EDULEARN 16

8TH INTERNATIONAL CONFERENCE ON EDUCATION AND NEW LEARNING TECHNOLOGIES

BARCELONA (SPAIN)
4TH - 6TH OF JULY, 2016

CONFERENCE PROCEEDINGS

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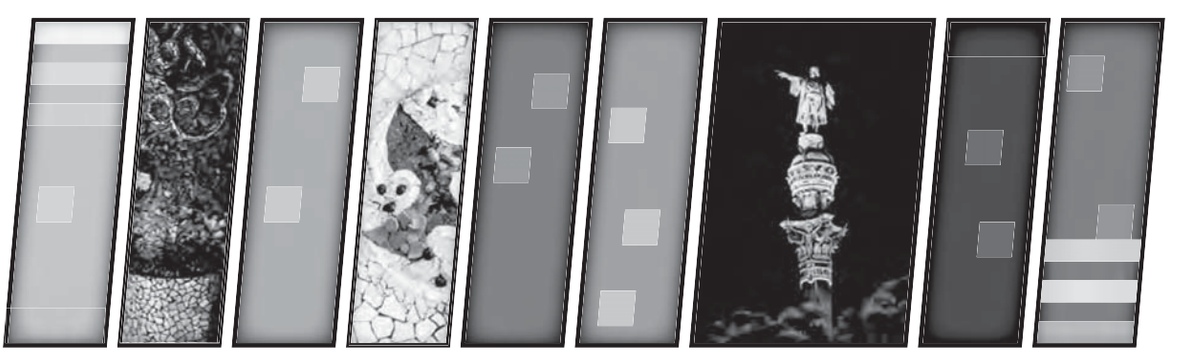

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HIGH PERFORMANCE OF UNIVERSITY STUDENTS: FOCUS ON LECTURES SCHEDULES

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Abstract

Currently the lectures are drawing following the society routines attending students, professors, transportation, sports activities timetables, etc. This organization is really a consequence of culture background, but in general has the handicap that it does not take into account the students' performance.

The students, as general society people, are classified according circadian typologies leading to a genetic origin: morning shows high performance at early hours of the day, noon, and evening, with 25%, 50 and 25 student´s percentages respectively; it is important to point out that several studies classify as potentially the most intelligent evening people.

The master lectures are planned from 8:30 am to 14:00 am and laboratory or practical lectures from 16:00 to 19:00 h, in particular for Spanish Engineering students. Literature has showed that "evening people" students attempted University due to this organization. Then, it is very clear that could be attempt the lectures hours attending the potential best performance of our University students distinguishing between the scenarios Bachelor, Master and PhD. It Last years have appeared another important variable, called worker student which must combine both activities, study and job. It has the disadvantage of using a lot of energy.

The purpose of this paper is to present and analyze some strategies to design as lectures and examinations schedules and hours distribution along the day in order to obtain maximum performance of University students.

Keywords: University students, Lecture Schedules, Student Performance, Chronobiology

1 INTRODUCTION

Currently the society has routines due of heritage rules, job timetable imposed by country establishment, etc., that leads to implanted fixed schedules from long time ago. There are several studies that propose some changes on these schedules to improve the socio- economic performance [1-3]. This paper considers the possibility that these schedules imposed on society affect negatively the intellectual development of university students, demotivating this development in some cases, or even driving the university dropout in some potential valid students.

Bachelor, College as University, priority is based is the adjustment of teaching workload within the working hours of the majority of society in schedules planning currently and only in rare cases they are designed to obtain the optimum performance of students. The authors of this study believe that, among others, one of the objectives of the universities to detect early enough the brightest or potentially more intelligent students, urging them for the arduous field of research, and also those with shortcomings, to help them overcome them.

The first step that has been taken in this study is to attempt demonstrate the influence of the schedules on ratings and skills, as on students which decide to examine such as to analyze the causes that make that some students decline attendance the examination since it is a very good signal of an early leaving of interest on the course. To do fix this purpose it has carried out a statistical study of the different subjects taught in morning and evening schedules developed by several teachers with high expertise in the field of teaching. One of the main conclusion is the higher performance of students, which are involved in University schedules during afternoon.

Secondly, it was performed an analysis of the experiences and personal impressions of teachers in different courses, regarding to the performance, attitude, student interaction, etc. with particular emphasis on working hours.

