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The Picard's iteration method for determining the critical buckling load of Euler elastic columns

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Abstract: The Picard's successive iteration method is applied to determine the Euler critical force for a slender column. The initial approximation of the buckling mode of the column is a polynomial function that satisfies the boundary conditions. A numerical example is solved and the obtained result is compared with that obtained by the Euler formula. An assessment of the accuracy of the solution is made at each iteration step. In the paper is shown that the Picard's iteration method could also be used for obtaining the closed form exact solution of the buckling load. The investigated column is hinged at its upper end and supported by a Q-apparatus at the other. It is loaded with a compressive force at the upper end.

Keywords: STABILITY, CRITICAL FORCE, ELASTIC COLUMNS, PICARD'S METHOD, EULER'S FORMULA

1. Introduction

Stability of axially compressed columns has been studied thoroughly by Euler. If a slender column is loaded by a load above its critical buckling load, it may buckle. If the compressive force is less than the critical load, the rectilinear equilibrium form of the column is stable. [4]

The stability analysis in mechanical engineering leads to nonlinear differential equations that could be solved numerically or with approximate solution techniques.

In [1, 2], the homotopy analysis method is applied to determine the critical forces in Euler columns. Article [5] is devoted to the variational iteration method for stability analysis of a column.

The Picard's iterative process consists of constructing a sequence of functions that will get closer and closer to the desired solution. The Picard's technique is based on the simple and powerful notation that the sequence of solutions can be generated from an arbitrary initial function satisfying described boundary conditions. The advantages of the method are its easy application and fast convergence. [6]

In [3] the Picard's method is applied for stability analysis of a Euler column with pinned ends. A suitable function, satisfying the boundary conditions, is used for the initial approximation to the buckling mode.

This paper investigates the stability of a Euler column using the Picard's method. The column into the consideration is pinned at one of its ends, and on a Q-apparatus at the other.

2. Problem formulation

The present paper considers a buckled column of length l under an external axial compressive force F . The column, shown in Fig.1, is hinged at its upper end. In the lower end the rotation is fixed and the translation, lateral to the axis of the column, is free.



Fig. 1 Static scheme of the investigated column

The governing equation for the buckled slender column derived in the books of strength of materials has the form:

$$(1) \quad EI \frac{\partial^2 w}{\partial x^2} = -F \frac{\partial w}{\partial x}$$

where EI is the rigidity of the column and w is the lateral displacement of its cross-section as a result of the buckling.

The Picard's iteration method is based on the idea of generating a sequence of approximate solutions to a boundary value problem starting from an initial function that satisfies the boundary conditions of the problem. In the case of ordinary differential equation, the sequence of approximate solutions converges to the exact solution when the initial function satisfies the boundary conditions, is integrable and continuous [3].

For the Euler column shown in Fig.1 the boundary conditions are as follows:

$$(2) \quad w(0)=0; w'(0)=0; w(l)=0; w'(l)=0$$

The initial function in the iteration process for solving the equation (1) is chosen to be:

$$(3) \quad w_1(x) = w_0 \left(1 - \frac{x^2}{l^2} \right)$$

Then

$$(4) \quad \frac{\partial^2 w_2}{\partial x^2} = -\frac{F w_0}{EI} \left(1 - \frac{x^2}{l^2} \right)$$

$$(5) \quad \frac{\partial w_2}{\partial x} = -\frac{F w_0}{EI} \left(x - \frac{x^3}{3l^2} + C_1 \right)$$

$$(6) \quad w_2'(0)=0 \rightarrow C_1=0$$

$$(7) \quad \frac{\partial w_2}{\partial x} = -\frac{F w_0}{EI} \left(x - \frac{x^3}{3l^2} \right)$$

$$(8) \quad w_2(x) = -\frac{F w_0}{EI} \left(\frac{x^2}{2} - \frac{x^4}{12l^2} + C_2 \right)$$

$$(9) \quad w_2(l)=0 \rightarrow C_2 = -\frac{5}{12} l^2$$

$$(10) \quad w_2(x) = -\frac{F w_0}{EI} \left(\frac{x^2}{2} - \frac{x^4}{12l^2} - \frac{5}{12} l^2 \right)$$

The first approximation to the buckling load $F_{cr}^{(1)}$ is found considering:

$$(11) \quad w_2(0) = w_1(0)$$

$$(12) \frac{F w_0}{EI} \frac{5}{12} l^2 = w_0 \rightarrow F_{cr}^{(1)} = 2,4 \frac{EI}{l^2}$$

The exact solution for the column shown in Fig.1 is:

$$(13) F_{cr} = 2,46 \frac{EI}{l^2}$$

Note that the first iteration gives a result very close to the true solution.

The function $w_2(x)$, obtained in the first iteration is used as an input in the second iteration.

$$(14) \frac{\partial^2 w_3}{\partial x^2} = -\frac{F^{(2)}}{EI} w_2(x)$$

$$(15) \frac{\partial^2 w_3}{\partial x^2} = \frac{F^{(2)}}{EI} \frac{F^{(1)} w_0}{EI} \left(\frac{x^2}{2} - \frac{x^4}{12 l^2} - \frac{5}{12} l^2 \right)$$

$$(16) \frac{\partial w_3}{\partial x} = \frac{F^{(2)}}{EI} \frac{F^{(1)} w_0}{EI} \left(\frac{x^3}{6} - \frac{x^5}{60 l^2} - \frac{5}{12} l^2 x + C_1 \right)$$

$$(17) w_3'(0) = 0 \rightarrow C_1 = 0$$

$$(18) w_3(x) = \frac{F^{(2)}}{EI} \frac{F^{(1)} w_0}{EI} \left(\frac{x^4}{24} - \frac{x^6}{360 l^2} - \frac{5}{24} l^2 x^2 + C_2 \right)$$

$$(19) w_3(l) = 0 \rightarrow C_2 = \frac{61}{360} l^4$$

$$(20) w_3(x) = \frac{F^{(2)}}{EI} \frac{F^{(1)} w_0}{EI} \left(\frac{x^4}{24} - \frac{x^6}{360 l^2} - \frac{5}{24} l^2 x^2 + \frac{61}{360} l^4 \right)$$

The second approximation to the buckling load $F_{cr}^{(2)}$ is found considering:

$$(21) w_3(0) = w_2(0)$$

$$(22) \frac{F^{(2)}}{EI} \frac{F^{(1)} w_0}{EI} \frac{61}{360} l^4 = \frac{F^{(1)} w_0}{EI} \frac{5}{12} l^2 \rightarrow F_{cr}^{(2)} = 2,459 \frac{EI}{l^2}$$

The results show that for the column shown in Fig.1 the iteration process converges fast, needing just two iterations.

The Pickard's iteration method could be used for obtaining the closed form exact solution.

The exact function describing the n -th buckling mode for the column in Fig.1 has the form:

$$(23) w_1(x) = w_0 \cos \frac{n\pi x}{2l}$$

The exact function (23) is entered into the equation (1) and the following equation is obtained:

$$(24) \frac{\partial^2 w_2}{\partial x^2} = -\frac{F w_0}{EI} \cos \frac{n\pi x}{2l}$$

$$(25) \frac{\partial w_2}{\partial x} = -\frac{F w_0}{EI} \left(\frac{2l}{n\pi} \sin \frac{n\pi x}{2l} + C_1 \right)$$

$$(26) w_2'(0) = 0 \rightarrow C_1 = 0$$

$$(27) w_2(x) = \frac{F w_0}{EI} \left(\frac{4l^2}{n^2 \pi^2} \cos \frac{n\pi x}{2l} + C_2 \right)$$

$$(28) w_2(l) = 0 \rightarrow C_2 = 0$$

$$(29) w_2(x) = \frac{F w_0}{EI} \left(\frac{4l^2}{n^2 \pi^2} \cos \frac{n\pi x}{2l} \right)$$

The buckling load F_{cr} for n -th buckling mode is found considering:

$$(30) w_2(0) = w_1(0)$$

$$(31) \frac{F w_0}{EI} \frac{4l^2}{n^2 \pi^2} = w_0$$

$$(32) F_{cr} = 2,46 \frac{n^2 EI}{l^2}$$

3. Conclusion

The applied method of Picard to solve the stability problem of a Euler column has a fairly good convergence. It is shown that when a polynomial function is used as a first approximation to the buckling mode, only two iterations are enough to obtain the exact value of the critical force.

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Change management as a marketing opportunity

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Abstract: Change is the only constant dominating business world today. How well managers cope with change has become a key skill which organizations look for. This applies in particular to marketing, where the rate of change is much faster than ever before. The purpose of this article is to reveal how change management can facilitate new marketing opportunities. The research methodology is based on an in-depth review and analysis of various qualitative and quantitative studies, of specialized literature in the field of change management and marketing. A model for change management in the marketing function is proposed, which helps a company to grow more innovative and with more marketing capabilities. This model improves marketing function through 5 steps: implementation of mission, vision and corporate values; implementation of information management systems; implementation of business culture of communication and brand identity; restructuring and optimization of processes and teams; continuous implementation of innovations and conducting trainings. It is argued that change management in the marketing department of a company under the influence of metamorphoses of external or internal factors can be seen as an opportunity for those managers who are agile, smart and visionary. The results summarized in this work may help marketing managers plan, implement and assess change processes, contributing to better company performance.

Keywords: CHANGE MANAGEMENT, AGILE MARKETING, BRAND IDENTITY

1. Introduction

Change management is related to restructuring companies, production, automation and digitalization, along which completely new units and need for specialists emerge, while old ones are closed or changed. It is also related to a change in the communication strategy in the cases where it affects large processes such as complete rebranding. It is common to talk about change management along with crises, and the crisis related to COVID19 has led to the need for rapid action and a number of changes in many global companies.

Contemporary life faces huge advances in all areas which in turn impacts directly or indirectly the business environment. In a fast changing environment, organizations, and especially their marketing departments, need to look for ways to deal with the unknown and adapt to the changes, minimizing their negative effects. Hence it is imperative for business organizations to build a firm and clear vision and strategy to understand the changes and navigate the situation.

The *purpose* of this study is to reveal how change management can facilitate new marketing opportunities. The *thesis* is that change management in the marketing department of a company under the influence of metamorphoses of external or internal factors can be seen as an opportunity for those managers who are agile, smart and visionary. The *research methodology* is based on an in-depth review and analysis of various qualitative and quantitative studies, of specialized literature in the field of change management and marketing.

2. Analyzes and results

Marketers neglected erecting a change management capability for a long time, resulting in a rather reactive behavior than cultivating an approach where they have control over their own fate. However, the courage to keep changing is at the heart of the business. Transformation at all levels in an organization is crucial.

Well-prepared companies and visionary managers stand ready to face upcoming changes, as well as quickly and easily manage situations before they grow into crises for the company itself, before the company ceases to exist or the brand disappears forever.

In one of his bestsellers, “Leading Change”, John Kotter, an American professor, author, and consultant, defines 8 steps in managing change [1]:

- Create a sense of urgency;
- Build guiding coalition;
- Form strategic vision initiatives;
- Enlist volunteer army;

- Enable action by removing barriers;
- Generate short-term wins;
- Sustain acceleration;
- Institute change.

According to Forbes [2], 62 % of employees interpret the change negatively and this makes them reluctant to leave their comfort zone. Understanding why people resist change may help leaders to manage the change adequately and create marketing opportunities. Kotter [1] outlines 4 main reasons for resisting change:

- Low tolerance for change. This is inherent in most people who are not in the group of Innovators.
- Parochial self-interest – the desire not to lose something they have.
- Misunderstanding of change and what follows then.
- Different assessments of the situation – a belief that the change is not applicable and is meaningless.

Psychographic segmentation is a research tool that allows to achieve a deeper understanding of the basic motives of people in terms of consumption and perception of innovation. This segmentation uses variables related to personality traits, values and lifestyles and identifies the shared characteristics of a specific group of people, showing why they make their choices in life and explaining their habits.

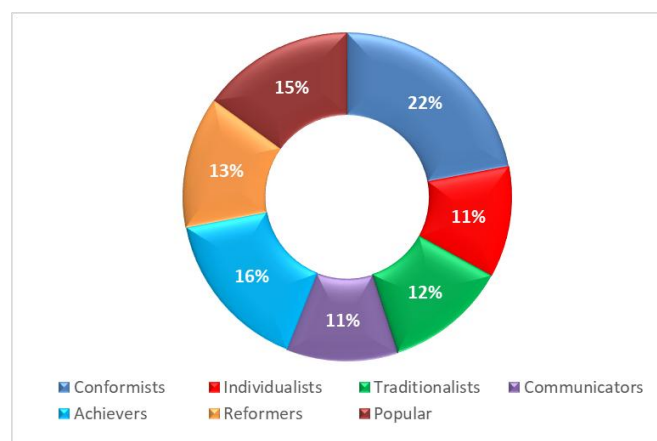


Fig. 1. A psychographic segmentation of the Bulgarian consumer

Source: According to Arbitrage [3]

According to marketing research [3], the psychographic segmentation of the Bulgarian consumer is dominated by conformists (21.6%), and they together with the individualists (10.6%) and the traditionalists (12.3%) form the largest segment.

The "reformers" (or so-called "innovators") are only 13.5%, and they are the group that would most easily accept organizational change, especially related to innovation, digitalization.

This makes change management easier if marketing managers know how to direct their approach to each group, how to communicate, which ones to bring as "ambassadors" of change, in order to be able to transfer their positive influence to more difficult or resistant-to-change groups.

