



# Experimental Research of Effective «The Ship's Captain and the Pilot» Interaction Formation by Means of Training Technologies

## Estudio Experimental de la Formación de Interacción Efectiva "Capitán / Piloto" Mediante Tecnologías de Entrenamiento

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#### ABSTRACT:

This study experimentally confirms that the "Master / Pilot Relationships on the bridge" course is sufficiently effective to form the interaction of a ship captain with a pilot. It is theoretically substantiated and empirically established how implementing this course based on learning technologies can enhance participants' skills. Specially designed practical and theoretical tasks have been introduced to increase the effectiveness of participants' interaction on the bridge.

**Keywords:** Sea security, pilotage, professional competences.

#### RESUMEN:

Este estudio confirma de modo experimental que el curso "Relaciones Maestro / Piloto en el puente" es bastante efectivo para la formación de la interacción entre el capitán del barco y el piloto. Ha sido teóricamente comprobado y empíricamente establecido como la implementación del curso basado en las tecnologías del aprendizaje puede mejorar las habilidades de los participantes. Se han propuesto tareas prácticas y teóricas especialmente elaboradas que elevan la efectividad de la interacción entre los participantes en el puente.

**Palabras clave:** Seguridad marítima, pilotaje, competencias profesionales.

## 1. Introduction

In recent decades, sea security has become a key issue in the maritime industry. The globalizations of the world space, the vector offset of maritime trade into Asia are stimulating the world community to pay close attention to the state of sea security. The key to reducing the accident rates of maritime transport and conserving human resources is a high-quality training, retraining and advanced training of marine personnel (Nosov et al., 2019a). Recently, more and more attention is being paid to the development of automated (Ben et al., 2019; Nosov et al., 2019a, 2019b) and automatic (Zinchenko et al., 2019a, 2019b, 2019c) vessel traffic management systems and their means of practicing.

Ukraine is a maritime state that provides marine world companies with qualified specialists. The safety and security at sea of its citizens is a priority of public policy (Nosov et al., 2019a). The world community is taking prudent steps in this direction. A diplomatic conference on sea security was held in London in 2013. Conference delegates adopted new principles for the current "International Convention for the Safety of Life at Sea" (SOLAS) (1974-2012) (Nosov et al., 2019a) to enhance maritime safety.

A number of effective measures allowed continuing the qualitative work on forming a culture of international interaction. The key objective is to establish coordination between ships and port facilities to establish and prevent acts that pose a threat in the maritime transport sector (Nosov et al., 2019b). International forums on these issues are held regularly in all maritime countries. In particular, International scientific conference "Life Safety in Transport and Production – Education, Science, Practice", Kherson, September 2019; international scientific conference on the memory of Professors Yu. Fomin and V. Semenov (FS-2019), April 24-28, 2019, Odesa – Istanbul – Odesa and other conferences have addressed a number of relevant sea security issues.

Let us look at the interconnection between the quality of the interaction and the security of the watch on the ship. Especially, during navigational tasks and maneuvers, it is possible to form steady interactions between watch members. It is proven that such interaction depends on the level of experience and qualification. It is experimentally established that such interactions violate the rules of watch and localize the formed groups from other ship handlers. In order to prevent adverse effects, researchers have proposed and tested software tools to identify local entities that adversely affect ship management tasks (Nosov et al., 2019b).

The safety of the ship and its personnel is always the responsibility of the captain. The exception may be the "forced" pilotage. The pilot, who arrives on board in such critical (stressful) situations, becomes responsible for the pilotage (Nosov et al., 2019a). At the same time, it is stated that responsibility for safe navigation of the vessel and personnel is NOT transferred to the pilot (Zinchenko et al., 2019b).

A key duty of the pilot is the ability and power to maneuver the ship so that the local special features hazards, rules and various warnings that were in the area of pilotage become apparent to the captain (Nosov et al., 2019a). Good pilot's performances of his duties should help to avoid dangers. Ex facte, this is how it works, but in part, the "interpersonal effect" or "human factor" (in the aforementioned situation) is crucial (Nosov et al., 2019b; Zinchenko et al., 2019a).

Undoubtedly, the professional training of the captain and the pilot are important. In such training "hard skills" competencies are important, but in the delineated situation studied "soft skills" (relationships skills) competencies are sometimes conclusive (Nosov et al., 2019b). Effective interaction and constructive communication are able to provide the optimum result, if the professional level of its participants is acceptable.

