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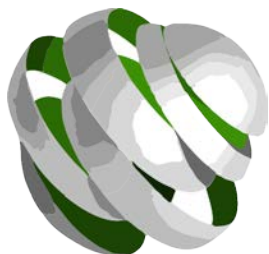
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EXERGY ANALYSIS OF STEAM TURBINE GOVERNING VALVE FROM A SUPER CRITICAL THERMAL POWER PLANT

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Abstract: Exergy analysis of steam turbine governing valve from a super critical thermal power plant is presented in this paper. Governing valve was analyzed not only at the highest, but also on two partial steam system loads. The lowest valve exergy destruction is 3598 kW and is obtained at the highest steam system load, while at partial loads of 80% and 60% valve exergy destruction is 13550 kW and 21360 kW. Valve exergy efficiency increases with an increase in system load, from 95.58% at 60% of load to 97.87% at 80% of load. At the highest load, valve exergy efficiency is the highest and is 99.57%. Change in valve steam specific entropy increment (difference in steam specific entropy between valve outlet and inlet) can be used as a tool for quick assessment of valve losses change. The ambient temperature influence on governing valve exergy analysis is low, especially in the highest steam system load where the majority of valve operation can be expected.

KEYWORDS: GOVERNING VALVE, EXERGY ANALYSIS, AMBIENT TEMPERATURE, SUPER CRITICAL POWER PLANT

1. Introduction

Governing valves were used in any type of power plants (land based or marine power plants) [1]. The main function of governing valves is to reduce pressure of operating medium [2]. When the governing valves are used in steam power plants (super critical or sub critical) their operating medium is superheated steam.

Main operating characteristics of superheated steam governing valves are that with the pressure reduction the steam temperature also reduces. During the superheated steam pressure and temperature reduction, steam specific entropy increases [3]. As the governing valves are mounted before the turbine housing, its operation allows obtaining the desired superheated steam operating parameters at the turbine entrance [4], what is necessary for safe and reliable turbine operation.

The essential rule for the governing valve operation is that before and after valve specific enthalpy of operating medium remains constant [5] (the negligible difference in specific enthalpy can occur only due to losses). In such way, operating medium pressure is reduced while the energy content remains unchanged [6].

It is irrelevant to investigate governing valves from the energy viewpoint, because without any operating medium mass flow leakage, governing valves have energy efficiency of 100 % and energy power losses equal to zero.

In the scientific and professional literature analysis of any valve type is rare. After an extensive search, papers were found about the investigation of steam turbine control valves [7], or analysis of steam turbine control valve along with its actuation system [8]. In [9] authors analyzed compressible superheated steam flow rate through pressure reduction valves.

This paper analyzed steam turbine governing valve mounted on the high pressure turbine inlet in a super critical thermal power plant, through three different steam system loads. Measurement results of governing valve operating parameters (steam pressures, temperatures and mass flow rates) at each steam system load enable calculation of valve exergy power inputs and outputs, as well as valve exergy destruction and exergy efficiency. At each steam system load the differences in steam specific entropy between governing valve outlet and inlet are also calculated and presented, which is a good indicator of system load and valve losses. Governing valve was also analyzed during the ambient temperature change.

2. Analyzed governing valve operating characteristics

The analyzed governing valve is mounted on the high pressure turbine inlet in a supercritical thermal power plant, Fig. 1. The main function of governing valve is steam pressure reducing before steam enters in the turbine. In the land-based steam power plant, steam generator (or more of them) will usually produce superheated steam with the highest possible pressure and temperature (defined by the steam generator producer) during the majority of plant operation.

The changeable variable is usually the steam mass flow rate, which is the most important parameter for defining the power plant load.

Governing valves, which reduces steam pressure at the inlet of the first power plant turbine (high pressure turbine) are used for fine-tuning of power plant current load, while the steam energy content remains the same before and after the valve (the same steam specific enthalpy). Governing valves are important elements in any steam power plant, especially when plant operates at partial load.

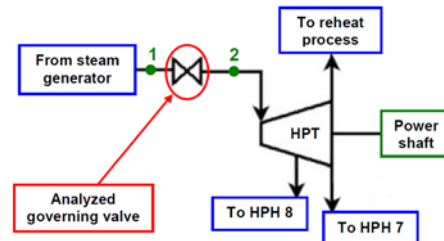


Fig. 1. Analyzed governing valve position with marked inlet (1) and outlet (2) at the entrance of high pressure turbine from a super critical thermal power plant [10]

Steam turbine governing valves in thermal power plants are usually of Venturi type. Cross-section of the turbine steam chest along with governing valves and its main bar is presented in Fig. 2. The main bar mechanism is used for raising and lowering of the governing valves. All governing valves are not lifted at the same time equally, but periodically, one by one. Such opening regime is allowable by different lengths of each governing valve stem. The main bar lifting mechanism is usually driven by servomotor, as presented in Fig. 2.

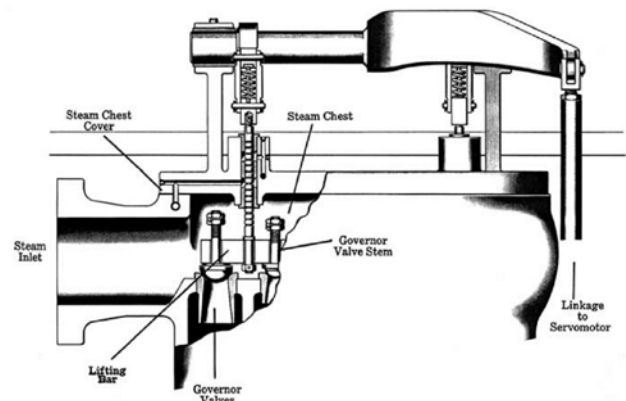


Fig. 2. Venturi governing valves and bar lift mechanism [11]

3. Exergy analysis of a control volume

3.1. Governing equations for exergy analysis

Mass flow balance for a control volume in steady state disregarding potential and kinetic energy is defined according to [12] by an equation:

$$\sum \dot{m}_{IN} = \sum \dot{m}_{OUT} \quad (1)$$

Exergy analysis is based on the second law of thermodynamics [13]. The main exergy balance equation for a control volume in steady state [14] is:

$$\dot{X}_{heat} - P = \sum \dot{m}_{OUT} \cdot \varepsilon_{OUT} - \sum \dot{m}_{IN} \cdot \varepsilon_{IN} + \dot{E}_{ex,D} \quad (2)$$

where the net exergy transfer by heat ($\dot{X}_{heat}$) at the temperature T can be defined, according to [15], by an following equation:

$$\dot{X}_{heat} = \sum (1 - \frac{T_0}{T}) \cdot \dot{Q} \quad (3)$$

Specific exergy is defined [16] by an equation:

$$\varepsilon = (h - h_0) - T_0 \cdot (s - s_0) \quad (4)$$

The exergy power of any flow stream [17,18] is defined as:

$$\dot{E}_{ex} = \dot{m} \cdot \varepsilon = \dot{m} \cdot [(h - h_0) - T_0 \cdot (s - s_0)] \quad (5)$$

The definition of control volume exergy efficiency depends on a control volume type and operation principle. In general, exergy efficiency of any control volume can be defined, according to [19,20], by an equation:

$$\eta_{ex} = \frac{\text{Exergy output}}{\text{Exergy input}} \quad (6)$$

3.2. Exergy analysis of governing valve from a super critical thermal power plant

Necessary operating points for steam turbine governing valve exergy analysis are presented in Fig. 1. The required steam specific enthalpies and specific entropies are calculated by using measured steam pressures and temperatures from Table 1 with Nist-REFPROP 9.0 software [21].

Steam temperature and pressure change through the governing valve resulted with the change in steam specific entropy. Change in steam specific entropy resulted with a significant change of steam specific exergy, equation (4) and steam exergy power, equation (5). Change of governing valve outlet exergy power, in comparison with valve inlet, resulted with the change in the governing valve exergy destruction and exergy efficiency.

Mass and exergy balances for the analyzed steam turbine governing valve, according to Fig. 1, are:

Governing valve mass flow balance:

$$\dot{m}_1 = \dot{m}_2 \quad (7)$$

Governing valve exergy balance:

- Exergy power input:

$$\dot{E}_{ex,IN} = \dot{m}_1 \cdot \varepsilon_1 \quad (8)$$

- Exergy power output:

$$\dot{E}_{ex,OUT} = \dot{m}_2 \cdot \varepsilon_2 \quad (9)$$

- Exergy destruction (exergy power loss):

$$\dot{E}_{ex,D} = \dot{E}_{ex,IN} - \dot{E}_{ex,OUT} = \dot{m}_1 \cdot \varepsilon_1 - \dot{m}_2 \cdot \varepsilon_2 \quad (10)$$

- Exergy efficiency:

$$\eta_{ex} = \frac{\dot{E}_{ex,OUT}}{\dot{E}_{ex,IN}} = \frac{\dot{m}_2 \cdot \varepsilon_2}{\dot{m}_1 \cdot \varepsilon_1} \quad (11)$$

The ambient state in the plant during the measurements was:

- pressure: $p_0 = 1 \text{ bar} = 0.1 \text{ MPa}$,
- temperature: $T_0 = 25 \text{ }^\circ\text{C} = 298 \text{ K}$.

4. Measurement of governing valve flow streams

Measurement results of governing valve flow streams (at valve inlet and outlet) were presented in [10] for three different thermal power plant loads (load of 60%, 80% and full load – 100%), Table 1. From Table 1 it can be seen that at any load steam pressure and temperature remain constant at governing valve inlet, while steam mass flow rates at valve inlet decreases with a decrease in plant load. The steam temperature at governing valve outlet depends on the pressure reduction. Higher pressure reduction (lower steam pressure at valve outlet) will result with lower steam temperature at the valve outlet.

Table 1. Measured data of steam flow streams at the governing valve inlet and outlet [10]

Load (%)	INLET (1*)			OUTLET (2*)		
	Temp. (K)	Press. (bar)	Steam mass flow rate (kg/s)	Temp. (K)	Press. (bar)	Steam mass flow rate (kg/s)
100	810.1	242.2	562.2	805.1	229.2	562.2
80	810.1	242.2	435.7	787.0	183.0	435.7
60	810.1	242.2	327.6	766.5	138.1	327.6

* Streams numeration refers to Fig. 1

From Table 1 it can be seen that power plant (steam system) load is mostly influenced with steam mass flow rate, which is the lowest at the lowest load and then increases up to the highest load.

Analyzed governing valve parameter which can also determine steam system load is the pressure reduction. The highest pressure reduction occurs at the lowest steam system load and for the analyzed valve it is 104.1 bar (reduction from 242.2 bar to 138.1 bar - load of 60%). Governing valve pressure reduction decreases with an increase in steam system load.

It can be concluded that governing valve pressure reduction and steam system load are reverse proportional, while the steam mass flow rate and steam system load are directly proportional.

5. Governing valve exergy analysis results with the discussion

5.1. Governing valve exergy analysis - based on the measurement results

Analyzed governing valve exergy power input and output change during the change in steam system load is presented in Fig. 3. An increase in steam mass flow rate, according to Table 1 and equations (8) and (9), is the most important reason for the increase of valve exergy power input and output during the increase in steam system load.

Governing valve exergy power input increases from 483538 kW at steam system load of 60%, to 643093 kW at a load of 80% and finally to 829807 kW at the highest steam system load of 100%, Fig. 3. Between the same steam system loads, valve exergy power output increases from 462178 kW to 629543 kW and finally it is 826209 kW at the highest steam system load.

The difference between valve exergy power input and output at each load represents valve exergy destruction (valve exergy power losses). From Fig. 3 and from presented values of valve exergy power input and output at each load it can be seen that those differences become lower and lower as steam system load increases. Governing valve has an operation principle as the most of other steam power plant components - the lowest exergy destruction will be obtained at the highest system load.

Exergy destruction of the analyzed governing valve, as a difference between exergy power input and output - equation (10), is the lowest at the highest steam system load and is 3598 kW, Fig. 4. As the steam system load decreases, valve exergy destruction increases and is 13550 kW at steam system load of 80%, while at

the lowest observed steam system load of 60% governing valve exergy destruction amounts 21360 kW.

Governing valve exergy efficiency, calculated according to equation (11) is the highest at the highest steam system load (99.57%) and then decreases with a decrease in steam system load. At partial steam system load of 80% valve exergy efficiency is 97.87%, while at the lowest load valve exergy efficiency is equal to 95.58%. It should be concluded that governing valve exergy efficiency has a very high values, even at a partial steam system loads.

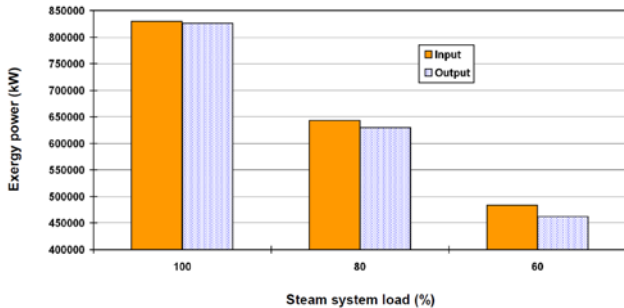


Fig. 3. Change of governing valve exergy power input and output during the change in steam system load

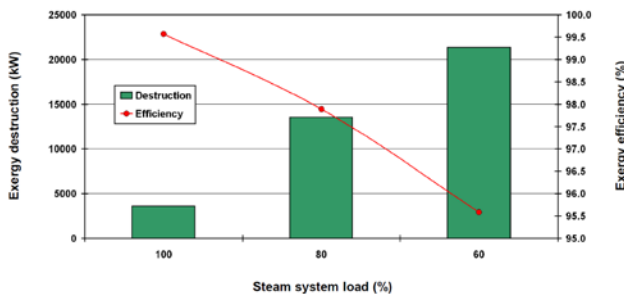


Fig. 4. Change of the governing valve exergy destruction and exergy efficiency during the change in steam system load

As mentioned before from the presented measurement results, pressure reduction on the analyzed governing valve and steam system load are reverse proportional. Additional operating parameter of the analyzed governing valve can be used for detecting the change in steam plant load. This operating parameter is steam specific entropy difference between valve outlet and inlet. Steam specific entropy at the governing valve outlet is higher than steam specific entropy at valve inlet due to pressure reduction and losses which can occur during this process. Pressure reduction on the governing valve and specific entropy difference (increment) on the same governing valve are directly proportional - they increase during the decrease in steam system load, Fig. 5.

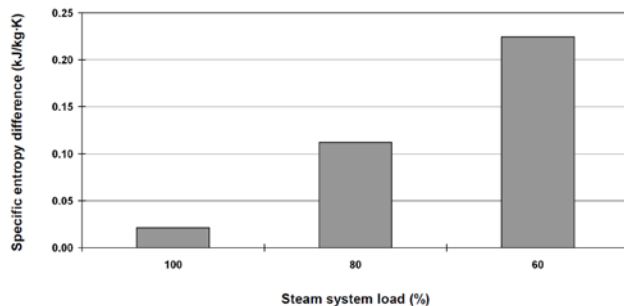


Fig. 5. Change of steam specific entropy increment between governing valve outlet and inlet during the change in system load

Specific entropy increment of any steam plant component represents losses which occur during the component operation and therefore, it can also be the real indicator of the analyzed component operation. When comparing Fig. 4 and Fig. 5 it can be concluded that calculation of exergy destruction is not necessary for

governing valve loss assessment at different steam system loads - it is enough to calculate steam specific entropy increment. So, steam specific entropy increment can be used as a tool for quick assessment of valve losses, while a detailed analysis require calculation of valve exergy destruction.

From Fig. 5 it can be seen that analyzed valve specific entropy increment decreases with an increase in steam system load from 0.224 kJ/kg·K at 60% of load to 0.112 kJ/kg·K at 80% of load. At the highest load, valve specific entropy increment amounts only 0.021 kJ/kg·K.

5.2. Governing valve exergy analysis - the ambient temperature variation

As for the most other steam plant components [22], it can be expected that the influence of the ambient temperature change on exergy analysis of governing valve will also have low impact. In this analysis, the ambient temperature was varied from 283 K to 313 K in the steps of 10 K, while the ambient pressure remains constant at the measurement state (1 bar) in each observed system load.

The change in analyzed governing valve exergy destruction for all observed steam system loads during the ambient temperature variation is presented in Fig. 6. It can clearly be seen that the ambient temperature change has as higher impact on valve exergy destruction as the steam system load decreases.

At the highest steam system load, valve exergy destruction is the lowest and increase in the ambient temperature for 10 K causes a slight increase in valve exergy destruction for only 120 kW in average. The same increase in the ambient temperature resulted in an increase in valve exergy destruction for 500 kW in average at the steam system load of 80%. At the lowest steam system load of 60% increase in the ambient temperature for 10 K causes the highest increase in valve exergy destruction which is 740 kW in average.

Several conclusions can be derived from Fig. 6. First of all, governing valve exergy destruction (exergy power losses) significantly increases during the decrease in steam system load. Second, the change in the ambient temperature more and more affects the valve exergy destruction as steam system load decreases.

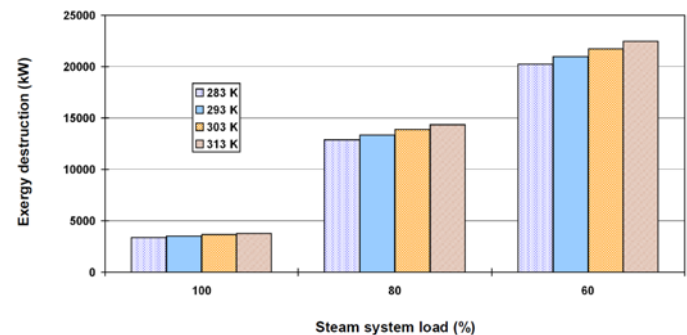


Fig. 6. Change of governing valve exergy destruction during the variation in the ambient temperature

Analyzed governing valve exergy efficiency change during the ambient temperature variation is presented in Table 2. The ambient temperature increase causes decrease in governing valve exergy efficiency, but that decrease is low at all steam system loads. Still, the highest decrease in governing valve exergy efficiency during the ambient temperature increase is notable at the lowest system load.

Table 2. Governing valve exergy efficiency change during the ambient temperature variation

Load (%)	Exergy efficiency at the ambient temperature			
	283 K	293 K	303 K	313 K
100	99.62%	99.59%	99.55%	99.52%
80	98.11%	97.97%	97.80%	97.63%
60	96.05%	95.75%	95.42%	95.07%

6. Conclusion

The paper presents exergy analysis of steam turbine governing valve mounted on the high pressure turbine inlet in a super critical thermal power plant. Governing valve was analyzed through three different steam system loads. Measurement results of steam operating parameters (pressures, temperatures and mass flow rates) at governing valve inlet and outlet enables calculation of valve exergy power inputs and outputs, as well as valve exergy destruction and exergy efficiency at each steam system load.

Increase in steam mass flow rate is the most important reason for the increase of valve exergy power input and output during the increase in steam system load. The difference between valve exergy power input and output becomes lower as steam system load increases. That difference represents valve exergy destruction (valve exergy power losses) at each steam system load.

The lowest valve exergy destruction which amounts 3598 kW and the highest valve exergy efficiency (99.57%) was obtained at the highest steam system load. Decrease in steam system load resulted in an increase in valve exergy destruction which is 13550 kW at 80% of load and 21360 kW at 60% of load, while at the same time valve exergy efficiency decreases (97.87% - 80% of load and 95.58% - 60% of load).