Marketing activities are related to process management, inventory and warehouse logistics, time management. Any change in this long chain can lead both to an improvement in the process and to resistance within the team or in the way of work with clients. It is important for everyone "affected" to realize the need and benefits of the new and the call for change of the model. There are a number of companies that do not find it necessary to make changes and are so engrossed in the phrase "I don't have time" that they slow down their own growth and development.

In this regard, an effective model for change management in the marketing function is proposed, which would only make it easier for a company to grow more innovative and with more marketing capabilities.

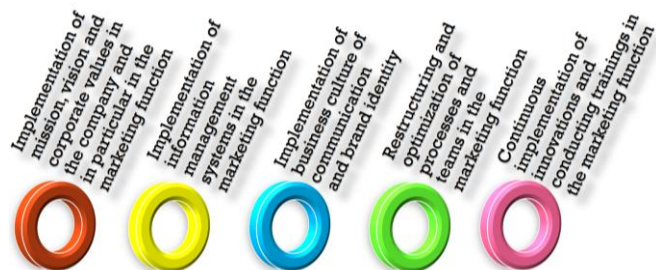


Fig. 2. Model for change management in the marketing function

Source: author's development

This model consists of the following components:

- ❖ *Implementation of mission, vision and corporate values in the company and in particular in the marketing function.*

Of course, these anchors must be in line with the vision of the business leader, but he must also set a personal example in following them. It is necessary to remind them to the whole team periodically. According to Forbes [4] 81% of those working for companies with a strong mission stated their stakeholders hold trust for their leadership team, whereas that number was 54 percent for organizations without a strong mission.

- ❖ *Implementation of information management systems in the marketing function.*

Many companies, for example, do not have CRM to manage their customer relationships. According to IBM [5] 74% of businesses increased customer relationships through CRM systems. It is essential to digitize as much as possible the information, marketing campaigns, communication with customers (for example, through autoreply chatbots, etc.). It is possible to use an infinite number of applications for this purpose.

- ❖ *Implementation of business culture of communication and brand identity.*

How is a customer's e-mail answered and when, how is information about an upcoming event summarized, what is the overall action plan? Are there ready-made scenarios, is there a back up plan? What do email signatures look like, is there a brand identity in the preparation of presentations, brand fonts, colors, etc.?

A Company Bible could be made with clear rules of communication, action, and behavior consistent with corporate values. Clear procedures and risk assessment scenarios could be developed to give employees confidence in how to react in certain situations. According to Forbes [6] consistent brand presentation across all platforms contributes up to 23 percent revenue growth.

- ❖ *Restructuring and optimization of processes and teams in the marketing function.*

There are a number of opportunities for optimizing processes in the marketing function by digitizing and redirecting the work of employees to more creative and strategic tasks for business development. Linear and vertical management have long since begun to be supplanted by more innovative and digital companies which are now talking about agile marketing. Agile marketing is a framework that enables teams to do work in short cycles. Well-defined projects are completed cooperatively. The agile teams measure the impact of each iteration, respond to changes in the market and adjust tactics, so as to continuously improve results over time.

In agile marketing, the work process is designed in a way which enables everyone to make an instant decision if it is justified and when an immediate response is required, to achieve a result or avoid a problem. In agile marketing management the final working product is more important than comprehensive documentation, good communication with the customer is more important than formal contracts, and continuous response to changes is more important than following the original plan. Agile management is widely used in Google, Facebook, Adobe, IBM, SAP, etc. According to Forbes and CMG Partners [7], 93% of CMOs say that agile practices have improved their speed to market for ideas, campaigns, and products.

Meetings could also be optimized, virtual meetings and video conferencing could be held, customer service and the way offers are prepared could be optimized.

- ❖ *Continuous implementation of innovations and conducting trainings in the marketing function.*

Innovation is very important to increase competitiveness. Digitalization and automation of processes in the marketing department are often discussed topics, but there are also many other smaller steps to feel the "wind of change". According to Marketo [8] transformational marketing requires success in three areas: tools, alignment, and methodology. It suggests that these success factors break down as follows:

- 20% of the success comes from marketing automation features and tool;
- 30% comes from the particular methodology that is chosen to use crossfunctionally;
- 50% comes from organizational alignment and structure.

The power of internal training, as well as talent development, should not be underestimated. It is necessary to delegate, taking into account that if someone and his talent are trusted without fully monitoring his training and education, it can fail not only him but the whole team, and this is unacceptable. It is recommended to make a good psychological profile of the team members, to assess the strengths and weaknesses of each, in order to use the potency as much as possible without focusing on the gaps.

In a small company, it turns out that even if only one person resists useful changes and innovations, it can poison the whole team. Therefore, no compromises should be made with people who are against change and innovation and who do not have the intrinsic motivation to change, learn and develop, no matter how valuable their experience for the company may seem at first glance. Naturally, all this will take time, training, communication within the company, but whatever resistance there might be, it must be continued to realize the change and show its positive effect.

3. Conclusion

Change is the only constant dominating business world today. How well managers cope with change has become a key skill which organizations look for. This applies in particular to marketing, where the rate of change is much faster than ever before. To achieve stronger, more capable and efficient marketing function, it needs to embrace the change, so the marketing executives could play the central role in the future of the organization.

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Trends in the development tourism transport infrastructure in georgia and the wider the region

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Abstract. *Tourism is one of the engines for the regional economic development. The management of the development of the tourism potential of the region should be provided primarily through the development of tourism infrastructure. It is especially important to study the existing tourism transport infrastructure and introduce new innovative technologies in its management. We have studied several tourist facilities in the western region, among other issues, studied the tourism infrastructure and set the ways to increase the tourism potential in the region, which will contribute to the development of tourism in Georgia and the wider region and attract the visitors to the region.*

KEY WORDS: TOURIZM, SYNERGIZM, TRANSPORT SERVICES, TRANSPORT SERVICES MARKET, TOURIST ROUTES.

1. Introduction

Georgia, due to its geopolitical situation and available natural, historical or cultural resources, has superb opportunities for tourism development. Today, when tourism is recognized as one of the priorities of economic development of Georgia and contributes to the socio-economic development of the country, it is especially important to study the existing tourism transport infrastructure and introduce the innovative technologies in its management.

Tourism is one of the engines for the regional development. As can be seen from the analysis of the main regularities of the Georgian Development Program, numerous problems that restrain growth of tourist flows include underdeveloped and, in a number of regions, outdated tourist infrastructure, and the most important among them are [1]:

- Underdeveloped and, in a number of regions, outdated engineering infrastructure (including transport network);
- Overburdened and inadequate transportation system, including poor roads and underdeveloped roadside facilities;
- Problems with sanitary stops, acute shortage;
- Insufficient funding for equipping and reconstruction of demonstration tourist sites, specially protected natural territories of tourist-recreational type;
- A medium level of tourism infrastructure development;
- Poor quality of service in some facilities of the tourism industry due to poorly trained staff;
- Incompatibility of tourism services with their cost;
- The imperfect social tourism support mechanism;
- Lack of infrastructure for travel and leisure for people with disabilities, today, when tourism is recognized as one of the priorities of economic development of Georgia and contributes to the socio-economic development of the country, it is especially important to lay the foundation for the development of inclusive tourism. Not only people with disabilities living in Georgia and foreign tourists, but also many other members of society will benefit from tourism services;
- Transportation of patients by modern special medical vehicle designs is a high-tech process, which allows to carry out the necessary procedures promptly and correctly, depending on the type and severity of the patient's illness/injury. Of particular interest is the analysis of the process of transporting the patient in extreme conditions, when unpredictable external factors such as health deterioration processes caused by intense external vibratory loads on the patient's body and the difficulty of managing them. There has been very limited research on the biomechanics of occupant safety in the ambulance environment in regards to random vibrations during transportation in extreme road conditions. Occupant protection or safety standards in that direction for these unique vehicles are still lacking. The ambulances are identified as high-risk passenger transport vehicles. Involving factors such as random vibrations induced by rough road surfaces or other external factors could result serious health deterioration for already critically injured

patients. This study was conducted to identify some of the occupant safety hazards because of the induced random vibrations in the ambulance environment and to determine the efficacy of some countermeasures to mitigate further ambulance occupant injury [2];

- This experimentation is carried out to study effects of vehicle vibration on patient's health deterioration in ambulance environment through vibration analysis. So far, based on the study the following conclusions are drawn:
- As road condition varies from rough to smooth the acceleration level decreases.
- As speed increases acceleration level also increases up to certain limit (i.e. from 40 to 60 km/h) then the acceleration level decreases (from 60 to 80 km/h)
- For rough road the acceleration levels subsequently the vibration levels are higher, therefor the risk of getting additional health problems increases.
- For rough roads if the patient is exposed to vibrations for 25 to 35 minutes the chance of health deterioration is high. (Depending on type of injury and its severity)
- For smooth roads if the patient is exposed to vibrations for more than 90 to 120 minutes, he will feel uncomfortable.
- On the human body, the random vibrations have harmful effects, leading to the occurrence of discomfort, fatigue, pain and in some cases serious health problems. The body vibration sensitivity depends on the direction and on nature of the oscillatory movement. The vibrations produced by the vehicle, in different directions, have different frequencies and amplitudes, even in the case of simple sinusoidal excitation. The style of driving of the vehicles, the experience of the driver is another crucial criterion related to the movement and to the driving comfort. The reduction of speed, while time is valuable resource for the injured patient, might not be the best solution in every situation [4];
- The shortage of available tourist buses;
- The imperfect statistical accounting system for data on the state of tourism development and its multiplier effect on the economy of the region;
- The lack of awareness of the opportunities of the region among potential tourists;
- Uncoordinated work of tourist market participants (the absence of synergy);
- Hotels, transport infrastructure and most tourist facilities require large capital investments.

2. Preconditions and means for resolving the problem

Tourist transport services are one of the main bases of tourism infrastructure [5]. The importance of a study on tourism transport infrastructure is conditioned by the changing role of transport in tourism, and transport not only allows tourists to travel, but also provides access to tourism resources, transport is a factor in the development of tourism as one of the main sectors of the economy of Georgia. The study on tourism transport infrastructure in Georgia is a new direction in the area of scientific research.

Tourism infrastructure includes traffic routes (roads, stations, airports, ports, etc.), communications (water supply, electricity and gas networks, heating systems, sewerage, communications, etc.), an aggregate of tourist resources, demonstrative tourist facilities, accommodation, food, trade, medical institutions and other objects necessary for the development of the tourism industry. The tourism industry is primarily a combination of hotels and other accommodation facilities, vehicles, entertainment, shopping, catering and other facilities, organizations that perform the functions of tour operators and travel agents, and a range of other services necessary for travel. consider Transport infrastructure is considered by recognized scientists to be the basis

of a transport complex and is a real transport network used to transport cargo and passengers, as well as an organizational structure that ensures the efficient use of vehicles. Tourism is therefore closely linked to shipping arrangement and the use of vehicles. Transport and transport infrastructure are an integral part of the tourism industry and tourism infrastructure [3].

The peculiarity of the tourism transport infrastructure lies in the fact that it is used in many cases not only by tourists but also by the ordinary citizens to address their daily social and economic challenges: personal travel, cargo transportation and other purposes. However, we cannot gloss over the special tourist vehicles and tourist routes. For a more detailed study of tourism transport infrastructure, it is necessary to formulate its definition and develop a system classification. Based on various existing scientific definitions and tourism practices, tourism transport infrastructure can be defined as follows: "Tourism transport infrastructure is a complex that includes vehicles, transport facilities, transport routes, services provided on the tourist routes, and the service and tourist facilities. Tourism transport infrastructure is presented schematically in Figure 1.

