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A challenge to improuve the interest of students for mathematics education

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Abstract. This paper presents the results and the conclusions that we have drawn from the analysis made following two surveys conducted with the first years' students from the Faculty of Navigation and Naval Management from "Mircea cel Batran" Naval Academy in the second semester of the academic year 2017-2018. The aim was to find out, in the students' understanding, which is the importance of Linear Algebra, Analytical Geometry and Differential Geometry in the educational process. Both surveys sought to emerge from the tradition of teaching classical mathematics, structured on programs that have not undergone much change over time, which was based on exacerbated formalism, abstracting and disregard for the exceptional advances of science and technology from the last decades.
Keywords: Mathematics education, Algorithm, Graph Theory, Critical Path Method

1. Introduction

Nowadays, society has new expectations about skills training and the obtaining of more advances skills at the graduates of higher education institutions.

On the one hand, it is want those to have a good knowledge and the deepening of the fundamental notions such that to be able to make the transition from the abstract to the practical problems by applying as accurately and efficiently the theory as possible. On the other hand, it is desirable to get from them, the best results in their evolution as a follow of their involvement in projects that model and interpret data and information from the real life through the mathematical tools already acquired.

This paper is structured on three sections. First section is in relation with the importance of mathematics in the formation of future professionals in technical fields. The second section contains observations made on the results of two surveys among the students. The last section presents how could be use an algorithm, more precise, “The Critical Path method”[1] through it is wants to point out how the mathematics is useful again!

2. Mathematics the necessary connection to evolution

It is true that real life without mathematics is hard to conceive, allowing to everybody to enter in the realm of technical sciences every time.

Studies show that human being has strongly felt the need to deepen the fundamental elements of mathematics without which the evolution of technical sciences would not have taken place.

Starting from these ideas and knowing that at this point, more than ever, it is required the awareness of the necessity of using mathematics in the field of exact sciences, making an analysis of the state of the educational system, in general, it is observed that it can be said that it is in decline. This decline can be seen as a result of the inadequacy of education and training methods, but also because

of excessive access to information, from anywhere and everywhere, information that is not subject to prior filtering and is often taken over as come and not always reflect reality.

Therefore, I think the problem is that we, the teachers, have to try to completely change the way the information is transmitted during the classes.

If we will analyze, discuss and organize carefully what we want them to understand and if they will find that what they have learned in math classes has great applicability in the technical disciplines and all of those will create them opportunities for both professional and emotional development, because human evolution implies a connection between them, we can say that we have achieved much of the goals of forming future professionals.

A real collaboration with generations of future graduates which will have to produce an evolution of the global society in which we live must be a desideratum and not at all to remain at the stage of desire. In the same context, the teacher (the trainer) needs to realize as much as possible, that he is not the sole owner of knowledge and information, as it was in the pre-internet era. His role at this time is much changed, he must accept and adapt on the go from the new conditions of evolution of the sciences in general.

From such a position, I have tried to answer at some of the questions that I put myself over time about the place and role that I can have play in shaping future professionals in shipping domain. As everything is in a continuous movement and transformation, other standards and other methods of communication are required. Even though mathematics in its essence is the same, however, the type of mathematics used depends on the technical and cultural requirements of the time...and more than that depends on the amount and quality of knowledge that our future students have when they come into higher education.

Image 1 [2]

Image 2 [3]

All these ideas made me use at a certain moment the mathematics, this profound synthesis of the whole human wisdom, and try to change something in the teaching activity, which is why I started the knowledge activities of the problems faced by students and I will try to present them below.

3. Some of the students' opinions obtained from surveys

First survey was conducted in the sixth week of study knowing that we have fourteen weeks of study for this discipline. When I decided to conceive the first set of questions, I thought the questionnaire has to have up of three parts: one of which would show up if the students were accustomed to the name of the discipline and its component parts, the second part related to the level of difficulty of the discipline and the stage of students preparation and the third part is that the one could reflect the level of students' satisfaction in relation with the efficiency of the student-teacher collaboration, but also about the link between the number of classes hours of assimilation of notions and the amount of information transmitted.