Steam specific entropy difference (increment) between valve outlet and inlet is an additional operating parameter which can be used for detecting the change in steam plant load. Steam specific entropy increment of the analyzed valve can also be used as a tool for quick assessment of valve losses.

The conclusion which follows from the ambient temperature variation is that the ambient temperature influence on analyzed governing valve exergy analysis is low, especially at the highest steam system load where the majority of valve operation can be expected.

7. Acknowledgment

This work has been fully supported by the Croatian Science Foundation under the project IP-2018-01-3739.

8. Nomenclature

Latin Symbols:	Greek symbols:
$\dot{E}$ stream flow power, kW	ε specific exergy, kJ/kg
h specific enthalpy, kJ/kg	η efficiency, -
$\dot{m}$ mass flow rate, kg/s	
p pressure, bar	Subscripts:
P power, kW	0 ambient state
$\dot{Q}$ heat transfer, kW	D destruction
s specific entropy, kJ/kg·K	ex exergy
T temperature, K	IN inlet (input)
$\dot{X}_{\text{heat}}$ heat exergy transfer, kW	OUT outlet (output)

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THEORY OF FACTOR EXPERIMENT (MATRIX OF IMPACT) OF GREENHOUSE AS A COMPOSITION SYSTEM FOR BIOGAS PRODUCTION AND REGULATION FOR PERMISSIBLE EMISSIONS OF HARMFUL MATERIALS IN ATMOSPHERE

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Abstract: By applying a complex, exact and scientific approach, was performed the development, calculation and analysis of a complex pilot installation (bioenergetics system consisting of the following elements: greenhouse for early vegetation crops, digester and internal combustion engine powered by biogas). Using the factorial experiment, i.e. applying the matrix of influence, a complete optimization of the internal combustion engine was performed in function of the other elements of the installation. An analysis is also made from the aspect of the positive current EU regulations in the field of air pollution.

Keywords: greenhouse, digester, factor experiment, emissions, EU regulations.

1. Introduction

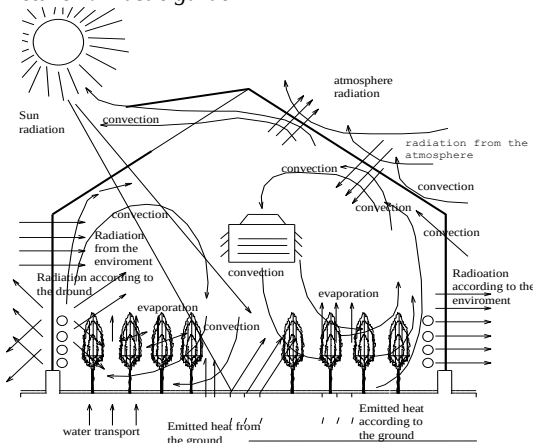
An intricate situation is elaborated, calculated and analyzed (bioenergetics system consisting of a plastic garden for early garden crops, a digester and an internal combustion engine). Here we are talking about an environmentally friendly energy production system, especially in terms of global warming, because it is with zero carbon dioxide ejection in the atmosphere.

In the installation the producer of biogas is the digester in which is performed continuous delivery of plant biomass from the greenhouse, which ensures continuous production of biogas. This gas is used by a motor generator that produces electricity to illuminate the greenhouse, the needs of the system or the agricultural economy. The waste heat energy from the engine's cooling system is used to heat the greenhouse. The exhaust gases of the engine are sprayed with clean and non-combustible hydrocarbons and are directly used into the plastic garden. They partly carry out the heating of the air and partly supplemental CO₂ yield, which increases the yield of products and biomass in the greenhouse. After the completion of the production process in the digest, there remains a high quality biological material that is used in the greenhouse for the increase on the yield of the production. A software model for quick calculation of the summarized production of biogas from the three-stage digester and a corresponding diagram of the same was developed.

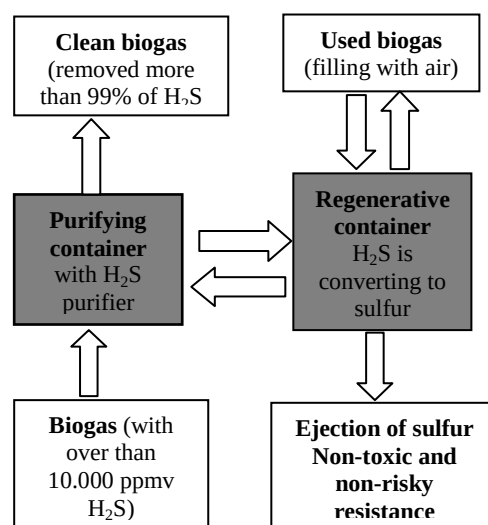
Analytical and numerical calculations have been verified using experimental results from well-known researchers and existing single-chamber digesters. Additional optimization of the system with application of the impact matrix was made, with a special review of the motor optimization.

2. Plastic garden and theory of factor experiment (matrix of impact)

Picture 1. Plastic garden



Picture 2. Theory of factor experiment



With this theory of factor experiment presented, described and planned in pictures number 1 and number 2, factors of action of the three main elements in the installation are taken into account on the resultant parameters.

To use this theory is necessary:

1. The correct selection of input-output factors for the certain element;
2. Determining the magnitude of impact to a certain factor;
3. Ability to determine the optimal variant of a given element
4. The logical connection of the work of the elements, especially those that can be applied indirectly.

In the given case, although the most distinguished elements are the digester and the greenhouse, the greatest difficulty in completing the matrix of influence is on the internal combustion engine. The reason for this is the need to comment on parameters that are influential or influenced, but not each of them can be measured or visually determined. The point should be taken into account that the internal combustion engine is a machine in which numerous microprocesses take place.

Therefore, a great deal of knowledge and scientific concealment of the researcher in the use of this theory is required in order to determine the most optimal variant of the system.

3. The theory of factor experiment – matrix of impact

Table 1. The theory of factor experiment – matrix of impact

DIGESTOR	1	2	3	Σ D	4	5	6	7	8	9	Σ
Kind of anaerobic boiling process	+2	-	-	2	+9	+5	+6	+5	+6	+4	35
Size and type of material	+10	+8	+10	28	+9	+6	+6	+5	+6	+4	35
Temperature of the process	+10	-	+10	20	+9	+7	+7	+7	+7	+4	41
Pressure in digester	+10	+9	+7	26	+10	+8	+8	+8	+6	+6	46
Acidity pH	+10	+10	+10	30	+7	+7	+7	+6	+6	+4	36
An unbearable atmosphere in the digester	+10	+10	+10	30	+9	+9	+8	+9	+7	+4	46
Quality of methane bacteria	+10	+10	+10	30	+6	+5	+5	+4	+5	+4	29
Time of retaining the material (substrate)	+7	-	+10	17	+3	+2	+2	+4	+3	+3	17
The ratio of S and N2 to the material that is digested	+9	+9	+9	27	+6	+6	+5	+5	+4	+4	30
Mixing in the digester	+10	+8	+10	28	+4	+3	+3	+4	+3	+3	20
Removing the swim bark	+8	-	+8	16	+4	+3	+4	+3	+4	+3	21
Relation to dry organic matter and water	+10	+10	+10	30	+5	+3	+5	+4	+5	+4	28
MOTOR	1	2	3	Σ	4	5	6	7	8	9	ΣM
Q1 - total amount of heat from fueled fuel	-	-	-	-	+10	+10	+10	+10	+10	-	50

Qe - the amount of heat transformed into effective work	-	-	-	-	+10	+6	+6	+8	+10	-	40
Qw - the amount of heat taken with the cooling medium	-	-	-	-	+10	+2	+2	+8	-	-	22
Qr - quantity of heat taken with combustion products	-	-	-	-	+8	+2	+2	+7	-	-	19
Qng - quantity of heat taken with the non-combustible fuel product of combustion	-	-	-	-	+6	+2	+3	+5	-	-	16
Oopt - the difference in the amount of heat input and consumption	-	-	-	-	+9	+2	+2	+8	+3	-	24
n - number of turns	-	-	-	-	+10	+10	+10	+10	+10	+10	60
λ - coefficient of excess air	-	-	-	-	+10	+10	+10	+8	+8	+10	56
PLASTIC GARDEN	1	2	3	Σ	4	5	6	7	8	9	Σ
Material for making pipes	-	-	-	-	-	-	-	-	-	-	-
Material for making a glasshouse	-	-	-	-	-	-	-	-	-	-	-
Coefficient for heat transfer	-	-	-	-	-	-	-	-	-	-	-
Heated fluid	-	-	-	-	-	-	-	-	-	-	-
Regulation	-	-	-	-	-	-	-	-	-	-	-

Climate change in the greenhouse	-	-	-	-	-	-	-	-	-	-	-
Heat the soil	-	-	-	-	-	-	-	-	-	-	-
Influence on SO ₂	-	-	-	-	-	-	-	-	-	-	-
Influence on brightness	-	-	-	-	-	-	-	-	-	-	-
Influence on temperature	-	-	-	-	-	-	-	-	-	-	-

- 1 – Biogas production
- 2 – Biogas quality
- 3 – Biogas quantity
- 4 – P_e – effective power
- 5 – G_h – hour consumption
- 6 – g_e – Specific consumption
- 7 – p_e – middle effective pressure
- 8 – torque
- 9 – η_v – charging coefficient

In accordance with EU air regulations, partial state regulations should be compatible with the following directives:

The Directive (2008/50 / EC) for the quality of ambient air and cleaner air for Europe, covers most of the existing legislation (except for the fourth minor directive) without changing the existing air quality targets set out in the old framework air quality directive 96/62 / EC and the three minor directives. This Directive sets new air quality targets for PM_{2.5} (fine particles), including exposure concentration requirements and the objective of reducing exposure (Official Journal of the European Union).

The Ambient Air Quality Standard (96/62 / EC) prescribes air quality standards, while the four minor directives (the first (1999/30 / EC), the second (2000/69 / EC), the third / 3 / EC) and the fourth (2004/107 / EC), give limit values for specific substances in ambient air. Decision of the Council (97/101 / EC) for the exchange of information and data from networks and individual measurement stations of ambient air pollution within Member States.

Commission Decision:

- Commission Decision (2004/461 / EC), which sets out the form and content of the Member States' annual report on the quality of ambient air in their territories to the Council;
- Directive 2008/1 / EC on Integrated Pollution Prevention and Control;
- Directive 2001/80 / EC on the limitation of emissions of certain pollutants into the air from large combustion installations
- Directive 2001/81 / EC on national upper limits for emissions of certain pollutants;
- Directive 1999/13 / EC on the limitation of emissions of volatile organic compounds resulting from the use of organic solvents in certain activities and installations;

Environmental Legislation; Air quality – existing legislation.)

4. Conclusion

In such a complex installation, its optimal operation is the function of the optimal operation of each individual element. The discontinuance of optimum work has only in the discontinuous operation of one of the elements and its influence in the direction of the subsequent element, but not in the reverse direction.

The type of material that digests most directly affects the yield of biogas and the time of storage in the digester. Applied plant biomass from early breeding production is a good choice for that spa in the group of organic matter that is most frequently digested in the technical practice. The reason for this is the high numerical value this is obtained in the analyzing of the range of biogas yields obtained from it. Namely, the minimum yield on biogas ranges from 0.42-0.45 (m³ / kgOSM), and the maximum yield on biogas is 0.52-0.55 (m³ / kgOSM). Therefore, the average yield values for biogas for this type of plant biomass are in the group of the maximum and amount to 0, 50 – 0,575 (m³ / kgOSM). In the observed optimal conditions, the relation between the amount of digested material and the daily inflow of biogas is fairly proportional.

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CURRENT SITUATION AND DEVELOPMENT PROSPECTS FOR MARICULTURE IN THE REPUBLIC OF CROATIA

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Abstract: *Mariculture in the Republic of Croatia has a long tradition involving cultivation of white fish, oil-rich fish and shellfish. It is an interesting fact that in Europe cultivation had started in the territory of the Republic Croatia where it has been maintained until today. As the Republic of Croatia has joined the European Union, it has gained access to numerous opportunities for further development and progress of this activity. The Republic of Croatia has adopted the National Strategic Development Plan of Fishing in compliance with provisions of the Council Regulation (EC) No. 1198/2006 on the European Fisheries Fund whereby strategic and development guidelines for this activity are provided for the period 2014 -2020, in harmony with the Common Fisheries Policy.*

The aim and purpose of this work is to analyze the current state of mariculture in the Republic of Croatia and to give a comparative presentation of this activity within the European Union, as well as to estimate prospects for the development and positioning of mariculture of the Republic of Croatia within the European Union member states.

KEYWORDS: AQUACULTURE; EUROPEAN UNION; MARICULTURE; REPUBLIC OF CROATIA, COMMON FISHERIES POLICY

1. Introduction

Nowadays, mariculture as a branch of aquaculture and an important segment of fishing activity is increasingly emphasized by its importance. Farming of marine organisms, especially fish and shellfish, seeks to compensate for their ever smaller presence in the Adriatic Sea. Due to excessive fishing beyond the prescribed quotas, which is increasingly threatening the sustainability of the ecosystem, the Adriatic Sea has been rather depleted of the stock of marine organisms. Globally speaking, mariculture is considered one of the most propulsive activities, in particular in the southern Mediterranean. The advantages of the Adriatic Sea are particularly evident in natural predispositions such as numerous coves, channels and bays, suitable for the development of this activity, in addition to climatic conditions that favor faster and more efficient cultivation of fish and shellfish.

According to the Treaty of Rome, a Common Fisheries Policy (CFR) has been adopted with the main objective to ensure sustainable fishing and to secure income and steady jobs. Its main feature is to ensure fishing activities by contributing to sustainable long-term prerequisites concerning the environment and at the same time contributing to economic and social development [1]. In Croatia, mariculture contributes significantly to the survival of sensitive island communities, where it is socially fully accepted and where it represents one of the activities that provide continuous jobs throughout the year, thereby enhancing the tourist offer. Its importance is reflected in the fact that artificial farming in ecologically acceptable fish farms reduces the fishing rate of marine organisms. The basis of modern achievements in all sectors is the disclosure of information to the public with the aim to raise public awareness of the importance and significance of mariculture. The system of product certification and labeling as well as the production of information materials are the basis for success in the wider public. At present, the perception of mariculture still bears a negative sign, except in areas where there is no clean sea and people are accustomed to fish farming. Due to insufficient information on farming products, the vast majority of the public does not understand the fact that the nutritional value of breeding products is still stable and therefore 8 out of 10 people prefer 'wild fish' to farming products, maintaining that cultivated fish is fatter, softer and less tasty.

Within the common goal of all EU countries, priorities have been defined regarding the preservation of fishing resources, fisheries control and enforcement of fisheries regulations, structural assistance in fisheries, producer organization and joint market regulation, international relations and aquaculture. One of the structural and investment funds for the period 2014-2020 is the European Maritime and Fisheries Fund (EFPR). The Fund is an important financial instrument to support the EU Common Fisheries Policy. Apart from its importance to promote sustainable fisheries, control and implementation of data collection, the EFPR supports the achievement of the goals of tackling maritime and coastal area management issues, support for scientific research to increase

knowledge of the sea and spatial planning of the coastal area, at the European Union level. Accordingly, each Member State is allocated a share out of the total budget of the Fund, depending on the size of its fishing sector. With the access to the European Union, the Republic of Croatia has been opened the door to the international market, guaranteeing quality, greater employment rate, cross-border cooperation and the prosperity of small producers through access to the global market.

2. Analysis of the actual position of mariculture in the Republic of Croatia

Mariculture is mostly represented in the Republic of Croatia in the areas of the Split-Dalmatia and the Zadar County, although other coastal counties are also represented. In these areas, there is significant cultivation of the Atlantic blue tuna (*Thunnus thynnus*), gilt-head (sea) bream or orata (*Sparus aurata*), sea bass (*Dicentrarchus labrax*), while ostriches (*Ostrea edulis*) and mussels (*Mytilus galloprovincialis*) [2] are most distinguished among shellfish. For bivalve breeding, a great control of the sanitary conditions is necessary. The coastline of the eastern Adriatic, rich in channels, coves and bays protected from the action of waves and winds, is an ideal area for breeding in floating cages. Cultivation of Mediterranean oysters (*Ostrea edulis*) has the longest tradition along the Adriatic coast. Yet, mussel farming is considerably more represented in the Republic of Croatia than the oyster farming. The problem currently faced in the Republic of Croatia in the field of mariculture is the absence of shellfish nursery grounds, which implies the need for the necessary technology for the production of young oysters. The end product of traditional oyster breeding methods reaches a higher price on the market since owing to the protected designation of origin and the authenticity of the product. The cultivation of tuna is specific to the development of Croatian fisheries, as mariculture had started with its breeding. According to the data presented in Table 1, the total mariculture production in 2017 was 13,843 tons, which slightly exceeds the one of the preceding year, 2016. The largest share of production in mariculture belongs to sea bass and gilthead of 5,616 tons and 4,830 tons respectively. Interestingly, the eastern coast of the Adriatic is more favorable for breeding the sea bass. Tuna farming recorded increases and decreases in the production of these organisms in the observed period. The highest quantity of tuna was cultivated in 2016, to fall in 2017 to the smallest rate in the whole period since 2013 to only 2,162 tons. It is assumed that the differences in production in certain years were conditioned by the market demand.

According to available data, it is estimated that there are about 700,000 oysters grown annually in the Malostonski Bay. Finished products are sold on the domestic market, out of which almost 90% in the area of the Dubrovnik-Neretva County, where they play a significant role in the hospitality sector and in the trade with domestic employers. The Malostonski Bay is economically the most viable field for shellfish farming because the breeding products are

used in tourism and gastronomy. Sea shellfish breeding also takes place in the areas of Limski Channel, the Pula and Pirovac Bays and the Klimno Cove respectively.

Table 1: Total mariculture production 2013 - 2017

Species	2013.	2014.	2015.	2016.	2017.
Mussel	1950	714	746	699	920
Oyster	50	32	52	64	62
Shaping cap			0.016	0.06	0.04
Tuna	2616	2224	2603	2934	2162
Sea bass	2826	3215	4075	5310	5616
Sea bream	2978	3655	4488	4101	4830
Hama	44	60	67	125	253
Dentex	6	49	4	1	
Trout	4	13			
Rhombus		0.5			
Pagar		40			
Total (t)	10474	9960	12043	13235	13843

Today's export price for sea bass is 5.16 EUR, and it is important to add that until 1 July 2013 EU-export was limited by duty-free quotas, which had a considerable impact on export itself. Mariculture as an activity provides great opportunities for employment on islands, thus contributing to the stability of employment and the expansion of the tourist offer. It is important to note that Croatia had declared ZERP before having entered the European Union, in order to maintain its sovereignty over a certain part of the Adriatic Sea, the total surface having thus reached over 31,067 km² of territorial waters.

According to the data kept by the Register of the Republic of Croatia Ministry of Agriculture for 2014, there were 159 fish farmers, out of which 33 white fish breeders and 4 tuna breeders [3]. There were 345 fish farming locations in total, 267 of which were used for shellfish farming, 49 for white fish farming, 10 were designated for polyculture, 15 for tuna breeding, while only 4 locations were used for white fish nursing ground. Cage fish farming in Croatia is one of weaker links in the Republic of Croatia due to its underdeveloped condition in terms of technical and technological correctness. Another significant issue concerns a small number of remedies that could pose a threat to the further development of mariculture. The Republic of Croatia is not significantly positioned in mariculture, which can be seen in a way as an advantage where the occurrence of major damage and illness is involved. For future imports of fish fry, breeders should be linked to veterinary services as to prevent the risk of diseases. Generally speaking, the demand for fish and other marine organisms has been increasing on a daily basis. Our market has been increasingly promoting fish and shellfish farming because the sea is significantly depleted of marine organisms. The prices of marine products have a steadily growing trend and therefore the production demands increasing investments in the infrastructure and ecological stability. Quality mariculture greatly contributes to economic, social and environmental well-being, which is why it must be based on a well-developed infrastructure, properly qualified and professional human resources and well-regulated market.