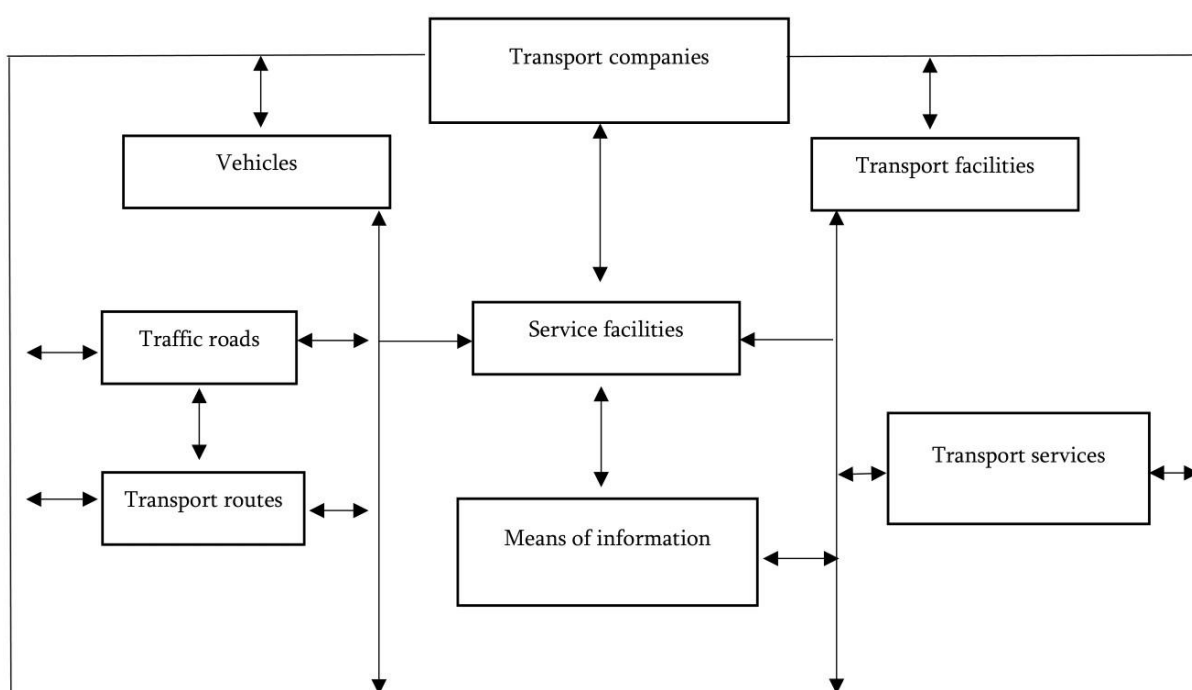


Fig.1. Tourism transport infrastructure

In order to better understand the tourism transport infrastructure, we have developed a classification of tourism transport infrastructure in several directions:

1. By status
 - International (located in several countries);
 - State property (State is a sole proprietor);
 - Private (owned by private structures);
 - Private - state (owners are State and private structures).
3. By applications
 - For mass tourism (charter flights, buses, trains, cruise ships, tourist buses, etc.);
 - For individual tourism (private planes, individual yachts, yachts, etc.);
 - For tourism using public services (public transport, trains, regular flights, airports, stations, etc.).
4. In terms of development
 - National (located within the borders of a single State);
 - Regional (located within the borders of a single region).
2. By form of ownership
 - Developed (all conditions are created for the development of tourism, minibuses are regulated, the roads are in good condition, there is a sufficient number of international, regional, local airports, railway junctions and stations, bus stations);
 - Developing (they exist, but are not enough);
 - Undeveloped (there are no unfavorable conditions for tourism development).
5. In terms of functional purposes
 - Vehicles (buses, cars, trains, river and sea vessels and other means of transportation);

- Transport facilities (bus stations, airports, stations, ports, petrol stations, stopping points);
- Traffic roads (air, river, sea, railway, bicycle, and walking roads);
- Transport routes (sea, river, rail, road, bicycle, walking roads);
- Transport services;
- Means of information;
- Tourist and service centers in transportation facilities, vehicles and in the vicinity of traffic roads.

In fact, tourism transport infrastructure can cover almost the entire transport complex and solving the problems of this complex will allow to meet many challenges related to the management of tourism transport infrastructure development and of course the management of tourism development.

According to the Kutaisi Tourism Information Center, currently six travel agencies are officially registered in the tourism service market of Imereti region. Surveys show that the existing travel agencies do not have any means of transport for tourists, they rent vehicles or have contracts with transport companies operating in Kutaisi, which greatly reduces the quality of tourist services. We have studied several tourist sites in the western region, among other issues (we studied the tourism infrastructure), the main focus was on the description of the traffic roads to the tourist destination, with a view to point the means of transport we were recommended for a particular tourist route. The studies revealed that of the six tourist

sites, such as Kutaisi - Bagrati Cathedral; Kutaisi - Motsameta - Gelati; Kutaisi - Tskaltubo - Kumistavi (Prometheus Cave); Kutaisi - Terjola - Tkibuli - Shaori Lake - Nikortsminda; Kutaisi - Chiatura - Sachkhere - Skhivitori (Akaki Tsereteli House Museum) - Katskhi Pillar, all tourist routes are original and due to the characteristics of the road, the use of the same type of transport is not recommended for tourist services. As for the transport services market in the western region, in particular in Kutaisi, there is a lack of modern type of transport services that would provide comfortable transport services to tourists at this or that tourist facility. We offer cooperation to these firms, and after conducting research, we can work out recommendations, that is, provide them with tourist passports to the main tourist facilities in the western region where along with many other interesting information, there will be recommended the types of vehicles that can be used for particular tourist facility, and these recommendations can also be used for raising the qualification of drivers employed in the field of tourist transport services. Imereti region has a great tourist potential, has the best geographical situation, and combines well natural resources and cultural-historical heritage.

Even in the case of good enough conditions for the realization of tourism potential, the sector has a number of problems. First of all, they are caused by the lack of effective tourist infrastructure in the region. The main problem in the development of tourism infrastructure in the Imereti region is its outdated and worn out facilities. The development of tourism infrastructure in the region has a negative impact on underdeveloped transport, energy and communication infrastructure.

3. Conclusion

To enhance the image of tourism potential (in terms of transport services), it is necessary to create:

1. The regional tourist transport service center, which will be aimed at:
 - creating an integrated tourist transport network in the regions of Georgia;
 - ensuring high quality tourist transport services by developing a new information-logistics system;
 - using the environmentally friendly specialized vehicles;

- providing transport scheme for people with disabilities, type of train rolling stock and operating modes that are particularly suited to the needs of wheelchair users; determining the direction of movement, travel time and transportation reliability.

Today, when tourism is recognized as one of the priorities for the development of the economy of Georgia, and it contributes to the socio-economic development of the country, it is especially important to lay the foundation for the development of inclusive tourism. Not only people with disabilities living in Georgia and foreign tourists, but also many other members of society will benefit from the tourism services.

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The cross-boundary impact of the landfill fires in Poland on air quality

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Abstract: In Poland, in 2018 there were 22044 fires of landfill and waste storage yards. Out of these, 79 covered area bigger than 300 m². For comparison in the years 2010-2017 the number of such fires was not exceeding 36 (only in 2015 this number was 47). During these fires, many pollutants are emitted into the atmospheric air. These pollutants are subject to meteorological conditions, especially to dispersion. There are few models which can be used for the calculation of dispersion of these substances in the atmosphere. Depending on the location of the fire, its size and duration, burned material, the concentrations of the pollutants have different spatial distribution. In the case of particulate matter (PM), which has a negative health impact regardless of the concentration, identification of any additional concentration of PM in ambient air is important. In the work, the dispersion of green-house gases and the other selected air pollutants from two fires from 2018, which has the biggest impact on air quality in the international scale, is presented.

Keywords: WASTE FIRES, CO, CO₂, NO_x, PM₁₀, SO₂, DISPERSION MODELLING, HYSPLIT

1. Introduction

In 2018 there were 23 landfill fires classified by Polish State Fire Service as very big fires [1]. This number is significantly higher than the average number in years 2010-2017 which equals 9.5. Each of very big fires covered object of area of at least 1000 m² or volume 5000 m³. Apart from direct impact, the landfill fires cause long-range impact in the atmospheric air. The air is object to the meteorological conditions of atmosphere and is not limited by any borders, hence the problem of landfill fires in one country can have negative impact on air quality in other countries. The scale of the dispersion can be evaluated using dispersion modeling which can provide areas where the increase of concentration of the substances emitted during landfill fire changes air quality.

In the work, 2 fires with long range (continental) impact are described. As a measure of impact, the increase of 1-hour average concentrations were analyzed. The work presents the dispersion of the selected air pollutants and green-house gases.

2. Materials and methods

In the study the dispersions of pollutants from two of the biggest land fires in 2018 were analyzed. The amount of the emitted pollutants and green-house gases can be evaluated knowing the volume of the burned object, burned material and its emission factors (EF), according to the methodology described in [2]. The first fire was a tire fire on 26 May 2018 [3]. The fire was located in Trzebinia, Chrzanów Powiat¹ and firefighting action was 87h long. The fires of waste tires were already discussed [4]. For uncontrolled combustion of tires, the EF for only four substances were found. The EF of CO, CO₂ and SO₂ were taken from [5] and for PM₁₀ according to [6] and the bulk density was assumed as 0.41 Mg/m³ according to [7]. The second fire was on 24 July 2018, in Jakubów [8], Polkowice Powiat. The fire was 96h long and the unspecified, general waste were burned, some stated that they were chemical waste [8]. The EF for this fire were based on the following publications: CH₄ and CO from [9], CO₂ from [10], NO_x and SO₂ as an average of values in [9] and [11], PM₁₀ from [11]. The bulk density of the waste was assumed as 0.5 Mg/m³ according to [12].

In this work the dispersion of the pollutants was calculated using HYSPLIT [13], [14]. HYSPLIT allows to calculate dispersion of the gases and of the particulates in the atmosphere according to the meteorological conditions. For the particulate matter PM₁₀ the simulation assumed dry deposition. All the calculations were performed in a domain between 0 and 10000 m above ground level, and the results were evaluated in region closest to the ground level. Due to the limitations of HYSPLIT, all results were obtained for minimum layer 0-100 m above ground level. As the results polygons with 1-hour averaged increase of concentrations of pollutants and green-house gases were obtained. The further

processing was done in the GIS software, QGIS [15]. In the GIS software, all the polygons representing given 1-hour average concentration were aggregated and presented on the contour map of the Europe showing the maximal range of impact of the increase of concentration due to landfill fires.

The 1-hour average concentrations of NO₂, PM₁₀ and SO₂ are subject to the law regulations in Poland [16] and the reference limits are 200 µg/m³, 280 µg/m³ and 350 µg/m³ respectively. The increase in concentrations due to landfill fires were plotted in areas with the value of 500%, 100%, 20%, 4% and so on, of the reference value. The concentrations of CH₄, CO and CO₂ do not have 1-hour reference levels, however, in regulation about the levels of some substances in air [17], there is limit value of 8-hour average concentration of CO, i.e., 10000 µg/m³.

3. Results

3.1 Tire fire on 26 May 2018

The pollutants emitted during tire fire on 26 May 2021 in Trzebinia were transported in atmosphere in the north west direction. The plume covered Belgium, Czech Republic, Denmark, France, Germany, Netherlands, Norway, Slovakia, Sweden and United Kingdom.

The concentration of CO is presented in Figure 1. The concentrations outside the Poland are lower than 16 µg/m³ and are much lower than limit value. The increase in concentration of CO₂ due to tire fire are presented in Figure 2. The concentration 0.3 µg/m³ was exceeded only in the Czech Republic and Germany.

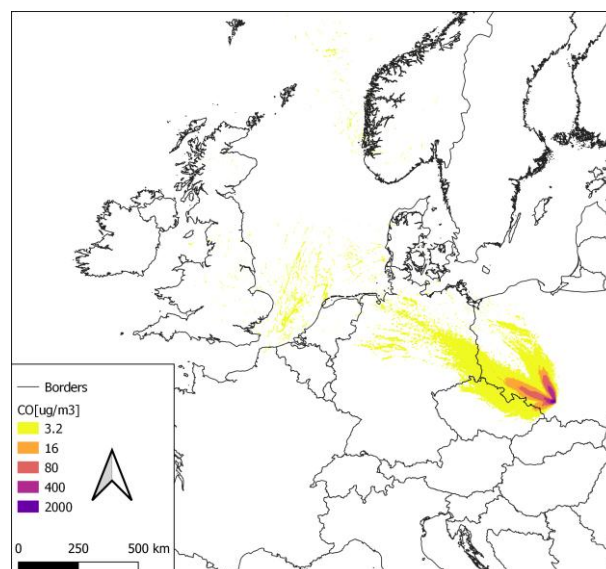


Figure 1: The sum 1-hour average increase in concentration of CO in layer 0-100 m above ground level emitted during tire fire at 26 May 2018.

¹ Powiat is LAU-1 unit [21] in Poland (former NUTS-4 unit)

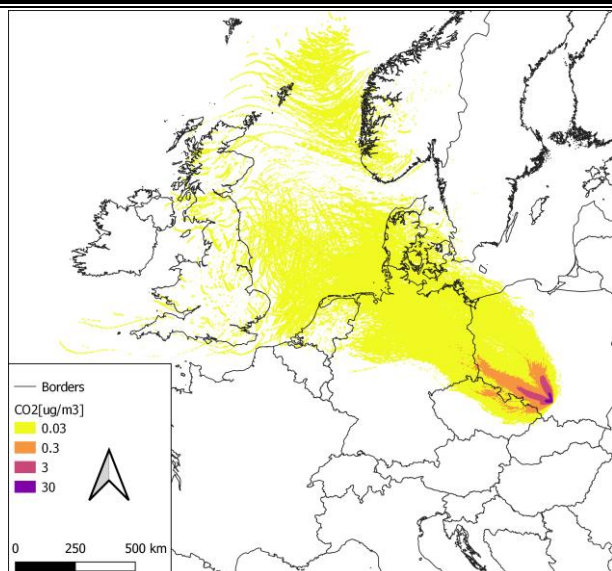


Figure 2: The sum 1-hour average increase in concentration of CO_2 in layer 0-100 m above ground level emitted during tire fire at 26 May 2018.

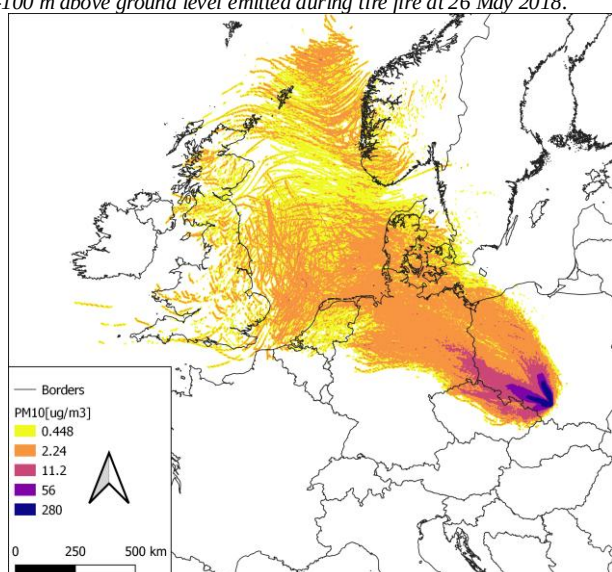


Figure 3: The sum 1-hour average increase in concentration of PM_{10} in layer 0-100 m above ground level emitted during tire fire at 26 May 2018.