Thirdly, the attempt has been look for an explanation to find one or more possible justifications for the influence of the schedules on ratings, in the cases that would exist. To do this, the circadian rhythms of students were taken as a reference, considering information obtained in the literature. There is consensus and evidence that there are three types of people classified attending its maximum attendance and concentration level: morning people, noon people, and evening people, distributed approximately between 25%, 50 and 25% respectively. Each circadian typology is genetic (clock gene) [4, 5] and, in general, each one has features of different personality [6], the latter being the smartest potentially [7]. Each type has different performances during daylight hours [8, 9,10] and it should be noted, finally, that morning people are the most benefited of the schedules that arise both at the level of high school and University in comparison with evening people [11], with highest early dropped out and leave academic institutions.

In this work proposes a method to define different schedules, with the aim to favor equally to all types of students. It is noteworthy, that the application of this method would be equally suitable for the different level´s teaching to the university, because implanting it, a decrease of early drop out and leave in secondary education and the bachelor would obtain.

2 STEP 1. INFLUENCE OF SCHEDULE IN CALIFICATIONS: STATISTICS

The comparison study between students that attendance final examinations, (A, "*Presentados"*) and not attended (NA, "*No Presentados"*), has been done using a statistic analysis, pointing out the schedule of lectures: Morning Lectures, ML or Afternoon Lectures, AL. This data will provide the interest or handicap that finds students against the particular topic. The analyzed lectures are physics, civil engineering, mechanical engineering, construction technologies, structures, etc. and have different distribution between morning and afternoon working times. It is noticeable that could be distinguish between early morning shifts from 08:00 h to 10:30 h.

Figure 1 and Figure 2 show the obtained results for ML and AL student´s interest, respectively, it has been considered different types of lectures, applied to different student´s groups by undergoing same professor. ML and AL offer these percentages: A 62% and NA 38% against A 56% and NA 44%, respectively. This first data indicate a little higher interest of morning students for the lectures in comparison AL. The second observation is devoted to important differences between topic of lectures, independent their schedules. So, Structure's Technology, (*Tecnología de Estructuras I*), has a low participation, against Physics (*Física*) or Building Structure's (*Edificación*) wherein is close to 100%.

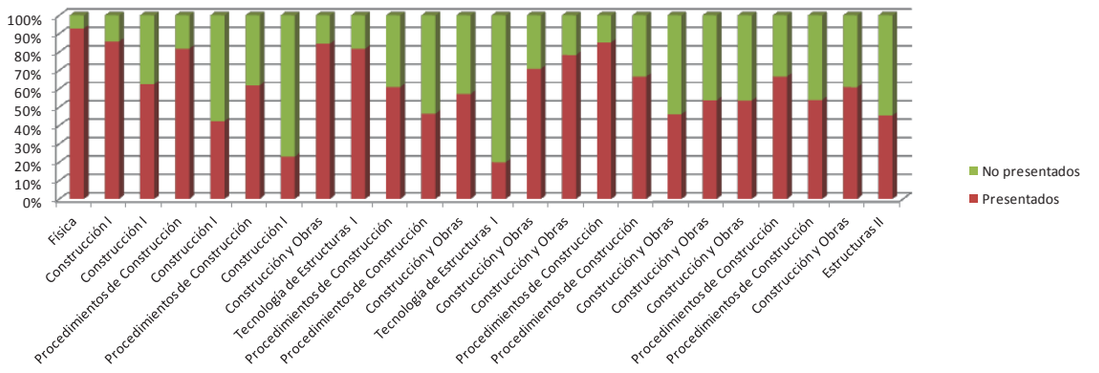

Figure 1: ML: student´s interest.

Figure 3 and Figure 4 show the ML and AL schedules of building and construction topic lectures, imparted to different student´s groups by same professor. The results are according to previous observation: attendance exams student´s number is higher in morning schedule related to afternoon one, and non-attendance examination student's number is lower in ML in comparison to AL, A 63% and NA 37% for ML against A 49% and NA 51% for AL.

Figure 4 remarks on group type effect wherein have been detected different rankings: ML with A 71% and NA 29% and AL with A 79% and NA 21%. It is clear evidence higher interest in this particular student´s analyzed group for AL. The results balance a little bit if the study pays attention to different students groups.

