

Software optimization of Teaching at a University level

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Summary

This paper aims to use the Matlab program system to determine the ability of a sample of subjects, in this case students, to adapt to the requirements of the transition path from theoretical abstractions to concrete situations in everyday life, respectively to the self-constitution of the teams on the basis of the test scores. In the analyzed situation, the main feature of the test is imposing the distribution of the ordered vertical scores in an ordered horizontal plane as well as in a horizontal stochastic plane. The final evaluation criteria depended both, on the correctness of the course required to complete the test, as well as on the individual desire to belong to a team, which confirms the individual autonomy of the students. By an analysis in form of cluster, using common criteria, it was possible to determine the belonging of each subject to a team and the numerical differences between the formed teams. This type of program suggests the practice of self-chosen and specific assignments in each discipline of studies, conducted towards a deadline. This type of activity enables subjects to truly understand what the role of collaboration and competition, in specially formed teams, is; as well as their benefits and limitations in everyday work. Furthermore, they can understand and learn the tools of voluntary and spontaneous practice of activities in / and with the help of the team, as well as their usefulness in defining and understanding the condition of a person.

Key words:

Psycho-behavioural mobility, the Matlab program system, Cluster, K-means, Performance analysis

1. Introduction

During this period of time, the international community [1] is preparing to adopt new codes, new understandings and meaningful detonations, and through them a new cultural vision able to adapt its own citizens to the new global transformations. The contemporary individual reality is showing that education is commonly used for survival and adaptation in this transformation which is carried out on a planetary scale [2]. Without considering taxonomy of these changes, it is worth mentioning that the amount of information we need to take into account has increased considerably. The most appropriate form of adaptation to new situations seems to be the team. In this respect, we can see a centralization of the researchers' concerns with a

view to developing an application-utilitarian theme, which aims to increase the possibilities of analyzing the quantity of data which has to be traced. This centralization aims at realizing skills and activating the capacities needed for individual social integration. For the purpose of this study, the idea was that the proposed instruction for the application in university education should be directed towards solving some instructive objectives according to the requirements of overcoming the social hold-ups. The unconditional or fractional transfer of the learning-teaching intentionality, based on their parameters and dimensions, are objectified and established through the diagnosis-prognosis activities defined below, aimed at identifying and developing the individual functionality of the students by general means (work, abnegation, desire to affirm, etc.); (discipline, system of rewards and sanctions, awareness, activation, etc.) and internal (self-discipline, self-awareness, self-activation, etc.) where the imposed cycle is closed. The autonomous activity in the society begins here as well as within the team, as it is described in this case. We have proposed ourselves that after this program, the participants: will learn to position themselves correctly in the required life competitions. Will be learning through interaction with others; will learn the feeling of belonging to the group and safety; will learn to accept and be accepted even under unsuccessful conditions. Improving the quality and efficiency of the training process through the modern tools of the trainers described here, involves the promotion of thinking through specific teaching and learning objectives such as: self-defining the strategic objectives of personal development, identifying elementary activities that directly or indirectly interfere with the formulation of the objective and the links between them, quantitatively and qualitatively determining the nature of these links and their expression. From the instructional point of view the system of appreciation specific to the mentioned complex does not only reveal the achievement of the result but also some particular aspects in the educational performance level, defined by the objective or subjective efforts of the subject's training. In this didactic approach we considered the activities that can lead to the achievement of the objectives, taking into

account the age characteristics and the training of the authors of the effort. In order to find a balanced path between the maintenance/development requirements of life, including further professional development, as well as the corporate requirements, we will go from the valid and binding provisions promoted within the curriculum established at the level of the faculty. In practice, the development of the curricular framework applied through didactic activity presupposes the optimal combination of methods, materials and didactic means [3]. This is a totality that acts in interdependence (the interpenetration of content and form, quantity and quality, cause and effect) that potentially influences the totality of changes, transformations and processes on the elements and systems involved in the didactic framework. Within this type of program there are elements of self-organization, self-determination, etc., with consequences in approaching the social global model. In its turn, the global social model will be improved by the particular action of programs focused on the development of such functional abilities, capable of optimizing the functioning of society as a whole.