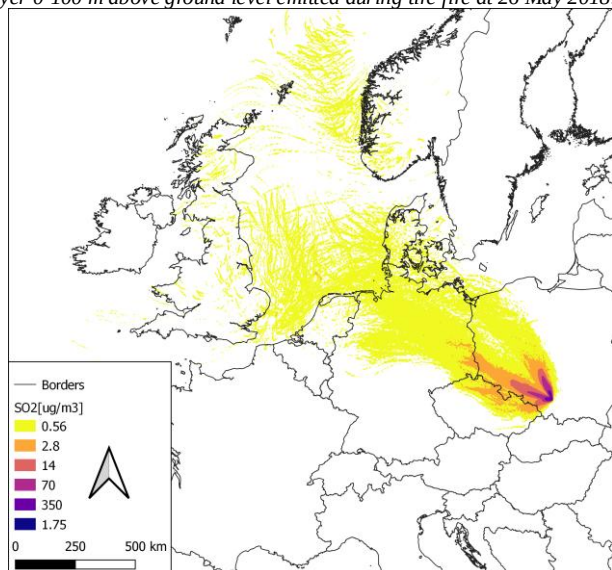


Figure 4: The sum 1-hour average increase in concentration of SO_2 in layer 0-100 m above ground level emitted during tire fire at 26 May 2018.

The reference level of the 1-hour average concentration PM_{10} in the layer 0-100 m above the ground level (Figure 3) was exceeded only in the territory of Poland, while the 4% of the reference level,

i.e., $11.2 \mu\text{g}/\text{m}^3$, was exceeded also in the Czech Republic and Germany. The level of 0.8% of reference level was exceeded in territories of Belgium, Denmark, France, Netherlands, Norway, Slovakia, Sweden and United Kingdom.

The 1-hour average concentration of SO_2 (Figure 4) in layer 0-100 m above the ground exceeded the reference level only in Poland. In other countries, level was not exceeding 4% of reference level (only Czech Republic and Germany), while in the remaining countries in Figure 4 the level was not exceeding $2.8 \mu\text{g}/\text{m}^3$ of SO_2 (0.8%).

3.2 General waste fire on 27 July 2018

Due to the transport in the atmospheric air the pollutants and green-house gases emitted during waste fire on 27 July 2018 caused increase in their concentrations in territories of Albania, Austria, Belgium, Bosnia and Herzegovina, Croatia, Czech Republic, France, Germany, Greece, Hungary, Italy, Kosovo, Montenegro, Netherlands, Northern Macedonia, San Marino, Serbia, Slovenia, Switzerland

The emission of CH_4 in waste fire caused the increase in concentration in over $16 \mu\text{g}/\text{m}^3$ only in Poland and Germany (Figure 5) while increase over $3.2 \mu\text{g}/\text{m}^3$ was found also in Austria, Czech Republic Italy and small isolated spots at other countries (see to the Figure 5).

The concentrations of CO are presented in Figure 6. The values of $2000 \mu\text{g}/\text{m}^3$ were exceeded only in Poland while $80 \mu\text{g}/\text{m}^3$ also in Czech Republic and Germany. The increase in 1-hour average concentration by $16 \mu\text{g}/\text{m}^3$ were present Austria, Hungary, Italy and in isolated locations in almost all countries covered by plume. The increase in 1-hour average concentration of CO_2 is presented in Figure 7. The increase exceeded value $0.3 \mu\text{g}/\text{m}^3$ only in Czech Republic and Germany.

The concentration of NO_x emitted in waste fire is presented in Figure 8. The 4% of the reference value was exceeded only in Austria, Czech Republic, Germany and Italy while in Poland, the reference value, $200 \mu\text{g}/\text{m}^3$, was also exceeded.

The dispersion of the PM_{10} emitted during waste fire is presented in Figure 9. The 4% of the reference value of 1-hour average increase in concentration PM_{10} was present only in Germany, while the reference value ($280 \mu\text{g}/\text{m}^3$) was exceeded in Poland. The emission of SO_2 during this fire was small and the 1-hour average concentration increased outside Poland by no more than 0.8% of reference value.

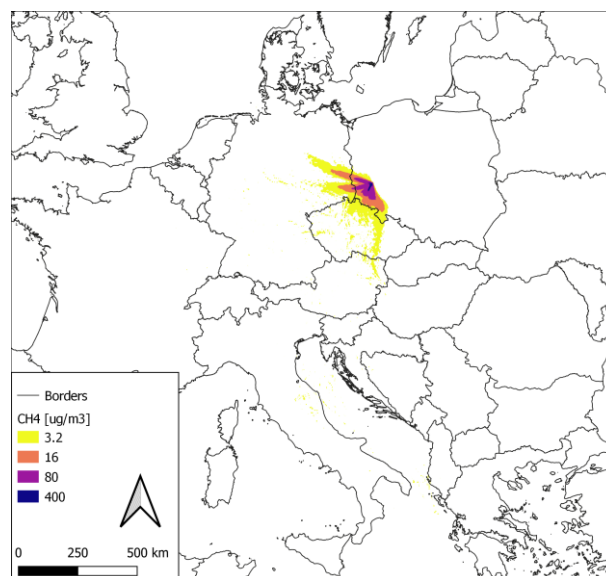


Figure 5: The sum 1-hour average increase in concentration of CH_4 in layer 0-100 m above ground level emitted during waste fire at 24 July 2018.

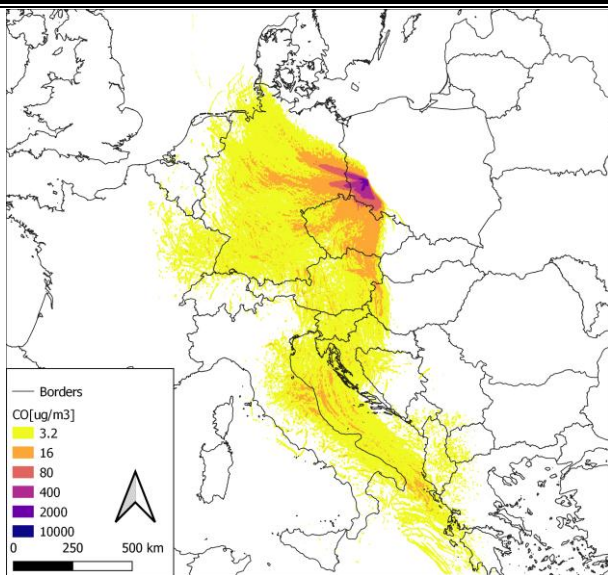


Figure 6: The sum 1-hour average increase in concentration of CO in layer 0-100 m above ground level emitted during waste fire at 24 July 2018.

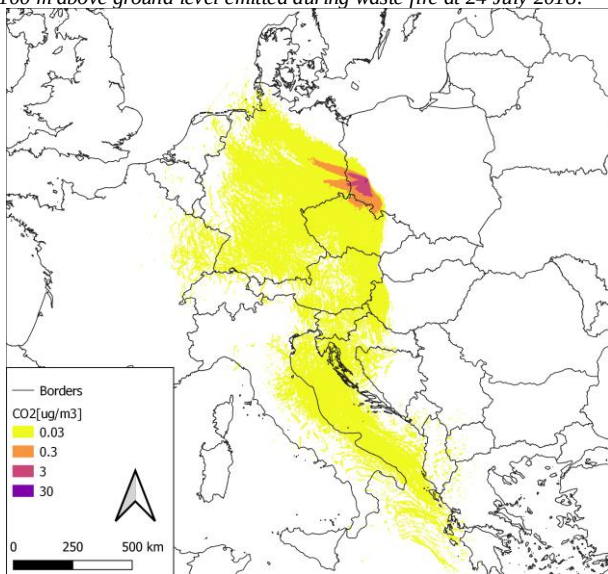


Figure 7: The sum 1-hour average increase in concentration of CO₂ in layer 0-100 m above ground level emitted during waste fire at 24 July 2018.

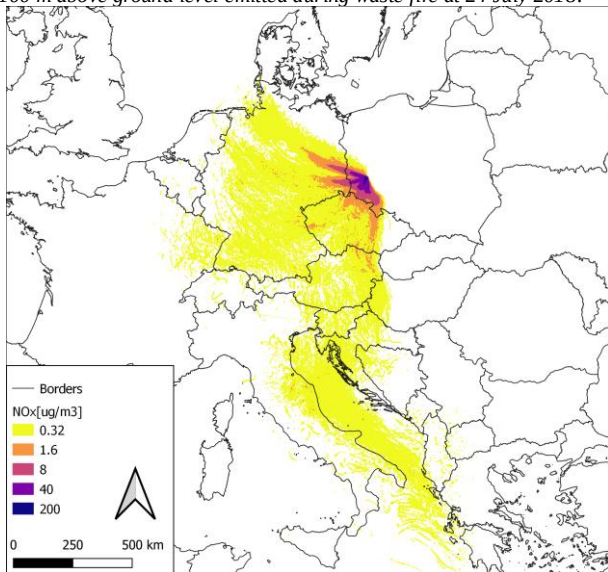


Figure 8: The sum 1-hour average increase in concentration of NO_x in layer 0-100 m above ground level emitted during waste fire at 24 July 2018.

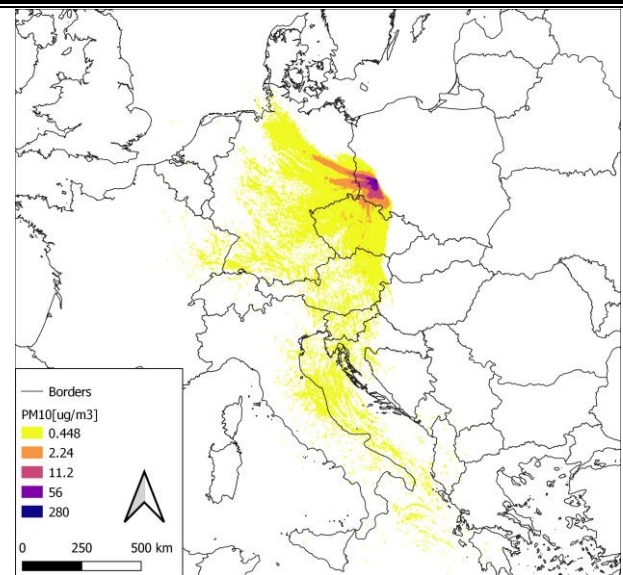


Figure 9: The sum 1-hour average increase in concentration of PM₁₀ in layer 0-100 m above ground level emitted during waste fire at 24 July 2018.

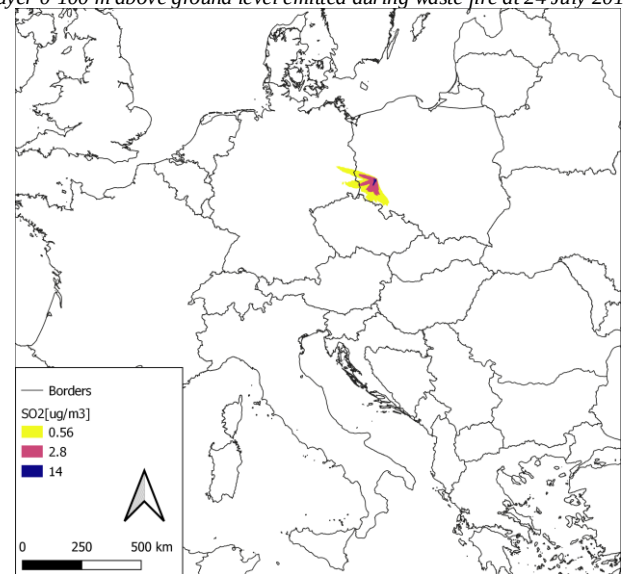


Figure 10: The sum 1-hour average increase in concentration of SO₂ in layer 0-100 m above ground level emitted during waste fire at 24 July 2018.

4. Discussion

The emission of the substances during the landfill fires is a significant problem with international impact. The 1-hour average CO concentration increase in waste fire covered much bigger area than in case of tire fire while the increase concentrations of CO₂ were observed on similar areas. The impact of tire fire on concentration of PM₁₀ in layer 0-100 m above the ground level was significant to air quality in many countries. PM₁₀ is substance which has negative health impact without threshold value [18]–[20]. The range of impact of emission of SO₂ from waste fire (measured as range of increase in 1-hour average concentration) is much lower (only national, regional) while tire fire has subcontinental impact.

Although the concentrations seem to be low in relation to the permitted yearly levels, however, the discussed concentrations are additional concentrations caused by single landfill fire. In Poland, in 2018, 23 very big landfill fires occurred and hence, the impact of all fires is important for air quality in Europe.