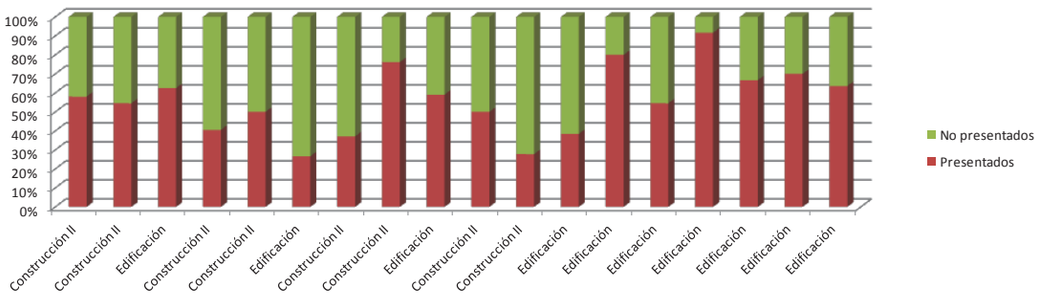

Figure 2: AL: student´s interest.

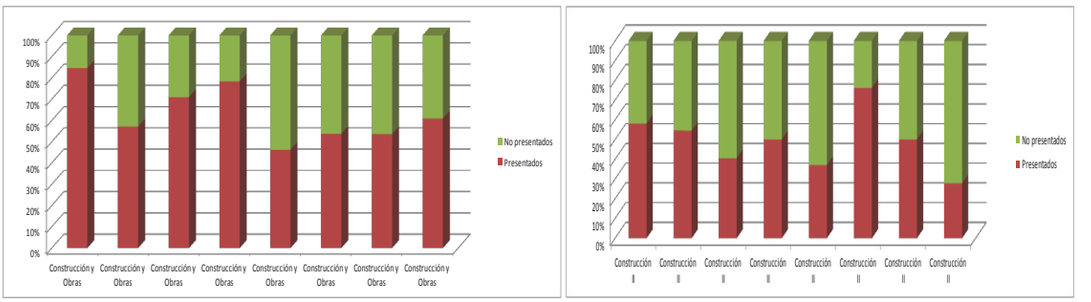

Figure 3: ML and NPA performance students considering A and NA variable.

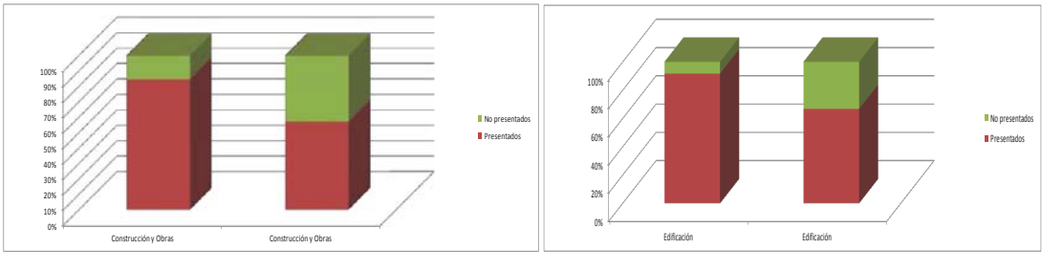

Figure 4: ML and AL students' interest. Effect of the type of student´s groups.

The effect of direct student´s performance has defined by the data of Pass (P, *Aprobados*) and No Pass (NP, *Suspendidos*) final examination. Figure 5 and Figure 6 present the ML and AL students' performance respectively, considering, that the same professor in charge teachs different topics to different students groups.

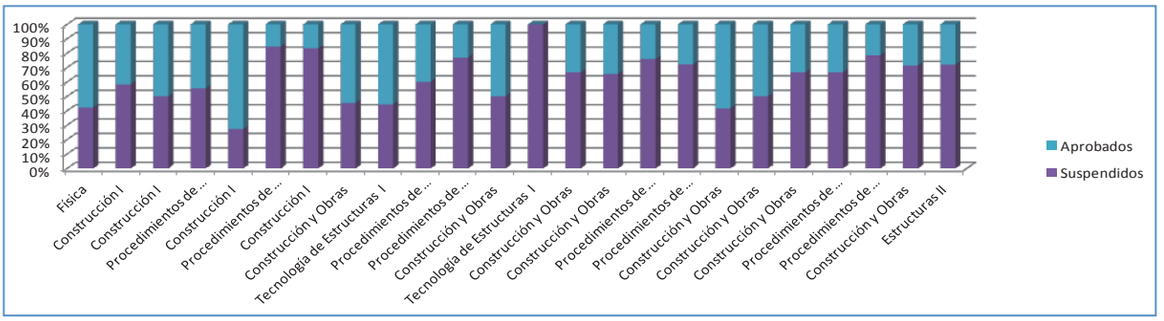

Figure 5: ML: students' performance.