By effective "The Ship's Captain / the Pilot" interaction we mean pilotage that provides optimum maneuverability for the ship, taking into account all threats, dangers and warnings that are known to the pilot and which are objectively transmitted and properly received and taken into consideration by the captain without any loss (Zinchenko et al., 2019a).

*Hypothesis.* We assume that the proposed psychodiagnostic set of parameters will relevantly reflect the subject of the study; application of the study results will allow operationalizing and increasing the efficiency of regular "Master/Pilot Relationships on the bridge" courses.

*Purpose.* The psychological meaningful features of effective "The Ship's Captain / the Pilot" interpersonal interaction formation by means of "Master/Pilot Relationships on the bridge" training technologies are to be experimentally researched.

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## 2. Methodology

The methodology for the experimental research of effective "The Ship's Captain and the Pilot" interaction formation by means of training technologies is a series of sequential measures using psychodiagnostic tools. The proposed methodology has been tested in researches of various human activities (Blynova et al., 2020; Popovych et al., 2020a; 2020b). All the experimental and empirical studies outlined are directly related to the subject of our study. In the scientific and educational works on "organization of the bridge" the attention is paid to the importance of high-quality information exchange (Ben et al., 2019; Nosov et al., 2019a et al.). After every maritime accident associated with pilotage, the cost of which is human lives and material and environmental damage, there is an increased focus on quality "The Ship's Captain / the Pilot" interaction (Ben et al., 2019; Nosov et al., 2019a et al.).

Here are some of the biggest tanker accidents: "Exxon Valdez", 1989, Alaska (USA); "Sea Empress", 1996, Milford Haven (England); "Nassia", 1994, Bosphorus Strait (Turkey); "Erika", 1999, France; "Prestige" 2002, Spain (Nosov et al., 2019a) and others. In order to avoid such and similar situations, it is necessary to work on the formation of international interaction culture at sea and to follow the recommendations of the "Bridge Procedures Guide" (1998) and "Bridge Team" (2008). They provide a list of stages of information exchange in the studied "The Ship's Captain / the Pilot" interaction. The first stage "Pre-Arrival Information Exchange with the Pilot" begins before the ship approaches the port (passing a complex section of the sea). The second stage "Master/Pilot Information Exchange on boarding" starts after the pilot arrives on the bridge. The third (an important) stage "Master/Pilot Relationships on the bridge" is the process of pilotage.

We see the most important task of the generated research methodology in a qualitatively designed study subject. This, in turn, will allow us to select the relevant complex of psychological meaningful parameters of "The Ship's Captain / the Pilot" interpersonal interaction. We understand that the problem of "interpersonal interaction" is multidisciplinary: managerial, psychological, and philosophical. The cross-cultural nature of such interaction should not be overlooked, since the application for pilotage in a timely and qualitative manner does not aim to take into account and cannot take into consideration the interethnic, intercultural and other differences of the participants of "The Ship's Captain / the Pilot" interaction (Ben et al., 2019; Nosov et al., 2019a et al.).

Priority is given to the selection of meaningful psychological parameters that are relevant and original scientific units of "The Ship's Captain / the Pilot" interaction study. We have applied standardized validated test methods with a high degree of retest reliability. In our opinion, the list of methods selected allows us to optimally delineate the semantic nature of the phenomenon under study. In constructing the logic of the experimental study, we have started from the fact that the phenomenon under study is an integral set of empirical characteristics. This complex has the ability to delineate person's mental activity and to influence the process and outcome of personality's activity (Izard, 1991). The proposed methodology and logic of the experimental study allowed us to approach the creation of an "empirical picture" of the research.

## **2.1. Participants**

The participants of the experimental research were delegates – three persons: captain – 1; chief officer – 2. Delegates underwent advanced training in the program "Master/Pilot Relationships on the bridge" in October 2019. The experimental base was in Kherson State Maritime Academy (KSMA), Ukraine. The average age of the sample population is 46.33 years, all – male.

## **2.2. Organization of Research**

An empirical ascertaining section was made before the course. The "Master/Pilot Relationships on the bridge" course lasted five training days, with a total of one ECTS (European Credit Transfer and Accumulation System) credit. The training organizers planned it in such a way that, besides the participants, a leader, a dispatcher, two instructors and a pilot were involved. The training organizers planned it in such a way that, besides the participants, a leader, a dispatcher, two instructors and a pilot were involved. The trainers monitored the delegates' training process, took notes, and gave feedback during the break between assignments and after completion. After completing the course, the instructors made an expert evaluation of the class delegates on a special letterhead of Company "Marlow Navigation Ukraine". The control section was made after the course. We have obtained prior permission from the Higher Education Institution (KSMA) administration to conduct the study.