Acknowledgements

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Research during remote learning

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Abstract: The article depicts the case of making a research paper of students, aged 15-16. In the research paper made during the remote learning period, the students were investigating natural acid-base indicators. They used various plant materials (vegetables, fruits, flowers) that they found in their kitchen at home and prepared dye extracts, which they used as indicators. The colouring of individual indicator was then verified in acidic and basic solution, also made at home. They found out that various plant extracts can be used as natural acid-base indicators, e.g. an extract from the pomegranate fruit, blueberries, raspberries, rosehips, plums and poinsettia flowers.

Keywords: REMOTE LEARNING, RESEARCH ASSIGNMENT, ACID - BASE INDICATORS

1. Introduction

1.1 The meaning of natural colorants

Many different colours can be found in nature and we take it for granted to live in a world with such a vast array of the most diverse colour shades one can find. The colours that surround us are the consequence of coloured chemical compounds, but sometimes they occur due to physical phenomena. The colours are mainly the result of light absorption of certain wavelengths on various substances. The coloration of chemical compounds depends on their structure. The compounds used as colorants are mostly compounds with an extensive system of conjugated double bonds, frequently occurring in combination with groups, consisting of heteroatoms, such as oxygen or nitrogen.

Natural colorants are colouring substances that occur in the cells of a living organism. Some natural colorants have a key role in physiological processes, such as photosynthesis, the process of photosynthesis, the process of observing and oxygen transfer in blood. Certain animals with expressive coloration, particularly males, exploit the colour effect during their mating rituals and to protect their habitat against other males. Strongly contrasted patterns also serve as warning colours. In certain cases, i.e. indigo and scarlet, the natural colorant will develop its distinctive colour only outside of the organism, where it was synthesized.

Before the discovery and introduction of the first synthetic colorants in the 19th century, all the practical and artistic products were dyed exclusively with natural colorants and inorganic pigments from natural sources. The colorants were high-priced and had an important role in trading goods and money. [1]

1.2 Colorants as acid-base indicators

Some natural colorants can be used to distinguish between acidic and basic solutions, i.e. as pH indicators.

More than 300 years ago an English chemist and physicist Robert Boyle defined the acids and bases (alkalis). He described the acids as acidic substances. He noticed that in acids certain blue-coloured flowers become red and described bases as bitter substances, tasting like soap stock.

The two concepts – acid and base – are well familiar to all of us. We know that vinegar contains acetic acid, much of the acid can also be found in gastric fluid and carbonated drinks are also slightly acidic. The bases, which are in some way the opposite of acids, are a little less familiar. A soap, for example, is basic and a much stronger base is lime (either hydrated or quicklime). Acidity or basicity of solutions is measured by a pH scale. The solutions with a pH level under 7 are acidic. If that level exceeds 7, the solutions are basic. When the pH level of solution equals 7, it is commonly referred to as neutral. [2]

In 1909 a Danish biochemist Søren Sørensen was the first to present the concept of pH values. By definition the pH value is defined as a negative decimal logarithm of the molar concentration of hydrogen ions (equation 1).

$$\text{pH} = -\log[\text{H}^+] \quad (1)$$

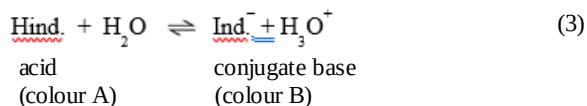
According to Brønsted's definition of acids and bases the concept of pH is defined in the following way (equation 2):

$$\text{pH} = -\log[\text{H}_3\text{O}^+] \quad (2)$$

where $[\text{H}_3\text{O}^+]$ is molar concentration of oxonium ions.

The stated pH definition is only accurate for diluted electrolyte solutions (up to 0.1 M) and pH values are measured in different ways. In order to provide accurate measurements, we use pH meters. A quick assessment of pH value can also be given by acid-base indicators, which are slightly less accurate.

The indicators are weak acids (or bases), where the acid (HInd.) is differently coloured from the conjugate base (Ind⁻). The protolytic equation is shown as follows (equation 3):



The acid dissociation constant is defined as follows (equation 4).

$$K_a = \frac{[\text{Ind}^-] [\text{H}_3\text{O}^+]}{[\text{HInd}]} \quad (4)$$

where K_a is acid dissociation constant, $[\text{Ind}^-]$ is molar concentration of conjugate base, $[\text{HInd}]$ is molar concentration of indicator.

The dependence of protolytic equilibrium from pH goes as follows (equation 5):

$$\text{pH} = \text{p}K_a + \log \frac{[\text{Ind}^-]}{[\text{HInd}]} \quad (5)$$

If we change pH within the $\text{p}K_a \pm 1$ limits (for 2 units), the $[\text{Ind}^-] / [\text{HInd}]$ ratio changes as well, including the colour. In case there is a small amount of indicator in the solution, we can change the colour by adding smaller quantities of acids and bases. In the example above (see equation 3) the indicator has colour A in a strongly acidic solution and colour B in a strongly basic solution. [3]

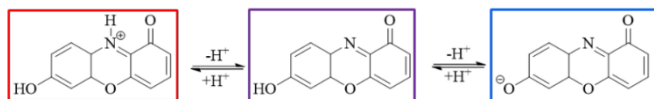
Initially, natural compounds were used as indicators. The first indicators were made of litmus, acquired from lichen. Due to development the society started using sources from crude oil and other indicators were used. A universal indicator was developed, which is really a mixture of different indicators and pH in the entire range of water solutions can be defined with it.

In order to reduce human effect on the environment as much as possible, the society tends to focus on obtaining solutions from nature. The benefit of this approach in pH indicators is safe use, as classic indicators are toxic and expensive.

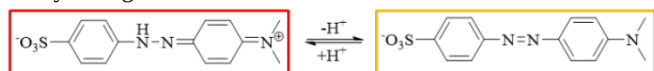
Nowadays the most frequently used indicators are litmus, methyl orange and phenolphthalein. In acidic solution litmus will turn red and in basic it will turn blue. Colour transition occurs between pH 5.0 and 8.0. Methyl orange turns red in a strongly

acidic solution and yellow in a strongly basic solution. Colour transition takes place between pH 3.1 and 4.4. Phenolphthalein is a weak acid, which becomes colourless in the pH range under 8.3 and over 10.0 it turns bright purple. (see Fig. 1) [4-7]

Litmus



Methyl orange



Phenolphthalein

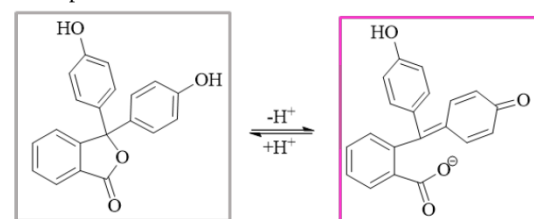


Fig. 1 The coloration of litmus, methyl orange and phenolphthalein ⁴⁻⁷

1.3 The division of natural colorants

According to their structure natural colorants can roughly be divided in five larger groups: the derivatives of pyrimidine, the derivatives of quinone, the derivatives of pyrrole, the derivatives of isoprene and the derivatives of pyran. [1]

The most common colorants in the patterns that we researched, are the following:

Betanin (belongs to the derivatives of pyrrole). It is a red colorant found in red beet.

Cyanidin, delphinidin, peonidin, petunidin, malvidin (belongs to the anthocyanins, which are the derivatives of pyran).

Cyanidin is a dark red colorant found in the fruits of rosehips, raspberries, plums, pomegranate, rose flowers, poinsettia flowers, red cabbage leaves. Delphinidin is a scarlet-blue colorant found in the blueberry fruits, blackcurrant, violet flowers and pomegranate. Pelargonidin is a red colorant found in poinsettia flowers and in pomegranate fruits. Peonidin is a magenta colorant found in blueberries and black grapes. Petunidin is a dark red to violet colorant, which, among other things, can be found in blueberries and violet-coloured flowers. [8]

Anthocyanins are glycosides. They are compounds consisting of sugar (glycon) and other components (aglycone). Aglycones of anthocyanins are called anthocyanidins; in nature the most common are the ones in the figure 2:

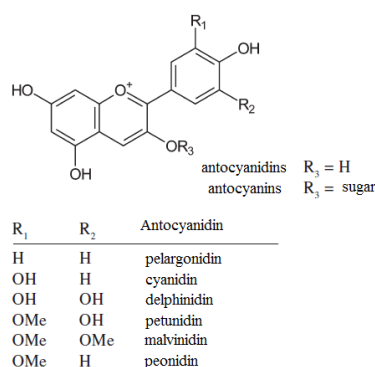


Fig. 2 The formula of anthocyanidins and anthocyanins⁹

2. Experimental part

We learned about various indicators at school, mostly synthetic. We became familiarized with the extract of red cabbage in a group of natural indicators. A question was raised as to whether or not any other known plants could be used instead of red cabbage. When reviewing the literature, we learned that natural indicators, beside the red cabbage extract, do not commonly occur.

With this task we wanted to investigate, which natural colorants from fruits, vegetables or flowers could be used for the same purpose. A research questions was therefore asked:

Can other colorants, extracted from fruits, vegetables or decorative flowers, be indicators for acid-base solutions?

2.1 Hypotheses

Two hypotheses were formed:

First hypothesis: Substances from certain types of fruit, vegetable or decorative flowers can be used as acid-base indicators.

Second hypothesis: Substances, extracted from certain types of fruit, vegetable or decorative flowers turn into different colours in basic and acidic solution.

2.2 Plant material

In order to extract colorants, the following plant material was used:

- red beet (one root)
- plums (several fruits)
- poinsettia leaves (several flowers)
- pomegranate (one fruit)
- red cabbage (several leaves)
- blueberries (several fruits)
- raspberries (several fruits)
- rosehip (several fruits)

2.3 Experimental equipment

As the experimental work was carried out at home, the instruments from home kitchen were used, such as:

- several transparent, colourless glasses
- teaspoons
- knife, fork
- chopping board
- coffee grinder

2.4 Acidic and basic substances

In order to make an acidic and basic solution we used:

- quick pickled vinegar (acidic solution)
- sodium bicarbonate (base)

2.5 The work procedure

2.5.1. Preparation of colorants

Red beet colorant. Half of a red beet root was grated, 2 dl of hot water was poured over it and left standing for 5 minutes. The mixture was then filtered and the clear liquid was stored in a glass.

Pomegranate colorant. First, the pomegranate fruit was peeled. Juice was squeezed out of it and used as an indicator.

Poinsettia leaves colorant. First, poinsettia leaves were cut, poured over with 1 dl of hot water and left for 10 minutes. Then the liquid was filtered and stored.

Plum colorant. Some of the plum fruits were deseeded. What remained was mashed with fork into a dense mixture and filtered through a sieve. The liquid was used as an indicator.

Red cabbage colorant. A larger leaf of red cabbage was thinly sliced and poured with 2 dl of hot water. It was left for 10 minutes and then filtered. The liquid was stored for experiments.

Blueberry and raspberry colorant. Frozen fruits were used, so they had to be thawed. Then they were mashed with fork and filtered through a sieve. Blueberry liquid and raspberry liquid were used as an indicator, respectively.

Colorant from rosehip fruits. Some rosehip fruits were ground in a coffee grinder. Ground rosehip was poured with 1 dl of hot water, left for 10 minutes and then filtered. The liquid was used as an indicator.

2.5.2. Performing the experiments

In order to determine the colour of individual indicator, one acidic and one basic substance were used. A quick pickled vinegar was used for the acidic substance, because it is colourless. Basic solution was prepared by dissolving 1 teaspoon of sodium bicarbonate in 200 ml of water. For every subsequent experiment two clean, transparent glasses were used and two teaspoons. 0,5 dl of vinegar was added in the first glass and 0.5 dl of basic solution in the second. Both glasses were placed on a white sheet of paper. Then 3 teaspoons of the prepared colorant – the indicator – were added in each glass and stirred.

2.6 Results of experiments

Colorations of individual colorants are presented in the table below.

Table 1: Coloration of individual colorants

Indicator	Indicator colour in acid	Indicator colour in base
Red beet colorant	dark pink	dark violet
Pomegranate colorant	red-orange	dark blue
Poinsettia colorant	bright orange	yellow
Plum colorant	orange-red	bright brown
Red cabbage colorant	red-pink	blue
Blueberry colorant	red	dark violet
Raspberry colorant	red-orange	dark violet
Rosehip colorant	red-orange	dark violet

Figure 3 shows the coloration of blueberry colorant in acid and basic solution.



Fig. 3 The coloration of blueberry colorant in acid (left) and basic solution (right). (Photo: SEPŠ)

Figure 4 shows the coloration of poinsettia and pomegranate colorants in basic and acid solution.



Fig. 4 The coloration of poinsettia (left) and pomegranate(right) colorants in basic and acidic solution. (Photo: SEPŠ)

3. Discussion and conclusion

Based on the experiments performed the following was concluded:

- Colorants, extracted from different types of fruit, vegetable or flowers, can be used as indicators. This confirms the hypothesis 1 (*Substances from certain types of fruit, vegetable or decorative flowers can be used as acid-base indicators.*).

- Most of the colorants, extracted from plant material, turned different colours in an acidic and basic solution. The smallest difference in coloration was noticed when using a red beet extract. The hypothesis 2 (*Substances, extracted from certain types of fruit, vegetable or decorative flowers turn into different colours in basic and acidic solution*) was therefore partially confirmed.

The students enjoyed the research and it encouraged them to form new research questions. It could be tested, which of the colorants used above would be appropriate to prepare the colour scale across the entire pH range (from 1 to 14).

It was determined that with most natural indicators that were used, a noticeable change of colour took place and therefore many plants can be considered to be potential replacement for commercially available synthetic pH indicators. Obtaining extractions is also cheap and simple.