The main topics are linked with mechanical and civil engineering (civil construction, civil engineering, structural technology, building and performance, etc). The performance has been at ML of P 37% and NP 63%, meanwhile AL has been of P 63%, NP 37%. These results are incredible different and has been one of the main reason to follow with this study; nevertheless is mandatory mentioning how the lectures organization is quite different between morning and afternoon, since the lectures more difficult

for students are allocated during morning. This fact has been a traditional schedule at mechanical engineering studies and nobody, not previously analyzed.

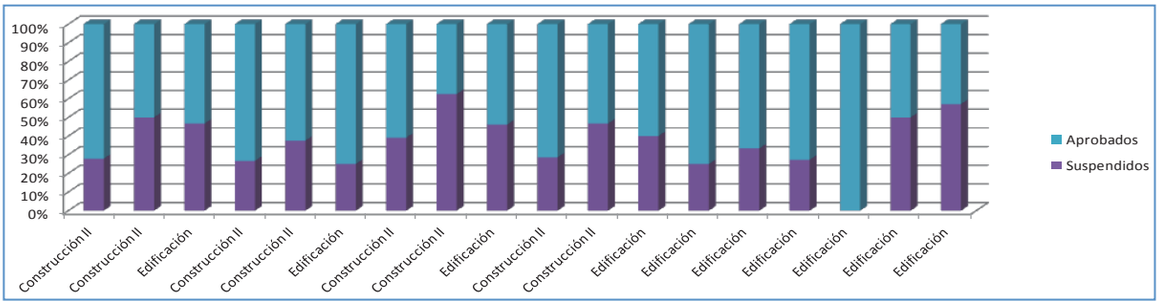

Figure 6: AL: students´ performance.

Figure 7 presents the results of ML and AL students' performance considering, that the same responsible professor imparts identical topics, civil building, to different students groups. The performance has been different attending P, NP casuistic. The clear dissimilar trends indicate a influence ML and AL effects since ML students show lower performance P 43%, NP 57% related to AL students, close to P 60%, NP 40% that implies an increase of successful of 39,5%.

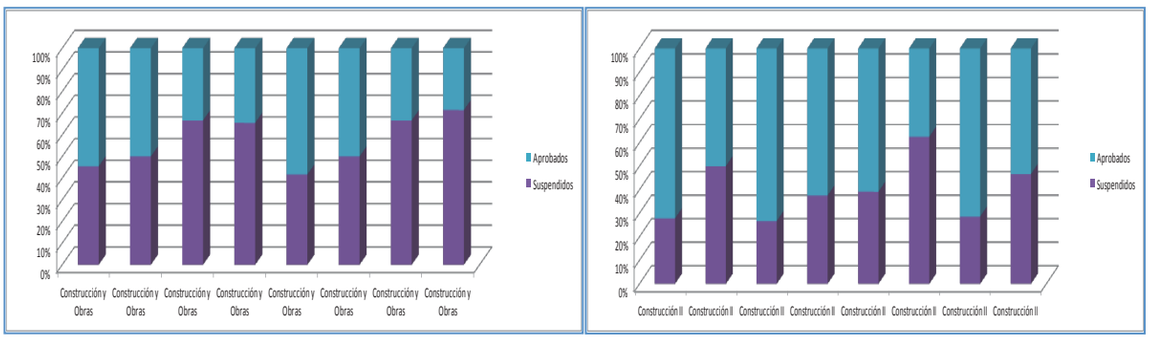

Figure 7: ML and AL students' performance.

Figure 8 show results with identical idea of Figure 7 but considering as variable identical students group ML P 52%, NP 48%, AL P 86%, NP 14%.