## **2.3. Procedures and Instruments**

The determined object and subject of the study, the established methodological basis prompted us to choose methods that will allow us to qualitatively reveal the effectiveness of "The Ship's Captain / the Pilot" interaction. Let's submit test methods. The questionnaire "Level of Social Expectations" ("LSE") (Popovych, 2019) allowed us to establish the expected self-regulatory capacity of the participants of training. According to this method, we define four groups of motives: "motivational core of the personality", "achievement of difficult goals", "predicted

evaluation of the subject's activity" and "responsible activity". The indexes of reliability, obtained by means of Cronbach's alpha (Gottsdanker, 1978), were:  $\alpha = .721$ .

In two methods the responses were evaluated by means of the bipolar semantic differential scale, its value was within the range of -3 (absolutely disagree) and +3 (absolutely agree). Coping-test "Way of Coping Questionnaire" ("WCQ") (Lazarus & Folkman, 1984; adapted by Kriukova & Kuftiak, 2007) was used to determine coping-strategies – eight ways to overcome challenges in different areas of mental activity. The indexes of reliability, obtained by means of Cronbach's alpha (Gottsdanker, 1978), were:  $\alpha = .831$ .

Here are the coping-strategies that determine the success of training: confrontation, distancing, self-control, seeking social support, accepting responsibility, avoidance, planning to solve a problem, positive reestimation. In this method, the responses were evaluated by an unipolar semantic differential scale, which values ranged from 0 (never) to 3 (often). The indexes of reliability, obtained by means of Cronbach's alpha (Gottsdanker, 1978), were:  $\alpha = .818$ .

The methods "Expected Situation" ("ES") (Popovych, 2019) and "Realization of Expectations" ("RE") (Popovych, 2019) were used to determine the characteristics of social expectations: internality, externality, activeness, passiveness, openness, closeness, adequacy and inadequacy. The dichotomous scale was used, Cronbach's alpha (Gottsdanker, 1978) was  $\alpha = .732$ . The indexes of reliability of the methods used and the tests of Cronbach's alpha were within sufficient .7 and high .9 levels (Gottsdanker, 1978).

## 2.4. Statistical Analysis

Statistical analysis was performed by programs "Statistical Package for the Social Sciences" (v. 23.0) or the other name PASW (Predictive Analytics SoftWare) Statistics and "Microsoft Excel". Correlations are established using the Spearman's rank correlation coefficient (rs) (Gottsdanker, 1978). Arithmetic mean value of parameters (M) and mean-square deviation (SD) were calculated. The normal distribution is determined by the Kolmogorov-Smirnov criterion k (Gottsdanker, 1978).

The differences between the diagnostic sections of the ascertaining and control stages were established using the Student's t-test (Gottsdanker, 1978).

## 3. Results

### 3.1. Psychodiagnostics of the ascertaining stage of the research of "The Ship's Captain and the Pilot" interaction effectiveness

Frequency characteristics were measured using the arithmetic mean (M) and mean-square deviation (SD) scales. At the beginning of psychodiagnostics, using "Expected Situation" and "Realization of Expectations" and using a coding matrix, it is established that the expected regulatory capacity of the participants of training has the following values of properties: openness – within .85-1.00; internality – within .85-.90; activeness – within .90-1.00; adequacy is within the range of .10-.20, which are presented in Tabl. 1.

**Table 1**  
Frequency characteristics of properties by methods  
"Expected Situation" and "Realization of Expectations"

Scale	Arithmetic mean, M	Mean-square deviation, SD
Internality / Externality (IEp)	.88	.03
Activeness / Passiveness (APp)	.93	.06
Openness / Closeness (OCp)	.93	.08

<b>Adequacy / Inadequacy (AIp)</b>	.17	.06
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Using the "Level of Social Expectations" questionnaire, frequency characteristics were measured on the arithmetic mean (M) and mean-square deviation (SD) scales. The parameters of the expected regulatory capacity of the participants of training were found to have high values, which are presented in Tabl. 2.

**Table 2**  
Frequency characteristics of parameters by to the questionnaire "Level of Social Expectations"

<b>Scale</b>	<b>Arithmetic mean, M</b>	<b>Mean-square deviation, SD</b>
<b>The Level of Awareness of the Expected Events (LAEp)</b>	24.00	.00
<b>The Level of the Expected Attitude (LEAp)</b>	18.33	2.31
<b>The Level of the Expected Performance (LEPp)</b>	47.33	.58
<b>The Level of Social Expectations of Personality (LSEp)</b>	89.67	2.08

Using the "Level of Aspirations of Personality" questionnaire, the frequency characteristics of the respondents' motivational structure parameters were measured using the arithmetic mean (M) and mean-square deviation (SD) scales. It is established that the motivational parameters of the four blocks have mean values, which are presented in Tabl. 3.