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The art of postponing the inevitable

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Abstract: This paper briefly reviews the deterioration of written heritage from a chemical point of view and then discusses conservation and restoration. Restoration is seen as an art surgery, and conservation as an art by which we postpone the inevitable aging and preservation of the written heritage. The ecological approaches in this area are considered.

KEYWORDS: CONSERVATION, RESTORATION, WRITTEN HERITAGE, ECOLOGICAL APPROACHES;

1. Introduction

Preservation of the written cultural heritage requires the development of strategies for preventive protection, which must be increasingly innovative, effective, long-lasting, as well as economically sustainable. Although existing legislation provides for planned maintenance aimed at preventing deterioration and reducing operating costs, there are currently no decision support tools to support the periodic planning of interventions to be implemented. The aim is to define the techniques and innovative strategies of the conservation process, emphasizing the intelligent capacity of this process.

Today, countries with intensive cultural development can afford to set aside funds for conservation and restoration. For them, this is a national policy, as is digitalization. But in Bulgaria at this stage, along with digitalization at the national level we must consider extending the life of the originals, because the original is irreplaceable. When we talk about a document, in addition to the basic semantic information it carries, the original carries a lot of additional information. For example, the nature of paper, parchment, printing, bindings, inks, dyes. And that's not all. The original is a living organism, each individual has its own biography and individual characteristics. Who held it in their hands, what signs - notes, autographs, drawings, etc. has left the human presence. The seals, the signatures, the ex-libris, it's all socio-cultural memory, and it carries knowledge that awaits "decoding." The digital copy will mark the characters with photographic accuracy, but will not adequately transfer memory because it is not, and cannot be, a complete replacement for the original.

2. Factors on which the destruction of written heritage and ecological treatment depends

The reasons for the destruction of library and archival funds as monuments of civilization and the spiritual memory of human genius, in the most general form on the one hand are defined as changes that occur as a result of natural processes of natural aging of organic matter, which we don't can stop, but we can keep the "kiss of time", and on the other hand as changes that take place under the influence of the environment - the chemical destructive processes that develop under the action of temperature, humidity, light, atmospheric gases and mechanical stress. Biocorrosions occurs when the microclimatic and hygienic conditions of storage are violated, as well as when contaminated and disinfected documents are imported. For these reasons, each institution must reassess the existing storage conditions and, on the basis of a realistic assessment, develop a "Program for the Preservation and Preservation of Written Heritage".

Chemicals are toxic and should not be used directly on the elements of the collections. By assessing their negative effects on human health and the environment, the notion of applying non-toxic methods is becoming more and more widespread. Institutions

must therefore begin to change their attitude towards the use of these products.

In an effort to treat collections of invading bio-agents, document conservation experts are developing effective treatments. Chemical treatments have long been widely used in the preservation of cultural collections. After research and scientific evidence from various international organizations such that these methods are highly toxic and harmful to humans, the environment and collections, experts began to apply alternative environmental methods of treatment without toxic chemicals - freezing methods and modified atmosphere anoxia. In recent years, methods of atmospheres modified by anoxia have aroused great interest. The published results of researchers and conservation specialists from their research allow the dissemination and improvement of the method. The treatment is considered safe, environmentally friendly, non-toxic and is completely inert to artifacts of organic origin, such as paper, leather, wood, fabric, or in combination with inorganic materials. Its methodology uses specific materials and equipment to ensure efficiency parameters. There is no risk to human health and the environment, as no chemicals are used that can cause harmful side effects, as well as oxidation of documents, corrosion and physicochemical changes.

Modified anoxia atmosphere techniques consist mainly of removing oxygen in an enclosed space in which the materials are isolated during treatment. This can be done with three variants of the system:

- by applying carbon dioxide or inert gas;
- with oxygen absorbers;
- both processes simultaneously.

The result is the elimination of living organisms (decomposition of agents) in some of its evolutionary stages (egg, larva, pupa and adults).



Fig. 1. Static anoxia system applied to Levski's notebook

In the restoration practice, which can be considered as "art surgery", before proceeding to any restoration procedures, especially of these documents of proven scientific and international

significance, a comprehensive study of the materials from which the document is made, the degree of development of the destruction processes is taken into account, i.e. Scientific-conservation expertise is applied, which is a key point in choosing an appropriate restoration technology, because there is no single analytical method that gives comprehensive information about the nature, nature and physicochemical properties of the individual document. Restoration and conservation should be considered as unique activities in which, with the help of the most modern science-based and technologically applicable achievements, it is possible to achieve the least interference in the structure of the documents.

The principle of the individual approach to each object for restoration is very important, by preliminary analysis of its condition, preceding the processes of restorative restoration intervention, in accordance with the different material carrier (parchment, paper, fabric), as well as inks, dyes and combinations between them. The application of these methods and techniques allows the recovered material to be stored in an optimal mode, i.e. for its conservation.

As a standardized method worldwide, the classical method of restoration still prevails. In this method, all restoration activities are carried out by manual means. For this purpose, papers of different thickness and color, fabrics and polymer compounds are used. With this method there is no serious intervention on the structure of the document and inks, due to which there is a complete reversibility during restoration. The only drawback of the classical restoration - a very slow and low-productivity process.

Sheet casting as a mechanized method of restoration, in which the main raw material is fibrous cellulose material, i.e. broken pulp. This method makes it possible to optimize the processes of restoration of documents on paper. It is used to repair severely damaged documents and books, especially those destroyed by mold and insects.

When the documents are in a fragile condition, despite the consolidated treatment, a lamination restoration process may be recommended.

3. Conclusions

The application of modern technologies in the preservation of library and archival materials is an important task. Today, the driving force of the restoration are scientific institutes and laboratories led by scientists and specialists - chemists, physicists, entomologists, mycologists, historians, paleographers, who pave the way for a new science - the science of reviving these relics, without which history would become a legend. Technological development is not only a desire, but also a commitment to invest time and money. Research and development in the field of preservation of the written cultural heritage requires patience, and the paths for successful decisions are marked with failures that require determination and preservation of commitment and responsibility. Regardless of the era, any progress requires years of work and accumulation of knowledge and skills to achieve perfect results.

A public, global archive of information on biological pest damage and successful treatments would be a key step in a new, common policy for the preservation of written cultural heritage.

In the new dynamically changing environment, through the improvement of management technologies and the introduction of new advanced environmental methods and standards, cultural institutions must be able to ensure access to and protection of the written heritage of Bulgaria, constantly identifying the factors on

which they depend diametrically. opposing but compatible missions - access and protection.

4. Acknowledgement

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The linguistic values of the French Christmas chant *Petit Papa Noël*

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Abstract: The character of *Petit Papa Noël* represents linguistic values which are shared by a community of speakers allowing the popularity of this character within the community. In order to provide an explanation for this sharing of linguistic values, we discuss the chorus in *Petit Papa Noël* lyrics. This approach allows observing the linguistic values in their socio-cultural and collective dimension. In order to achieve this aim, Saussure's values and Jung's archetypes are related to the notional and the empirical. However, what is defined here is a semantic approach which belongs to the science of language and because the archetypal entities are discussed in terms of Saussurean values, these archetypal entities are therefore treated as linguistic ones.

Keywords: LINGUISTIC VALUE, ASSOCIATION, RECURSION, REFLEXIVITY, LANGUAGE USERS

1. Introduction

According to the *Course* [1], the linguistic value is a differential phenomenon. Following the concept of the negativity of the linguistic value, the differential principle is at the heart of the universal principal of organization of languages. The fragment 29j of the manuscripts "On the dual essence of language" [2, 3], however, presents the linguistic value as a double phenomenon, differential and post-elaborational at the same time. As a recently discovered and discussed notion [4] within the Saussurean manuscripts, the post-elaboration has implications for the concept of the linguistic value: the differential principle is always the first operating one and results in the differentiation of linguistic units, but is imperatively followed by the operation of post-elaboration. This operation consists of the classification and the association of the differentiated linguistic units according to common and shared entities and allows languages to describe themselves. The autodescriptive operation has also a social dimension as it is unseparated from the language users within their linguistic community. As a result, the linguistic value appears to be a social phenomenon with autodescriptive capacity and associative nature. We thus aim to study the associations of linguistic values in the French Christmas chant *Petit Papa Noël* to reveal the social and autodescriptive nature of the phenomenon of linguistic values.

2. Associations and linguistic values: discussion and results

The Saussurean legacy presents a fundamental thought and ideals about languages, but not a standalone finite theory. This lack of theory therefore opens the way to the development of theoretical and methodological approaches [5]. We refer thus to Saussure's concept of associative series, and in order to make further precisions on the social aspect of the linguistic values and their associations, we resort to associations in the way they are considered in some of Jung's works.

2.1. Saussure's associative series

In order to emphasize the relationships of every speaker and entire collectivity of speakers with the use and understanding of words, Saussure prefers to refer to the term of *association* during his lectures with students [6] and *association* remains a distinct concept from *parallélisme* in Saussure's works [7]. Saussure's associative series thus have a conventional and social aspect as they are agreements between speakers and are psychic entities which exist within the collectivity of language users [8].

Associations are also relations between linguistic values out of discourse while syntagmatic relations between linguistic values are formed within discourse. Associations thus are relations *in absentia* and syntagmatic ones are relations *in praesentia*. Both types of relations, however, are highly interdependent and operate simultaneously: when French says *marchons!* '(let's) walk!', they must choose from more than one associative series, because there is the associative series *marchons!* '(let's) walk!', *marche!* '(you singular) walk!', *marchez!* '(you plural) walk!', but there is also

marchons! '(let's) walk!', *montons!* '(let's) go up!', *mangeons!* '(let's) eat!'. Any linguistic value in discourse results from some differential operation within several associative series *in absentia*. Linguistic values thus differ in their identities: there are values which are common and constitutive of associative series; there are values which are presented in discourse; and there are values which remain *in absentia*. These three types of identities of linguistic values allow from an Aristotelian perspective [9, 10] to define numerical, specific and generic values.

2.2. Jung's associations

In order to learn more about the way socio-cultural conditions influence his patients, Jung [11, 12] studies associations of words made by members of many families (about the relation family – type of word association, see also [13]). He then classifies these word associations into fifteen categories as follows: 1.Coordination; 2.Sub- and Supraordination; 3.Association by contrast; 4.Subjective predication; 5.Predicative association; 6.Association expressing the relation of the verb to its subject or to its complement; 7.Designation of place, time, means, goal, substance, etc.; 8.Definition; 9.Coexistence; 10.Identity; 11.Motor-verbal association; 12.Compound words; 13.Word complement; 14.Assonance; 15.Defective reactions (for further details on the classification of word associations, see [14]). Associations fall into the fifteen categories according to linguistic criteria and their classification therefore relates to facts of language. Jung then relates the fifteen categories of word associations to some of his patients' cultural and social characteristics. He remarks that not so intelligent people and those who are aware of their inferiority make word associations of 8.Definition-type, while intelligent and well-educated people use 11.Motor-verbal association, 12.Compound words and 14.Assonance. Elderly people and especially elderly women prefer the 5.Predicative association-type. The type of association formed by children within their family is closer to the type of the mother than that of the father and parents have a tendency to agree the type of associations they prefer to use. It also happens that after the marriage, the wife changes her type of word association and starts unconsciously, at least in Jung's time, to use the same type as her husband. The choice of the linguistic type of word associations therefore is influenced by the intelligence, education and family environment of language users and also can vary from generation to generation. The formation of word associations thus is a dynamic socio-cultural phenomenon as intelligence, studies, family and generations are conditions of the variety of association types.

The categorization of word associations into fifteen types has a double aspect, metalinguistic and socio-conventional. The metalinguistic aspect results from the recursive nature of some linguistic phenomena, criteria and categories such as predication, word-formation, adverbialization, etc., which are found among word associations. The socio-conventional aspect results from the recursive nature of some social conditions, such as generation, age, family, education, etc., in a given collectivity. The word associations thus become agreements within members of a

collectivity. The two aspects of word associations, metalinguistic and socio-conventional, interact and are inseparable.

2.2.1. Associations as a method and some archetypal entities

Word association is one of the methods [15] that allow studying archetypal entities. The archetypal entities are of three types, archetypes, archetypal representations and archetypal qualities. The archetypes, such as *la Mère* ('Mother archetype') [16], *l'Enfant* ('Child archetype') [17], *l'Esprit* ('the Spirit') [18] et *l'Ombre* ('the Trickster-Figure' or 'the Shadow') [19] belong to the psychic layer of the collective unconscious and are only observable through their representations, such as *ciel* ('heaven') of the Mother archetype, *père* ('grandfather'/'father') of the Spirit archetype, *enfant* ('child') of the Child archetype and *pape des bouffons* ('the bishop of buffoons') of the Shadow archetype. The archetypal representations appear at superficial psychic layers and are of infinite variety. Finally, archetypes are their qualities among which are *sauveur* ('savior') of the Shadow archetype, *discernement* ('insight'), *illumination* ('enlightenment', 'reflection'), *ruse* ('surreptitiously'), *connaissance* ('knowledge'), *serviabilité* ('readiness to help'), *bienveillance* ('goodwill'), *méchanceté* ('wicked aspect') of the Spirit archetype, *protecteur* ('protection'), *alimentation* ('fruitfulness'), *renaissance* ('rebirth') of the Mother archetype, *impuissance* ('inability to do otherwise'), *insignifiant* ('insignificant'), *bisexués* ('bisexual nature') of the Child archetype (for the archetypes, archetypal representations and archetypal qualities in German, see [20] and in English, see [21]).