3. Comparative analysis of mariculture in the Republic of Croatia and EU countries

The objective of the Common Fisheries Policy (CFP) is to enable aquaculture and fisheries to contribute to a sustainable and long-term environmental-related concept that is needed for economic and social development. Owing to the common market arrangements, the Republic of Croatia, as well as many other EU member states, has harmonized the balance between supply and demand. The prices of import and export products are determined according to the rules that are equal for all countries. The common fisheries policy should contribute to increased productivity, an adequate standard of living and stable markets, and should ensure resource availability and affordability of the offer to consumers at

reasonable prices. The European aquaculture compared to the global one shows that the trend in Europe is noticeably worse. The European aquaculture is leading in 4 species: mussels (39% of total volume), trout (15%), salmon (14%) and oysters (8%).

The Republic of Croatia has a share in the total production dominated by mussels breeding with 920 tons, followed by 62 tons of oysters in 2017. In a slightly smaller quantity, other types of organisms are produced such as bass and smooth or brown Venus-clam. The main producers among the EU member states in the aquaculture sector are Spain (22%), France (17%), United Kingdom (16%), Italy (13%) and Greece (8.5%), and their production in 2011 represented 77% of total production in aquaculture.

With respect to product value, the leading producers are the United Kingdom (21%), France (19%), Greece (13%) and Spain (12%).

The production of each country depends on the tradition of fish farming, the development of the area and indentedness of coastal areas. Croatia's production differs greatly from that of Italy. In Croatia and Greece, intensive production is used in areas where coastal zones are protected, while production in Italy comes from extensive and semi-intensive cultivation in lagoons. Extensive farming means any production based on the development of organisms not stimulated by additional feeding. Intensive farming system includes breeding techniques mainly aimed at and featured by the establishment of highly controlled farming, which implies control of the area where certain species are grown. The offshore method is applied in countries such as France and Spain and in island countries like Malta and Cyprus where such a method has been fully accepted.

The EU fishing industry is the fourth largest in the world and it supplies the fish market with approximately 6.4 million tons per year. There are approximately 350,000 persons employed in the fish processing and fish farming sector. To provide sources of fishermen's income and at the same time to end overfishing and depletion of fish stocks are precisely the goals of the Common Fisheries Policy implemented by the European Union. Fisheries, as a branch of agriculture, play an important role in the economy of European Union countries, especially in coastal localities where it contributes to employment and economic activities. In some European countries more than half of the jobs refer to the fisheries sector. In Spain, it employs a quarter of the total number of workers, while in Italy, Portugal and Greece taken together it employs 70% of the total number of employees in EU fisheries. The aquaculture sector employs 85,000 people and also contributes to socio-economic prosperity. Fish farming production is 1.25 million tons, which makes 20% of total production in EU fisheries and 1.5% in the world. The European Union fish farming is placed seventh, the aquaculture production relying mostly on crustacean farming, followed by seawater and freshwater fish farming. Leading countries are Great Britain, France, Spain, Italy and Germany, the major portion of the production consisting of canned fish, crustaceans and mollusks.

Table 2 shows the aquaculture production by the country in the period 2011 - 2015. All the countries feature a notable increase in the production, while the Republic of Croatia was close to the production in Sweden. Compared to 2014, production increased by 2,700 tons, which is obviously attributable to the development preceded by the Common Fisheries Policy. Great Britain and Greece occupy the top of the chart, followed by Italy, Spain and Germany.

Table 2: Aquaculture production by the country in the period 2011-2015

Country	2011.	2012.	2013.	2014.	2015.
UTD.KINGDOM	161033	175292	174,897	178417	201578
GREECE	111217	116073	125,58	115200	112159
SPAIN	61992	59920	55694	59356	64186
ITALY	64781	58100	57590	57990	55480
FRANCE	45980	44540	40205	41641	44595
DENMARK	38653	33552	39281	38934	38829
POLAND	28745	32524	33535	37070	38590
CZECH REPUBLIC	20448	19462	18201	19092	19113
GERMANY	16467	15155	16150	16449	15341
HUNGARY	15434	14477	14251	14378	16124
FINLAND	9220	9000	9954	12448	12500
IRELAND	13434	13434	12450	11400	12000
SWEDEN	11963	12441	11657	11144	11144
CROATIA	10687	8822	8512	10201	12903
NETHERLANDS	6150	5620	6305	6305	6305
PORTUGAL	5130	7000	3635	5760	5919
CYPRUS	4665	4313	6171	4810	5409
AUSTRIA	2823	3007	3121	3128	3128
Grand total (t)	628731	632732	637189	643723	674493

Table 3 shows the aquaculture production, where it is obvious that the sea bream and sea bass prevail in cultivation. In the period between 2013 and 2015, production was increased by almost 3,500 tons.

Table 3: Aquaculture production by the species 2013-2015

Croatia	Production(t)		
Species	2013.	2014.	2015.
Sea Bream	2466	3640	4500
Sea Bass	3014	3500	4500
Common Carp	2100	2100	2100
Portion Rainbow Trout	350	361	400
Silver Carp	350	350	315
Grass carp	200	200	200
Total	8480	10151	12015

The lack of capacity of the hatcheries and poorly developed infrastructure are the weaknesses of mariculture but also of aquaculture in general. Poor cooperation between the science and production sector makes the weakness of mariculture in the Republic of Croatia, which is to the largest extent related to the prevention and treatment of young organisms. What is beneficial for the Republic of Croatia are the European Structural Funds that are based on environment-friendly farming and encourage small producers to join the large European market. Having joined the European Union, Croatia has been opened numerous doors with regard to various funds, education and cooperation with foreign institutions, as well as to information from foreign institutions related to particular areas of food, which can represent the competitive advantage of products and improve consumer perception. Although mariculture plays a significant role in increasing employment, it also plays an important role in preserving fish stocks and increasing consumption of cultivated marine organisms. Collaboration with processors enables development of potentials for ever increasing competitiveness. Mariculture as part of the Blue Growth 40 strategy means an association of all institutions, Member States and producers to overcome challenges and ensure sustainable development and production and therefore its development is an important factor in achieving the EU development strategy by 2020 [4].

The European Commission proposes for the support of the maritime industry to be strengthened in comparison to the period from 2014 to 2020, taking into consideration the high potential of this sector whose world production is estimated at 1.3 billion EUR

which could be doubled by 2030. Coastal communities will be allocated greater support for establishing local partnerships and technology transfer across all "blue economy" sectors, including aquaculture and coastal tourism. The European Union has committed itself to making the sea and the oceans safer, with a higher quality of cleanliness and sustainable management at the international level, within the framework of the United Nations Sustainable Development Program for 2030. The new European Fisheries and Maritime Fund will, among other things, provide the necessary resources to improve maritime surveillance, security and coast guard cooperation.

The European Fund for Maritime Affairs and Fisheries finances projects beside the national sources of funding where each Member State has a share in the overall budget [5]. Member States draw up their national operational programs including clear plans for spending money. Once approved by the Commission, national bodies decide which projects they want to support. According to the established budget, new instruments are being harmonized with modernized programs in order to effectively achieve the European Union priorities and respond to new challenges.

4. Development prospects of mariculture in the Republic of Croatia

Looking at the broader picture of mariculture in the Republic of Croatia, this sector is currently in the phase of continuous increase in the quantity of cultivated organisms. Reduced fish stocks in marine environments have initiated shifting to new technologies such as seafood farming in controlled conditions. Far East Countries such as Japan, China and Indonesia currently dominate in mariculture. Other countries that are also outstanding in the quantity of cultivated products are France, Spain and Italy.

Although cultivation of marine organisms has been present for many years, numerous spatial locations as well as appropriate biological and economic advantages are an excellent prerequisite for its development and expansion. The fish farming activity in the Mediterranean has developed enormously in the last 20 years and is currently one of the fastest growing sectors in food production. In Croatia, mariculture as an economic activity provides employment of islanders throughout the year. Tourism brings revenue and, together with mariculture, they complement each other. Mariculture provides seafood products to numerous restaurants while tourism attracts populations from around the world [6]. If broad perspectives are analyzed, these activities complement each other and make a multiplication factor for economic development. According to the National Strategic Plan for Aquaculture Development of the Republic of Croatia 2014-2020, production is expected to increase by almost 300%, as presented in Table 4.

Table 4: Presentation of growth in all forms of cultivation of organisms

Species	2012	2020
Breeding in the sea	4650	20000
Bluefin tuna	1907	2000
Shellfish	3150	10000
Hot-water freshwater species	3209	10000
Coldwater freshwater species	1000	1500
Total (t)	13916	44500

Cultivation of organisms in the sea continues to play a leading role in relation to freshwater farming. According to the data shown in Table 4, the most representative is bivalve breeding which amounted to 3.150 tons in 2012. According to the forecasts of the National Strategic Development Plan by 2020, a threefold increase is expected. For the Republic of Croatia this will mean a major step forward in sustainable development of seafood farming as well as a greater possibility of placing on the international and global markets

[8]. According to estimates, the total annual growth in 2020, in the sea, will amount to around 32,000 tons, which together with the cultivation in fresh water will amount to around 44,500 tons.

Obviously enough, marine environments have become ever more depleted of marine organisms and it is therefore essential for a long-term sustainable development to be first developed a broader perspective. One of the long-term goals is to bring Croatia to the leading position in the production of organisms, but it is necessary first to develop quality infrastructure and increase the variety of cultivated products [9]. While Croatian production is of a smaller scale, this integration in the wider society is a challenge for a small country. Tourism in the Republic of Croatia provides a major export market for national products and such a potential form of promotion and marketing of domestic products should be more accepted than classical exports, as it raises product prices. Mariculture and tourism should jointly develop a common gastronomic cuisine like countries such as Italy and Spain. There is also the world-famous tourist attraction "Swim with the Tuna" in the Australian city of Port Lincoln, where visitors can go sightseeing in the farm and dive with tunas. The length of guests' stay of at a tourist destination can be positively influenced not only by expanding the offer and developing new tourist attractions, but also by making visitors familiar with mariculture products applying an educational approach.

By joining the European Union, Croatia has set several strategic goals through the National Strategic Plan 2014, which should be achieved by 2020. Increasing the production of white fish hatcheries to 40,000,000 young fishes, increasing the production of whitefish cultivation to 18,000 tons are only some of the foreseen targets [7]. The emphasis is certainly placed on the reconstruction of existing hatcheries, the setting up of farms and the introduction of new species in breeding. After accession to the European Union, fisheries support within the framework of the Common Fisheries Policy was enabled for all countries, including the Republic of Croatia. Fisheries support is applicable through two European funds: European Maritime and Fisheries Fund (EMFF) for 2014-2020 and the European Fisheries Fund 2007-2013. Within the current EMFF, Croatia has available EUR 252.6 million, and a third has already been used. Croatia, like other countries, has the priority to offer an ecologically healthy and nutritiously rich product, which guarantees sustainable development in the future for the whole world.

As for the far future, the Republic of Croatia is aiming to become one of the leading countries in the field of fish and shellfish production, with the fulfillment of all ecological and quality standards. First of all, it needs to develop new technologies that will enable much easier manipulation and then develop ecologically profitable activity.

5. Conclusion

The Common Fisheries Policy (CFP) prescribes a series of regulations regulating fisheries issues across all EU member states. Marine wealth protection, structural measures, market regulation and ecologically sustainable development are the underlying goals of a common policy. The breeding of shellfish and marine organisms has great prospects for the Republic of Croatia and for the whole European Union. Today, farming products are increasingly replacing the reduced offer of natural catches. Fish breeding in suitable and environmentally friendly places guarantees a high quality product and affordable price. Entering the European Union has provided for island communities a high employment rate, product exports to the international market, production expanding and the end product that guarantees certified quality.

6. Literature

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STATE OF RECYCLING OF WASTE IN BULGARIA

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Abstract: *The state of collection, storage and processing of some main waste in Bulgaria is under consideration. In accordance with the legislation in force in Bulgaria and the EU, separate collection of waste is increasingly necessary. Some examples of different types of waste show what the actual condition is and show good examples of work in this area.*

KEYWORDS: COLLECTION, RECYCLING, SEPARATE COLLECTION, STORAGE, WASTE

1. Introduction

Over the last few decades, mankind has been faced with the growing amount of waste generated by people's activities. Apart from that, more and more attention is being paid to the re-use of raw materials and the recycling of waste products. This will play a very important role both in the use of scarce raw materials and in the reduction of these raw materials, their reuse and a significant reduction in the volume of waste on a global scale.

If you are one of the people who dispose of household waste separately, you may have been in the situation for long and long time to search for the yellow, green or blue container in nearby neighborhood streets loaded with a good amount of garbage. Finally, in good luck, your efforts have been rewarded and you have succeeded in finding them. It remains and of course only waste of this type is disposed of, not waste of any type [1]. Of course, if you have not given up and you have not scrapped the raw materials in the nearest household rubbish container and you have not stopped with the separate collection at all. Such difficulty is experienced by visiting foreigners in Bulgaria, for whom the separate collection of waste is normal practice. Because you have often seen how these containers are poured into the general waste bin in the cleaning company's dump truck.

2.1. State of the separate collection

Dilution of containers is just one of the scenarios that are currently being observed. If you are a resident of the Lyulin quarter of Sofia, you probably will not find a specialized container. If you've been from Student's City, Vubrnice, Poduyane or Pancharevo for about a year, you have not only left yellow containers for paper and plastic but also no glass for glass. If you are from Ovcha Kupel or Kremikovtzi, you have never had one.

The reasons why the usual European and world practice is not very successful in Bulgarian cities are heterogeneous, and the countries involved have been blaming each other for years. Organizations that need to collect and pass on raw materials recycle blame municipalities for not controlling their citizens who do not throw out properly, and as a result, organizations regularly carry a large amount of household waste in their trucks. Municipalities in turn believe that separate collection is a task for organizations that receive money from their members and are additionally funded by European funds, such as companies placing packaging on the market (on a polluter-pays principle). Citizens generally do not believe that their organizations are doing their work conscientiously, and that their efforts have some meaning for which there are multiple signals from bona fide citizens who send written signals and videos about violations in collecting and transporting these wastes. Organizations are mutually accused of misconduct. There is also a problem with shoemakers, and rather with the points that buy raw materials, such as paper and plastic bottles, without a certificate of origin and others.

All this is happening against the background of the European requirements that Bulgaria has to observe and the bar on them rises every year. Municipalities have higher requirements that they will have to meet by 2020. And last but not least, the country itself has an urgent need for better waste management to ensure better use of raw materials and a cleaner environment in the future. There are still fresh memories of the last decade with the transport of household waste to a number of municipalities in tens or even hundreds of

kilometers in the landfills of other cities, the closure of landfills, the dumping of bales of waste on landfills and other environmental problems with waste treatment.

In other words, the separate collection is something to be done. This can only be done through good cooperation between all the parties involved and by finding better solutions and practices. The problem is more than up-to-date, as there is a new signing of the contracts of the organizations working in the capital as well as their re-licensing of the new requirements of the ministry. In my opinion, the legislation in force in Bulgaria should be applied more strictly.

In theory, everything is extremely clear and cluttered. The idea of separate collection is clear to everyone. Much of the waste generated is a raw material that can be reused, can be a source of energy or transform into compost and used for soil fertilization and recultivation. Waste of this value must be separated from the rest of the garbage and recycled. Thus, resources are used smarter, and the amount of rubbish that goes into landfills becomes considerably less, and they in turn fill up more slowly and can be used considerably longer. This removes the need for new and new landfills, which for unknown reasons in Bulgaria are being built slowly and painfully. Separately, it will also limit the emergence of unregulated landfills, which are not controlled by anyone and are detrimental to our environment. "World and European experience shows that after recycling and composting, the level of municipal waste drops above 80%," Evgenia Tasheva, of the For The Earth Association, in her study. Or else, separate collection is a very important part of the overall waste management and should not be neglected. This has already been practiced in a number of countries, both in Europe and around the world.

2.2. Major types of waste that require special conditions

Separate collection in Bulgaria, as in a number of other countries, was entrusted to special business organizations in which companies placing packed goods on the market are members and pay fees. Against this, these organizations are committed to collecting and transmitting for recycling a certain percentage of the quantities and types of packaging their members have placed on the market - targets that are reported annually to the ministry. On this basis companies such as Extrapack and Multipack and other plastic packaging manufacturers collect and process hundreds of tons of polyethylene from packaging, Belana company processes tons of paper and others. This gives a second waste life and stores tons of wood, pulp and other primary materials. For example, in 2015, the overall target was to separate 55% of the packaging placed on the market, 57% in 2016 and 60% in 2017. Organizations are responsible for building a system for separate collection for the population using known green, yellow and blue containers and information campaigns conducted in the print and electronic media.

Considerably improved work with the growing generation and last but not least personal example in the family and society. The municipalities had to provide places for the placement of the containers and to take care only of the household waste, which eventually undergoes some sorting of the landfill itself. However, we often observe the actions of the shufflers, which shuffle the containers and carry out the separation of the waste and pass it on to the secondary raw material points. For some, this has turned into a lucrative business and even used motor vehicles to transport waste

from the containers to the points. Over the past few years, there has hardly been a resident of the big cities in Bulgaria who have not witnessed quarrels between groupings of divisions to distribute areas and containers. But it also has its social meaning because it is some income for the homeless and a reduction in the volume of waste dumped.

The balance looks like this: for 2016, 337,000 tons of packaging are placed on the market. Of these, 182.6 thousand tons have been handed over for recycling. Or, organizations have fulfilled their objectives, but the household collection channel through colored containers remains the poorest source of raw materials, and the quantities accounted for by greening are collected either from sub-contractors or from large logistical and business centers. At the same time, according to official statistics, which the NSI calculates for the municipalities, only 36 thousand tons are recycled. The overall picture is that households eject about 3 million tonnes of waste per year. Or, a very small part of the total does not fall into the landfill [4].

However, following the latest changes to the Waste Management Act, municipalities will have to take a more serious look at the separate collection, as they already have targets that they have to meet. By 2020, biodegradable waste entering the landfill (food, garden, paper, cardboard, etc.) should have fallen to 35% of its total. Paper, plastic, metal and glass must have decreased at least 50%, with an increasing percentage of them being processed secondarily.

Construction waste must be recycled to a minimum of 70%, broken down and used for inert materials and put into service. Recycling of construction waste is the separation and processing of recyclable waste materials obtained during construction, reconstruction and demolition. Materials used in construction can be in many forms: wood, metal, glass, windows, asphalt, doors, plumbing, concrete, tiles, gypsum board, disused electrical and electronic equipment, etc. All of them are potentially reusable raw materials. On the other hand, most of them are inert, heavy, bulky, overburdened and non-biodegradable. Most of this waste goes to landfills. Chemically treated timber can, for example, cause soil and water pollution.

Most importantly, recycling of construction waste is their separate collection at the time of generation. Large metal containers for separate collection must be provided. Materials such as metal, plumbing, cables, plasterboard and wood should be placed in individual containers. They must be close enough to the building site to be used on time.