Sixty-seven students who wanted to collaborate responded to this survey, convinced that this could lead to the formation of good maritime transport practitioners.

I consider it is relevant that to the question of the first part, related to the structure of the discipline, were obtained fifty-four answered correctly.

From the group of questions related to the second part, it was also the one that highlighted the satisfaction of the students about their stage of preparation at that time and fifteen of them were satisfied while two of them had no opinion.

Corresponding to the third part, fifty-three of the respondents answered that the results obtained are a function of their own effort; thirty-eight considered the teaching-student collaboration to be good and twenty-eight of them considered that the number of hour's seminar sessions is insufficient.

Three questions were formulated in both surveys. Thus, from the first question we found out which was the difficulty level at the first test and the results are represented in the first diagram. Another question presented in both surveys was the one that helped us to find out if the students are satisfied with the results obtained in the first test and the answers will be found the second diagram. The third question was about the teacher-student collaboration that was established in the educational process, and the answers will be represented in the last diagram.

All these diagrams being immediately represented:

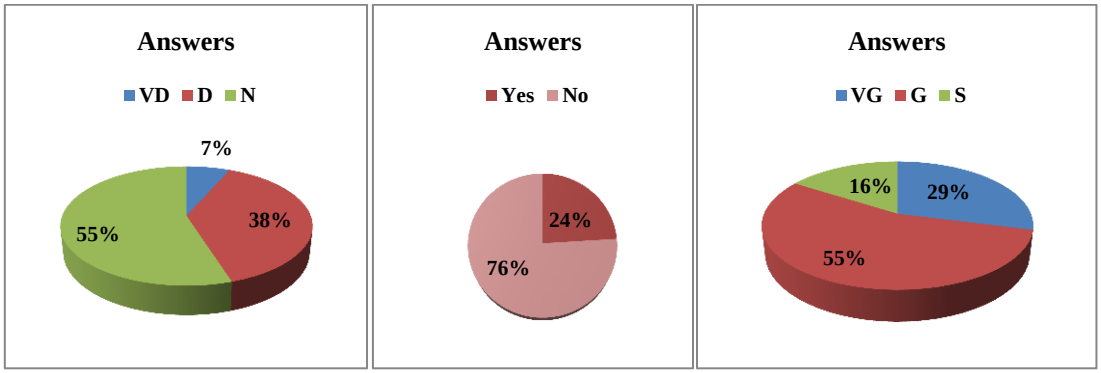


Diagram 1 Diagram 2 Diagram 3

The results obtained made me think that could be better to continue with a second survey because I considered that students from the first year of study still have no clear opinions and that they have not yet formed proper study skills.

As we approached the exam session, I considered it was appropriate that the second survey could be conducted in the twelfth week of the study, when much of the discipline material had passed, and the periodic testing to establish the grade along the way had been carried out, and I've been thinking about structuring the new survey on five parts. I consider it necessary to say that at that time a number of fifty-nine students wanted to attend this survey.

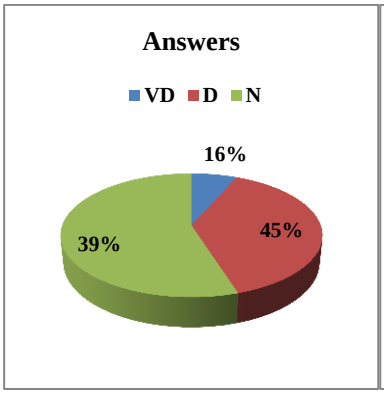
The first part of the second survey was aimed to highlight the students' view of the need to study mathematical subjects in previous years of study and forty-two students considered it absolutely necessary to study mathematics in pre-university education.

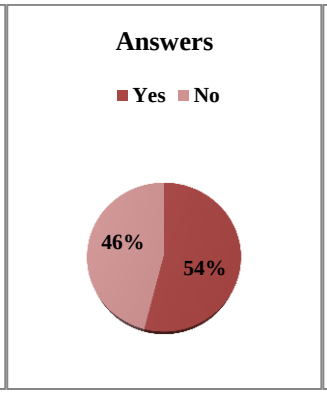
Another part of the survey wanted to find the percentage of students who consider that active attendance at the courses and seminars has provided the good way to be prepared to support math exams. Thus, of those questioned, thirty-five responded that class hours are very necessary, while twenty-four considered that seminar hours were more necessary.