3. The associations in Petit Papa Noël

The linguistic values **PAPA NOËL**, **CIEL** and **JOUETS** are values in *praesentia* as they occur in discourse of the lyrics in the chorus of the French Christmas chant *Petit Papa Noël* [22]:

Petit **PAPA NOËL**,
Quand tu descendras du **CIEL**
Avec tes **JOUETS** par milliers,
N'oublie pas mon petit soulier.

Their presence in the discourse defines them as generic values which are the first ones of every association below:

(1) **PAPA NOËL** – **papa** – FAM. ÉTYM **pape** – **pape** – **catholique** – FAM. ÉTYM **sauf** (*sauveur*)

(2) **PAPA NOËL** – **noël** – **Père Noël** – **certain**, **aine** – FAM. ÉTYM **certes** – **discerner** DE (*discernement*)

(3) **PAPA NOËL** – **noël** – **Père Noël** – **inspirer** – FAM. ÉTYM **soupirer** – **esprit** (*illumination*)

(4) **PAPA NOËL** – **noël** – **Père Noël** – **inspirer** – **cause** – FAM. ÉTYM **chose** (*ruse*)

(5) **PAPA NOËL** – **noël** – **Père Noël** – **respect** – **reconnaître** – FAM. ÉTYM **connaître** (*connaissance*)

(6) **PAPA NOËL** – **noël** – **Père Noël** – **réserve** – FAM. ÉTYM **servir** – **serviable** DE (*serviabilité*)

(7) **PAPA NOËL** – **noël** – **Père Noël** – **condescendance** – **bienveillant**, **ante** DE (*bienveillance*)

(8) **PAPA NOËL** – **noël** – **Père Noël** – **condescendance** – **bienveillant**, **ante** DE – **bienveillance** CONTR. (*méchanceté*)

(9) **CIEL** – **aspect** – « regarder » – **regarder** – FAM. ÉTYM **garder** – à l'égard de (*protecteur*)

(10) **CIEL** – **visible** – FAM. ÉTYM **voir** – **visible** CONTR. (*secret*)

(11) **CIEL** – **au-dessus de** – **haut**, **haute** – FAM. ÉTYM **haut** (*alimentation*)

(12) **CIEL** – **tête** – **corps** – FAM. ÉTYM. **corps** – **corps** – → **réincarnation** (*renaissance*)

(13) **JOUETS** – **enfant** – **naissance** – **indépendant**, **ante** – DE **1. in-** (*impuissance*)

(14) **JOUETS** – **enfant** – **naissance** – **indépendant**, **ante** – DE **1. in-** (*insignifiant*)

(15) **JOUETS** – **enfant** – **naissance** – **organisme** – FAM. ÉTYM **organe** – **organe** (*bisexués*)

3.1. The metalinguistic aspect of the associations

While the occurrence of the generic values **PAPA NOËL**, **CIEL** and **JOUETS** is discourse based, the specific and the numeric values of the associations come from the lexicographical signified [23] of each generic value. For example in the first association above, the lexicographical signified of the generic value **PAPA NOËL** holds the specific value **papa** and the latter holds in its signified the specific value **pape**, while the signified of **catholique** holds the numeric value **sauf**. This inclusive operation of formation of the association defines the common nature of the numeric values: each numeric value is a shared value by generic and specific values in each association and in many associations (see the cases (13) and (14) above). As shared and common linguistic units, the numeric values become metalinguistic units: they act as metalinguistic categories as they class and associate the other linguistic units. This inclusive operation therefore correlates with the recursive aspect of the metalinguistic units. This metalinguistic operation also is an oriented one as it always starts from the generic values and finishes in the numeric ones. The metalinguistic phenomenon finally has a qualitative character as the numeric values belong to the signified of (*sauveur*), (*discernement*), (*illumination*), ... and (*bisexués*) and as *sauveur*, *discernement*, *illumination*, ... and *bisexués* are qualities of the Mother, Child, Trickster and Child archetypes. The metalinguistic phenomenon thus is inclusive, oriented and qualitative one. As the metalinguistic operation takes place in the signified in the linguistic values, this operation also has semantic nature.

3.2. The socio-conventional aspect of the associations

The associative types of the series of linguistic values of *Petit Papa Noël* also are defined by the following lexicographical remarks:

FAM. ÉTYM., DE, →, CONTR.

These lexicographical remarks allow some empirical and notional parallels with Jung's fifteen types of word associations.

3.2.1. Associations by etymology

Etymons [24, 25] indicate etymological relations between the lexical units they refer to. In the associations of *Petit Papa Noël*, FAM. ETYM indicates the etymological relationship between the associated values and thus ensures continuity between these values. Jung's 9th category of word associations is *Coexistence* and defines relations of continuity or simultaneity ("Der Zusammenhang der Koexistenz ist die Kontiguität oder Simultaneität, [...]“ [26]. The examples of *Coexistence* provided by Jung *table* – *chaise*, *plante* – *pot*, *couteau* – *assiette* [27] and *Tinte* – *Feder*, *Heft* – *Messer*, *Tisch* – *Suppe*, *Weihnachten* – *Christbaum*, *Sonntag* – *Kirche*, *Schüler* – *Lehrer*, *Tisch* – *Stuhl*, *Lampe* – *Familie*, *Mutter* – *Kind*, *Anstalt* – *Wärter*, *reiten* – *Pferd*, *Auge* – *sehen*; *Bleistift*, *Papier*, *Heft*, *singen*, *rechnen*, *Schule* – *schreiben*, *reiten* – *Sattel*, *Ohr* – *hören* [28] do not, however, hold etymologically related linguistic units and the rapprochement between etymological family associations and coexistence ones thus remains partial as it is limited to the notional.

3.2.2. Associations by derivation

The lexicographical remark **de** preceding a form in an etymology section means that the word is formed by derivation (« Tableau des termes, signes conventionnels et abréviations du dictionnaire », see [29]). The lexicographical remark **de** thus refers to a morphological operation of word formation. Jung's 13th category of word association is *Word complement* and involves obtaining a new lexical unit from a word, which is considered to be a word-stimulus, by adding a non-autonomous linguistic form, which is considered to be an answer. The lexicographical remark DE in the associations (1) – (15) above and the associations by *Word complement* therefore are related to the notional.

Following Jung's examples [30] the lexicographical remark DE and the associations by *Word complement* are also related to the empirical:

(16a) *fleur* – *iste*

(16b) *fil* – *er*

In the first case, the derivation is by suffixation and is attested by the dictionary (see *fleuriste* in [31]). The morphological form – *er* in the second case is a characteristic one for 1st group verbs in French according to the same dictionary (see *conjugaison 1* in [32]). The examples for *Word complement* in Deutsch [33]

(17a) *Wunder* -*bar*

(17b) *Herz* -*ig*

(17c) *bescheiden* -*heit*

(17d) *Freund* -*lich*

are also to be considered as derivation by suffixation as the dictionary [34] offers hyphenation in syllables of words:

(18a) *wun|der|bar*

(18b) *her|zig*

(18c) *Be|schei|den|heit*

(18d) *freund|lich*.

The notional and the empirical relation between the derivation word associations in *Petit Papa Noël* and Jung's associations of the type *Word complement* however stays partial as Jung's associations are only examples of derivation by suffixation, while the associations in *Petit Papa Noël* also have cases of derivation by prefixation in (13) and (14) (concerning different types of derivation, see [35]):

(19a) *indépendant, ante* – DE *1. in-* (impuissance)

(19b) *indépendant, ante* – DE *1. in-* (insignifiant, iante)

3.2.3. Associations by analogy

According to the dictionary (see « Tableau des termes, signes conventionnels et abréviations du dictionnaire » in [36]) the lexicographical remark ➔ followed by a word in bold, presents a word that has a relation of meaning with the word that precedes. The associations of values by analogy in *Petit Papa Noël* thus belong to the semantic axis and have empirical relation with Jung's 10th category of word associations that is *Identity*:

(20a) *tuer* – *massacrer*,

(20b) *prairie* – *pré*. [37]

According to the dictionary [38] *massacre* and *pré* refer by analogy to *tuer* and *prairie*. Jung's examples [39]

(21a) *großartig* – *prächtigt*,

(21b) *aufpassen* – *aufmerken* (*im schweizerdeutschen Gebrauche wesentlich synonym*),

(21c) *zanken* – *Streit*,

are also attested by the dictionary [40]:

(22a) *prächtigt* (Adj.)

mit großer Pracht ausgestattet; vortrefflich; herrlich, großartig; Sy prachtvoll;

(22b) *aufpassen*

1. (V. i.) *achtgeben, aufmerksam sein; [...]*

(22c) *Streit* (m.)

1. [...]; *Zank, [...]*.

The relation between the associations by analogy in *Petit Papa Noël* and Jung's word associations by *Identity* is limited to the empirical and thus remains partial.

3.2.4. Associations by contrariety

The linguistic values associated by contrariety in *Petit Papa Noël* come from the contrary terms indicated by CONTR. in the final section of the lexicographical articles. It is possible to empirically relate these associations to ones in Jung's 3rd category *Association by contrast*:

(23b) *vite* – *lent*

(23b) *lourd* – *léger*

(23c) *dormir* – *veiller*

(23d) *sale* – *propre* [41]

These examples are found in the final part of the lexicographical articles in the dictionary [42] where the opposite terms are presented:

(24a) *vite*

CONTRAIRES : *Lent. [...]*.

(24b) *lourd, lourde*

CONTRAIRES : [...], *Léger, [...]*.

(24c) *dormir*

CONTRAIRES : *Veiller. [...]*.

(24d) *sale*

CONTRAIRES : [...], *propre, [...]*.

Some of Jung's examples in Deutsch *Schmerz* – *Lust*, *sauer* – *süß*, *freundlich* – *zornig*, *gut* – *lasterhaft*, *Tier* – *Pflanze*, *Rache* – *verzeihen*, [43] however cannot be found in the dictionary. On the other hand, the following

(25a) *Leid* – *Freude*,

(25b) *gut* – *böse*,

(25c) *hell* – *dunkel*,

(25d) *Verstand* – *Dummheit*,

necessitate lexicographical definitions and examples to be illustrated:

(26a) *Leid* (n.)

Freud und ~ miteinander teilen

in Freud und ~ zusammenstehen

(26b) *böse* (Adj.)

wenn es im Gutem nicht geht, dann im Bösen

im Gutem wie im Bösen

jenseits von Gut und Böse

(26c) *dunkel* (Adj.)

1. nicht hell, lichtlos, finster

(26d) Dummheit (f.)

1. (unz.) [...] : ~ und Stolz wachsen auf einem Holz
(Sprichw.) *Unverstand u. Dünkel gehören zusammen*

The relation between the associations by contrariety in *Petit Papa Noël* and Jung's word *Associations by contrast* thus remains of a general character.

4. Conclusion

As the associations of linguistic values differ according to the language users' social and cultural environment, the Christmas festivities thus define the collective socio-cultural framework of the associations of values in *Petit Papa Noël*. This guarantees the conventional aspect of the linguistic values associations formed within the community of French speakers: the linguistic values and their associations appear to be social and collective agreements resulting from a collective language, but also a socio-cultural activity. These socio-cultural agreements assure the mutual understanding and language communication within the speakers' community.

The character of *Petit Papa Noël* also appears as a cultural phenomenon combining some features coming from the archetypes of the Mother, the Child, the Spirit and the Shadow as some qualities of these four archetypes are related to the associations formed within the chorus of the French Christmas chant *Petit Papa Noël*.

This language and socio-cultural activity of formation of values associations nevertheless remains outside the language users' immediate knowledge and is only accessible by linguistic observation.

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Educational counseling in Romania and Turkey – comparative aspects

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Abstract: Educational counseling, an integral part of the educator-educated pedagogical correlation, is constituted as a means of self-knowledge and development of the student's personality. It is a special experience of communication and search, a way to optimize interpersonal relationships, to learn positive behavioral and attitudinal models, a way to support students who face educational, emotional, social difficulties. It is an important factor in preventing difficulties that can hinder the mental development of the student - difficulties in communication, behavior, school adaptation, physical, emotional and mental health etc. The present study proposes a analysis on the specific aspects of educational counseling in Romania and Turkey. The study presents the following analysis criteria: institutions that coordinate the activity of educational counseling; objectives of educational counseling; services provided; topics covered; methods of work.

Keywords: EDUCATIONAL COUNSELING, PEDAGOGICAL RELATIONSHIP, OBJECTIVES OF EDUCATIONAL COUNSELING

1. Introduction

Educational counseling is a special experience of communication and search, a way to optimize interpersonal relationships, to learn positive behavioral and attitudinal models, a way to support students who face educational, emotional, social difficulties. Integral part of the educator-educated pedagogical correlation, the educational counseling is an important factor in preventing difficulties that can hinder the mental development of the student - difficulties in communication, behavior, school adaptation, physical, emotional and mental health etc. The educational counseling influences the development of the student's personality, facilitates the free and creative expression of school and professional options and decisions, maximizes intellectual, emotional and volitional availability, changes maladaptive attitudes and behaviors, facilitates the self-knowledge, training social skills favorable to teamwork, cooperation and collaboration, mastering effective learning techniques etc.