Construction companies have to plan waste recycling even before construction starts. The location of the recycling containers is predetermined and clear. All workers must diligently separate the materials for recycling to be effective. Thus, there will be no danger that small quantities of hazardous material will fall into one that can be recycled.

The main steps in the recycling of construction waste are:

- 1) Sorting (division);
- 2) Shredding with a hydraulic shear or hammer (if the size of the waste is larger than the chopper opening);
- 3) Removal of metals (for reinforced concrete waste);
- 4) Sifting (of unwanted impurities);
- 5) Crushing;
- 6) Fractionation (grouping according to the size of the grains with different sieves);
- 7) Purification of the fractional materials (wood, plastic, etc.) and of the dust fraction, which may prevent re-use as an additive material.

Construction waste has been identified as a priority by the European Union. There is great potential for recycling and reuse. In addition, waste recovery technology is well-developed, readily available and relatively inexpensive. However, within the European Union the recycling and re-use rate varies between 10% and 90%. One of the objectives of the Waste Framework Directive (2008/98 / EC) is to make European society recyclable. EU Member States are foreseen to take the necessary measures to allow at least 70% of non-hazardous construction waste to be reused, recycled or

otherwise recovered by 2020. In Bulgaria landfilling is still a major method of disposal of construction waste. In Bulgaria, the Ministry of Environment and Water publishes the Construction Waste Management Ordinance and the "Construction Waste Management Guide on the Territory of the Republic of Bulgaria". European requirements in this field are also ratified in Bulgaria. The purpose of the Ordinance is to introduce a new model for building waste management, reduce the total amount of landfill and reach 70% recycling by 2020. According to the Ministry's forecast, a major source of construction waste by the end of the decade will be sooner from the road and rail sectors, than from those related to the renovation and rehabilitation of buildings. It is precisely the fact that they are most often mixed and are generated over a longer period, in relatively small quantities and from different objects, is the biggest obstacle to being a major source of recyclable building materials.

Some materials can be recycled directly into the same product for reuse. Others may be processed into other products. Recycling, which requires additional treatment, is often not economically viable unless the recycling facility is near the source of the material.

The cost of landfilling a ton of waste in a landfill should also grow over the years, and this is an additional financial incentive to split raw materials from genuine waste that can not be used for anything else.

The new regulation of the Ministry of the Environment of the Republic of Bulgaria envisages that at least 6 million of the population of the country should be able to dispose of them separately. Separate collection should exist in all settlements with a population of more than 5,000 and will be mandatory for all resorts.

Targets for municipalities can only be achieved by better separation of waste as it comes out from households, as much of the raw materials that are otherwise recyclable have already been destroyed to separate the landfill. In other words, organizations and municipalities are mutually necessary, but they need to work in greater co-operation, and the synergy between them needs to be greatly improved.

After many years the Sofia Municipality was trying to solve the Sofia waste problem, it did a private company. About a decade ago, Ekobulpak, one of the five packaging waste recovery organizations in Bulgaria, opened a factory for the processing of waste from glass, paper and plastic in the Philipovtsi quarter of Sofia. This is the first such facility in Bulgaria and a long preparatory path has been spent on it and the experience of other European capitals and European funding has been used [4].

According to the investor at the plant, if its capacity is loaded to the maximum, the volume of garbage ejected to the Sofia waste dumps can be reduced by about 60%. At present only Sofia produces about 1000 tons of household waste per day, which are transported to the landfill near Suhodol, where they are stored and processed. Separately, through separate collection systems, specialized organizations such as Ecobulpack collect, separate and pass on recycling an average of about 400,000 tons of packaging waste per year. Approximately 200 people work in the factory for a three-shift operation.

The investment in the new facilities is 7.5 million leva - part of the credit from Raiffeisenbank, and another from Raiffeisenleasing, through which the machines for the plant were bought. In principle, the plant consists of two main parts - an installation for the separation of waste from plastics, paper and metals and recycling of glass. The first one has a capacity of 100 thousand tons per year and the second one is 40 thousand tons per year. So far the waste collected by Ekobulpak is enough to load half the machines in the factory, said procurator of the organization Milen Dimitrov. That's why the owners are also negotiating with other recycling organizations to process gatherings and garbage from them. Although there are no contracts signed yet, the plant owners say there is no interest, and probably in the future, Ecobulpack's plant will also process foreign waste from across the country. The installation of EcoBulpack for paper, plastic and metal will sort the individual types of waste so that they prepare them for processing. It can also be used for household waste sorting, which also has useful components. However, conversations with the Sofia Municipality in

this direction are not yet being conducted. "We have informed them that we find such an installation, if they are interested, we can negotiate," said Ecobulpack.

According to the requirements of a European directive, 50% of household waste should be recycled and not disposed of. At present, however, in Bulgaria mainly regional garbage depots are being built, and only a few municipalities are working on the construction of a plant. However, no plant has yet started work. Thus, by reducing the amount of waste in the landfill, the newly-opened Ecobulpack facility can be part of the scheme to meet this requirement. The mayor of Elin Pelin welcomed all attendees and pointed out the fact that the investment of Integral Plasticys PLC, amounting to EUR 40 million, is the first for Bulgaria and Europe to recycle plastics with innovative equipment meeting the highest standards and environmental criteria of the European Union. He presented the official guest at the meeting - George Kremlis, who has been working in the ecology and economy since 1981, and is a prominent expert not only of a European but also a world-renowned adviser to a number of ministers and a former prime minister of Greece. Thanks to his work and his authority over the past few years, some of the largest projects in the field of ecology in Europe have been realized. The mayor thanked the guests for the visit and the investor for the project, which will be key to waste processing and the environmental sphere. At the end of his statement, he pointed out that it is of utmost importance for Elin Pelin to protect the rights and interests of citizens, their health and the future of their families. This meeting answers some of their concerns and questions about the construction of a plastics processing plant in the immediate vicinity of Elin Pelin in order to be calm about the new investments in the municipality.

The range of traded plastic scrap is extremely wide.

The Company trades with the following items of secondary raw materials, but not only:

- 1) Polypropylene - PP / PP / - crates, crates, packaging, etc.
- 2) Polyethylene - PE / HDPE & LDPE / - thick nylon, stretch / expandable / foil, etc.;
- 3) Polystyrene PS / PS / - widely used in packaging for the food industry;
- 4) Polyvinyl chloride - PVC / PVC / - pipes, joinery, cable insulation and others.
- 5) Polyethylene terephthalate - PET / PET / - bottles of mineral water, soft drinks, beer and other, sorted by color, as well as blanks - industrial marriage from industries using PET as a raw material;

In his address, Mr. George Kremlis, Honorary Director of the European Commission (DG Environment), emphasized the principles of the circular economy that effectively uses separate collection and subsequent recycling of waste as well as the overriding European norms in the sector. Mr Kremlis' recast welcomed the investment and pointed out that this is a unique project that fully complies with EU and national legislation. "The plant will have a high added value and will contribute to achieving the recycling targets that are set by Bulgaria under EU legislation.

By 2020, Bulgaria has to achieve waste recycling rates to 50%, and the target is currently below 20%. For that reason, for two years, Bulgaria has had to make serious efforts to reach the set goals. If this goal is not reached by 2021, there will be procedures to impose sanctions and fines on Bulgaria - an EU member state that has not complied with European norms, "he added. This project will contribute to the development of recycling in Bulgaria as well as at the regional level for Elin Pelin Municipality. Plastics processing is of the utmost importance to the European Commission and currently has a functioning Plastics Strategy. If the necessary measures are not taken today to reduce the amount of used and disposed plastic, the time will come in the future when there may be more plastic waste in the ocean than fish. The European Union is conducting environmental policies to prevent this from happening.

He answered the questions of the citizens of Elin Pelin municipality about the environmental assessment of the project and its safety for the population and nature in the region. This pioneer plant is the first on the Balkan Peninsula to use this type of technology and machinery for processing recyclable plastic

products. The finished products will be of high quality for the European industry and will meet the principles of the circular economy [6].

Julian Belev, executive director of Integra Plastics AD, described in detail the stages of operation of the new plastics processing plant, which is being built next to the town of Elin Pelin, and shared about the innovative processes through which the recycling will take place. After its opening, the plant of "Integra Plastics" PLC will reduce by 65% the volume of landfilled plastic products that are subject to recycling and will generally reduce environmental pollution, while producing high quality raw materials for new plastic products. The work of the plant will increase the pace of implementation of the European recycling standards that are mandatory for Bulgaria and will present Elin Pelin Municipality as a leading center for the environmental policy of the country.

"The plant is high-tech because it uses absolutely automated processes for waste processing without the involvement of a human hand. There are no combustion processes in the processing lines of the plant, and wastewater complies with environmental directives. The first step in creating a quality recyclate to be reused in industry is the proper separation of the individual types of plastics and this is one of the main objectives of the plant. This is made possible by the so-called optical separators in the form of streamlines developed by famous Scandinavian and German companies. Optical separators are widely used in other industries and can recognize different types of products and their qualitative performance. Plastics processing is part of the measures that will reduce the volume of discharged plastics in Europe and is a priority cause for us. There is no danger of harmful emissions to the atmosphere because no combustion processes are carried out in the process." - answered a question from the Hall about the impact of the new plant on the environment.

The director of Integra Plastics AD proposed to organize a new discussion meeting with municipal councilors, citizens of the municipality and / or other persons to provide more detailed information about the work of the plant and to clarify all issues to the public.

The Metropolitan Waste Plant is entering its final phase. Last week, the Supreme Administrative Court acknowledged Yordanka Fandakova's mayor's order to choose a builder valid, Sofia Municipality is finally expected to enter into a contract with the selected company - Actor JSC - Hlector JSC. The decision in practice saved the European funding of the project under the Environment Operational Program because the contract must be signed by the end of this year - the deadline of the programming period. It is now up to the plant to be implemented by the end of 2015 at the latest, again because of the requirements of Brussels

Of all importance is the recycling of electronic scrap. In Bulgaria, various companies are engaged in collecting, temporarily storing, packaging and transporting disused electronic and electrical equipment and components thereof:

- 1) Telephone relay stations;
- 2) Computing machines;
- 3) Electronic measuring apparatus;
- 4) Computers, motherboards, video cards, processors;
- 5) Mobile phone boards;
- 6) Capacitors, relays, microcircuits, transistors, diodes, resistors, connectors;
- 7) Radio lamps;
- 8) Contactors [5].

Companies have made significant investments in machinery, infrastructure and know-how and to date are specialized in the treatment and recycling of all kinds of waste cables. The company mainly processes copper and aluminum cables by extracting non-ferrous metals such as copper, aluminum, lead, nickel and others.

For example, Ecomax has made investments and purchased a telephone line for telecommunication cables and cables with a cross section less than 1 mm. The capacity of the processing line is 2500 kg. daily as the resulting copper "granulate" is of high quality and the processing losses are minimal. Of course, besides telephone and communication cables, the company manufactures mechanized and mined metals and all types of power cables.

To its corporate clients in the country, ECOMAX has the opportunity to offer complex buy-out of all types of cables and wires as well as other metallic and non-metallic secondary raw materials, including "from the place", by providing specialized containers for collection of recyclable waste, of different color and volume to suit the different types of secondary raw materials and to make it as easy as possible to use it by the company's customers [6].

In addition to our acquisition of secondary ferrous and nonferrous metals for scrap metal and scrap metal, our company is among the largest buyers of disposable batteries and accumulators (NUBA). From an ecological point of view, the price is not decisive, and the possibility of re-using the battery and protecting the environment from harmful emissions. The reusability requirement does not meet primary batteries, which occupy the main market share, hence the problem of their landfilling and recycling. Disposal and recycling of disused batteries is a problem not only for Eastern European countries but also for other countries with poorly developed separate waste collection programs. The first step towards reducing the current problem of recycling spent batteries is their proper and purposeful collection [2].

An example of the importance of the problem globally is the non-profit organization established in the United States, or so on. The Corporation for Battery Recycling (CBR) from the four largest manufacturers - Duracell, Energizer, Panasonic and Rayovac. The program started in 2013 and focuses on the collection and recycling of primary alkaline, zinc-carbon and reusable batteries based on zinc, silver oxide and lithium [2].

The cyclical use of power supplies is associated with a certain number of discharges and charges that are carried out without affecting the operating voltage. Each battery has a number of cycles guaranteed by the manufacturer, after which the voltage begins to change [3]. This requires the use of new batteries and accumulators so they can retain their factory metrics and perform their functions. And this in turn leads to the accumulation of new quantities of unnecessary devices that need to be stored under special conditions and processed to source materials or recycled.

Every month, over 250 tons of rechargeable batteries are collected, stored and transported in containers located in large commercial outlets, mobile operators' offices, and more. Partners of Rovotel Steel Ltd. in this activity are the largest recycling facilities for rechargeable batteries in Bulgaria, ensuring environmentally friendly, efficient and regular recycling of these hazardous waste.

'Rovotel Steel' Ltd., together with its partners from 'NUBA Recycling' AD, has over 200 special containers for collecting and storing rechargeable batteries and over 3600 small battery containers all over the country.

Containers of NUBA Recycling AD and Rovotel Steel Ltd. can be found in the retail chains, gas stations, malls, office and business buildings, schools and state institutions [8].

The largest importers of automobile tires in Bulgaria - Medina Med and Diana, opened a recycling plant for recycling of used tires - "Ecumenical wheelchair" in Stasi Zagora in 2015. In its construction, the owners have invested BGN 5 mln. Through the recycling of tires, several raw materials are produced - rubber granulate, metal and textile, for which markets are already secured.

The plant is built on a total area of 2200 sq.m in the place of an abandoned workshop of the former Agrobiotech, which has been completely rebuilt and modernized. For the construction of the new power the company has applied for OP "Competitiveness" and in particular under the scheme "Energy efficiency and green economy". The approved project is for BGN 4 million, with 50% of it being its own financing. An investment loan from UniCredit Bulbank also makes it possible to realize the idea.

The current regulatory chaos served as a motive for building the enterprise.

"A small number of consumers know that old tires can not be dumped at municipal landfills. We have a waste law but we did not have a regulation on how to deal with this law. We paid ecotaxes to the EMEPA in the state and we waited for it. We did the job, that is, to collect and destroy these tires.

As early as 2010, the government of Bulgaria has issued an ordinance authorizing companies to set up a collection, transport and tire recovery organization. Our plant was created on the basis of this regulation, "said Ivan Panchov, owner of" Medina Med "at the opening." We built the company in Stara Zagora because of the good location of the city in the center of Bulgaria, here we can easily collect the worn out and tires out of use on more than 60 sites across the country, "he added.

After the adoption of the Ordinance on the requirements for treatment of end-of-life tires under the Waste Management Act at the end of 2010, the two competing companies Medina Med and Diana established "Ecomediana-2010", which received a license for a recovery organization of discarded tires [8].

"Ecomediana" is now the largest such organization in Bulgaria, with more than 66% fulfillment of the targets for waste and used tires. There are 30 companies - importers and manufacturers of tires from Bulgaria. By joining the collective system, they are given the opportunity to free themselves from a product fee of 30 cents per kilogram for light tire and 20 cc per kilogram of heavy tire.

A second stage of the investment in the new plant will be invested, with an additional BGN 2-3 mln. We plan to install a textile and steel cleaning line, which will bring even better market positions, the owners say.

Looking ahead, we will also produce end products that we would not like to comment at this stage, they add. Owners of EKM expect to receive new funding opportunities for the second phase of the company's construction at the opening of the next programming period under OP Competitiveness [6].

The paper and metal wastes are not presented in the review because they have a good organization of collecting, transporting and recycling the raw materials. Although we have not yet achieved European requirements in this area, things are much better off than using and recycling other waste materials.

Finally, I would like to mention that the Sofia Waste Treatment Plant for the period 01.01.2018 to 31.12.2018 has processed 366,301 tons of incoming waste; 34 951 tonnes of recyclable materials; 171,109 tonnes RDF; 51 119 tonnes of landfilled quantities [4].

3. Conclusions:

1. In Bulgaria over the last decade, the separate collection of waste in large settlements has greatly improved. There is a separate waste collection system in place, but the population still has no habits for this type of waste collection.

2. Despite the explanatory work carried out in the mass media and the changes in the Bulgarian legislation, the achievements in this direction are far from the European and world norms.

3. It is necessary to implement not only the achievements of EU countries, but also Japan, China, USA, Russia and other countries in the collection and recycling of waste products and raw materials.

4. Literature:

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WITH „A DREAM OF A BOOK“ FROM SPONSORSHIP TO CROWDFUNDING

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Abstract: The purpose of the article is to reveal the specifics activity of the Bulgarian specialized crowdfunding platform „A Dream of a Book“, created by the Bulgarian writer Foundation in 2016, which provides the opportunity to raise funds and other non-financial - support through voluntary donations for projects in the field of literature.

Keywords: CROWDFUNDING, CROWDING PLATFORM, TYPES OF CROWDING, "A DREAM OF A BOOK", AUTHOR, PROJECT, FUNDING, DONATIONS, PRE-SALES

Introduction

The English term "crowdfunding" is most often translated into Bulgarian as "group funding", "shared funding", "crowd funding", "funding by people".

Although the idea of raising an amount of money from a large number of people has existed for centuries in different forms, it has, for example been gaining exceptional value in recent years mostly thanks to the Internet, [13] .

The crowdfunding is defined as :

- the most successful way to fund new ideas promising ventures or start-ups businesses by raising small amounts of money from a large number of people, usually via Internet, through specially designed for that online platforms" [9];
- "An way using Internet as a tool by raising money for companies, ideas or causes" [10] ;
- " One of the existing innovative business models " [4] ;
- An incredible opportunity and powerful force in the people's hands" [6];
- "An intelligent or modern way to find funds in order to start or develop your business" [15];
- "a tool for the realization of good ideas " [2] ;
- "One of the most promising new industries and its evolution for the last years has made it an important part of the Third Industrial Revolution" [7]

The model of modern crowdfunding usually involves the compliment of three main **roles** on the part of the **participants** :

- **as an initiator** (fundraiser, fundraiser, funded), who offers the idea or project to be funded,
- **as supporting** (backers, investors, funders) - individuals or organizations/groups supported the idea,
- and as **intermediaries** ("Crowdfunding Platform") that launched the idea.

On 27-th of January **2016**, a special broadcast was transmitted on the Bulgarian National Radio for the newly established **Bulgarian specialized crowdfunding platform - "A Dream of a book"** (www.dreambook.bg) [5].

It was created by the „Bulgarian Publishing House“ Foundation and it provides the opportunity to raise funds and other non-financial support through voluntary donations in favor of

projects in the field of literature [12].

The usefulness of a such a way of raising capital goes far beyond the pure fundraising - through access to new investors, the popularity of products and services are increased, and the business project gets a real-time consumer assessment [8].

If the development of social networks fueled "the fire" of the crowdfunding, then the appiarence of the most popular crowdfunding platforms in 2008 and 2009 - the San Francisco-based IngieGoGo and Brooklyn-based New York-based Kickstarter (2009) "burning it with fiery flames". The group funding platforms provide access to thousands of people with ideas not only for portfolios but also for the wisdom of the crowd. They became a tool for further development of the idea, validation and marketing [7].

In the worldwild, the crowdfunding industry generates huge financial resources - for example, for 2014, it amounts to 16.4 billion dollars. [3]. The provided funding for publishing projects for the same year through Kickstarter platform is 21.9 million. Dol., which is very close to the result of 2013 (22.9 million. Dol.), however, when the category "Journalism" is a subcategory of "Publishing" [6] .