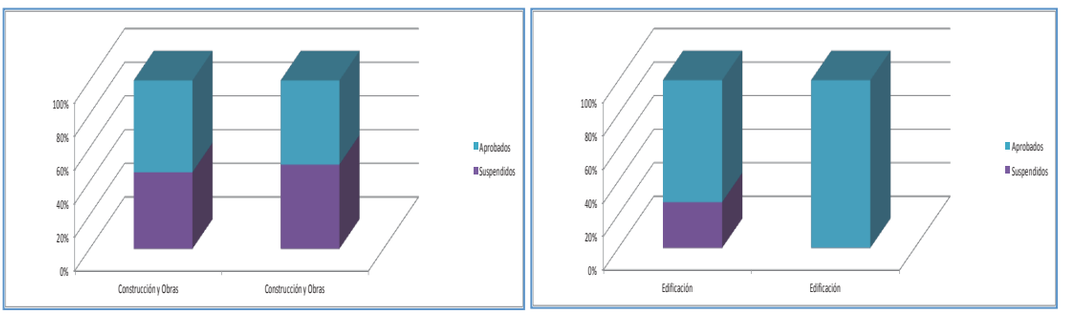

Figure 8: ML and AL student's performance.

It is more realistic to compare P number related to total students of the particular lecture versus NP together with NA examination as it collected in Figure 9 and Figure 10 for ML and AL respectively. ML: PE 24% y NP 76%, AL: PE 35% y NP 65%.

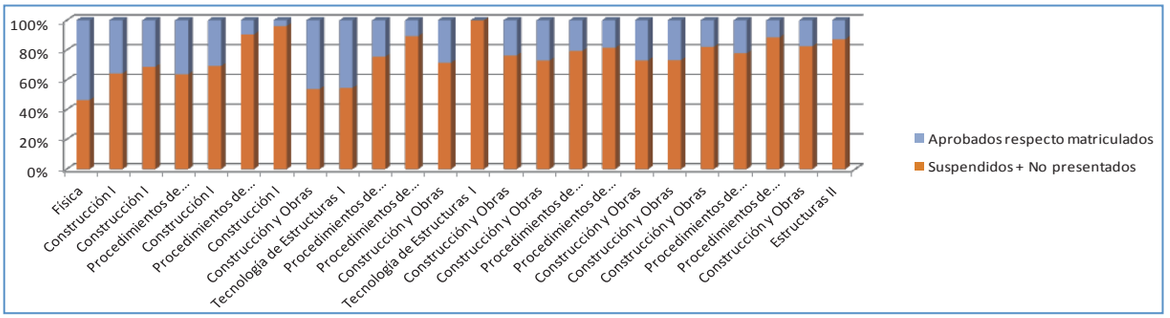

Figure 9: ML: students 'interest and performance.

The analysis of statistical data permits conclude that afternoon students obtain better results than morning ones; it is very difficult to assess the real root for it. Lectures topic is quite different and there is a long tradition to do a distribution of lectures: morning lectures that supposes less effort to students, Physic, Building and Construction, part I, etc., in opposite to afternoon lectures that implies more works hours, Building , part 2, Construction Performance, etc. There are a high percentage of ML students those attendance examinations.

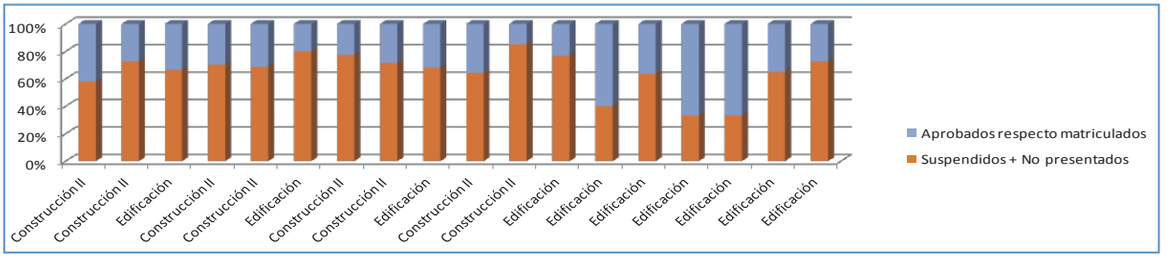

Figure 10: AL: students 'interest and performance.

3 STEP 2: INFLUENCE OF SCHEDULES IN QUANTIFICATIONS: PROFESSOR EXPERIENCIES

This step point out the opinion of two groups of professors: long and short ages of academic activity.