The third part of the survey contained questions about the level of difficulty of the discipline material of study, with which students faced both of the level of understanding and those of training. Four of them said the Linear Algebra was more difficult, while sixteen said that Analytical Geometry would have been more difficult, and thirty-four said that Differential Geometry was the most difficult.

In the fourth part of the survey, questions were devised so that it is possible to determine the students' satisfaction with the didactic material provided. Thus, fifty-six students declared that they are

content with the materials available, while only three of them declared that the materials are too difficult. The last part of the survey attempted to highlight the collaboration between the teaching staff and the student in the didactic process of preparing the students for their support of the examination corresponding to the discipline. As it was presented before, the results, from the three questions that are found as well in the second survey, are presented in the next diagrams:





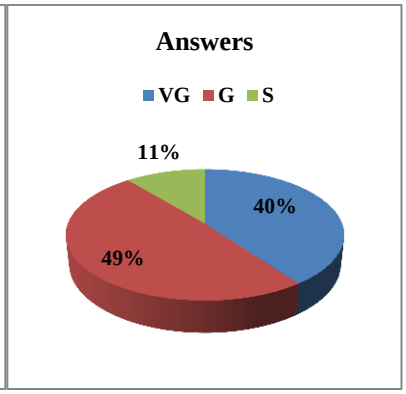


Diagram 4 Diagram 5 Diagram 6

This time, it is asked to mention that the questions are related to the last test on who the students sustained at the twelfth week of the study.

Following these two surveys a better collaboration has been achieved with the students, those have becoming more eager to present the problems they are facing during the years of study.

It is also important to specify that the purpose of these surveys was to lead us on the way to identifying and understanding the needs and boundaries with which students meet during their training as future professionals.

4. Another way to use Critical Path Method in educational process

It is known that "Critical Path Method (C.P.M.) is an absolutely necessary mathematical tool for management that has as its object the study and organization of complex planning, implementation and development programs. At the basis of the method is the principle of decomposing a complex program into component parts, called actions, activities or operations, to a level that allows their functional correlation, that is to say, to make it possible to establish the conditioning between the component parts. When establishing the list or network of x_i activities, the specialists involved in this operation must specify the activities that condition or necessarily precede the activity x_i. Therefore, a list of previous mandatory actions is made. Through these data, a graph G, called the associated graph or the program graph, is built.

The graph that is attached to a network of activities is a connected oriented graph without circuit with single vertex, x_1, of entry and a single vertex, x_n, of exit of the graph. This graph-program highlights the functional links between activities and is called a planning network. It is obvious that in a planning network there is at least one succession of activities from the entrance to the exit. Such a succession represents a path from the entrance to the exit, being characterized by a certain length.

In using the Critical Path Method, it is essential to note that the most "long" sequence of activities, from the entry in the graph to the output of this, represent the minimum possible duration of full program execution.

In fact, this succession of activities is called the critical path (the long-distance path). The arcs of this path represent critical operations, that is, those activities or actions which cannot be delayed without the completion of the entire work being affected.

Therefore, it is possible to analyze the program of some didactic activities for which it is intended to determine their duration. Following the analysis of the program, the specialists could establish the following table of operations (activities), the list of mandatory precedents activities and the duration of execution in months or weeks.