**Table 3**  
Frequency characteristics of the properties by the questionnaire "Level of Aspirations of Personality"

<b>Scale</b>	<b>Arithmetic mean, M</b>	<b>Mean-square deviation, SD</b>
<b>Internal Motif (IM)</b>	17.00	1.00
<b>Cognitive Motif (CM)</b>	20.00	1.00
<b>Avoidance Motif (AM)</b>	12.33	3.51
<b>The Motif of Competition (MC)</b>	14.33	3.55
<b>The Motif of Changing Activity (MCA)</b>	8.00	1.00
<b>The Motif of Self-Respect (MS)</b>	18.67	2.08
<b>The Significance of Results (SR)</b>	3.33	.57
<b>Task Complexity (TC)</b>	5.00	2.65

<b>Volitional Effort (VE)</b>	14.33	5.51
<b>Estimation of the Level of the Achieved Results (ELAR)</b>	12.67	.58
<b>Estimation of Personal Potential (EPP)</b>	16.68	2.52
<b>The Projected Level of Mobilizing Efforts (PLME)</b>	19.00	1.00
<b>The Expected Level of Results (ELR)</b>	11.67	3.22
<b>Regularity of Results (RR)</b>	18.00	3.00
<b>Initiative (I)</b>	14.00	1.73

Using the "Way of Coping Questionnaire" questionnaire, frequency characteristics of parameters of coping-strategies of delegates' behavior in critical (stressful) situations were measured using the arithmetic mean (M) and mean-square deviation (SD) scales. The parameters of the eight copying-strategies are found to have the values, which are presented in Tabl. 4.

**Table 4**  
Frequency characteristics of the properties by the questionnaire  
"Way of Coping Questionnaire"

<b>Scale</b>	<b>Arithmetic mean, M</b>	<b>Mean-square deviation, SD</b>
<b>Confrontation (C)</b>	7.00	1.00
<b>Distantiating (D)</b>	6.67	2.31
<b>Self-Control (SC)</b>	14.00	1.73
<b>Seeking Social Support (SSS)</b>	9.67	1.53
<b>Accepting Responsibility (AR)</b>	6.00	1.00
<b>Avoidance (A)</b>	4.67	2.08
<b>Planning to Polve a Problem (PSP)</b>	16.00	3.46
<b>Positive Overestimation (PO)</b>	10.33	3.21

The complex of thirty one psychological parameters is methodologically substantiated. Such a complex is relevant to the subject of study and allows you to reliably track changes between stages of measurement. According to the scales of the arithmetic mean (M) of the established psychological meaningful parameters, we conclude that: all delegates under study (n=3) have acceptable levels of expected regulatory capacity; have an acceptable motivational structure; have developed effective coping-strategies.

### 3.2. The forming stage of “The Ship’s Captain and the Pilot” interaction study

The essence of the forming stage of the study was passing the “Master/Pilot Relationships on the bridge” course by the delegates, which lasted five training days. Such forming experiment is inherently psychological-pedagogical, but has some peculiarities. The biggest special feature is the three delegates who are simultaneously training “on the bridge”. The forming experiment involved a program of tasks that were practically solved by delegates on the simulator. The choice of tasks and sequence of placement in the course program applies a verified system of principles: accessibility, systemacy, systematicness and consistency.

Another feature was that we did not have the traditional formation of experimental and control groups, and the comparison was made to determine significant changes between psychodiagnostic stages.

The methodological basis of the forming experiment was the initial principles of the training work that we have tested in previous experimental studies (Popovych et al., 2019a; 2019b).

The program included twelve simulated problem situations that delegates had to address. Each assignment began with a mini-lecture and an explanation of the terms of the assignment and the expected outcome. The pilot's participation in the simulated problem situations involved a specific role that made the task difficult.

The instructors constantly recorded the contribution of each delegate to the task, and accompanied the training process. Submission of new material was carried out in the form of mini-lectures, frontal, individual conversations, and group discussions. Preventive measures of negative manifestations in problem solving have been implemented through explanatory conversations and group discussions. Common forms of “Master/Pilot Relationships on the bridge” course were social-psychological training, post-training support, modeling of problem situations, individual problem-searching work.

