SCIENTIFIC APPLIED RESEARCH.
A PATTERN OF A CORRELATIVE ANALYSIS OF THE PHYSICAL TRAINING PARAMETERS TESTED ON NAVAL AND MARINE STUDENTS

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ABSTRACT

The applied scientific activity in the field of the pedagogical experiments on naval and marine students were widely extended and very complex. In our paper we'll reffer only to the final part of our scientical investigation action, mainly to the correlative analysis of the investigated data, as a result of our pedagogical intervention in order to complete the general education and training of the young navigators to be. So, we'll present here *the analysis of their longitudinal evolution and the statistical indicators of their correlation - analysed in different moments of their phases of the research - the correlative analysis between the statistical investigated indicators inside the final testing on experimental group, as well as the correlative analysis between the group of tests applied on the witness and experimental students' groups.* We consider these directions presented here are quite sufficient to show the complexity of our scientific action.

Keywords: *Statistical correlation, scientific investigation parameters,co-relation coeficient, longitudinal evolution, value uniformity, appreciation scale, co-relative matrix, statistical signification, etc.*

1. INTRODUCTION[1]

Usually, at the end of the researches having as object the evolution of some phenomenon as a result of an experimental improving interventions, a processing of the data and results is done, then the correlative calculations between the influence of different parameters we used, is also realised. As the hypotesis, the target the methods ad the the steps involved in our experimenton the naval and marine students were widely presented during many other speeches we'll only present here - because we do not have room enough - a correlative analysis of the parameters included in the scientific investigation.

2. THE GOAL OF THE RESEARCH

Our research goal in this specific domain, not very often accessible, was to put into effect an improving action of a new adequate training programme, according to the real requests of the physical and psycho motional needs aboard ships.

3. THE RESEARCH METHOD

They were really very many. We started from the study of the specific litterature, from the critical analysis of the educational programmes involving the improving experimental intervention, then, we statistically processed the investigated data and got the realistic conclusions due to realise a new, more adequate programme to answer the real conditions imposed by the navigation activities. The last part, that of the correlative analysis of the investigated parameters wil bee widely and thoroughly presented in this paper.

4. THE RESEARCH RESULTS ACCORDING TO CORRELATIVE ANALYSIS OF THE INVESTIGATED PARAMETERS PRINCIPLES

The innitial study of the mathematical statistics

We havw to note here that, in order to calculate the *statistic correlation co-eficient* between the involved parameters and the groups of new tests, we used the formula of *ranking method - SPEARMAN.*

The formula we used to calculate the statistical correlation coeficient by the ranking method - SPEARMAN.	The formula we used to calculate the statistical correlation coeficient by the method - PEARSON.
$$r^1 = 1 - \frac{6 \cdot \sum D^2}{n \cdot (n^2 - 1)}$$	$$r = \frac{\sum d_x \cdot d_y}{(n-1) \cdot S_x \cdot S_y}$$

The correlative study was orientated towards the three following directions:

A. The longitudinal evolution analysis of the correlation of the investigated statistical indicators in differnt phases of the research
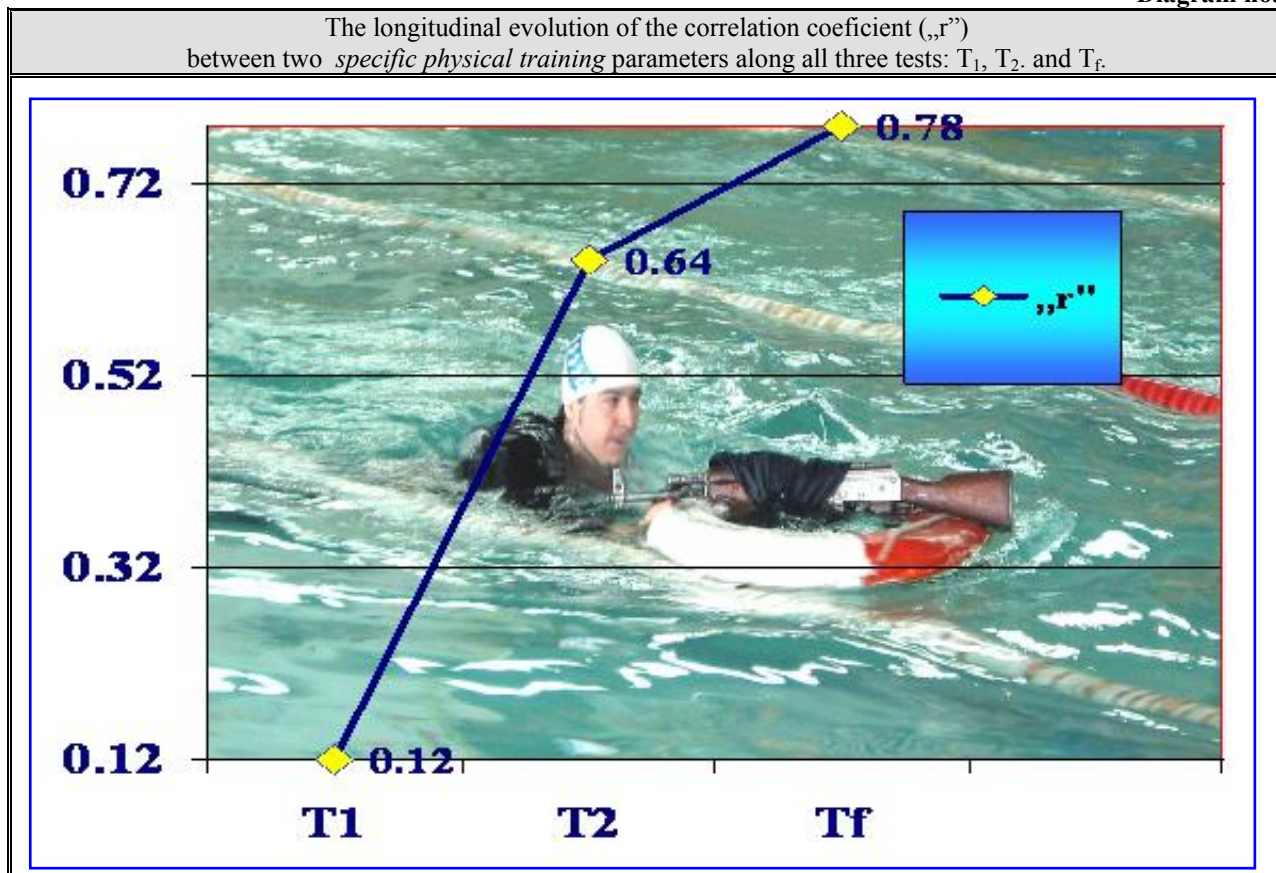
As the analysis is larger than we can afford to include in this paper, as a whole, we'll present here only the most significant general conclusions of the study we made, followed, of course by an example, the one showed in table no. 1 and in diagram no.1.

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[1] In the end we mention the contribution in achieving this work of mr. col. (rs.) psihologist **Dan NICOLAU**.

Table no. 1

Ord no.	Correlated parameters	T_1		T_2		T_f	
		1	2	1	2	1	2
1	**Swimming dressed 50 m. (t-shirt and trousers)**		**0,12**		**0,64**		**0,78**
2	**Carrying during swimming of the round life buoy, of the rifle and the equipment**						

The significant presentation of the longitudinal evolution of the correlation coeficient („r") between two *specific physical training* parameters along all three tests: T_1, T_2. and T_f.

Legend		
r < 0,52; p < 0,05;	**0,52 ≤ r ≤ 0,66**	**r > 0,66; p = 0,01.**

Diagram no.1

The longitudinal evolution of the correlation coeficient („r") between two *specific physical training* parameters along all three tests: T_1, T_2. and T_f.

Some tests included in our research showed the *correlation coeficients („r")* recorded statistical *significant increasing values.* This showed us in figures on the one hand that such an innitial uniformity of values of the students groups included in the pedagogical experiment is missing, and, on the other hand, their uniformization from this point of view all along our improving intervention and specific training. We concluded this way that the entire improving intervention process of the specific training of the navigators is positivel in their benefit. The final results demonstrated this fact. The experimental intervention using a new model of physical and specific psycho motional training of the naval amarine students lead them to better results some of them outstanding in the final tests. This reflected in a higher level of the quality of their intervention in rescue actions in the open sea storms.

B. The co-relative analysis between the statistical indicators we investigated in the final testing on the experimental group of students.