The crowdfunding is extremely suitable for small economies suffering from a chronic shortage of venture capital such as the Bulgarian one. It is not important for the market, nor for the profits, but the idea and its presentation to the potential investors is important, and this in most cases are the most ordinary people [10].

Till 2016, various initiatives and platforms for fundraising have been implemented in the Bulgarian virtual space for charity (TimeHeroes.org, Wishbox of „Dreams in Action“ Foundation, Yatoto, etc.), some of them with a noble purpose, others with a business purpose, but some of them fail to survive (BGINING, Start.Zadrujno.bg) [3].

At the moment of the appearance of "A Dream of a Book", among the newest platforms that were those created by Alexander Topalov Tramplin.bg (2014), and it is aimed for public benefit projects, and Krile.bg (2015), designed for commercial projects of people who want to start some kind of commercial activity [13]. Their creator is have the ambitious to overcome the existing obstacles to the Bulgarian crowdfunding and to offer all the necessary conditions—for the active development of projects. By mid-2015, the first platform has managed to implement 10 projects and the second one - 3.

The problems faced with these platforms and till which will face also the "A Dream of a Book" are:

- the crowdfunding is still not widely known in Bulgaria, and awaring of people with its tools is a challenge;
- most initiators are not quite aware of the way to present their projects;

- the number of people holding credit cards is insufficient - so the payment methods in the platforms are both with credit cards and debit cards and via bank transfer with the ePay and Easypay tools.
- the case of trust and security is a serious one, especially when it comes to a large amounts of money – in worldwide, by crowdfunding are collected hundreds of thousands, even millions of dollars for concrete projects, but in Bulgaria the method is still seems dubious for the majority of people [13].

The newly created "A Dream of a Book" platform offers to Bulgarian authors the **opportunity to find /funding for their books from private persons and public organizations**. As opposed to the existing platforms in the country it is **specializes precisely in the funding of books** and there are many tools that facilitate this process.

In order to be able to participate in the platform, the author as an project initiator must have **finished, completed book**. Partial finished projects are not-accepted. But you can apply for books that have already been published, if the the author has the patent rights over them. The author applies with his book at book@dreambook.bg. If the book is approved, they offered him **bids for different issues**, as well as an **expert judgment**, with **real circulation** could be sold. Once the terms have been specified, the **contract** is signed between the author and the "Bulgarian publisher" Foundation, managed by Ivan Bogdanov. In order for the implementation of the project to the platform, the author must have a **valid profile in Facebook** with a real name and a real photo.

The initial fee for participation in the project is 50 leva, and for all that the author receives **editing/correction of the advertisement text, advertising banner and one week of/for advertising on the first page of the project**.

The duration for one project is **two months**. If, within this time, the author has raised 50% of the **funding**, he gets **one additional month** to raise the missing amount of money. This is the way for the author to be offered to him the possibility mainly to **sell single copies-of his book**, but also to accept **donations**.

In other words "A dream of a Book" choose one of the two best-suited for the situation models: **crowdfunding-based on donations**. In this model, the persons who support the idea donate without expecting any material or non-material benefits (but sometimes the fundraising person can decide to express his/her gratitude). The second model is called "**crowdfunnding with the promise for a reward ((Rewards-based))**" – that mean that the "supporting people" receive a predetermined tangible or intangible benefit, and subsequently, after the initiators begin to receive a revenues from an idea or a project, so they can provide a **reward**, depending on the promised or depending on the amount they have received.

The „Bulgarian Publishers“ Foundation, as a publishing house specialized in the publication of Bulgarian authors, assumes the commitment and the guarantee that the **collected funds** will be invested for the publication of a book and not taken up by the author. If the project **does not collect 50% of the requested amount**, the money is returned to the purchasers. If more than 50% is collected, but below the total amount for the project, it is possible to **renegotiate the conditions** with the publisher so that it will publish a circulation that corresponds to the amount raised.

The purchase of books and the collection of money for the project are made by: bank transfer, postal payment, Epa / Easypay, Paypal.

The „Bulgarian Publishers“ Foundation provides the **missing funding** for one or more projects that have shown excellent performance on a quarterly basis. According to the donor's wishes **the donations** for the platform projects can

be **public and anonymous** .

Every donor receives a **donation treaty** to serve him to the National Revenue Agency (NRA). The donation is a **target** for a specific book, so a **donation** can not be made for the website. The author gets the donation immediately and he can use it for the development of his project. The „Bulgarian Publishers“ Foundation is not responsible and can not control the use of donations. **Donations do not return**, it doesn't matter regardless whether the author has raised funds for the project.

Taking in mind that Crowdfunding is in addition is a tool to of raising funding, it is also an "exclusive resource for online marketing", and the direct contact with the audience has been prepared to stimulate brand awareness and awareness of the author's brand [13], "A Dream of a Book" gives the authors the opportunity to publish on the platform the following materials:

- an advertising presentation for its own and the project, including parts of the text ac a size to 4 pages, format A4;
- selected parts from the text - up to 20 pages, format A4, that are presented on the website as a PDF file;
- a **sample of a cover** and/or other **illustrations** included in the book;
- a commercial **video**.

Additionally, the platform „A Dream of a book“ offers **various advertising sites on its website**, on the other **‘Bulgarian publisher’ Foundation** websites, as well as on **various facebook pages**, but the **main advertisement** is expected to come from the **authors' personal initiative**. One of the goals of the project is to teach the authors how to sell their books.

Already in the first half of its existence (from October 2015, when the platform was launched, until mid-June 2016), "A Dream of a Book" managed to make 6 successful projects. The debut is with "Seismic novel" by Tsvetelina Alexandrova, which receives 584 leva from its readers. After that, Ivan Bogdanov collected 590 leva for "Loneliness is sleeping on my pillow", from which 500 copies were sold, followed by "The Shadows of Memories" by Nadia Lukanova, who raised 600 leva, "How to becomes a knight" by Borislav Belinski, who has been awarded a prize of 671 leva and "The secrets of the old villa - 2 "of Glory Slavcheva collected from purchasing" green "792 lev [11].

The results of the 3-year activity of the creative approach of the sponsorship and crowdfunding for the Bulgarian platform "A Dream of a Book" since the end of November 2018 are the following:

- 5 active projects ("The Spiral of theTime", "Aria's Thoughts", "The Secrets of the Old Archive", "Stories about Dobrudzha", "Finding the Love in the most unexpected place");
- 19 successful projects that skillfully **combine pre-sales and donation** (Table 1).

Table 1. Data for the successful projects of the Bulgarian specialized crowdfunding platform "A Dream of a book" (2016 - November 2018)

№	Author Title	Price (BGN)	Pages	End date	Sold books from 100 (number of book)	Donations	Raised funds (leva)	Received payments (number)	Donations (number)	Non-confi paym (num
1.	Вероника Иг. Лазарова Завивам се с море Veronica Ig. Lazarova I turn to sea	12	228	2017-06-30	122	170	1634 от 1200	90	-	3
2.	Сесил Костадинова Звездата на скитниците Cossil The Star of the Wanderers	15	450	2018-02-28	56	440	1280 от 1500	19	3	1
3.	Владислав Ташев Тиков От ада или Одисеята на един съвременен Йов Vladislav Tashev Tikov From Hell or Odyssey of a Modern Job	12	196	2018-05-31	47	648	1212 от 1200	30	3	1
4.	Цветанка Ангелова Искам да се влюбя, а не смея Tsvetanka Angelova I want to fall in love, not laugh	8	80	2018-03-31	76	420	1028 от 800	22	2	1
5.	Петя Манева Иванова Спомни си забравените Petya Maneva Ivanova Remember the forgotten	12	200	2017-07-31	45	400	940 от 1200	34	-	2
6.	Румяна Попова-Бакърджиева Коричка вяра Rumyana Popova-BakardzhievaCorrect faith	8	88	2017-12-31	38	650	954 от 800	31	4	6
7.	Невена Гроздева Сегашно незавършено Nevena Grozdeva Currently incomplete	8	80	2018-07-31	60	440	920 от 800	45	3	5
8.	Недялка Арnaudова Истории по действителни случаи с куче Nedyalka Arnaudova Stories of actual cases with a dog	8	80	2017-12-31	60	332	812 от 800	50	6	4
9.	Иван Богданов Самотата (не) спи на възглавницата ми Ivan Bogdanov TheLoneliness (not) is sleeping on my pillow	10	200	2018-02-28	58	230	810 от 1000	30	-	1

Table 1. Data for the successful projects of the Bulgarian specialized crowdfunding platform "A Dream of a book" (2016 - November 2018) (continued)

№	Author Title	Price (BGN)	Pages	End date	Sold books from 100 (number of book)	Donations	Raised funds (leva)	Received payments (number)	Donations (number)	Non-confi paym (num
10.	Слава Славчева Тайните на старата вила – 2 Slava Slavcheva The Secrets of the old villa - 2	8	128	2016-05-31	49	400	792 от 800	39	-	5
11.	Нина Дончева Мълчанието на майките Nina Doncheva The silence of mothers	7	100	2016-12-31	71	200	697 от 700	32	-	3
12.	Борислав Белински Как се става рицар Borislav Belinski How to become a knight	7	80	2016-01-31	38	405	671 от 650	23	-	3
13.	Момичето Лунатично Азбуката от А до Я през моята душа The Girl Lunar The alphabet from A to Z through my soul	4	36	2018-04-30	128	156	668 от 400	3	1	7
14.	Рая Вид /Радка Видьова/ Нишки от преплетена вяра Heaven Type / Radka Vidyova /Threads of intertwined faith	8	160	2018-02-28	5	600	640 от 800	5	-	-
15.	Надя Луканова Сенките на спомените Nadia Lukanova The shadows of memories	8	96	2016-05-06	50	211	611 от 800	48	-	-
16.	Иван Богданов Самотата спи на възглавницата ми Ivan Bogdanov Loneliness is sleeping on my pillow	10	100	2016-01-10	63	20	650 от 1000	41	-	7
17.	Цветелина Александрова Сеизмичен роман Tsvetelina Alexandrova A seismic novel	8	116	2016-01-31	39	272	584 от 800	30	-	4
18.	Елена Николова – Хели Приказки за Ейри Elena Nikolova - Heli Tales about Arie	8	90	2017-12-31	63	0	504 от 450	9	-	5
19.	Ангел Филипов – Ахаир Под звездното небе Angel Filipov - Ahair Under the starry sky	7	96	2017-01-31	32	130	354 от 700	33	-	-

Conclusion

Crowdfunding platform "A Dream of a Book" is not only an innovative way of financing, it is also an extremely useful

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CURRENT TRENDS IN THE MARITIME LEADERSHIP TRAINING APPROACHES

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Abstract: *The paper presents aspects of the current trends in the maritime domain in the context of the diversity management practices and gender perspective. The relevance of the problem increases by different processes like demographic change, labor market fluctuations, shortage of high qualified maritime personnel etc. The changing maritime environment itself is high dynamic and specific. The technological processes in the fast developing maritime industry makes the profession more demanding. Various circumstances in the current globalized and competitive maritime economy challenge the successful implementation of already established practices. Considering the high level of regulation of the seafaring profession the International Maritime Organisation (IMO) put a great value on the development and implementation of new leadership training framework including effective management of the mentioned trends. Change needs time especially when it comes to values, organizational culture or habits. The paper describes some approaches for establishing, managing and changing organisational culture in the shipping industry pursuing the diversity management and gender perspective in the maritime profession. The overview of the presented functional leadership techniques with respect of orientation and retain of female personnel in the seagoing services demonstrates the need to train additional team management skills in the specific maritime environment combining and expanding them on the basis of anti-discrimination, fare resource provision and adequate promotion which seafarers pointed out as the most common problematic issues by carrying out the duties.*

Keywords: NAVAL FORCES, LEADERSHIP, MARITIME EDUCATION, TRAINING APPROACHES

1. Introduction

Based on the conducted large research on attitudes of different professional groups in the maritime domain some conclusions give us an intention to identify some challenges regarding the involvement of women in the seafaring profession. Especially, the most common obstacles occur by promoting female staff to leading positions. Although the question has many different sides and point of analysis we will focus on some problems that are specifically valid in the maritime environment. The relevance of the problem increases by different trends and processes like demographic change, labor market fluctuations, shortage of high qualified maritime personnel etc. National or international perspective, promoting gender equality as a whole concept can not be applied overall despite some major common problems.

The very specific maritime environment indicates some thoughts on existing constraints that need to be more detailed analyzed and understood. The management and the leadership include capabilities for effective management and/or participation in the deck team. The problem is not if men and women possess in the same way those capabilities - technical know-how about the ship, managing know-how and team work experience and proactive approach- but rather why they can not execute, apply and perform them equally. On the first sight it is because of the specific structure of the ship organization: hierarchical one with very clear chain of command. So, overcoming the obstacles being on lower level positions onboard opens the way to higher ones.

You may possess all of the mental, personal and physical characteristics of the good leader but it does not mean that you will automatically "climb the ladder" because you are prepared for that. It is a statistically approved fact that exactly the age and the professional experience influence the attitudes to the gender perspective and equality problems onboard. Older professionals find it hard to accept the change in gender stereotypes in the maritime industry. The most common way of leading in the ship organization culture is a combination between authoritarian, bureaucratic and task-oriented leadership. So, does it mean that effective integration of female personnel onboard means to consider different leadership styles, namely the strategic leadership and the so called transformational leadership. The answer is no. Good leaders often instinctively switch from style to style depending on the people who they manage and the work to be done. Furthermore, effectively

promoting social justice and moral very often refers to more „stronger” and decisive way of leading than to the very liberal and democratic one. So it is about applying different leadership techniques rather than fixing one or another style of managing the crew members. Current practices of techniques should be presented in view of diversity and gender management skills.[1] [2].

2. Leadership approaches

Help interpret the meaning of events: Helping people to discover the meaning of complex events is important, especially when the change is quick and practically touches every part of life. In this sense the gender perspective is definitely the case. On one hand, the maritime industry face various problems: shortage of management experience in such new relationships; the routine accumulations of the past; and deficit of prepared managers for effective diversity management of the overall transformation process. On the other, professional reliability, in general, is a result of not only professional competence (i.e. certain knowledge and skills required for performance), but also reliable functioning of a human organism and mentality. Thus the problem of reliability of professional activity is directly connected with reliability of the person's mentality, in other words - with psychological aspects of the human factor. People with a long record of service on sea-going vessels are characterised by narrowness and specialization of aspirations and interests, jealous attitude to their status, a peculiar emotional conservatism.[3] Maritime personnel should be assisted in adapting to the new environment, to understand it correctly, and to change their behaviour (where needed) in order to deal with it successfully.

Consent on goals and strategies to achieve them: One of the most challenging processes especially when it comes to a heterogeneous groups with diverse structure. Effective collective activity requires agreement on what and how to do. The consensus in this case is particularly important for newly formed groups and for groups in crisis. It comes to the manager's particular ability to express strategic views about the organization's or individual substructure's purposes, and to motivate and persuade others to perceive these views. The potential ability to influence members of the organization, and even to make changes related to the organization's development and activity as well. The leader should be able to define and develop the organization's goal, the vision for its realization, the key strategies, the optimal structure, to identify the right people for the right positions, and to organize the most efficient processes to achieve the organization's success. The leader

should try to create an organizational structure, allocate resources to the organization, and express strategic views about the organization (about its development). An environment is created where members of the organization can predict its needs in the context of its work. This kind of leadership practice (so called functional strategic leadership) is the use of creativity, understanding and planning to help each member of the organization fulfill its goals and tasks. Leaders are people who can generate and express strategic views about the organization's development, assert them, and constantly lead their subordinates to their realization.

Dedication and optimism: The execution of difficult, stressful tasks requires dedication and persistence in the face of obstacles and temporary defeats. There are several basic theories-behavioral, random, distinctiveness, theories of power and influence etc. On the basis of all theories today, it is concluded that leaders must have different qualities that will bring benefits to them to be successful. In this context the gender problematic has important role because of the psychologically incorporated differences. Men and women could act instinctively different especially in stress situations which are very common onboard due to the specific environment. The know-how about physical, mental and social personal qualities is provided from the beginning of the maritime leadership training. Additionally the programs are updated in regard of the gender problematic in order to maintain common proper understanding of the personal motivation and dedication attitudes of seafarers.

Physical characteristics	Mentality/character	Characteristics related to participation in the work process
Powerfullness Resistance	Self-confidence Honesty and integrity Enthusiasm Desire to lead Independence	Striving to reach the outcome, to excellence Good faith in reaching the goals Ability to work with any difficulty, persistence
Social requirements	Social characteristics	Mental abilities
Education Mobility	Contact manners, interpersonal relations Ability to attract people to cooperate Team work experience Tactic, diplomatic manner	Intellectual, cognitive abilities Knowledge Thoughtfulness Decisive manner

Mutual trust and cooperation: Effective implementation of collective tasks requires cooperation and mutual trust that is possible when people are understood, tolerant to diversity, and capable of resolving their contradictions in a constructive way. In this context the masculinity-femininity social dimension among crew members plays an important role. A society is called „masculine” when emotional gender roles are clearly distinct: men are supposed to be assertive, tough and focused on material success. Whereas women are supposed to be more modest, tender, and

concerned with the quality of life. A society is called „feminine” when emotional gender roles overlap: both men and women are supposed to be modest, tender, and concerned with the quality of life.[4] Such stereotypes are not changeable over night if ever but the issue should be discussed in the context of finding mutual understandable way to cooperate in order to perform tasks together without isolation and division and finally to achieve the organizational goals.

Building and strengthening of collective identity: The effectiveness of a group or organization requires at least a medium degree of collective identification. If not correctly managed diversities could split the team, respectively the crew. Again, the challenge of building the desired effective organizational culture needs more attention and clarification. Cultural values unite people around high ideals and common goals, create enthusiasm and direct the teams' action in line with strategic priorities in the organization's development. Achieving results is strongly dependent on the values of organizational culture and the economic performance of the organization. Organizational culture management, based on Kurt Lewin's model [5], includes the following stages:

- "Unfreezing" - there is a disturbance of balance, there is a motivation for change.
- "Culture changing" - this is the process of learning new behavior, which is realized using the "error-proof" method or by the imitation of the behavior of others.
- "Re-Freezing" - this is the establishment of new behavior and views through obtaining confirmatory evidence.

When an organization begins to change, it is not clear from the beginning whether it will need to change its culture or not. The question should be answered whether culture will contribute to the changes in the organization or in contrary will hinder them. That is why clear objectives for change are first formulated and then culture is evaluated.

Organization and coordination of activities: Successful implementation of complex tasks requires the capacity to coordinate many different but interconnected activities in a way that makes effective use of people and resources. Since the goals we pursue are almost always more than what we can achieve with the available resources, an important issue of efficiency is which goal to choose, or, "what exactly" we want to do. Thus, effective resource management requires prioritization of goals. Another important problem of resource efficiency, which also follows from their limitations, is how to do what we have decided to do. This means that effective resource management also requires prioritization of resources and technologies. Last but not least, limited resources imply the distribution question "for whom". Many of the ship's resources are used to sustain the lives and motivation of the crew. How to distribute „fair” food, water, living space on the ship? How to distribute power? Should the female crew have more of this goods and how to distribute this between them as well?