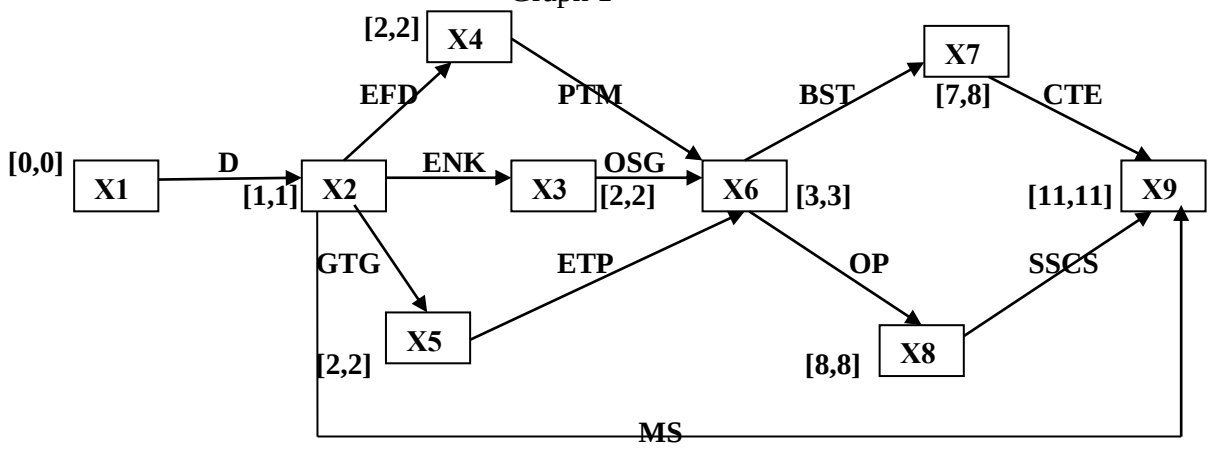
In the table below there are the activities considered, the previous mandatory activities and the time needed for the deployment of those.

No.	Name of the activity (Abridged Note)	Previous mandatory activities	Time required (in months)
1	Designing (D)	-	1
2	Elaboration of Discipline File (EFD)	D	1
3	Establishing necessary knowledge (ENK)	D	1
4	Choosing Target Groups (CTG)	D	1
5	Material Selection (MS)	D	6
6	Organization of student groups (OSG)	EFD; CTG;ENK	1
7	Presentation of Teaching Material (PTM)	EFD; CTG	1
8	Establishing test periods (ETP)	EFD; CTG	1
9	Basic Skills Training (BST)	OSG	4
10	Obtaining Performance (OP)	OSG	5
11	Continuous Testing and Evaluation (CTE)	OSG; BST	3
12	Scientific Session Communication Sessions (SSCS)	OP	3

Table 1

At this point, with these considered activities, using Bellman's algorithm, the t_i and t_i * numbers are determined, passing them in square brackets on the graph attached to the considered planning project. It is necessary to specify that t_i is the shortest time for realization of event x_i and t_i * is the longest time to achieve event x_i. According to the Critical Path Method, three critical path variants can be obtained, which could be one of the following paths: $\{x_1, x_2, x_3, x_6, x_8, x_9\}$, $\{x_1, x_2, x_4, x_6, x_8, x_9\}$ or $\{x_1, x_2, x_5, x_6, x_8, x_9\}$. The length of the critical path is eleven months, this time being the maximum necessary for a good development of the chosen didactic process.

Graph 1



5. Conclusions

The educational process is obviously one that requires a lot of effort on the part of the students, but to a great extent also on the part of the teachers/trainers. The choice and ordering of information requires great attention and the way information is transmitted requires adaptation to form a logical thinking ready to make the right decisions at all times.

Following the results, it can be observed that as the amount of new knowledge has increased, the number of students, who have specified this, increased.

Regarding the results of the test students, they are not satisfied with their own results and this is encouraging because they will be able to prepare for better results in the exams.

What is gratifying for the teacher is that the collaboration relationship in the educational process between teacher and student has seen a positive transformation as seen in the comparison of the last diagrams.

It is clear that as the educational process continued to take place, the time offered a respite, on the one hand, to the teacher and on the other to the students, to communicate, to practice and to cooperate, in this way the educational process could become more efficient.

Thinking about efficiency, this will be stronger, if and only if, in the following years of study, such tests will continue to transform the way to teach mathematics on the new conditions of global society evolution.

In the architecture of this philosophy that means to be a teacher/ trainer, it is necessary to start from the primary source, that is, from the mathematical experience.

Therefore, as a final conclusion, in order to do mathematics, to convey mathematical knowledge, also from mathematics must be started by choosing algorithms, relationships, equations, and sets so that combining them it could be achieve the progress.

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