2. Didactic action technology

In the view of the modern didactic technology, it is with certainty that the participatory and formative methods and means, manage to activate and realize the participation of subjects to the training process as well as to increase the efficiency and unity of the teaching / learning ratio. Activation is accomplished by creating (directing) learning situations through which performers themselves become the subjects. In other words, the subjects take every interest and every effort to self-refine themselves. Other elements such as: motivation, teachers' competence, working conditions, availability of performers, etc. Creativity is achieved / evaluated by the team's contribution to the learning situation, plus the degree of difficulty inserted by the teacher according to the training of the trainees through the learning situation as well. Developing creativity will also continue with encouraging the use of electronic means of communication in running team activities and generating feedback. Awareness is achieved by bringing subjects into a "comprehension of what they are doing and acting in accordance with a set of rules or working principles that ensure the achievement of the proposed operational objective. Empowerment is achieved when the instructed one deliberately applies the knowledge acquired in the learning situation, specifically created by the teacher, in order to help his own team temporarily in a competition or in a collaborative relationship with the other teams. This leads to the direct finding of individual efficiency by participating in the assessment process (infringement / self-assessment). Self-activation (we are dealing with, we cut out ...) is achieved

through directly observable behavioral manifestations of the subjects in relation to the activities the team has decided to fulfill spontaneously and voluntarily. A separate chapter of the activities may be revealed and / or through new queries in the field of study desired by the student. The work program will be based on the scenario and is geared towards generating concrete psycho-behavioral results of the participants. The stated goal of the teams is not only to facilitate the training process but also to gain rotation experiences in the teams so that each participant has to go through the team leadership experience, in correlation with the other teammates. A set of tasks cannot be avoided - the team's outcome depends on the success of each parts. In conclusion the practical application of the chosen activities uses modern training methods based on the practical and feasible practical applicability in relation to the choice of each team. As a methodical indication, the pedagogical density should be up to 40% and the functional density at least 60%. Assimilation of knowledge and skills development will be ensured by: activities according to the degree of accessibility of the group using: practical activities, exercises, case studies, participation in voluntary activities through voluntary enrollment, etc. It is important that the program allows the modular structure, monitoring and evaluation of the activities carried out as well as the attitudinal changes of the leading authors.

3. Presentation of the test itself

In the context of the diagnosis operations - we predict, as mentioned above, the set of coherent and objective goals for which strategies and efficient working plans are meant to be proposed, solved, planned and scheduled. The forecast is the starting point for developing working strategies with the teams and is defined as "a scientific provision of the state of future events, expressed as prognostic information" [4]. This method can be engaged using the mathematical device - easy to implement in Matlab, Cluster - and can lead to effective training programs. Computing by calculating work patterns and establishing optimal variations increases the decision speed in selecting strategies and driving technologies to achieve the proposed goals without altering the essence of the problem we have to solve.

In the study, the relationship between the two forms of the psycho-pedagogical experiment is presented, namely, the observational (recording of the existing situation at a certain moment) and formatively by the methodological approach explicitly described in this paper proposing a way of tracking the factors of progress in a view which shows the improvement of the targeted behaviors. In order to achieve differentiated results after completing the test, eight categories of answers are listed in Greek letters (α , β ,

$\gamma, \delta, \epsilon, \zeta, \eta, \theta$) to avoid confusion between the various numbers used in the test. It should also be added that these categories having a placebo effect, were introduced, on the one hand, with the intention of persuading the test subjects of their veracity and on the other hand, for the important to implement the idea of belonging to a team as an essential behavioral expression. The qualitative aspect at this level is relatively unimportant, especially because you cannot always choose what you want in life. In doing so, a disambiguated functional category was obtained, characterized by the assignment of standard numerical indicators that allow statistical analysis using the Cluster method by Matlab as the programming environment. In each of the sections of Table 1, 10 points will be distributed among those statements that best describe the individual's behavior. These points can be distributed among several statements. Only in extreme cases the points can be allocated between all statements or all ten points will be given to a single statement. These cases will indicate exceptional situations that can be treated separately.

