiment conducted it was found that the mere awareness of their own learning style model, strengths and weaknesses increased the academic results of the group. At the end of the experiment the difference between the mean of the control group and the exercise group at Advances Database Systems discipline was of 2 points, the percentage increase being 38.54%.

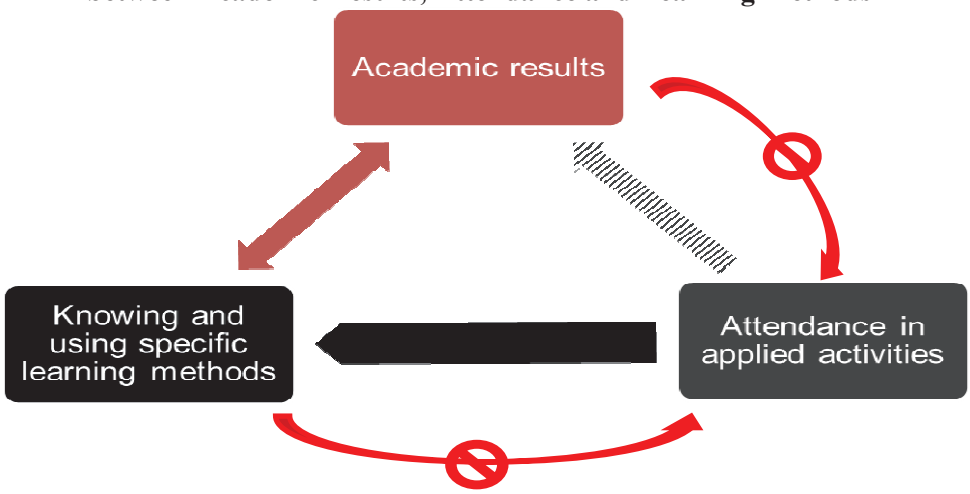
In order to get the best results, it is necessary to attend at least 75% of laboratory activities, in order to get grades above 7, it is necessary to attend a minimum of 62.5% of labs, and to promote it is necessary to attend at least half of the laboratories.

Participation in laboratory activities conditions the success of learning methods, but it does not stimulate intrinsic motivation.

The correlation between attendance and participation in the testing and counselling session shows that the methods adapted to individual learning style helped and motivated the students to achieve better results, but did not determine them to participate in more laboratory activities.

Based on the results of the experiment the following model (Chart 6) can be developed for determining relations between academic achievements, attendance in applied activities, and knowing and using methods specific the individual learning style.

Chart 6. Model regarding the Determination Relations between Academic Results, Attendance and Learning Methods



Increased self-awareness allows individuals who learn to analyse themselves in terms of learning habits and facilitate the selection and application of various learning styles and strategies. Pupils, students and adults who study will be better motivated in the learning process if they learn more about their own strengths and weaknesses.

Factors that are recommended to be considered, in order to eliminate the bottleneck in the IT labour market and increase the quality of graduates and promotion rate, refer to several aspects:

a. Increasing awareness of own learning style methods, strengths and weaknesses, for higher academic results, through personal development counselling available in the university.
b. A minimum attendance rate should be mandatory in order to ensure students are promoting the IT or applicative discipline, and higher rates of attendance should be rewarded.
c. Introducing motivational incentives and connections with real professional activities through the tasks and activities in the laboratory.
d. Promoting team work, collaboration and building connections between students through the activities in the laboratory. If a student skipped a class, he/she should be determined by colleagues to catch up and continue his/her part of the task.
e. Using different combined teaching methods that address all learning styles of the students in a group, and resources specific to each learning style, available to all students.

According to Microsoft, IT became a utility of core importance in every company. In this respect, the research shows it is of vital priority that the educational system adapts to the market demand, in the most suitable manner.

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