We have to remind you that we used the previously mentioned formula of *„ranking method - SPEARMAN"* and respected the evaluation scale of the official statistics recognized by the whole scientific world and presented here in the table no.2. We contributed this way to an absolute objectivization of our research and evaluation procedures.

Table 2

The value of the statistical correlation coeficient („r")		Interpretation	The value of the statistical significance threshold („p")
r > 0,66	0,68,…etc.	The statistical very significant correlation	p = 0,01
	0,67		
r ≥ 0,52; r ≤ 0,66.	0,66	The statistical significant correlation	p = 0,05
	0,65		
	0,64		
	0,63		
	0,62		
	0,61		
	0,60		
	0,59		
	0,58		
	0,57		
	0,56		
	0,55		
	0,54		
	0,53		
	0,52		
r < 0,52	0,51	The statistical non-significant correlation	p < 0,05

Table caption: The appreciation and interpretation scale of the statistical correlation coeficient („r").

B.a. The correlative analysis of the morphological development parameters

We present in the table no.3, below the situation

Table 3

The correlative matrix and the correlation coeficients of the *morphological development parameters* at the students of the experimental group (E) in the final testing (T_f) of the research

Ord. No.	Investigated parameters	1	2	3	4	5	6	7	8	9	10	11
1	Height		0,75	0,97	0,99	0,87	0,92	0,97	0,83	0,91	0,97	0,92
2	Weight			0,70	0,66	0,52	0,68	0,69	0,42	0,58	0,63	0,55
3	Height when lying on the back				0,96	0,85	0,90	0,96	0,84	0,91	0,97	0,93
4	Arms amplitude					0,88	0,88	0,96	0,80	0,89	0,96	0,91
5	Body height up to the shoulders						0,84	0,91	0,82	0,89	0,89	0,88
6	Legs lenght							0,88	0,84	0,96	0,95	0,88
7	Shoulders width								0,84	0,90	0,95	0,92
8	The excedent when coiled up									0,94	0,92	0,82
9	Specific amplitude										0,97	0,89
10	I.M.Ma. (Σ 3-9)											0,93
11	Pool width											

Legend

r < 0,52; p < 0,05;	0,52 ≤ r ≤ 0,66	r > 0,66; p = 0,01.

(I.M.Ma. (Σ 3-9) = Morphological Indicator of the navigator.)

When analyzing the correlative matrix with the morphological parameters we notice statistically signifiant values of the correlation coeficient „r" between all morphological parameters at the statistical significance threshold (0,05) but mostly the p=0,01, which means very clearly there's a nomal balanced proportionality of the body and limbs measures

in the experimental group of students, over 21. More than that, the indicator I.M.Ma is an additional one in characterizing globally the morphology considering the value of an indicator raises in the same direction. As you can see in table no.33 we have only one exception, the correlation between *specific amplitude* and *body weight*,

but not being in any relation (r = 0,42 < 0,52 at p < 0,05).

B.b. The correlative analysis between the active parameters of the breathing apparatus.

Table 4

Ord. no.	Correlated parameters	1	2	3
	The correlative matrix containing the correlation coeficients of the *breathing apparatus* parameters gathered from the students of the experimental group (E) in the final test (T_f)			
1	Respiratory frequency (F.R.)		0,16	0,11
2	Vital capacity (C.V.)			**0,91**
3	Apnoea time (T.Ap.)			
Legend				
r < 0,52; p < 0,05;		0,52 ≤ r ≤ 0,66		r > 0,66; p = 0,01.

B.c. *The correlative analysis othe physical training parameters*

The correlative matrix is shown in the table below (5)

Table 5

Ord no.	Correlated parameters	1	2	3	5	6	7	8	9
	The correlative matrix including the correlation coeficients of the *general physical training*, at the students of the experimental group (E) in the final test (T_f)								
1.	Arm pullings		0,22	- 0,15	0,21	0,25	0,34	**0,84**	0,09
2.	Abdominal flexions			0,25	- 0,67	0,45	0,46	0,02	0,60
3.	The standing jump				0,14	0,16	- 0,01	- 0,38	**0,57**
4.	Long distance run on 4000 m					**0,89**	0,04	- 0,27	0,44
5.	Free style swimming for 30'						0,18	- 0,29	0,50
6.	Sprint on 50 m							- 0,009	0,19
7.	Freestyle swimming on 50 m								- 0,25
8.	Specific balance								
Legend									
r < 0,52; p < 0,05;		0,52 ≤ r ≤ 0,66			r > 0,66; p = 0,01.				