Professor 1. Professor of Materials Science during 27 years. Currently devotes academic activity to Degree University "Materials Science and Technology" and Master of New Material. In general, the distribution of lectures schedules is: theory lectures in mornings and practical session's problems and laboratory activities in the afternoon.

Concerning morning activities, it is necessary to point out that a high degree of motivation depends on stimulation that student receive from professor and the specific time of lecture since as early, from 08:30 h to 11:30 h, the attention is higher than last schedule, from12:00 h 14:00 h due to fatigue and tired state is accumulative. The only way to perform high performance student is leading to students that they be the main players during lectures: to create discussions, perform little groups, maximum four student wherein each week one is the leader provoking a positive discussion about the theory studied, motivating to create new topics for next lectures, etc. Afternoon: always practice early, just after lunch. Being practical classes and have to be very involved, performance is optimum. We can distinguish various types of practices.

Afternoon activities are more complex considering the long journey of students and Mediterranean timetables: later time lunch time and few breaks for restore energy. Practical exercises developing in a similar way that morning lectures: the key is creating little groups of students promoting the discussion and resolution of each problem. Then, each one enters into a motivation for its resolution comparing, analyzing and picking up particular opinion and conclusions. Related to laboratory activities, students should be implied as much as possible since they are the favorite for them, in engineering activities, since acquire the ability to understand the behavior of materials in situ. In general these activities are completed with the visit of a company directly link with the topic of study. We can conclude that this last one is the peered for students along the academic activity. The fourth group practices involve classes in the street. Students must observe, take pictures, discuss and analyze in situ the problem.

At the end of it, they must make a personal report of the analyzed. Such practices also involve a great success in performance, because the student feels active object at all times [12].

Master lectures, experience during five years, are quite different because implies a lot of intensive lectures along the day, with different professors. This distribution and design program is really anti-pedagogical, because classes are held from 09:30 h to 13:30 h and from 15:00 h to 17:00 h. It should be noted that many students have high distance from home to university. This event as short time to do breaks push to real fatigue and stress state that affect to the student performance. The only way to maintain high level of student attention is provide to student the developed program in advance, and create active groups during lectures that study in situ each item of program; then, each group do an exposition to the another student of their improvements and share a positive discussion. In such occasions, this activity is developed at campus area, looking for real situations of the studied topics.

Professor 2. Currently at Engineering Mechanical School, Guipuzcoa, University of Basque Country, Spain, during 6 years. He is currently imparting lectures, ML and AL, to grade students within theory, practical activities.

The main conclusion is identical for theory and practical lectures since ML student´s performance is optimum during morning time until noon. Meanwhile during AL this behavior is observed from lunch break until 17:00 h noting a incredible decrease after this time.

4 STEP 3: REASONS FOR INFLUENCE OF SCHEDULE IN QUANTIFICATIONS

It should be noted another aspect of performance during the day of people, this is chronobiology, in addition to the influence of accumulated fatigue throughout the day since no all humans are diurnal animals. There are three circadian typologies or chronotypes defined in terms of what it took to generate the sleep-inducing melatonin after stimulation of the pineal gland, catalyzed by absence of light [13].

Morning people include 25% of population. These are people who tend to wake up early and go to bed early, their higher cognitive functions are at their maximum magnitude in the morning. This is because secreting melatonin very quickly as the light stops inhibit the suprachiasmatic nucleus. Evening people supposes 25% of population. They tend to get up late (11-13 a.m.) and go to bed later (1-3 a.m.). This is because melatonin secretion occurs several hours after cessation of light inhibition of suprachiasmatic nucleus (about 6 hours later that morning people). Higher cognitive functions are at their peak in the afternoon and evening. Noon people are approximately remaining ones, 50%, Secretes melatonin 3 hours after and later that the above typologies respectively and can accommodate up early or stay up late. Figure 11 shows this distribution.

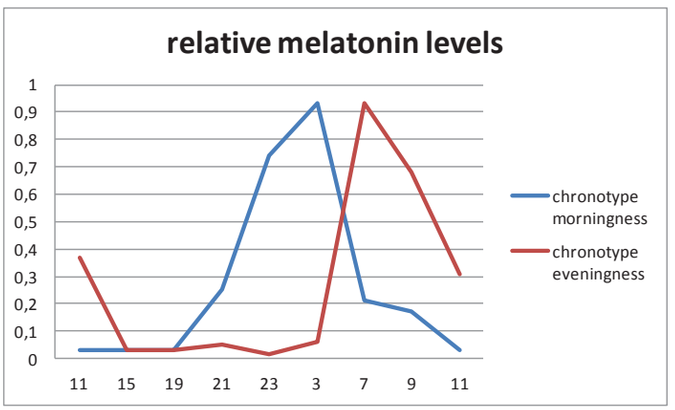

Figure 11: Relative melatonin levels [13].