Encouraging and facilitating collective learning and providing the necessary resources and support: Continuous learning and innovation are essential to the survival and prosperity of the organization. Its members should collectively study good practices of working together to achieve the common goals. For most groups and organizations, survival and development require interaction with outside groups, people, organizations. Resources, endorsement, assistance and political support should be obtained from senior levels or from people outside the organization. In the context of the gender perspective we have good examples for supporting, legally, the problem. Various national and international doctrines, programs, regulations etc. set the necessary framework for the right approach. Not least the non-governmental sector, incl. the maritime industry, shows affection and initial support. More should be done from now to start implementing it in more concrete and pragmatic way.

Developing and empowering people: To be successful, any group or organization usually needs active membership of their members in solving problems, making decisions, and making changes. The leader should help members of the organization develop appropriate skills to be ready for leadership roles, new responsibilities, and participation in changes. In this sense the concept of the transformational leadership could be very useful because we have a process of significant changes in the transition from one condition to another, subject to certain rules that will probably change.¹ Again, we face the challenge of a routine accumulations from the past and respectively deficit of prepared managers for effective management of the overall transformation process.

Promoting social justice and morals: Satisfaction and dedication of members of the organization grows by creating a climate of honesty, compassion, and social responsibility. Establishing and maintaining it requires active efforts to protect individual rights, encourage social responsibility, and oppose unethical practice. Especially when dealing with diversity management the aspects of an ethical leadership are very important. Moral standards include the extent to which the leader's behavior: violates basic public laws; denies the rights of others; endangers the health and life of others; includes attempts to exploit others for personal gain.

3. Conclusion

Current research in the area of diversity management including the gender perspective shows more demand on re-thinking of well-known and well-established approaches used in the leadership training programmes on national and international level. The overview of ten functional techniques with respect of orientation and retain of female personell in the seagoing services demonstrates the need to train additional team management skills in the specific maritime environment combining and expanding them on the basis of anti-discrimination, fare ressource provision and adequate promotion which seafarers pointed out as the most common problematic issues by carrying out the duties.

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- [5]https://www.mindtools.com/pages/article/newPPM_94.htm, accessed on 10.01.2019.

¹ A process where leaders and followers help each other and interact on the way to the common goal. The process is based on high ethics and motivation that can not be achieved by the usual labor force exchange for its material equivalent. Transforming leaders make people pursue their personal interests, work for more goods; they are addressing the needs of their followers. In essence, this is an expression of a behavioral pattern of a fundamentally new type of leader, whose style goes beyond the old doctrine of strategy, structure and system, to a more flexible model built on the purpose, process, and people (Maslow Theory, MacGregor's Y theory, Chris Argyris Model, Two-Factor Theory of Frederick Herzberg, Bernard Bass Transformational Leadership Theory a.o.).

THE DARK SIDE OF ANALOGY-MAKING

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Abstract: *Analogy-making is the most beautiful manifestation of the fundamental property of human's thought. It shows how the incoming information maps to the already memorized old one, and they both change until fit consistently. What we see depends on what we already know and vice versa, what we know depends on what we have already seen. It is broadly accepted that ability to make deep analogies is one of the strongest predictors of the intelligence, the creativity, the ability to understand causal relationships. However, analogy-making, being one of the strongest instrument of human thought, may have a dark side too. There are examples in the literature how wrong analogies may produce various fallacies of human thought. Widespread beliefs in world conspiracy, superstitions, etc. could be a product of wrong analogies. Different effects of the known phenomena of confirmation bias are also modeled by the sub-processes of analogy-making. This paper systematizes different types of fallacies and possibilities how those effects could be modeled within a cognitive architecture are discussed.*

KEYWORDS: COGNITIVE SCIENCE, ANALOGY-MAKING, FALLACIES, COGNITIVE MODELING

1. Introduction

Analogy-making is the most beautiful manifestation of the fundamental property of human's thought how the incoming information maps to the already memorized old one, and they both change until fit consistently [1, 2]. What we see depends on what we already know and vice versa, what we know depends on what we have already seen. Indeed, many researchers assume the sub-processes of analogy-making as being at the core of human cognition [2, 3]. These sub-processes are used by various cognitive models of thinking, but also by models of understanding social interactions, judgment and decision making, even vision and emotions [4, 5, 6].

It is broadly accepted that ability to make deep analogies is one of the strongest predictors of the intelligence [7], the creativity [8, 9, 1], the ability to understand causal relationships [10], learning of logical inferences [11]. The scientists make a lot of analogies during their work. Beautiful analogies had inspired some of the greatest scientific discoveries, as well some of the most famous artworks [12].

However, analogy-making, being one of the strongest instrument of human thought, may have a dark side too. There are examples in the literature how wrong analogies may produce various fallacies of human thought [13]. Widespread beliefs in world conspiracy, superstitions could be a product of wrong analogies. Different effects of the known phenomena of confirmation bias are also modeled by the sub-processes of analogy-making [14].

The DUAL cognitive architecture [15, 16, 17] is a perfect instrument for modeling various phenomena based on analogy-making. DUAL combines associative organization of the memory with powerful mechanisms for discovering and transferring complex relational structures. DUAL combines the advantages of the classical neural networks – high context sensitivity and fluid representation of the concepts and situations, with the potential of the symbolic modeling to manipulate structures. Within the DUAL cognitive architecture already had been modeled various cognitive phenomena: classical analogy-making [17], constructive vision [5], judgment on a scale, choice, and decision-making [18], constructive memory [19], concept formation [20], etc.

In the sections below, different known from the literature fallacies of human thought are discusses and classifies. The possibility how they may emerge from the sub-processes of analogy-making is analyzed, as well how they could be modeled within the DUAL cognitive architecture. More specifically, the assumption is that some fallacies are a product of the associative,

network-based organization of the memory, whereas some others are result of a transfer of complex relational structures.

2. Taxonomy of the common simple fallacies of the human thinking

The fallacies usually are grouped into informal and formal (or logical) ones [21].

The informal fallacies could be caused by a wrong deductive conclusion, applied to a particular case in an inappropriate context. For example, if from the statement that humans are capable of seeing is inferred that the blind men are capable of seeing. Such type of fallacies deserves a special attention because of the prototypical hierarchical organization of human memory [see for example 22, 23]. The taxonomic of the human conceptual system includes a huge number of exceptions – for example, the birds can fly as a general rule, but many birds do not. Many of the cognitive models of the human memory assume a kind of hierarchical organization (at least for some concepts), in which the properties of the concepts are encoded at the highest possible level. For example, the penguins are birds, the birds are animals. The properties like *lives*, *breathes*, etc. usually are associated with the concept at the highest level (animal in the example); the property of *flying* is attached to the concept of bird. This organization allows economy of encoding, as well ability for deductive transfer of knowledge. Now, in order to encode the information about any exception, it should be attached to the more concrete concept. In the example, the information that the penguins *do not fly* should be associated directly to the concept of penguin. This organization of the human memory is very suitable for most of the task people perform – transfer of knowledge beyond the perceptions, deduction, etc. However, in some specific circumstances it may produce informal fallacies as well. The exceptional knowledge could be forgot, weekly activated or its manipulation could be obstructed for one or another reason. The DUAL cognitive architecture uses a classical taxonomical organization of the memory. In addition, the spreading activation mechanism is suitable for modeling all these effects of temporal or permanent inability to deal with a concrete piece of memory.

A lot of the informal fallacies are related to a kind of shift of the main point. The well-known ad hominem fallacy (speaking against the man rather than to the issue) is in this group. The usage of various emotional arguments (inducing sympathy or unsympathy to the speaker) also is similar kind of fallacy. We argue analogy-making is probably the main mechanism for producing these type of fallacies. People can transfer the relational structure of that wrong argumentation from one domain to another very easy. Here, the second of the main characteristics of the DUAL architecture plays a

role. DUAL is equipped with powerful mechanisms for transfer of complex relational structures from one domain to another.

Very interesting structure can be observed in the so-called circular fallacies. Example of that is: "Wellington is in New Zealand. Therefore, Wellington is in New Zealand" [24]. These type of reasoning is broadly used from people, even from the scientists. [25] point that "using the scientific method to judge the scientific method is circular reasoning". Actually, often it is very hard to distinguish the circular thought from the non-circular one. The common structure of this fallacy is that a sequence of statements $p_1, p_2, \dots, p_n$ is used as a sequence of premises and conclusions (p_1 is used for inferring p_2 , p_2 is used for inferring $p_3, \dots$) but finally p_n is used as a premise for inferring p_1 . This is just a relational structure of arguments. Once learned, it could be applied in various domains and contexts. The result is a set of seeming superficially different fallacies but their deep relational structure is the same and probably the main mechanism of their producing is analogy-making and more specifically, the mechanisms for transfer of relational structures. In addition, the definitions of the words are most of the time circular too. As most of the thinking is performed with words, probably the circular thought is even much more widespread than we may expect.

One of the characteristics of the human cognitive system is the ambiguity between concepts and words. We often use one and the same word for pointing different entities and vice versa, the languages are full of synonyms depicting one and the same things with different words. This may produce various verbal informal fallacies. One well-known example is the pseudo syllogism: "Nothing is better than the eternal happiness. Ham sandwich is better than nothing. Thus follows that ham sandwich is better than the eternal happiness" [26]. Actually, the vagueness of the human concepts and the misalignments between words and concepts are good things. They lay at the basis of our flexible usage of language. They allow metaphor creation, conceptual combination [27]. Probably they are basic elements of creative thinking and various aspects of the intelligence. However, at the same time, the mechanisms for analogy-making may work independently of the data and may detect similarities on the basis of common words even where there are not such similarities at the conceptual level. The problem with the example above, about the eternal happiness, is obvious – the word *nothing* is used with two completely different meanings.

Finally, the formal fallacies violate the formal logic of the inferences, most often of the syllogistic inferences. For example, "If George is a man of good faith, he can be entrusted with this office; but George is not a man of good faith; therefore, George cannot be entrusted with this office" or "If Amos was a prophet, then he had a social conscience; he had a social conscience; hence, Amos was a prophet" [21]. This type of fallacies again depends on the structure of the inference, not on its meaning. As usual when we face a relational structure, the mechanisms of analogy-making offer an excellent explanation of the cause and process of the fallacy creation. Once formed, the wrong logical structure could be easily transferred in various domains.

3. More complex human fallacies

In the previous section, the most popular simple fallacies of human thinking were systematized. A brief possible explanation of how the sub-processes of analogy-making may produce them, was proposed. Summarizing, some of the fallacies emerge from the mechanism of transfer of relational structures. Some other – from the associative organization of human conceptual system, with a lot of exceptional conceptual properties, as well with a lot of misalignment between concepts and words. All these mechanisms

are modeled in the cognitive architecture DUAL [15, 16, 17] for simulating various positive aspects of analogy-making. However, some aspects of the "dark side" of analogy-making were also simulated by DUAL. [14] simulated successfully various aspects of the so-called confirmation bias. More precisely, human tend to retrieve, to search, and to interpret information in a biased way, trying to verify but not to falsify their current hypotheses. In a series of four simulations, it was shown how the mechanisms of spreading activation and transfer of relational structures may underlie the effects of confirmation bias, known from the literature [28, 29, 30].

The effects of confirmation bias are more dangerous than the fallacies from the previous section. Confirmation bias may lay in wrong decisions in various domains. [31] explores the so-called filter bubbles in social media. The editors often use such filter bubbles showing to the auditory news and points of view that people are more likely to agree with, censoring opposite views. [32], as well [33] proved experimentally that judges become more extreme in their verdicts when more people support those extreme views.

In the medicine and psychology, the therapists often evaluate the improvement of their patients in a biased way, misguided by the confirmation bias [34]. Dangerous practices from the alternative medicine emerge also from the confirmation bias [35, 36].

Finally, confirmation bias is one of the factors implying paranormal beliefs [37]. The same author argues that the phenomena of the so-called numerological pyramidology probably is based on the same mechanisms.

4. Conclusion

One of the general direction in cognitive science is to search for the basic mental differences between humans and the other animals. Many researchers test different hypotheses of what the fundamental difference could be – the language, or the ability to use and produce tools, the socialization...

[38] assumes that the interaction between the processes of language acquisition and relational thinking is the fundamental, innate difference between humans and apes, and all other differences are later consequences. Nowadays the hypotheses that analogy-making, and particular, relational reasoning is the most important mental capability of humans, is shared many researchers. Analogy-making is related with creativity, intelligence, understanding of causality, etc.

However, few researchers only try to connect this capability, typical for the humans only, to some less pleasant mental differences between the humans and the animals. If analogy-making is so basic and fundamental for humans, it probably is the building block for fallacies in thinking, beliefs in world conspiracy, superstitions, etc.

This paper summarizes some of the well-known fallacies in thinking, and groups them accordingly to the cognitive mechanisms that may produce them. It is hypothesized that there are two mechanisms, basic for the process of analogy-making, that may produce all of these fallacies, either severally or combined. The first mechanism is the associative organization of the memory; the second one is the ability to compare relational structures. Both mechanisms are evolutionary developed and are very useful. However, in a certain context, they may produce also a lot of mistakes and problems.

Both mechanism are modeled in the cognitive architecture DUAL, which makes this model very convenient for modeling various fallacies of human thought.

This line of research may have a lot of applications in education, but also in politics, journalism, even in law.

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AN UNDERWATER FACTORY

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Abstract: As part of our chemistry club we did a research on the influence of certain external factors on photosynthesis. We chose an experimental approach. Our focus was on aquatic plants in which we were monitoring photosynthesis by measuring generated oxygen.

Keywords: RESEARCH ASSIGNMENT IN PRIMARY SCHOOL, PHOTOSYNTHESIS, EXPERIMENTAL WORK

1. Introduction

The objective of the instruction in the subject Science in primary school is to enable pupils an acquaintance with and understanding of scientific concepts and laws needed for the comprehension of natural phenomena from the point of view of interconnections between animate and inanimate nature, especially the search for cause-and-effect links between characteristics and the structure and functioning of animate and inanimate systems in the environment. The acquisition of content objectives in the field of Physics, Chemistry and Biology takes place in the framework of reaching process objectives, which encompass a range of cognitive processes. By training in experimentation and research skills and by getting acquainted with research methodology, students do not acquire only basic knowledge in natural sciences, but, among other things, learn about the significant role of natural sciences as regards sustainable development. Teaching Science needs to be planned in a way that allows pupils to apply gained knowledge and skills to identifying and solving authentic problems in the natural environment as well as in other areas of human activity. The primary school subject Science is defined as a general education subject through which students gain fundamental knowledge in natural sciences and develop their experimental skills, which can be summed into the natural sciences literacy – equipping pupils for a responsible and active life and participation in contemporary society. The experiential-experimental-problem-and-research-oriented approach to teaching contributes to a better comprehension of and a positive attitude towards scientific findings and these scientific fields in general.

2. Research assignment on photosynthesis as an example of using scientific research in primary school

1. INTRODUCTION

The writing of a research assignment enables students to do independent research into the links between different phenomena, to form hypotheses and to test them by doing experiments, which the student plans and carries out on his or her own.

1.1 Objectives

Photosynthesis is one of the most widespread chemical reactions that take place in the natural world. Photosynthesis is performed by all green plants, both those that live on land and those living in water. The basic steps of the process of photosynthesis were taught in Year 5 (of an eight-year primary school), in the framework of Science (or, literally, “Learning about Nature”), but we wanted to expand our knowledge through a research assignment. In our research, we focused on water plants. We were interested in the following:

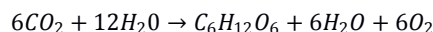
1. How is the process of photosynthesis affected by different kinds of water (different pH, distilled water, sea water, mineral water ..), in which green plants find themselves?
2. Do different plants produce different amounts of oxygen during photosynthesis?

2. THEORETICAL PART

2.1 What is photosynthesis?

Photosynthesis is a process through which plants turn the energy of light into chemical energy, which enables the conversion of carbon dioxide and water into sugar. In photosynthesis, organic matter is produced from inorganic. Photosynthesis is the synthesis of sugar with the help of sunlight. It is one of the basic life processes taking place on Earth. In the process, basic elements (sugars) building up the world of plants are generated with the help of sunlight, from the gas carbon dioxide and water. As a byproduct, the gas oxygen is generated, needed by people and animals for our existence. Plants and their fruits are built from substances produced in the process of photosynthesis and its further products. Both plants themselves and their fruits are also the foundation of Earth's food chain, where more developed organisms feed on those that are less developed. Plants with their fruits are basic food for the animal world as well as people.

The simplified equation of photosynthesis is:



For photosynthesis, the plant needs a »factory«, a sort of an assembly line, which is termed the »photosynthetic apparatus« - chlorophyll, other pigments, various proteins, membranes, molecular pumps etc. The plant has got the photosynthetic apparatus chloroplast, as it developed through evolution and as the basic characteristic of plants. As any factory, the plant needs an energy source and raw materials for production (photosynthesis). The light energy, which propels the photosynthetic factory, is generously and freely supplied by the Sun. While raw materials are also close at hand – carbon dioxide, a gaseous component of our atmosphere, and little water. Light, carbon dioxide, water, the biological assembly line – and sugars come out. An economic miracle!

2.2 The photosynthetic apparatus

Photosynthesis takes place deep in the structure of each leaf. That is where special little grains are located, namely chloroplasts. We call chloroplasts the plants' photosynthetic apparatus. Chloroplast is a microscopically small grain, which has a very complex inner structure despite its size. There are green-coloured plastids. Inside a chloroplast, there is plenty of interconnected stacks of discs called thylakoids, which are some kind of flattened and interconnected membrane sacs or pouches. Molecules of the green photosynthetic pigment chlorophyll are bound to the membranes of thylakoids. Chlorophyll "steals" the energy from the Sun, namely the energy which is used in the process of sugar production. Chlorophyll is a lipophilic pigment (it is not water-soluble). On thylakoids, the transmutation of light energy into chemical one takes place. The majority of thylakoids is organised into stacks – grana. In the stroma, a synthesis of carbohydrates takes place, through the binding of carbon. During intense photosynthesis, primary or photosynthetic starch accumulates during the day in the chloroplast's stroma. At night, this starch decomposes and turns into sucrose, which passes (along the transport tissue phloem) into those parts of the plant which need carbohydrates. In reserve tissues (e.g. in seeds and tubers), sucrose can turn into starch again and is

stored for the long term – this is reserve starch, accumulated in amyloplasts.

3. EXPERIMENTAL PART

For the purposes of our research assignment we used the following methods:

- ☐ the overview of relevant literature;
- ☐ field work
- ☐ laboratory work.

We gathered the majority of literature at the Srečko Vilhar Central Library in Koper, while also finding some things of interest on the Internet.

After collecting all literature we came up with the concept of our research. Our essential research method was laboratory work. We precisely determined the experimental procedure and prepared the laboratory equipment.

We decided that we would do our laboratory work at school, in Chemistry room.

We started our field work by collecting plants and different water samples. In the nearby stream, we collected the common water cress (*Nasturtium Officinale*) and sampled the stream water. We purchased some aquarium plants in a specialised shop. We also set off to the sea shore and took a sample of sea water.

3.1 Organising the experimental part

The experimental part was then divided into two sections:

a) In the first set of experiments we made 7 experiments. We tried to find out the amount of oxygen produced during the photosynthesis of the common water cress (*Nasturtium Officinale*) in relation to water's pH and the type of water.

We used:

- distilled water
- tap water
- river water
- alkaline water with the pH = 8 (we added a few drops of sodium hydroxide solution to tap water)
- acidic water with the pH = 4 (we added a few drops of concentrated hydrochloric acid to tap water)
- sea water
- mineral water

b) In the second set of experiments we carried out 5 experiments, through which we established the volume of the oxygen produced in the photosynthesis of different kinds of water plants in tap water. We used the following plants:

- *Nasturtium Officinale* – the common water cress
- *Samolus Valerandi*
- *Echinodorus bleheri* (paniculatus)
- *Lilaeopsis brasiliensis*
- *Anubias barteri nana*

The procedure was the same in all cases.