As can be seen, from the correlative matrix we recorded values of the statistically significant correlation coeficient between the *tests of pulling in arms* and *freestyle swimming 50 m* (r = 0,84 at p = 0.01), as well as between the *long distance run 4,000 m* and *freestyle long distance swimming 30'* (r = 0,89 at p = 0.01).

The experience showed us the best sprinters on the ground (50 m) are not the best, or fastest sprinters when swimming the 50 m distance. In spite these two tests are focused on the same 50 m. Distance testing the motional capacity, the speed, the structure of the motional acts is totally different, r = - 0,009 at p < 0,05.

This fact is of greatest importance demonstrating *the need to guide, and lead the navigator's training to the*

specific effective workin contact with the water, as the best sportsmen on the ground are not at al the best when swimming or rowing in boats !

B.d. The correlative analysis of the specific physical training parameters

Concerning the specific physical training (see table no. 6) We can notice statistically significant correlations between the results obtained at pulling the rope in orthostatic position (standing) and rowing a single person boat, r = 056 at p = 0,05.

Table 6

Ord. no.	Correlated parameters	1	2	3	4	5	6
The correlative matrix of correlation coeficients of the specific physical training of the students in the experimental group (E) in the final test (T_f) of the research						
1	Pulling the rope (1) in orthostatic position (standing)		**0,56**	0,15	**0,995**	-0,02	0,28
2	Rowing in a single person boat			0,34	0,18	0,28	0,13
3	Swimming dressed 50 m (t-shirt and trousers)				0,39	**0,78**	-0,1
4	Pulling the rope (2) while swimming					0,10	0,03
5	Carrying while swimming, the circle (round) lifebuoy, the rifle and the equipment pack						-0,1
6	Exercise ittinerary for rapid run and obstacles aboard ship						
Legend						
	**r < 0,52; p < 0,05;**		**0,52 ≤ r ≤ 0,66**			**r > 0,66; p = 0,01.**

We also noticed significant and visible correlations between th results of the students of the experimental group in the final test at: *pulling the rope in orthostatic position* and *pulling the rope while swimming,* r = 0,995 at p = 0,01 and between the *swimming test dressed* and the *test of swimming vith the rifle , the equipment pack and the lifebuoy*, r = 0,78 at p = 0,01.

B.e. The correlative analysis of the specific psycho motional training parameters

When analyzing the correlative matrix together with the specific psychomotional parameters (shown in the table no. 46)we may notice a correlation between the results of the two variants of „Oprişan test", r=086 at p=0,01, a very significant correlation from statistical point of view, meaning both variants of the test are completing each other and form the specific features and qualities the activities aboard ship request. Therefore the improvement of the results at one of the variants guides to the increasing the specific medium capability of the group to realise the other one in best (optimal) conditions.

Table 7

Ord. no.	Correlated parameters	1	2
The correlative matrix with the correlation coeficients of specific psycho motional parameters, we collected from the experimental group students (E) in the final tests (T_f).		
1	***„Oprişan" test. First variant***		**0,86**
2	***„Oprişan" test. Second variant***		
Legend		
r < 0,52; p < 0,05;		**0,52 ≤ r ≤ 0,66; p = 0,05**	**r > 0,66; p = 0,01.**

The general conclusion we may get is, practically we still can create some other variants of the ittinerary, larger or smaller, according to the specific physical and psycho motional posibilities of the crew the man is working whithin, for attending a higer level of the psycho motional experience, more and different developed in order to face the difficulties the activities on the ship request. Each member of the crew has to have a most appropriate answer to help the general succes of the crew.

The results get at the final psychomotional testing as well as the correlation level of the two variants of the psycho motional specific test („Oprişan") applied in our experimenal research we present to you make us aware to conclude our unique pedagogical experiment with the naval and marine students and the general methodology, fully reached the target they expected.

Generally speaking, we recorded at the level of all the investigated parameters in *innitial test* (T_1) a large scale of values of statistical indicators

(Vmax-Vmin). We expected in the intermediary test (T_2) and final test (T_f) this scale to record a lower value by uniformization in training of the experimental group members. It didn't happen.