This difference between the three types refer only to natural biological and not behavior tendency and today is considered that it would be interesting to apply the results obtained in studies of chronobiology to the workplace. It has look for the way to evaluate this tendency in humans from long time ago. Some of the questionnaires that are designed for this purpose are designed taking account a morning scale as survey “chronotypes Munich and morningness-eveningness questionnaire MEQ”

[14]. They are few studies that have evaluated and analyzed morning-evening people and personality variables.

Therefore, the model of personality Millon [15], could offer an interesting study for it and has been suggested for this purpose since permits evaluate the motivational, cognitive and behavioral aspects of personality through an inventory designed for that purpose. Based on these results, some authors have expressed that morning people are characterized by being more organized and systematic in transforming the environment information showing a tendency to process information in logical-rational parameters, while the evening people has personality characteristics related to creativity and innovation.

Figure 12 shows the performance differences found by Goldstein [16] crystalized intelligence (vocabulary, (a) and fluid intelligence or score composed by memory and transcribing digit codes, (b) according chronotype and time of day.

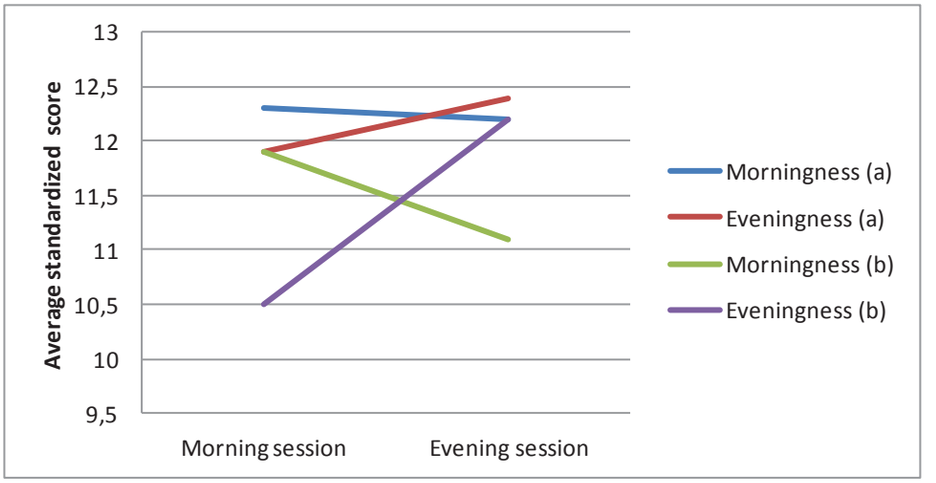

Figure 12: Differences in performance (memory and transcribing digit codes) in optimal time vs. not optimal according chronotype [16].

The alert level of the morning people is higher during morning time starting to decrease along the day and has a phase lead of 6-8 hours in advance to opposite to evening people [17, 18]. The study and job morning schedule organizations [19], push to a clear advantage for morning people, in this context, for morning students [20]. So, this study has taken care of ML and as a variable to consider in the final analysis of academic performance.

5 STEP 4: PLANNING METHODOLOGY SCHEDULE

With the aim to define and know best and worst schedules lecture for students where more attention put most students it has made an Excel spreadsheet with three main columns, defined as part 1, 2 and 3. It is noteworthy that many of the data considered are aseptic criterion. The used criteria for this example have agreed between different professors.

Part 1: 0-50 students' performance. The input data for the types ML and AL, have been achieved cross referencing the experience of professors and chronobiologic study. The percentages of each type have picked up to obtain the average value [21] (Figure 13).