3.2 Laboratory equipment

One experiment required:

- a large beaker 1000 ml
- a funnel
- a graduated tube (10 ml)
- a splinter of wood
- a green water plant
- water

3.3 Work procedure

We weighed 5 g of the water plant. We poured water into the beaker. Then we placed the plant under a funnel (see Image 4) and submerged everything to the bottom of the beaker.

We mounted the tube on the funnel so that the tube was completely filled with water. There was not a bubble of air in the tube.

The thus prepared apparatus was placed on the window sill in the classroom. Air temperature ranged from 20 to 22°C.

After 7 days, we read off the volume of the gas produced in the tube. We proved the presence of oxygen by inserting a smouldering sliver of wood into the tube, where the sliver caught fire.

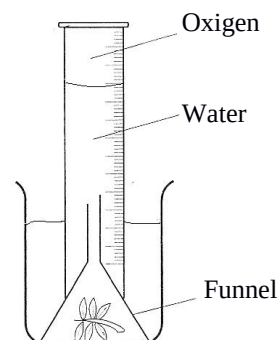


Image 1: A sketch of the apparatus for experiments

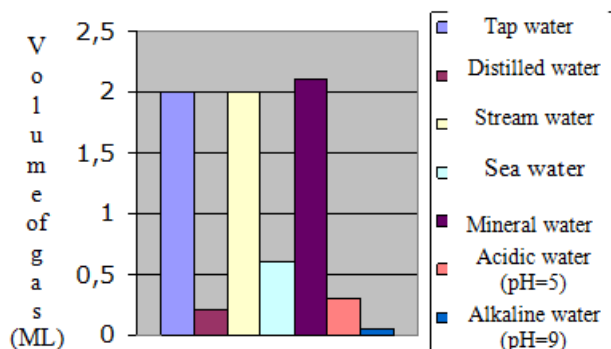
4. RESULTS

4.1 Oxygen produced with different types of water

The photosynthesis of the common water cress in different types of water produced the following results:

WATER	VOLUME OF GAS (ml)
Tap water	2.0
Distilled water	0.2
Stream water	2.0
Sea water	0.6
Mineral water	2.1
Acidic water (pH=5)	0.3
Alkaline water (pH=9)	0.05

Table 1: Oxygen produced with different types of water



Graph 1: Oxygen produced with different types of water

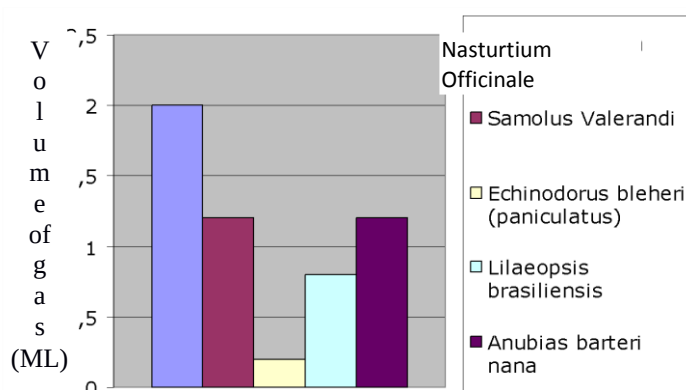
Most oxygen was produced during the photosynthesis in mineral water (2.1 ml) as well as in tap and stream water (2.0 ml). Least oxygen was generated in alkaline water (0.05 ml).

4.2 Oxygen produced with different plants

As regards the photosynthesis of various plants in tap water, we got the following findings:

PLANT	VOLUME OF GAS (ml)
Nasturtium officinale (the common water cress)	2.0
Samolus Valerandi	1.2
Echinodorus bleheri (paniculatus)	0.2
Lilaeopsis brasiliensis	0.8
Anubias barteri nana	1.2

Table 2: Oxygen produced with different plants



Graph 2: Oxygen produced with different plants

Most oxygen was produced during the photosynthesis of the common water cress (2.0 ml), while least oxygen was produced by Echinodorus bleheri (0.2 ml).

5. DISCUSSION AND CONCLUSION

The experiments done helped us determine the following:

5.1 Photosynthesis occurred with the same intensity both in stream and tap water. Therefore hypothesis 1 (*Most oxygen is produced by the plant in stream water, where the plant also grows*) was refuted. Tap water is thus an equally good environment for carrying out photosynthesis as stream water, which is the common water cress's native natural environment.

5.2 Photosynthesis occurred considerably less intensely in acidic water (7-times less intensely than in stream water), while it practically did not take place in alkaline water, by which we confirmed hypothesis 2 (*Acidic and alkaline water impede the process of photosynthesis*). A change in the pH value damages plant's cells and hinders the performance of vital processes.

5.3 Photosynthesis also took place in sea water, though at 3-times lesser intensity than in stream water, by which we refuted hypothesis 3 (*Freshwater plants do not perform photosynthesis in sea water*). In sea water, some life processes occur only to some extent and at some level they stop altogether due to the changed environment (osmosis).

5.4 According to our results, photosynthesis was at its most intense in mineral water, which proves hypothesis 4 (*An increase in the concentration of carbon dioxide accelerates photosynthesis*). An increased concentration of CO₂ speeds up photosynthesis because there is more substance – reactant – at disposal.

5.5 In distilled water, photosynthesis took place with 10-times lesser intensity than in stream water, which actually refutes hypothesis 5 (*Photosynthesis does not take place in distilled water*). Since the reading of the oxygen's volume was very small indeed, we do not exclude the chance that the present gas was the result of our proceedings at the start of the experiment (the bubbles on leaves, present already in the preparation stage of the experiment). Because distilled water is a pure substance, we assumed that photosynthesis does not happen there due to the absence of carbon dioxide.

5.6 The intensity of photosynthesis also depends on the type of plant – most oxygen was produced by the common water cress, while least (which was, in fact, 10-times less) was produced by Echinodorus bleheri (paniculatus). Our findings support hypothesis 5 (*Different plants produce different amounts of oxygen*). A variety of plants implies different surfaces of leaves and different numbers of stomata, and, with the exception of water cress, all plants were of tropical origin.

3. Conclusions

While writing a research paper, pupils gain an abundance of new knowledge and skills. The use of laboratory equipment and experimental work meant for them extending and deepening their knowledge of Chemistry and Biology. Research assignments provide individuals with a chance to develop their potentials, interests and their particular talents. They represent an ideal opportunity for personalization, which essentially means that we adapt our teaching to an individual student. Research allows students to direct their interest and learning. Of course the mentor's support and consultation are indispensable.

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PREPARING FOR GLOBAL EDUCATION THROUGH LANGUAGE LEARNING AND ACQUANTING WITH THE TYPES OF INTERCULTURAL DIALOGUE

ПОДГОТОВКА ЗА ГЛОБАЛНО ОБРАЗОВАНИЕ, ЧРЕЗ ЕЗИКОВО ОБУЧЕНИЕ И ЗАПОЗНАВАНЕ С ВИДОВЕТЕ ИНТЕРКУЛТУРЕН ДИАЛОГ

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Abstract: Global education in the modern world poses few challenges. The preparation for it in this report, which presents the experience of approved variants, is two-layer work: linguistic and intercultural. The approach is chosen because of the key role of speech communication and social performance of participants in the global educational space. At the heart of the practical work is the issue of the emotional climate in the learning process and the motivation.

KEY WORDS: MOTIVATION, EMOTIONAL CLIMATE, GLOBAL EDUCATION, INTERCULTURAL DIALOGUE

Introduction

In an increasingly global and mobile society, we are faced with greater cultural diversity both in our professional and private lives. As a result of this, more and more emphasis is being placed on the need for intercultural awareness, adaptation and respect for cultural differences. For English language teachers, the real challenge is to find a meaningful and entertaining way to sensitize learners to the complexities of this topic, while assisting them in the development of their professional English skills. This work investigates the implementation and results of pedagogical method which involves a group of 9th grade students for a role-play activity by means of the Communicative Language approach and in accordance with the European Common Framework for languages.

Key concepts

Global Education is a world-class education for acquainting with and understanding the global problems of mankind and building key competences to address them in order to form an active and responsible global citizen. Global Education, as defined by the Council of Europe, is education that opens the mind and heart for the interrelationships and similarities that exist between people and communities around the world. It gives young people the knowledge, skills and values that will help them make the future of the world fair and shared. Global education focuses on exploring the interrelationships that exist between countries, between communities, people in the global social environment, and also focuses on developing the skills of young people to act in accordance with knowledge of these interrelationships and the values of the global citizen.

Global Perspective [2] : discusses issues such as interdependence, poverty and social justice, identity and cultural diversity, conflict resolution, human rights and responsibilities, the environment; places an emphasis on the future and the opportunity that each of us has to change and defines this future; considers society and the environment as a whole; uses interactive learning methods such as teamwork, role play, discussions to develop skills for effective communication and participation in global society; builds skills for searching for information, understanding, critical thinking; affirms values such as sense of justice, tolerance, responsibility and positive, creative attitude;

Intercultural communication covers communication between people from different cultures and focuses on interpersonal relationships of their individuals. We need to study intercultural communication by a number of reasons: - the opening of borders, the intensified migration of people from culture to culture, the development of the global information

network obliges us to look at the world through the eyes of the other, and to expand our worldview by exploring other cultures; - development of global consciousness as a result of the interaction of people from different cultures; - the presence of some commonality factors influencing the formation of global consciousness.

Intercultural communication is defined as a set of interactions between people from different cultural backgrounds, which consists on a process of exchanging, negotiating and mediating cultural differences through language, non-verbal gestures and space relationships.

As a competence, intercultural communication involves the ability to be aware of how cultural differences influence communication process and its outcomes. Through this competence we realize the distinctions between people coming from different cultures.

Being competent on intercultural communication means to:

- Understand how people from different cultural backgrounds behave, communicate, express feelings and perceive the world.
- Understand basic cultural differences influencing intercultural communication.
- Identify different forms and means of intercultural communication and how to manage them.
- Understand the principles and conditions of effective intercultural communication.
- Avoid cultural conflicts related with communication.

The benefits of managing Intercultural Communication are several: willingness to accept differences, personal growth through increased tolerance, better skills related to dialogue and cooperation, as well as development of a positive attitude towards otherness. On the other hand, applying intercultural communication skills with a group of learners can lead them to other type of benefits, such as:

- improving verbal and nonverbal communication
- becoming better in recognizing and undertaking communication behaviours
- better adaptation to a new environment
- better understanding of one's own culture and finding one's place in a society
- reduced feeling of anxiety in contacts with members of other cultures

- learning about customs and habitual behaviours of members of other cultures
- improving abilities related with intercultural conflict resolution

The goal of intercultural education is to help each participant in the educational process be formed as a unique person who prides himself on his socio-cultural specifics and the richness of cultures he carries and is capable not only of establishing himself in the multicultural society, but to accept others as just as valuable as yourself. This goal can be achieved when knowledge about differences, communication skills and positive attitudes towards intercultural dialogue are gained.

Classroom activities

Practical work consisted of role play activities as a main part of the lesson.

Role play - One of the staples of English as a Foreign Language (EFL) teaching is the role play. Role plays are used to allow students to practice speaking in a conversational situation, build confidence and fluency, assess progress, and put learning into action. Role-play is any speaking activity when you either put yourself into somebody else's shoes, or when you stay in your own shoes but put yourself into an imaginary situation!

They are often set up to target particular grammar points and to test social interaction skills such as negotiating, interrupting, asking for assistance and making small talk. Role plays may be as simple or as complicated as the teacher desires. Verbal instructions, secret messages, gestures and cue cards are all common ways of setting a scene.

In the classroom there are four main types of role plays: **1. The conflict role play** puts participants on a collision course and asks them to deal with this as best they can. **2. The cooperative role play** takes the opposite tack and requires participants to work together for the common good. **3. Information gap role plays** are based around filling in holes in the participants' knowledge. **4. Task-based role plays** require participants to complete a set activity such as checking into a hotel, giving directions to a taxi driver, ordering a meal or getting the phone number of a potential interest. They are useful for helping students to practice realistic survival English skills and are an excellent way to build students' confidence in their ability to function in real situations. This type of role play was used in the class to increase students' motivation.

Role playing activities can prepare students for real-life situations where they can apply their English language skills. Besides, the role play activities can liven up the classroom atmosphere and get the students to know each other better.

It is widely agreed that learning takes place when activities are engaging and memorable. Jeremy Harmer advocates the use of role-play for the following reasons: It's fun and motivating, quieter students get the chance to express themselves in a more forthright way, the world of the classroom is broadened to include the outside world - thus offering a much wider range of language opportunities

In addition to these reasons, students who will at some point travel to an English-speaking country are given a chance to rehearse their English in a safe environment. Real situations can be created and students can benefit from the practice. Mistakes can be made with no drastic consequences.

When learning a second language in a classroom setting, it's common for students to be shy when it comes to having open discussions. Role-play activities are an effective way for English as

a Foreign Language to encourage students to speak English and interact in realistic situations during class. Some of them can be Movie Scene Role Plays, Situation Role Plays, Auction Role Plays or Play the Game 'Simon Says'. All these activities help English-speaking beginners to build their confidence and to improve conversational skills. Many of these activities will produce laughs and all these activities are good for increasing one's knowledge of how to speak English. The more practice new students have will mean that their English will improve very. All the above activities will include a large amount of "speaking time" which is so important when learning a new language.

This **lesson plan** includes the following steps:

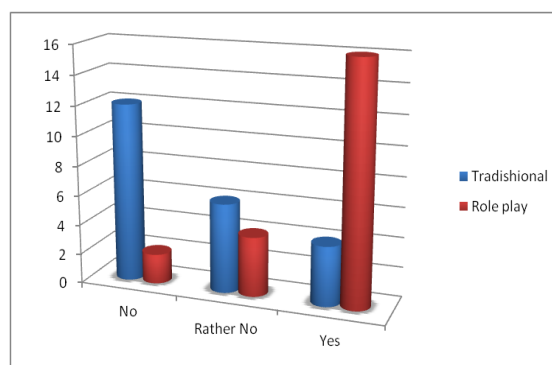
1. Warm-up activity
 - a/ Brainstorming – "robbery", in a form of a spider gram
 - b/ Have you ever been robbed? – individual answers
2. Video activity – YouTube "Most polite robbery ever caught on security cam CCTV", real life footage [7] followed by discussion
3. Role play
 - a/ Setting the task
 - b/ Distribution of roles
 - c/ role play [6] – mingling activity
4. Follow-up activity – writing dialogue "At the police station" as a homework.

This is a conversation game /role play/ for pre-intermediate to intermediate students for practising QUESTIONS and ANSWERS. It includes a set of 30 CHARACTER CARDS. The situation is the following:

Yesterday at 10:00 pm there was a robbery in the Bank in Central Lane. The police was called immediately to investigate the crime scene and found some evidence. It had snowed yesterday so there were footprints on the ground in the snow. Students /some are citizens, others are police officers, one is the robber/ go round the class and ask/answer questions about the personal information and take notes (What's your name? What's your job? Where are you from? What are your hobbies? Are you married? Do you have any children? Do you have a pet? What did you do yesterday? What were you doing at 10 last night?).

The above activity is a great resource for high school students at a pre-intermediate, A2 and intermediate B1 level. It is a useful material for practicing verb tenses and asking questions, and can be used for strengthening students' speaking skills in describing people.

Fig.1 Diagram of students' motivation



As you can see, fig. 1 shows the interest of students towards teaching content in FL classes where there are different types of activities. Students had been asked about their opinion and feelings to making various dialogues in English. Blue answers refer to students' reactions to traditional dialogue making /reading, retelling/ and show that few learners really liked this kind of exercises. Red answers refer to role play activity and show that the majority of students enjoyed this type of tasks.

Conclusion

Increasing cultural pluralism requires active participation in democratic processes at all levels, not only in respect of citizen's participation in institutional structures, but also through the development of dialogue and consensus between groups with different interests, origins and backgrounds. Therefore we need to prepare a generation of young people with the motivation, commitments and skills, such as entrepreneurship, leadership, volunteering and capacity building, to be audacious problem-solvers and develop their critical and creative thinking capacity to deal with different opinions, acquire media literacy and develop intercultural skills, as well as social and civic competences including learning about cultural heritage.

Education and intercultural learning in their diverse settings are crucial to ensure sustainable progress in the field of active citizenship. Learning is a dynamic process which can take place in a multitude of settings, leading to the acquisition of additional life-skills, transferable knowledge and intercultural competences. Therefore, the report tackles the issue of education not just targeting children and young people but also ensuring the involvement of all generations, in particular through lifelong learning opportunities.

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THE BLENDED LEARNING TECHNIQUES IN TECHNICAL HIGHER EDUCATION

МЕТОДЫ СМЕШАННОГО ОБУЧЕНИЯ В ВЫСШЕМ ТЕХНИЧЕСКОМ ОБРАЗОВАНИИ

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Abstract: Nowadays systems can optimize the presentation of the course's content, suggesting next steps in subjects studying, dynamical planning of individual lectures with lecturers for students with special needs, and even create timetables of school buses accordingly to the time of courses running. We argue that massive open online courses created in Ukrainian by leading specialists in their fields and their implementation to the educational process can give students an opportunity to get up-to-date knowledge, a chance to study regardless of their financial state or an opportunity to enroll to the leading universities.

KEYWORDS: BLENDED LEARNING, DIGITAL LITERACY, LIFELONG LEARNING, MASSIVE OPEN ONLINE COURSE, ONLINE-LEARNING

1. Introduction

Modern trends in the world's educational process and the market's demand of technical specialists dictate new requirements to the personnel's quality and need to introduce the latest technologies into the educational process [1, 2]. Technical specialists are those who have needed to be clearly responsive to transient changes in the educational environment, knows how to assess trends and innovations, and choose the right ways to respond to the new challenges. The technical education is rapidly changing and those who are starting to obtain knowledge this year will be challenged with new technology not at the finish line of their bachelor's program but at the end of the first year of study and every year to come. The educational technologies for training such specialists should be constantly updated, be at the time and help the future professionals to find themselves in the post-industrial world controlled by information technology of a new age of society's development - artificial intelligence, based on the use of neural networks, virtual reality, online technology of different directions and style, new electronic devices, internet of things' development, space technologies, etc.

In 2008 Dave Cormier introduced the term MOOCs (Massive Open Online Courses). Such courses are available online for a wide audience and are designed for all interested users with Internet access regardless of age, sex, nationality, country of origin, social standards, etc. [2, 3]. In 2012 the world's top three modern online education platforms were launched simultaneously: Coursera (founded by Stanford University professors), Udacity (founded by Stanford University professors, developed due to courses of Georgia Institute of Technology) and edX (Harvard University and the Massachusetts Institute of Technology collaboration project). In Ukraine, the first attempt to create massive open online courses was made in 2013 in the Taras Shevchenko National University of Kyiv, where the UniversityOnline was created, but the project was not in high demand. In the spring of 2014, the EdEra project, launched in the form of online courses to help scholars to prepare for an external independent evaluation, started. The first successful platform for massive open online courses in Ukraine was founded in October 2014. The Prometheus platform today has over 750,000 active users, and this figure is constantly increasing. All courses offered by the platform are taught in Ukrainian and most of them are developed by leading Ukrainian lecturers [4, 5]. This massive open online courses' platform has introduced the project to implement blended learning techniques into Ukrainian educational process.