Developing our tests aboard a ship we attired attention and interest of the crew members, and, surprise! they wanted to take part in our experimental action. Of course, their participation stimulated, challanged the members of the experimental group. So, they maintainened constant the values of the differences between the first and the last in the courses timing. More than that, we noticed some important changes because the first in some tests came down the top in other tests. The most important thing we consider to have been gained was from far the interest the students involved in the experiment, their devotion, their challenging attitude.

C. The correlative analysis between the groups of tests

This analyse includes to calculate the statistical correlation coeficients, between the average of the values rankings of the tests inside the experimental group for each one of the eight groups of tests applied. As can be seen in table 47 we recorded correlation coeficients statistically significant, between most of thegroup of tests.

Table 8

		1	2	3	4	5	6	7	8
The correlative matrix to the correlation coeficients, between the group of tests applied to the experimental group members (E) in our final test (T_f)								
Ord. no.	**The correlated parameters**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	**The morphological development**		0,72	0,27	0,52	0,59	0,38	-0,14	0,58
2	**Breathing apparatus**			0,54	0,49	0,72	0,52	0,62	0,27
3	**Cardiovascular apparatus**				0,61	0,63	0,60	0,59	-0,02
4	**Physiological indicators**					0,76	0,81	0,51	0,47
5	**General physical training**						0,86	0,69	0,64
6	**Specific physical training**							0,78	0,47
7	**Specific psycho motional training**								0,51
8	**The psychosocial integration level**								
Legend								
	r < 0,52; p < 0,05;			**r ≥ 0,52; p = 0,05;**			**r > 0,66; p = 0,01.**		

5.   GENERAL CONCLUSIONS

As seen, the **morphological parameters** of the second experimental stage did not have a significant evolution either, showing the statistical significance threshold at p = 0,05 and freedom degree n-1. This demostrates again the evolutive processes in the anthropometric line are somehow closed at this age and the specific training only helps to come to maturity. What is left to be perfectible ? The parameters characterizing the joints mobility !

Concerning the final tests in order to determinethe evolution of the **functional capacity** we notice the experimental group recorded a positive evolution and astatistically significant difference at the level of all investigated parameters concerning the functional capacity of the **breathing apparatus**, as well as the functional capacity of the **cardiovascular apparatus.**

The positive evolution in improved direction of the investigated functional parameters at the experimental group level showed an excelant capacity to adaptation to efficiently support the physical effort. This demonstrates our new vision over the programming the education and specific physical training is positively useful according to the requests of the navigators activities aboard ships.

Even if we stressed a little more the activities to ensure a **specific physical training** and a **specific psiho motional training** of the naval and marine students inside our pedagogical experiment, we did not avoid to pay attention to the free time of the students, to help them have fun using the methods of the physical training.

More than that, we concluded that, by introducing specific and rationalized physical and psychomotional training according to the requests aboard ships we influenced in the same time the general physical training level.

In the final phase of the research the experimental group recorded superior values in the improved sense at seven from the nine investigated parameters in general physical training, the difference between the averages of the groups being „*very significant from statistical point of view*”, according to Fischer's table, at a statisttical significance threshold of „p”<0,001 and n-1.

Concerning **specific physical training**, the evolution of the recorded parameters in the final phase of the research fully demonsrated our programme is covering the training needs aboard ships.

The statistical calculation results revealed that the experimental group recorded at the level of the most investigated parameters ”*very significant from statistical point of view*” differences at the significant threshold of p = 0,01 and n-1

The objectivity by expressing only the figures representing our results, the mathematical modelling of the desired training level, together with the statistical and mathematical processing and interpreting of the results showed the target of the methodical-scientific research inside our experiment weas fully reached.

The results obtained at the final testing from the experimental second stagedemonstrated the same thing concerning the **specific psycho motional training**.

In both variants of specific psychomotional test („Oprişan” test), at the final test, the experimental group is included into the effort needs aboard ship, the average of the group being far better than the one of the witness group, „t” = 9,44 and 9,40, differences „*very significant from statistical point of view*” at p = 0,001 and n-1.

Concerning the **psycho temperamental testing** and the final one, the results of the Guilford - Zimermann test showed the students group we worked with are fully satisfying the requests the navigation security raises to the crews. They are not problems in this respect, no

statistically significant differences between the experimental and witness group were noticed.