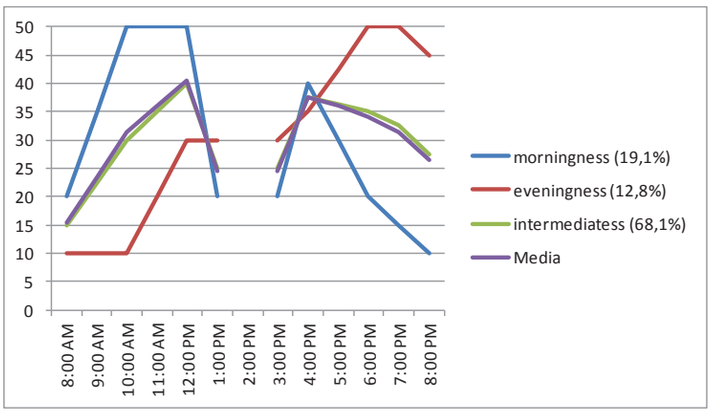

Figure 13: Student Performance along the day.

Note that the percentages of each type (Morning: 19.1%, evening: 12.8% and noon: 68.1%) at university level, vary with respect to those raised at first (Morning: 25%, evening: 25% and noon: 50%) for the whole of society. This variation may be due to early school leaving and given a greater percentage of neglected in the types morningness and eveningness.

Part 2 Student Performance from 0 to 50 for a week. The data were obtained by mixing the experience of teachers and research in the search for related articles [22]. As seen in Figure 14, it has been considered a steady increase until Wednesday (the day of the week where higher performance have most students), and in the days following a brusque drop in performance occurs.

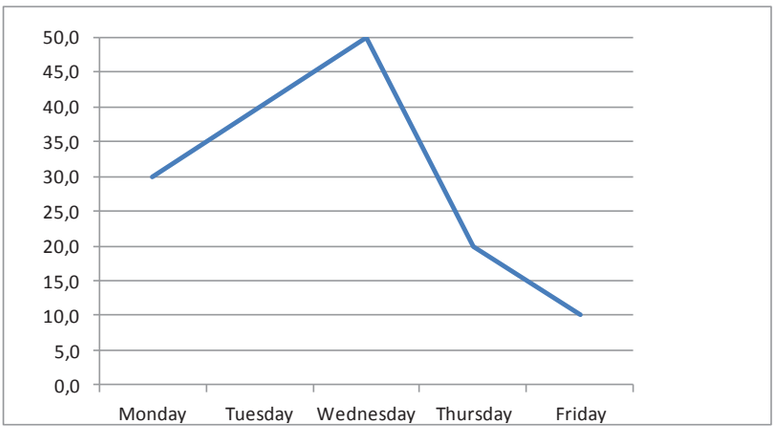

Figure 14: Student Performance for a week.

Part 3 is given a weight of importance to daily and weekly performance in this case is considered to give a weight of 2 daily and 1 weekly performance. (Values to be considered by the planner)

With this information the Excel spreadsheet list from best to worst the hours and days of the week depending on the capacity or performance of students.

Depends on the subject it would be interesting to make a classification of the most important or most difficult subjects to plan schedules. These subjects would be teaching in the hours and days of major student performance, early morning or in the middle of the afternoon. The students should be motivated to increase academic performance with enthusiasm for study and learning. Too, it is very important to design examinations schedule according with this criterion or methodology.

6 CONCLUSIONS

The authors of this article consider that should be given more importance to the timing of lectures and examinations schedules, in addition to classes distribution along the day/week, in order to obtain a

maximum application for University students. The analysis of statistical data concludes that afternoon students obtain better results than morning ones.

It is important to involve students to a self-learning by promoting active lectures, mainly concerned to worst schedules designed: lectures later time's morning and early times afternoon, attending the extensive Mediterranean journeys. The proposal activities invite to student to be the player of lectures, creating little student group to promote positive discussion, research, analysis, ability to develop well performed conclusions, etc.

As a rule, best morning lectures should be scheduled from 08:30h to 11:30h and afternoon ones from 16:00 h to 18:00 h in order to avoid this accumulative tired state that leads to loss of interest for attendance lectures and its direct consequence: low examination performance. Practical activities may be designed after a minimum ninety minutes of lunch break and afternoon practical activity's maximum of three hours. It has been observed a high rate during the first month due to these high dense schedules and bad lecture schedules.

In this work proposes a method to define different schedules, with the aim to favor equally to all types of students. It is noteworthy, that the application of this method would be equally suitable for the different level´s teaching to the university, because implanting it, a decrease of early drop out and leave in secondary education and the bachelor would obtain. Other methodologies [23-24].

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