The simulated failing conditions reflected typical situations that were taken from the “The Ship’s Captain and the Pilot” interaction experience. Such situations also have an educational and developmental direction. The final day of the classes facilitated the generalization of the gained knowledge and the consolidation of training self-correcting influences. It also promoted the self-analysis of personal achievements and mistakes. The control psychodiagnostic stage was conducted after completing the course.

### 3.3. The control stage of “The Ship’s Captain and the Pilot” interaction effectiveness study

At the control stage, similar test procedures were performed as at the ascertaining stage. We understand that significant changes in the prevailing part of the studied parameters should not be expected. Of scientific interest are the hypotheses of the study and the establishment of trends of change, which were recorded as a result of forming influences.

It is important to set acceptable levels of measured parameters. The evaluation of the effectiveness of the measures implemented at the control stage provided for expert evaluation by the course delegates. Expert evaluation was a significant indicator of change in three areas of the delegates’ training: cognitive, value-emotional and behavioral. The absence of significant disparities in survey results was demonstrated by comparing delegates’ results.

Our observations allow us to state that specially organized training “on the bridge” creates an invaluable emotional experience, a favorable learning and development environment, which influences the formation of behavioral patterns of the effective “The Ship’s Captain and the Pilot” interaction. We present a comparison of the parameters studied by the questionnaire “LSE” before and after the forming experiment in Tabl. 5.

**Table 5**  
Comparison of data of studied parameters by the questionnaire  
“Level of Social Expectations”

Scale	Average values
	Delegates (n=3)

	Before	After	Student's t-test value
<b>The Level of Awareness of the Expected Events (LAEp)</b>	24.00	24.67	.529
<b>The Level of the Expected Attitude (LEAp)</b>	18.33	19.00	.184
<b>The Level of the Expected Performance (LEPp)</b>	47.33	46.33	.580
<b>The Level of Social Expectations of Personality (LSEp)</b>	89.67	90.33	.728

Comparison of the results of the delegates' expected regulatory capacity before and after the forming experiment confirmed our assumptions. We state high parameters of the studied parameters and those that are within acceptable limits for delegates. We present clearly the studied parameters before and after the experiment by the questionnaire "Level of Social Expectations" in Figure 1.

**Figure 1**  
Comparison of the studied parameters before and after the experiment by the questionnaire "Level of Social Expectations"



Note: M – arithmetic mean.

After the forming experiment, the highest positive trend of the parameter "expected attitude towards participants of interpersonal interaction" was recorded ( $t=.184$ ;  $p > .05$ ).

We present a comparison of the parameters studied by the questionnaire "Level of Aspirations of Personality" before and after the forming experiment in Tabl. 6.

**Table 6**  
Comparison of data of studied parameters by the questionnaire "Level of Aspirations of Personality"

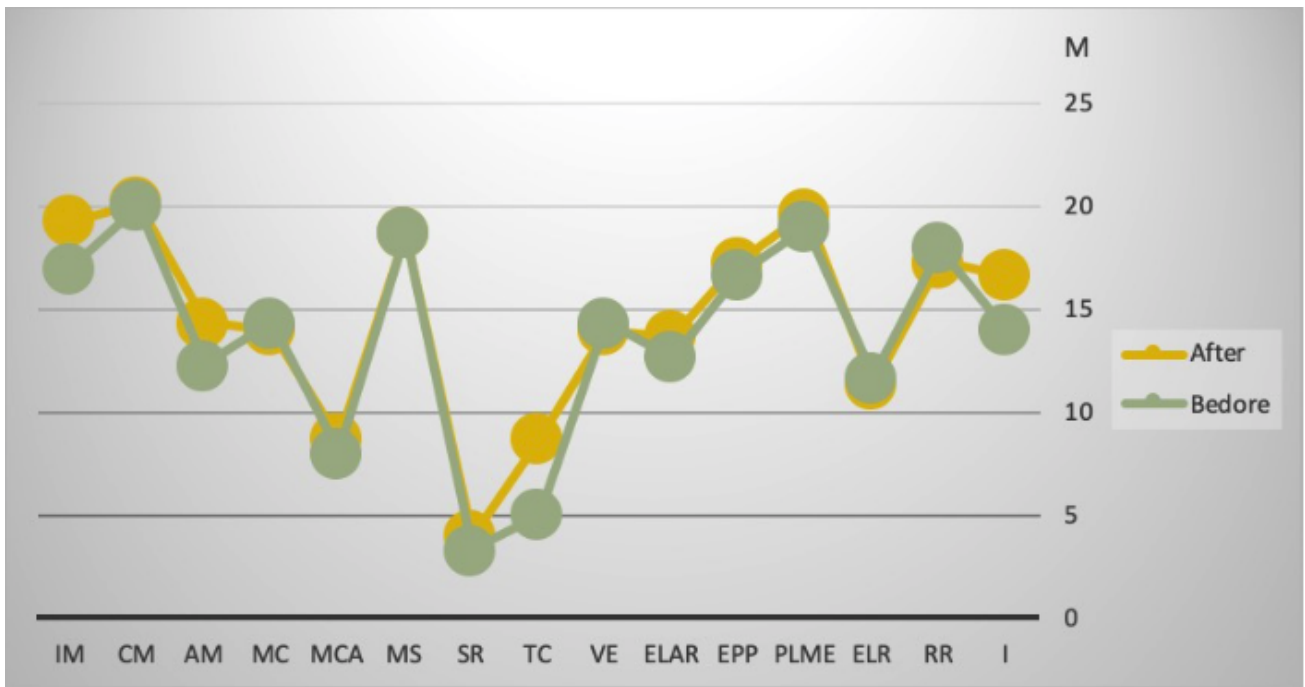
Scale	Average values
	Delegates (n=3)