Table 1. Section with statements describing the behavior of a subject.

Section I		Allocated Points
To Maximize My Utility In The Team:		
A	I would like to see new opportunities quickly and use them.	
B	I would like to be able to work well with a great variety of people.	
C	I would like to have the talent to produce new ideas spontaneously.	
D	I would like to have the ability to help people bring value to the group.	
E	I would like to be more efficient on all occasions.	
F	I would like to get results in the workings without this leading to a lack of popularity.	
G	I'd love to figure out what would work in a situation which is known to me.	
H	I would like to be able to offer alternatives for chose actions without scandals and prejudices.	
Total		10

Section ii		Allocated points
to be efficient in the team:		
A	I would like the workshops to be well run.	
B	I would like to be more generous with those who have a valuable point of view.	
C	I would like to be able to talk more as soon as the group moves on to new ideas.	
D	I would love to easily join colleagues enthusiastically without any difficulties.	
E	I would love not to be seen as authoritarian when something has to be done.	
F	I would love not to be too influenced by the group atmosphere.	
G	I'd love not to lose touch with what's going on.	
H	I would like not to be concerned about the details so that things go well.	
Total		10

Section iii		Allocated points
when i'm involved in a project:		
A	I would like to be able to influence other people.	
B	I would love not to make mistakes or omissions out of my inattention.	
C	I would like to determine actions so we won't waste time.	
D	I'd love to be able to count on myself.	
E	I would like to support a good suggestion in the interest of all.	
F	I'd love to always look for the latest ideas.	
G	I would like to be appreciated for my calm judgment.	
H	I would like to help organize important work.	
Total		10

Section iv		Allocated points
In the group work:		
A	I would love to know my colleagues better in a discreet way.	
B	I would like to challenge the opinions of others or to support the opinion of a minority.	
C	I'd love to easily find valid arguments.	
D	I'd love to have the talent to make things work.	
E	I would like to be able to come up with unexpected things.	
F	I would like to take on team assignments.	
G	I would like to solve the tasks even with contacts outside the group.	
H	I would like to not hesitate to decide once i have to make a decision.	
Total		10

Section V		Allocated Points
In Solving A Task:		
A	I Would Like To Weigh All The Possible Variants.	
B	I Would Like To Find Solutions To The Problems.	
C	I Would Like To Maintain Good Relationships With The Whole Group.	
D	I'd Love To Have An Influence On Decisions.	
E	I'd Love To Meet People Who Have Something New To Offer.	
F	I'd Love To Be Able To Get People To Find A Common Solution.	
G	I Would Like To Be Able To Give My Whole Attention To A Task.	
H	I'd Love To Be Able To Find A Field That Demands My Imagination.	
Total		10

Section vi		Allocated Points
If I Have To Deal With A Difficult Task:		
A	I Would Like To Have Time To Think About How To Get Out Of The Deadlock.	
B	I Would Like To Work With People Who Have Proven The Most Positive Approach.	
C	I Would Like To Find A Way To Reduce The Size Of The Given Task.	
D	I Would Like To Be Able To React To Emergencies To Respect The Program.	
E	I Would Like To Keep My Calm As A Condition Of Thinking Right.	
F	I Would Like To Be Able To Withstand The Pressure.	
G	I Would Like To Be Able To Ensure A Positive Presence In Case Of Failure.	
H	I Would Like To Be Able To Stimulate New Ideas To Bring Success.	
Total		10

Section VII		Allocated Points
About The Problems Which Are Encountered When Working In A Group:		
A	I Would Like To Be Able To Convince My Colleagues To Not Obstruct The Program Unnecessarily.	
B	I Would Like Not To Be Criticized For Being Too Analytical.	
C	I'd Like To Make Sure The Work's Done Well.	
D	I Would Like To Rely On One Or Two Team Members.	
E	I Would Love To Have Clear Goals In The Team.	
F	I'd Love To Make It Hard To Explain And Clarify Issues That Come Up.	
G	I Would Like To Be Helped With The Things That I Cannot Do.	
H	I Would Not Like To Face A Real Team Opposition.	
Total		10

To complete Table 1, the points assigned to each letter in each section in the score grid, will be transposed, section by section, into Table 2. The points on each column are added up to get a total scoring distribution of the team roles. Thus, in column 1 of Table 2, in the case of section I, a score will be passed only if in Table 1, there is a number of points at point d.