Concerning the **psychosocial integration capacity (the communicative emergency level)**, the results of the final test in the second experimental stage with the test *„MAK-KROSSKI"* showed an important superiority of the experimental group compared to the witness group „t" = 8,84, *„a very statistically significant"* difference at p = 0,001 and n-1.

This shows the specific and psychosocial integration emergency comunication parameters are influenced positively, are prfectible by introducing the new optimal system with its operational objectives of the specific physical and psycho motiomal training introduced in the practical training of the naval and marine students.

6. FINAL CONCLUSIONS

1. At the end of our study we concluded that the specific physical and psycho motional training, **in naval education is insufficient found in the litterature**.

The authors dealing withnavalspecific issues, are usually reffering mostly to the necessity of the psychological education in the field. They also recognize the real place the physical education has to have in a complete education of the future navigators, for its roleplay in the regulation of integrative function and the psycho motional capacities in the activities aboard ship.

2. Analyzing the **educational plans**, programmes and the other **planning documents** in the Navy we noticed the **small numbers of hours dedicated to the physical training** of the **naval and marine students**, no matter if civilians or military. The total amount was raising to the level of the time dedicated to study litterature, philosophyor...theology, totally incorrect for their future professional activities across the seas.

We also have to mention that until the start of our research, the hours included in the general planning in the field was orientated mostly to the general physical training, avoiding the specific psycho motional training, far from the needs of the students and the naval activity.

3. Analyzing **the results of the sociological investigation questionnaire** we concluded the specilists are aware of the necessity of enlarging the number of hours dedicated to specific physical training and guiding them correctly to thei future occupation.

The same thing was understood after **analyzing the laws and the rules designed** to regulate the navigation activities, they also being unefficient and not able to organize the putting into practice of the theoretical studies. There ,s a need to induce a new vision and methodical scientific way to replace the old traditional training system as to be able to be more practical in applying the established rules.

4. In order to follow the goal we suggested in our research we used a n important part of the **traditional tests** taken fom the litterature in the field but we also dared to introduce new **tests and parameters very specific** to the activity we were studying. This way we became practical and concrete supported by the results seen in the figures we presented.

5. The results we obtained in the second experimental stage were absolutely relevant, demonstrating that *the proposed optimal model applied in the specific physical and psycho motional training of the naval and marine students* was in their benefit. The specific methods in testing checking the results were according tothe real requests in the navigation activitiesand they reached al the concrete parameters able to give us a correct answer to our questions concerning the physical activity, the specific needs of the effort in the navigation.

This way we elaborated *„the model of the navigator"* having figures-parameters in all directions we are going to test the navigator, a model never realised before.

7. METHODICAL – PRACTICAL RECOMMENDATIONS

1. The results obtained by optimizing the structures and the contents of specific physical and psycho motional contents of the naval and marine students demonstrated the veracity of our research we did as well as the necessity to generalize the new optimal system of training applying on the entire navigator personnel.

2. The structure the professional activities are organized aboard ships must include compulsory the specific education and training in order to develop at highest level all activities included in the navigators life in best weather condition as well as in stormy conditions of the open sea. So it is obviously important to execute practical exercises in practical cases of „**The Roles of the Ship**" *(„man or men over board",fire on board" „flood in the tanks", „abbandon ship", „ salvation and surviving in case of wreckage",* etc.)

Therefore, the practical permanent training is absolutely and compulsory for every member of the crew in order to form and to maintain the physical qualities and a best capacity to react in any case to solve the bursting out problems.

3. The specific training algorythms and the optimal model to put into a structure wel organized all the practical elements we suggested are considered to be very flexible and adaptable to any kind of a ship.

The way we worked and oriented towards forming and keeping the psycho motional qualities specific to the navigators activities can be adopted also by the aviators, miners and other cathegories with good results.

4. The new line we suggest, very we;ll supported scientifically, as well as the results we obtained (verysignificant from the statistical mathematical point of view, obtained in our pedagogical experiment together with our groups of naval and marine students (even together with members of the crew!) fully confirmed the hypotesis previously established as wel as the goal, the tasks and the methodology we used.

5. The methodical-scientific guiding of the specific professional training has to be applied both inside the educational process and in the practical applications in the school, as well as all along the life and activities of the navigating pesonnel. The methodical line and the direction we mention is already in use in many navigation companies.

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