	<b>Before</b>	<b>After</b>	<b>Student's t-test value</b>
<b>Internal Motif (IM)</b>	17.00	19.33	.118
<b>Cognitive Motif (CM)</b>	20.00	20.00	1.0
<b>Avoidance Motif (AM)</b>	12.33	14.33	.074
<b>The Motif of Competition (MC)</b>	14.33	14.00	.808
<b>The Motif of Changing Activity (MCA)</b>	8.00	8.67	.423
<b>The Motif of Self-Respect (MS)</b>	18.67	18.67	1.0
<b>The Significance of Results (SR)</b>	3.33	4.00	.184
<b>Task Complexity (TC)</b>	5.00	8.67	.087
<b>Volitional Effort (VE)</b>	14.33	14.00	.885
<b>Estimation of the Level of the Achieved Results (ELAR)</b>	12.67	13.67	.225
<b>Estimation of Personal Potential (EPP)</b>	16.68	17.33	.184
<b>The Projected Level of Mobilizing Efforts (PLME)</b>	19.00	19.67	.184
<b>The Expected Level of Results (ELR)</b>	11.67	11.33	.423
<b>Regularity of Results (RR)</b>	18.00	17.33	.742
<b>Initiative (I)</b>	14.00	16.67	.057

Comparison of the results of the delegates' motivational structure before and after the forming experiment confirmed that the motivational meaningful parameters were admissible and not undergoing significant changes. We provide clearly studied parameters before and after the experiment by the questionnaire "Level of Aspirations of Personality" in Figure 2.

**Figure 2**  
Comparison of the studied parameters before and after the experiment with the questionnaire "Level of Aspirations of Personality"



Note: M – arithmetic mean.

After the forming experiment, the highest positive trends of the parameters AM ( $t=.074$ ;  $p > .05$ ), TC ( $t=.087$ ;  $p > .05$ ) and I ( $t=.057$ ;  $p > .05$ ) were recorded.

We give a comparison of the studied parameters by the questionnaire “Way of Coping Questionnaire” before and after the forming experiment in Tabl. 7.