Tab.2. Explanatory to the test analysis.

Section	1	2	3	4	5	6	7	8
	α	β	γ	δ	ε	ζ	η	θ
I	h	b	e	c	d	a	g	f
II	d	f	c	h	g	b	a	e
III	a	c	d	g	h	e	f	b
IV	b	e	g	d	a	f	c	h
V	g	a	f	b	e	h	d	c
VI	f	d	h	a	b	c	e	g
VII	c	g	a	e	f	b	h	d
Total								

The amount of points allocated to each letter in each section must meet the condition

$$\alpha + \beta + \gamma + \delta + \epsilon + \zeta + \eta + \theta = 70 \quad (1)$$

Depending on the size of the score obtained, the predominant individual quality is determined. The purpose of the activities and the rotation of the diversity of the roles performed by individuals within the teams are to ensure a more balanced score distribution. This will highlight not only the fulfillment of the tasks and requirements but also the individual psycho-behavioral progress of the participants. So rotating team members into these roles is essential in evaluating the program. The theory was previously exposed and applied to the second year students of the Faculty of Medicine of the Western University Vasile Goldiş from Arad, completing Tab.3.

Tab.3. Score awarded by students of the II year of the Faculty of Medicine.

Nr.	α	β	γ	δ	ε	ζ	η	α
1	10	8	0	14	6	22	10	0
2	10	9	1	13	11	14	15	0
3	2	15	9	19	9	0	3	13
4	10	10	13	9	10	5	7	6
5	10	10	12	9	11	5	7	6
6	20	8	5	6	12	6	9	4
7	13	13	4	6	8	12	7	7
8	15	11	11	9	8	2	14	0
9	3	7	14	3	9	16	10	8
10	17	7	5	13	11	10	4	3
11	15	10	5	11	7	8	9	5
12	11	9	7	9	9	11	5	9
13	5	5	5	10	11	10	11	13
14	11	9	3	12	6	8	16	5
15	8	9	9	8	9	10	14	3
16	14	11	5	12	4	11	5	8
17	13	9	7	11	6	7	10	7
18	21	3	8	9	4	9	0	16
19	14	6	7	10	5	8	12	8
20	14	0	24	15	9	0	6	4
21	5	25	0	9	13	12	3	3
22	14	7	11	14	8	9	7	0
23	15	3	6	9	10	8	12	7
24	15	3	6	9	10	8	12	7
25	11	9	3	12	4	6	10	15
26	7	11	13	9	5	11	5	9
27	15	15	7	3	11	5	6	8
28	1	10	5	1	16	12	1	24
29	16	14	9	11	4	2	8	6
30	11	8	10	5	11	7	8	10
31	10	8	1	13	11	12	0	15
32	20	8	9	5	9	5	6	8
33	6	19	3	10	7	15	4	6
34	9	3	5	10	17	12	8	7
35	14	15	6	9	7	10	6	3
36	0	17	10	10	6	8	12	7
37	7	11	8	8	10	9	7	10
38	7	11	6	6	11	12	9	8
39	8	10	14	8	9	7	5	9
40	11	13	3	11	13	4	14	1
41	16	3	7	6	9	23	6	0
42	10	12	0	10	22	9	0	7
43	0	0	0	0	30	20	20	0
44	13	8	4	9	18	7	6	5
45	10	14	2	8	12	14	11	9
46	9	11	10	4	9	9	7	11
47	11	11	0	4	16	11	6	11
48	8	15	15	14	0	5	11	2
49	10	9	10	7	9	9	10	6
50	11	8	1	8	16	9	15	2
51	7	19	6	4	7	4	3	20
52	8	12	2	8	11	11	10	8
53	3	14	6	13	11	8	8	7
54	13	7	10	11	12	4	7	8
55	11	7	9	9	8	9	8	9
56	9	8	13	8	8	8	9	7
57	4	8	11	6	10	14	17	0