2. Preconditions and means for resolving the problem

This innovation process in education leads to rapid online learning development and its implementation into the offline educational process. In 2016-2019 in Ukraine was successfully implemented a pilot project combining the massive open online courses and classic university education in the blended format.

This study's main aim is to determine relevant models in blended learning techniques in technical specialists' training by implementing these techniques in the educational process of several departments at National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute".

In the experiment's pilot version that was conducted on throughout the academic year 2016-2017, 320 students from 4 departments at National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" had participated. It was joint efforts by four lecturers who were in constant contact with MOOC platform representatives for obtaining operational data on student performance and with colleagues from other higher education institutions to exchange experiences and contribute corrected in the implementation process in real time. The online courses were used as in full (all lectures, practical tasks, additional materials, and certificate as part of the final assessment of the student), and partially (certain topics used in full, a part only fragmentary without student certificate and scoring in the final assessment).

For the introduction of MOOC in the educational process the lecturers independently evaluated courses materials, made it into the discipline's work plan and the curriculum, created topics for problem-oriented lectures and practical exercises. After each online part that students had to go through on their own, testing in an auditorium was necessarily carried out to assess the learning and discussion lectures and tests passed on the platform. As a result of the introduction, the academic performance of first-year students compared to the previous first year increased by 13%, the performance of second-year students increased by 17%. The number of received certificates of successful completion was 62% of all students who studied disciplines in blended format [6].

These results give an opportunity to argue that blended learning implementation in technical higher education can be a revolutionary way to combine best world practices and to keep students in the loop of the new changes in the world through up-to-date online courses introduction to the educational process. Thus, we need to understand which blended learning techniques are better suited for the technical disciplines and how we can implement these techniques in Ukrainian educational process.

3. The solution of the examined problem

Blended learning involves the use of a popular teaching practices (lectures, classroom practical classes, seminars, workshops, etc.) in conjunction with a digital component - the use of information technology for automating the testing process, performing homework tasks, reviewing lecture material, etc. At the present stage, blended learning involves the transfer of the lecture material in its classical presentation of the information lecture in the online by creating a video library and placing it on the appropriate platform [1]. It allows to deepen the material, stimulates students for independent study and involves critical thinking, optimizes the teaching time. Part of the practical classes or their full cycle can

also be translated online and fully automated. The selection of a digital particle and process automation depends on the purpose and tasks and the teacher-developer and inclusion the level of preparation of students.

As it was argued in previous studies, according to online learning studies for the average mass open online course the normal successful completion rate is about 7-8% [7]. This indicates a rather low students' motivation to complete the course, even though they have already registered for the course of their own choice or at the request of the management/lecturer, that is, from the beginning they had a certain intention, desire or purpose to learn.

Obviously, the reasons for the motivation loss to attend courses can be directly related to the course's content (subjective teacher's dissatisfaction, dissatisfaction with the course materials, the level of complexity of tasks, etc.), the nature of the materials' presentation and the educational process structure, and personal changes of plans.

There are no possibilities to influence the personal reasons for the motivation loss to study, since they depend on external circumstances. However, dealing with other barriers, especially of a technical and organizational nature would be feasible when using the individual approach to material submission, the time spent doing tasks, the reminders of various types, and encouragement to pass tests. Avoiding a personal component is possible only if the student's expectations of the course, the sphere of his interests, certain personal characteristics before the subscription to a course are determined [8]. The same problem is an uprising in blended learning process: the motivation lack can dramatically increase drop out from studies and students' failures. The proposed techniques analysis included motivational aspects and different motivational techniques was also used during field studies in implementation of blended learning introduction second stage in 2019.

In modern blended learning practice, different models are used. The most popular for higher education institutions is a rotational model, a flex model, a la carte model and an enrich virtual model [9, 10].

In terms of rotational model, there are three types of interaction between the lecturer and the students [1, 9, 10]:

1. Stations' rotation deals with different stations within one classroom to watch a video, conduct practical assignments, discuss proposed materials, create own product, etc. The stations and the order of their use are chosen by the lecturer according to the course tasks or together with the students to determine the type of work that will be most convenient for all participants in the educational process.
2. The second option is rotation in laboratories provided that the subject is studied, which involves laboratory classes and the use of laboratory equipment. Students move in laboratories, both real and virtual.
3. The third version is a popular model of "flipped classes" used in high-school education both in Europe (for example, in Finland) and in the United States. All the lecture material and preparation for the class are transmitted online, and in the classroom, the students perform practical tasks and disassemble they mastered at home or in another environment with access to the Internet.

The Flex model is used within an open space that can be arranged so that up to 100 people are simultaneously trained in it. Each of them has access to all equipment hosted, can watch online video, can contact other students, and so on. In the use of such a model the lecturer turns completely into a mentor who explains incomprehensible moments, together with the student develops a "road map" for studying the discipline, and for each student, such a plan of training will be individual, and everyone needs an individual approach [1].

The a la carte model implies the presence of a lecturer or a full-time online classroom program - lectures and practical, laboratory classes, if necessary, the student can go online

completely, including checking his / her tasks using the online learning platform [10].

Today's enrich virtual model is available only in the world's leading institutions of higher education, which began to introduce blended learning technologies in the mid-2000s. (MIT, Harvard, Yale, etc.) [10]. If this model is used, each of the courses available in a higher education institution has two options: online and offline. Students can choose courses to take in a classical format in class and maybe additionally or even as the main ones, to take courses that they pass online on the higher education institution platform.

4. Results

The realities of modern Ukrainian higher education for technical specialists do not allow to use all the proposed blended learning types. Thus, we argue that the most useful model for blended learning introduction for technical specialists is the rotation model. The study's results have shown that students get better results with blended learning [1, 6, 9] and the stations' rotation gets the highest demand from lecturers. The stations' rotation is best suited for IT specialists' training. During the same class, they can watch and discuss video lecturers, create programs or obtain practical skills to create them, make joint projects, share, etc. The rotation in laboratories creates space to obtain knowledge in natural science (chemistry, biology, physics, etc.) where the laboratory equipment in high demand. Thus, we plan to implement the pilot project for blended learning in natural science in the following years. The "flipped classes" is commonly used for students of the humanities.

The Flex model is now not used in Ukrainian higher education for technical specialists, but we argue it can be in high demand for mechanical engineering, robotics, space engineering with big open space rooms to create and to share with partners. We proposed to make such open space in Ukrainian higher educational institutions as a future project.

A la carte model can be introduced for theoretic knowledge obtaining. Among the examples, it is worthwhile students studying problematic issues that do not have a clear or consistent answer and require the student to analyze critically his own. After proper reflection and discussion in the audience, an exchange of views with other students and a teacher, one can reach a meaningful inference and determine the position on the controversial statement.

The enrich virtual model was never used in higher educational institutions in Ukraine. The realities of modern Ukrainian education do not allow full use. With the development of educational technologies and the increase in the number of online courses and materials for blended learning, such a model can gain active use both in technical and humanitarian higher education in Ukraine.

5. Conclusions

The blended learning is in high demand among technical professionals all over the world but was implemented in Ukrainian educational process only in 2016 with the pilot project for IT specialists. The enriched blended learning techniques analysis revealed that this way to study and obtain knowledge can be and must be used to training technical specialist but only those who are studying IT but engineers of all kinds, chemists, biologists, electronic specialist, space specialists, etc.

The study has shown that the most suited blended learning model for technical higher education is the rotation model, and the station rotation can be introduced into the educational process without further due. During the pilot implementation period at National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute students of the same year and the same program took the same course in traditional and blended way. Those who took the course in blended got completion better results (up to 15% in different subject groups) than those who took it in a traditional format.

Among the disadvantages it is worth noting:

- dependence on technical equipment;
- digital literacy problems;
- lack of group work;

- the motivation for self-study and mastering of material.

Digital literacy today is one of the components of not only successful learning, but also the implementation of yourself as a specialist in the future. We propose to introduce a self-passed course on digital literacy to overcome this difficulty,

Lack of proper hardware is one of the most important problems in the blended learning implementation since it depends to a large extent on the availability of a permanent and stable connection to the Internet and the necessary equipment to access the network. In large cities, regional centers of Ukraine, the possibility of using technical equipment is almost always available, but in small towns and villages, it is not always possible to overcome technical problems.

The lack of group lecture work can be overcome by further material's discussion during the problem-oriented lectures. However, the motivation for self-study still stays problematic. But individual ways to enhance motivation will improve the learning process quality and increase the overall success rate. Subsequent studies of various testing techniques for online course listeners will allow to identify key criteria for use, suggest ways to implement and automate the testing process, bypassing the individualization factors, as recent studies propose [8].

We propose to carry out large-scale experiment of blended learning implementation with massive open online courses created in Ukrainian by leading specialists in their fields and their implementation to the educational process to bring up-to-date knowledge, a chance to study regardless of financial state or an opportunity to enroll to the leading universities.

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MODEL OF EDUCATIONAL SPACE OF THE UNIVERSITY BY MEANS OF PROJECT ACTIVITY

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Abstract: The article identifies the problems of the global, planetary morality of the young generation, where the robotics, computerization of the educational process are lost, the main thing is live communication, the interaction of the teacher, the student and the environment between them. The person himself with his spiritual, moral qualities, with his desire and ability to live, study, work in the harmonious world of unity between people on earth is lost.

KEY WORDS: EDUCATIONAL SPACE; RESEARCH SPACE; INFORMATION AND INTELLECTUAL SPACE; SCHOOL OF STUDENT ACTIVISTS; RESEARCH LABORATORIES.

Educational space is a sphere of interaction between the teacher, student and the environment between them. This is a place (condition) where (or under which) human development or a qualitative change with it can occur.

The purpose of the educational space:

- the formation of an active, creative, responsible, professionally competent, successful member of society who is able to improve the surrounding reality by the means of project activity, self-actualize;

- creation of optimal conditions (environment) of the psychological climate for the development of the abilities of each student, for the formation of the individual's need for creative expression.

In modern pedagogy, the role of spiritual and moral education as the foundation of education in the development of unity between people on earth, in the pursuit of the world

community is increasingly recognized. In the context of the problem of global, planetary morality, the role of science in the development of models of the educational space of higher education is increasing, where optimal conditions will be created for the development of the abilities of each student, for the formation of personality in creative, intellectual self-expression.

The main goal of the model of educational space developed by us is the formation of an active, creative, responsible, professionally competent, successful member of society who is able to improve the surrounding reality and realize himself with the help of project activities.

The educational space includes many specific spaces for cognitive, creative and productive self-expression (see diagram 1). The educational space becomes successful if conditions are created for the successful organization of the educational space of the university (see diagram 2).

The idea and purpose of the university is appropriated by all subjects of the educational space		
– cause personal interest in learning activities	Project activities are the core of the whole educational process	Create groups of problem character: heuristic, reflexive
– create an environment for the development of research and project activities		Use various forms of organization of the educational process
– organize student search activities in the classroom, workshops, during extracurricular activities		Create a favorable socio-psychological climate for all subjects of the educational space
– create a media environment		

Diagram 2. Conditions for the successful organization of the university's educational space

The structure of the model of the educational space of the university, which promotes intellectual, creative, personal self-realization, the development of the spiritual and moral world of students by means of project activities, which is the core of the

whole educational process, includes places for learning, research and project activities and places for success of teaching staff and students.

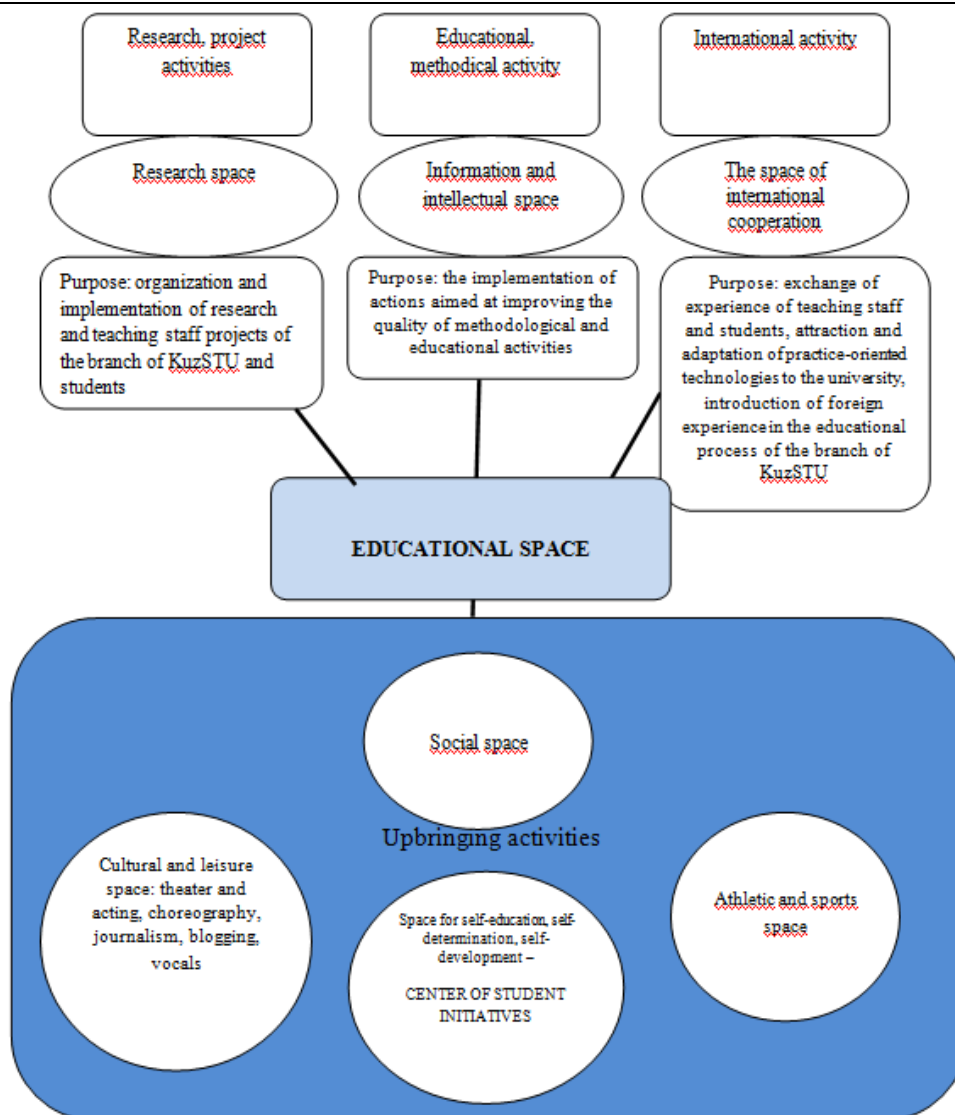


Diagram 1. Educational space

Places of learning and research activities			Place of demonstration for teaching staff and students
Lectures, seminars, workshops		Project activities	Scientific conferences of all levels
Research laboratories			Olympiads, contests of all levels
Temporary groups	creative-problem solving in educational activities	Educational space	Creative projects of students (textbooks, manuals, performances, actions, conferences, photo collages, films of own production about the history and sights of the native town and region)
	Permanent associations - student society		Defense of diploma theses and dissertations
Purpose: - introduction to the scientific work, the development of research activities		Purpose: - training and involvement in project activities; - preparation for scientific conferences	
Autumn and spring school of student activists Volunteer community "Krylatiy"		Media support of all stages of project activities (the emergence of ideas, preparation, implementation and presentation of results)	- author evenings - personal student exhibitions - scenarios of student activities - the museum of history of university branch

Diagram 3. The structure of the model of the educational space of the university, promoting intellectual, creative, personal self-realization, the formation of the spiritual and moral world of students by means of project activities

The experience of organizing and conducting the Student Asset School, which aims to reveal the communicative, organizational, creative, scientific, educational and research abilities of students, has become successful.

The Student Asset School is held in picturesque places of our region, where nature itself contributes to the birth of various projects, the disclosure of creative and intellectual abilities of students, the development of their social activity, personal growth. The projects aimed at the development of the tourism industry in the Mezhdurechensk town district include tourism, ethno-tourism, and extreme tourism.

Media support is very important at all stages of the implementation of project activities. Attracting media resources allows you to solve a whole range of important tasks: to learn to perceive and process information transmitted through media channels; develop critical thinking; develop the ability to find, prepare, transmit and receive the required information, including using various technical tools (computer, modem, fax, multimedia, etc.).

During the preparation and implementation of project activities, students use both finished media products (print, audio, video and electronic information), and directly create them in order to promote the project and visual presentation of the finished result.

We consider it possible to point out the main functions of media resources in the implementation of project activities:

- informational (increase in the volume and / or change in the number of students' knowledge);
- educational (the formation or change of the system of moral ideas; social orientation);
- motivational and regulatory (creating a certain emotional and psychological tone);
- communicative (strengthening, maintaining, weakening ties between subjects);
- image (formation and promotion of the university brand);
- reflexive (evaluation of results and process of activity).

In modern studies of media culture and media education, it is noted that one of the promising areas for improving the educational process of the university is the use of mass media, which occupy an important place in the life of the young generation. Printed and audiovisual media materials are increasingly used in the education system of modern schools and universities.

Within the framework of the educational space of the university, students are actively developing media projects aimed at solving educational problems.

Creating a media project is one of the most promising forms of educational work in higher education, reflecting the current state of educational practice.

In this case, there is not just a full-fledged dialogue between the teacher and the student, but a new type of work with information is realized when the teacher, the student and the media enter into three-way communication. This is of particular importance for education (a permanent factor is introduced to take into account the opinions of others, explicitly or implicitly, in the media reports) for the formation of personal value orientations. The formation of the foundations of critical thinking in this case repels itself from the independence of judgment and argumentation and characterizes the movement towards understanding and interpreting information, mastering figurative thinking. Ideally, the result is the realization of the creative potential of the individual in any form: from oral presentations to independent work on databases, websites, videos and other options for group or individual creative projects.

Teachers need to focus the attention of students on the semantic aspect of their activities, in order for them to learn how to consciously plan their activities. To achieve mental results, students are invited to determine:

- the purpose of the activity (what tasks can be performed using digital educational resources and why);
- the purpose of the activity (what mechanisms of activity were used, what sequence of search activities is needed to solve the tasks, what was done with these resources and how, what difficulties arose in the process of finding the necessary information or solving the problem);
- analysis of activities (how the structural system of the program correlates with other programs, for example, with the program used in previous lessons; what methods of intellectual work were used);
- activity prospects (creation of a media project, compilation of a catalog of electronic resources on a topic, etc.).

The research activities of students using media education resources can be represented by several main stages:

1. The preparatory stage, which includes the development of a work plan, the determination of the relevance of the project's theme, the formulation of the problem, goals, objectives and methods to be used in the development of the project; the study of scientific literature on the selected tasks and the subsequent preparation of a brief summary of the results of research that will be placed in the general provisions and conceptual framework of the project.

2. The stage of experimental activity includes the formulation of a working hypothesis, the development of ways to solve the main tasks of a project based on a detailed study of information sources on the subject of the project; including experimental ones.

3. The analytical stage includes the formulation of the results of the project, the presentation of the project and its evaluation during the discussion in the student group, in social networks, if the project goes beyond the educational organization to the level of the city, region, etc.

Contests of social projects with the use of media material are held within the framework of the organization of educational, research, socio-cultural activities of students.

Thus, the implementation of the presented model of the educational space of the university contributes to the process of formation of personality, covering all the structural components of spirituality (intellectual, moral, aesthetic), the development of the need for self-change, self-development, self-realization.

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