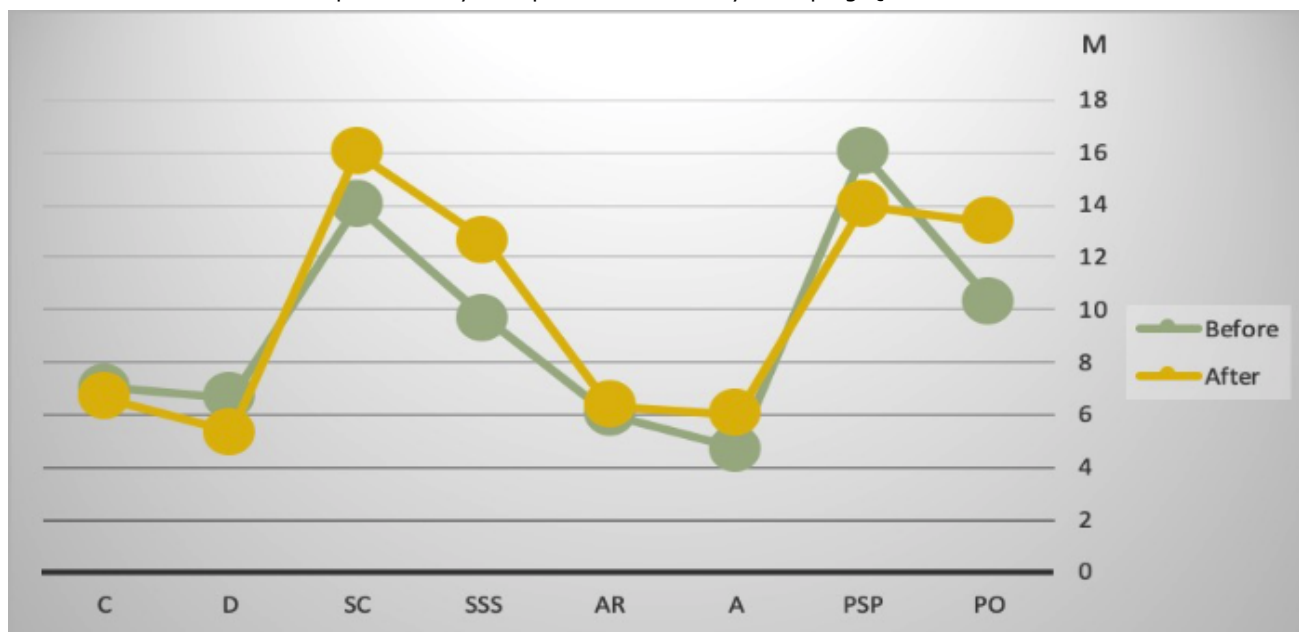
**Table 7**  
Comparison of data of studied parameters by the questionnaire “Way of Coping Questionnaire”

Scale	Average values		
	Delegates (n=3)		
	Before	After	Student's t-test value
<b>Confrontation (C)</b>	7.00	6.33	.184
<b>Distantiating (D)</b>	6.67	5.33	.383
<b>Self-Control (SC)</b>	14.00	16.00	.074
<b>Seeking Social Support (SSS)</b>	9.67	12.67	.188
<b>Accepting Responsibility (AR)</b>	6.00	6.33	.742
<b>Avoidance (A)</b>	4.67	6.00	.270
<b>Planning to Polve a Problem (PSP)</b>	16.00	14.00	.225
<b>Positive Overestimation (PO)</b>	10.33	13.33	.035

Our experimental expectations were confirmed by comparison of the results of the delegates' behavioral coping-strategies before and after the forming experiment. We establish the demonstration of the positive values of the parameters of the studied delegates' parameters in the context of their functional. We provide clearly studied parameters before and after the experiment with the questionnaire “WCQ” in Figure 3.

**Figure 3**

Comparison of the studied parameters before and after the experiment by the questionnaire "Way of Coping Questionnaire"



Note: M – arithmetic mean.

After the forming experiment, the highest positive trends of behavior parameters in coping-strategies were recorded: self-control (SC) ( $t=.074$ ;  $p > .05$ ) i positive overestimation (PO) ( $t=.035$ ;  $p > .05$ ).

Let us proceed to the next stage of showing the results of the experimental study – the expert evaluation of the instructors. In our study, for ethical reasons and the confidentiality of personal data, we present only summary results of the expert evaluation of the delegates’ general data (see Table 8) and summary results of the expert evaluation by the delegates’ key criteria (see Table 9).

**Table 8**

Summary results of the expert evaluation of the delegates’ general information (n=3)

<b>Version 2.0</b>	<b>Training Centre</b>	<b>XXX-X</b>	<b>Company "Marlow Navigation Ukraine"</b>
<b>Documents No: 1-2019; 2-2019; 3-2019;</b>	<b>MASTER / PILOT RELATION COURSE EVALUATION SHEET</b>		
<b>Delegate’s Name</b>	L. O.; B. V.; M. A.	<b>Instructor Name/Assessor</b>	C. Yu.; M. A.
<b>Delegate’s Rank</b>	Captain – 1; chief officer – 2	<b>Date</b>	22-25.10.2019
<b>Leadership</b>	<b>Average Result</b>		80%; 60%; 64%
It is very uncertain task to determine the Leadership type as per Evaluation Tool Instruction Manual within the subject course and exercises.	<b>Candidate passed</b>		Yes; No; No;
	<b>Needs further training</b>		No; Yes; Yes;
	<b>Performance to be reviewed</b>		No; Training; Training
	<b>General Comments and Conclusion</b>		
<b>Character</b>	Mr. _____ has good and stable results during		