4. Analytical software

The cluster method is a multivariate analysis method that identifies homogeneous data groups [5] and is applied to the data previously illustrated. This method consists of a collection of techniques by which a set of objects is divided into relatively homogeneous groups. The primary objective of cluster analysis is to classify objects into groups of the same kind, depending on a given set of variables. Group objects may be cases or variables [6]. Data processing in Table 3 will use a multivariate analysis method, namely cluster analysis. The processing was done using the Matlab software. Thus, a dendrogram (Fig. 1) is generated as well as a vector containing the number of nodes for each object in the dataset in Table 3.

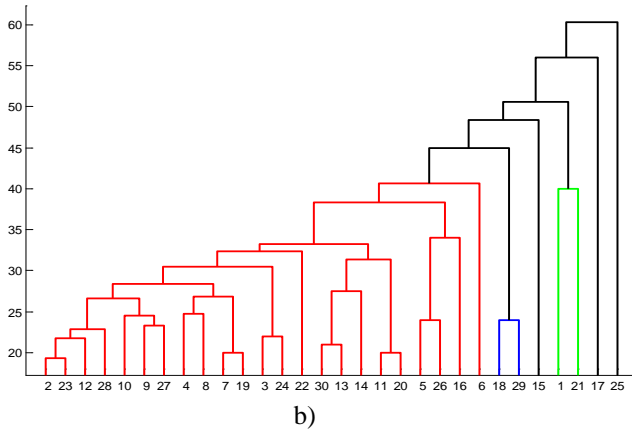
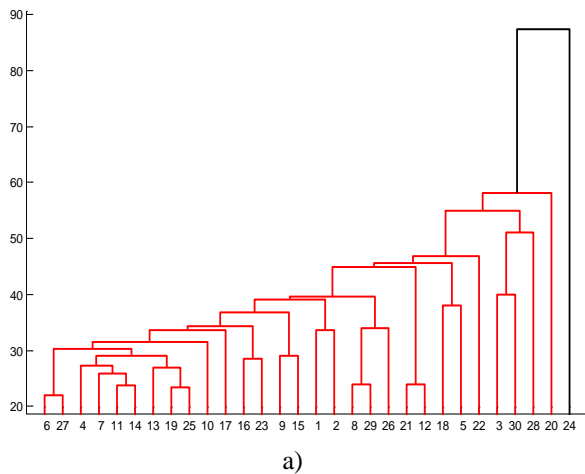


Figure 1. Dendrogram.

The distances between elements in the data set will be calculated to create a hierarchical cluster tree. In cluster analysis, the distance between group objects is important, because choosing a particular distance can essentially change the groups that are obtained. The most

important distance used in cluster analysis is the Euclidean distance.

$$d(i,j) = \sqrt{\sum_{k=1}^n (x_{ik} - x_{jk})^2} \tag{2}$$

It will be specified that the cluster function partitions the sample data into 8 clusters, that is, the elements in the data set which are grouped in 8 clusters. In this case, the cluster function creates a cluster containing objects 1.57 (Fig.2a) and subjects 1.48 (Fig.2b), respectively.