<p>It is very uncertain task to determine the Character type as per Evaluation Tool</p> <p>Instruction Manual within the subject course and exercises.</p>	<p>performing of the exercises. Able to accept self-criticism, feedbacks to his action. Very good used sources of Bridge Team during emergency or difficulties.</p> <p>Mr. _____ has three exercises with scoreless then 70 %, when many stress conditions were placed. He received very good lessons for his further experience with regards of all issues which were in exercises the last exercise, even with score 73%, was done with really improved performance.</p>
<p><b>Management style</b></p>	<p>Mr. _____ has three exercises with scoreless then 70 %, when many stress conditions were placed. He received very good lessons for his further experience with regards of all issues which were in exercises the last exercise, even with score 73%, was done with really improved performance.</p>
<p>It is very uncertain task to determine the management style as per Evaluation Tool</p> <p>Instruction Manual within the subject course and exercises.</p>	<p>Mr. _____ has three exercises with scoreless then 70 %, when many stress conditions were placed. He received very good lessons for his further experience with regards of all issues which were in exercises the last exercise, even with score 78%, was done with really improved performance.</p>
<p><b>Ship's handling skills</b></p>	

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**Table 9**  
Summary results of the expert evaluation by the delegates' key criteria (n=3)

Criteria	Result	Training needed
<b>Deals with critical situation if Pilot on Board</b>	81%; 68%; 65%	Competent; Needs Training; Needs Training
<b>Effective Master – Pilot Exchange</b>	81%; 64%; 66%	Competent; Needs Training; Needs Training
<b>Maneuvering the ship to pilot boarding area</b>	81%; 56%; 64%	Competent; Needs Training; Needs Training
<b>Bridge Team Management – Communication</b>	84%; 64%; 61%	Competent; Needs Training; Needs Training
<b>Keep situational awareness</b>	80%; 56%; 61%	Competent; Needs Training; Needs Training
<b>Necessary steps if in doubt with pilot on board</b>	78%; 59%; 61%	Needs Improvement; Needs Training; Needs Training
<b>Effective Passage Planning and exchange with and without Pilot</b>	80%; 59%; 73%	Competent; Needs Training; Needs Training
<b>Ship Maneuvering arrival or departure with and without Pilot</b>	76%; 59%; 60%	Needs Improvement; Needs Training; Needs Training

The expert evaluation in an experimental study is a key method of establishing the effectiveness of delegates training and the personal responsibility of instructors for the level set of received competences.

The next stage, which is used to establish the effectiveness of "The Ship's Captain and the Pilot" interaction by means of training technologies, is the use of an idiographic method (Cone, 1986;

Thomae, 1999). The use of the idiographic method made it possible to research personal changes and come to a comprehensive conclusion on the nomination of each delegate. This method is a combination of psychodiagnostic and expert evaluation in the personal dimension of each delegate.

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## 4. Discussion and Conclusions

We have not encountered any experimental research of the effective "The Ship's Captain and the Pilot" interaction formation by means of training technologies. In the context of our research (in particular – the design of the forming stage), we relied on the initial principles which were established by scholars in related fields, actively applying a multidisciplinary approach (Prokhorov et al., 2015). The facts of research of mental states and psychological meaningful features in educational and professional activity of students were of scientific interest (Popovych & Blynova, 2019a; 2019b).

The results were reviewed at a methodological conference in Kherson State Maritime Academy. Experimental confirmation of the effectiveness of the "Master/Pilot Relationships on the bridge" course and the technology of implementation was enriched with empirical data, a number of applied aspects were operationalized, and all practical tasks were specified. The results of the experimental research of effective "The Ship's Captain and the Pilot" interaction formation by means of training technologies will facilitate to solve problems in the training of ship handlers, as well as in improving the skills of captains. The positive trends in the studied parameters of the delegates were established: LEAp ( $t=.184$ ;  $p > .05$ ); AM ( $t=.074$ ;  $p > .05$ ), TC ( $t=.087$ ;  $p > .05$ ); I ( $t=.057$ ;  $p > .05$ ); SC ( $t=.074$ ;  $p > .05$ ) and PO ( $t=.035$ ;  $p > .05$ ). Three stages of establishing the effectiveness of the course are proposed: 1) measuring key psychological parameters of delegates by valid methods; 2) expert evaluation of instructors; 3) an idiographic method of studying each delegate.

The hypotheses are proven. The proposed psychodiagnostic set of parameters relevantly reflected the studied parameters of the delegates of the "Master/Pilot Relationships on the bridge" course.

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