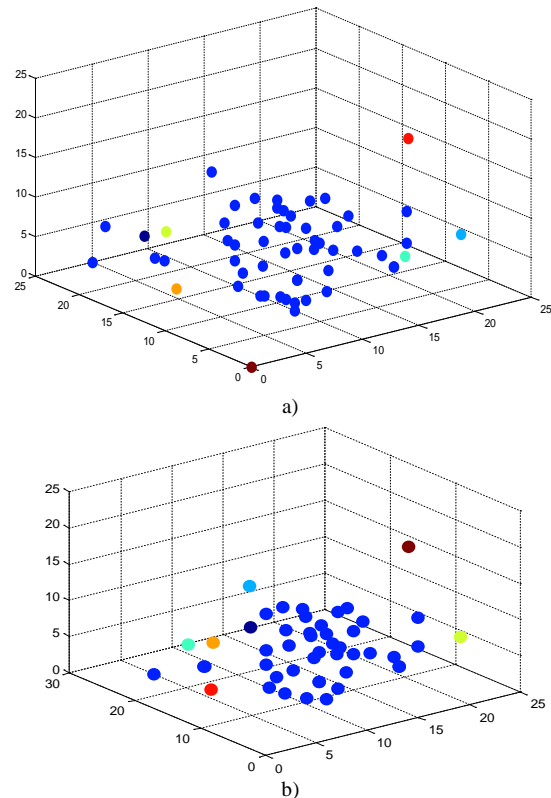


Figure 2. Representation of dates - each cluster being illustrated in a different color.

For more data (for example, with 15000 observations - Fig. 3), a hierarchical cluster tree can be created using the Ward [7] hierarchical classification method by aggregation. The method is considered to be the most efficient of all hierarchical classification methods, since it explicitly analyzes the homogenization of classes in order to minimize the intracluster variability, i.e. at each stage the two clusters are compacted for which the finality of the cluster is the smallest of all possibilities [8]. Next, we illustrate the K-means grouping method by which data is divided into k clusters and the cluster index to which each observation has been assigned. Unlike the hierarchical grouping, group k assumes a real observation and creates a

single level of clusters. This grouping is more appropriate than hierarchical grouping for large amounts of data (Fig.4).

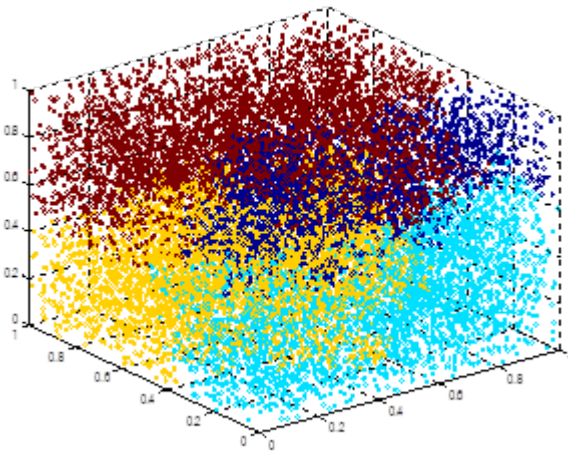


Figure 3. Representation of the hierarchical data tree cluster for 15,000 observations.

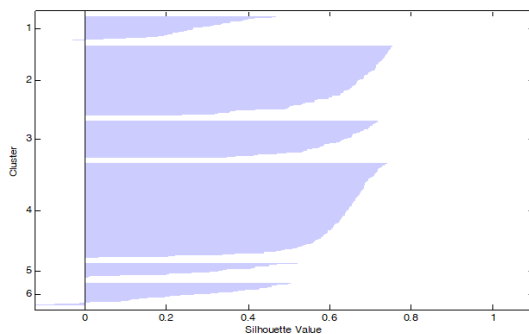


Figure 4. Grouping data by analyzing the breakdown results in 8 groups (teams).

5. Conclusion

The intuitive presentation of observable data allows for accurate evaluation by those interested because the separation of general information and essential information is much better. The graphical representations used figures that try to highlight the differences found. As a result of the analysis performed in Matlab by the method described in the paper it was found that a small number of individuals (9) of the total subjects (57) failed to translate the data from the vertical plane into a horizontal and stochastic plane, as shown in Table 3. According to the dendrogram, individual autonomous functionality is confirmed by the fact that all individuals have been able to affirm their belonging to a working team. But these teams do not have the same quality. In the paper it was demonstrated that through a cluster analysis the differences between the formed teams, using common

criteria, can be studied. The results obtained in this paper will lead in the future to the development of beneficial software at the level of universities which will easily be implemented. Thus, the cluster analysis will be dropped, based on an algorithm with restrictions, in order to assure equal teams.

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