The present study proposes a analysis on the specific aspects of educational counseling in Romania. The study presents the following analysis criteria: institutions that coordinate the activity of educational counseling; objectives of educational counseling; services provided; topics covered; methods of work.

2. Educational counseling in Romania – institutions, objectives, services, topics, methods

In Romania, the educational counseling activity takes place in the school, during the counseling and personal development classes. Also, in the School Cabinets of Psychopedagogical Assistance, subordinated to the County Center for Assistance and Educational Resources (CJRAE).

Starting with the 1998-1999 school year, the Ministry of Education proposed the introduction in the National Curriculum of the *Counseling and Orientation* curricular area, for primary, secondary and high school education. The learning contents for the subjects of this curricular area - *Personal Development, Counseling and Personal / Vocational Development* - are grouped in the following five thematic modules:

1. *Self-knowledge and personal development*
2. *Communication and social skills*
3. *Information and learning management*
4. *Career planning*
5. *Lifestyle*

The proposed topics are approached by teachers for primary and preschool education, teachers / counselors, teachers of psychology. The following attitudes and values are capitalized: respect, self-confidence and trust in others; recognizing the uniqueness of each person; receptivity to the emotions of others; valuing interpersonal relationships; critical and selective capitalization of information; adaptation and openness to new types of learning; motivation and flexibility in the elaboration of one's own educational and professional route; responsibility and availability for decisions and

actions regarding one's career; interest in lifelong learning in a changing world and in the knowledge society; orientation towards a quality life, now and in the future.

The counseling actions carried out with the class of students should not be confused with the lesson. Educational counseling is not taught, but is done in the form of practical activities. The purpose of educational counseling: to facilitate learning, practicing desirable behaviors. Targeted competencies: effective communication; problems solving and decision making; developing sensitivity for the needs of others; formulating short, medium and long term goals; identification, organization, planning and allocation of resources (time, financial, materials, etc.); obtaining and using information; use of new technologies; personal and career planning etc.

In the School Cabinets of Psychopedagogical Assistance, subordinated to the County Center for Assistance and Educational Resources (CJRAE), psychopedagogical counseling and school guidance services, assistance and qualified counseling are provided to students, parents and teachers. In Romania, the County Centers for Resources and Educational Assistance (CJRAE) coordinates specific educational services provided to children, teachers, parents and community members to ensure access to quality education for all, as well as necessary assistance in this regard.

CJRAE coordinates, monitors and evaluates, at county level, the activity and educational services offered by:

- County Center for Psychopedagogical Assistance (CJAP) and School Cabinets for Psychopedagogical Assistance - school and professional counseling and guidance services for students; information and counseling services for teachers, children, parents, other members of the community; guidance services for initial and continue teacher training; specific therapy services
- Interschool Speech Therapy Center (CLI) and School Speech Therapy Offices Language and Communication Disorders Therapy Services
- Resource Center for Inclusive Education (CREI) - support services and specific therapies for children with special educational needs integrated in mass education
- School Mediator - school mediation services, through the school mediator
- Social Worker - social assistance services, through the social worker

These institutions carry out their activity in collaboration with the Teaching Staff House, the School Inspectorate, the educational institutions, the Employment and Vocational Training Agencies, the County Centers of Preventive Medicine or other institutions with attributions or interests in the field of education, under the methodological guidance of the Ministry of Education.

CJRAE objectives:

- inclusion and maintenance in compulsory education of all children / young people, regardless of their psycho-individual and social peculiarities
- ensuring additional supports necessary for the development of quality education

- informing and advising teachers in order to improve the instructive-educational activity
- involvement of parents in activities specific to an effective relationship: school - family - community

At the beginning of the educational counseling activities, the rules according to which the group of students will work will be established, by mutual agreement - punctuality, mutual respect, respect for the diversity of opinions - theme and objectives pursued. Discussions will be approached in an empathetic, sincere and open manner. Visual contact between participants is very important (circle / semicircle arrangement is considered to be the most appropriate). Within the group, the subjects learn that they are not the only ones who encounter difficulties, who have worries and fears. The emphasis is on interactive work strategies: brainstorming, debate, problematization, role play, simulation, case study, critical thinking techniques, metaphorical exercises, etc. Their role is to facilitate the exchange of information, identification and clarification of problems, resolving misunderstandings, facilitating personal and professional development etc.

Scoring is not used in educational counseling activities. The specific evaluation strategies are: self-evaluation, questionnaires of interests and skills, observation grid, individual and group projects, etc. The evaluation must answer the following questions:

- *What is the level of training and development in students of the competencies specifically proposed through the curriculum for the curricular area Counseling and guidance?*
- *Has the frequency of students' adaptive behaviors to the information received increased?*
- *Are the students able to face the problems they have to solve in order to have a successful socio-professional insertion?*

Unlike Romania, in Turkey, for example, Psychological Counseling and Guidance (PDR) services helps the students better understand himself, to recognize his characteristics, to identify opportunities and options, to make realistic decisions for himself, to improve his potentials, to cope with obstacles and problems etc. The work carried out within this framework is mainly a matter of expertise, but it is not appropriate for a psychological counselor in a school to strive to perform these services alone without involving school personnel. As an important principle of the PDR services, it is necessary to cooperate with the staff in the school so that these services to function efficiently. The understanding and cooperation of the school staff is important.

Psychological testing, vocational career choice, and mental health concerns are currently paramount in defining what counseling is and what counselors do [3]. As in the United States and most other countries, counseling in Turkey began in the schools. Turkey has been making efforts to develop a system of counseling in schools for about fifty years. The first school counselors were primarily teachers, and counseling was a function they performed in addition to their teaching responsibilities. Their major duties involved career and educational counseling.

The main factors that have influenced the emergence of counseling in education settings in Turkey may be listed as follows:

1. Social changes, such as modernization, technological development, democratization, and changing family patterns, have created the need and the desire for counseling in education [3].
2. Counseling has been viewed as an effective means for developing human potential [1].
3. The individual differences emphasized in education have contributed to the emergence of counseling in the schools [4].
4. The counseling services have been seen as a useful means of modernizing and democratizing the school system (T.C MEB Türkiye Egitim Milli Komisyonu Raporu, 1960).

A rapid increase in the appointment of counselors has taken place during the last few years. The Ministry of National Education has also begun to assign counselors trained specifically as counselors to both elementary and secondary schools.

The history of counseling in Turkey is closely related to the history of educational practice and problems in the schools. As each country has its own unique historical background, political system, and economic conditions, any counseling model being appropriated from one society into another will naturally be affected by these factors. Counseling in Turkey is generally perceived as:

1. a corrective and remedial instrument [2]
2. a means of orienting students toward the schools and regulating the manpower that the country requires
3. a means of disciplining and controlling the students in schools
4. a means of special education
5. homeroom and various educational activities being carried out by ordinary teachers

The educational counseling in Turkey is seen as having a key role in the educational process, by encouraging the development of the individual. However, his place in Turkish schools has often been the target of criticism for regulating both the workforce the country needs and the behavior of young people, over whom he has had little control. As democratization, industrialization and urbanization continue to replace traditional cultural models of decision-making, career selection and the provision of human services, awareness of the need for counseling is growing in Turkey. Counseling research, publishing and training programs have advanced and will continue to promote the counseling movement in a way that is necessary in a modern, democratic and humane society.

So, here are some aspects of the educational counseling process in Turkey. We notice, from the analysis of this information, that we obtained from the works provided by a student of a university in Turkey who chose to study in Romania for a year, many similarities between the two countries, in what regarding the purpose of educational counseling activities.

3. Conclusions

The success of educational counseling is given by the active, conscious and responsible involvement of all educational factors in socio-educational and professional development, in awareness of abilities and resources, but also of personal and institutional limits, in creating an optimal psycho-educational environment for personality formation and development.

Focusing on the student's experience, on cultivating qualities and abilities, denotes the concern for valuing the dignity and human quality of those who dedicate their lives to shaping the human personality through education. The teacher has the mission and responsibility to initiate a coherent program of educational experiences that will lead to the personal, educational, professional and social development of the students.

The professional qualities of a good counselor must aim at:

- empathy
- sensitivity to students' problems
- unconditional acceptance of the student - recognition of the intrinsic value of the student's person
- acceptance of interpersonal differences
- honesty, fairness in the relationship with students
- authenticity
- good faith
- sincerity
- seriousness and sobriety, but also joviality
- positive valorization
- high capacity to observe and analyze objectively the specific particularities of the students (attitudes, possibilities, interests, abilities, behaviors, etc.)
- verbal skills (nuanced, persuasive speech)
- ability to send and receive both verbal and nonverbal messages
- continuous training in order to increase the accuracy of students' assessment and self-assessment
- responsibility

- competence in relation to students' problems
- self-imposition of high professional standards and a correct line of ethical conduct

The counselor teacher must live strongly anchored in the present; he must learn to become an expert in human relations, to successfully represent the social community in which he exists, to become a model that overlaps with social desideratum.

In this sense, the initial and continuous training of teachers through methodological-scientific and psycho-pedagogical activities, symposia, conferences, communication sessions, round tables, training programs, etc., is an important pedagogical objective. Through this training, the professional role increases and the roles of the teacher become aware, here and now, but also in perspective.

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Study of the psychophysiological state of adolescents using the method of gas-discharge visualization

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Abstract: The article presents the results of development and research of methods and adjustment of modes of operation of the device for gas-discharge visualization for the most accurate and prompt determination of the psychophysiological state of human health in the field of his professional activity. Determining the ability of a teenager to cope with certain intellectual tasks, both at the beginning of the educational task and at the end of the working day, is necessary for the rational use of human labor and to ensure the quality and efficiency of the educational institution as a whole. Factors influencing the quality of the process of obtaining and accuracy of processing information about the psychophysiological state of man with a device for gas-discharge visualization, among which the greatest influence are external factors such as human (correct preparation and conduct of the experiment), climatic (humidity, ambient temperature), guidance of electromagnetic fields from power-operated devices nearby, elimination, or at least minimization of which allows to increase accuracy (by 8-12%), reliability (by 3-5%) and reproducibility (more than 1.8 times) of results diagnosing a device for gas discharge visualization. The daily dependences of the psychophysiological state of the adolescent on mental load were obtained, which showed the following: the best indicators of the psychophysiological state observed in the morning (period from 10-00 to 12-00) in the absence of other physical and intellectual morning load. At the same time it is established that active rest for 40-60 minutes or change of mental exercises by physical (within 60-90 minutes) after mental loading, restores the previous psychophysiological condition of the teenager by 85-90% whereas passive rest within 120-150 minutes, allows you to restore the previous psychophysiological state of the adolescent by only 35-45%.

Keywords: GAS-DISCHARGE VISUALIZATION, PSYCHOPHYSIOLOGICAL STATE OF A PERSON, ADOLESCENT AGE GROUP, DIAGNOSIS, EFFICIENCY

1. Introduction

Human health is one of the problems of the world's population, which are vital both for the individual and for humanity as a whole. An important problem that negatively affects the health of the population, especially young people, is stress caused by significant physical and mental overload. The best mechanism for reducing the incidence is disease prevention, which is the most relevant tool today.

Prevention and prevention of morbidity of the population of any country, and especially the stressful state of people, should be carried out using reliable diagnostic methods and high-precision specialized devices. This research work is aimed at finding out the possibility of studying the psychophysiological state of man (on the example of high school students during the study period) using the method of gas-discharge visualization. The results of analytical and experimental studies presented in this paper can be used to identify the causes and consequences of abnormalities in the psychophysiological state of adolescents and to develop recommendations for eliminating and minimizing these abnormalities.

The aim of the work: improving the methodology of research of psychophysiological condition of adolescents by the method of gas-discharge visualization to increase the accuracy, reliability and reproducibility of diagnostic results

Currently, the method of gas-discharge visualization – GDV (Kirlian effect) is one of the few methods that allows you to quickly, accurately and safely investigate the physical, psycho-emotional and energy state of a person, detect disease and find its root cause, and quickly monitor the dynamics of selected individual treatment methods and recovery [1, 2].

In general, today scientists identify several groups of factors that adversely affect human health [3]:

1. Technopathogenic influence. The source of such influence, scientists identify all technical devices and devices that run on electricity: computers, microwave ovens, refrigerators, televisions, cell and radiotelephones, radios and more.

According to numerous studies conducted in Russia, the United States, France, the negative impact of weak electromagnetic fields of ultra-low and low frequencies on human health [4]. The nervous, immune and reproductive systems especially suffer from their influence. These studies have shown that the main reason for the negative impact of these technical means on their users are the information components of electromagnetic radiation, which are very harmful to human health because they destroy the biofield.

2. Geopathogenic impact. The source of this type of influence are the so-called "destructive" places that are not suitable for human life and activity. According to the hypothesis of the German scientist Hartmann, the earth's surface can be divided into "healthy" and "sick" zones. It is established that the lines of force of the geomagnetic field "stick together in the walls" with a thickness of 20-30 and more centimeters, which is at a distance of 2.5 m from each other in Central Europe in planes perpendicular to the meridian passing from the North to the South. The walls, which are formed by lines of force in the direction of the magnetic meridians, are separated from each other by 2 m. Thus, the "walls" of the magnetic lines of force form regular rectangular cells. "Sick" areas - the intersection of walls - are dangerous to human health. If a person is in such areas for a long time (sleeps, works), he begins to worry about headaches, irritability. In the future, diseases develop quite rapidly (hypertension, coronary heart disease, diabetes, oncology and others). Moreover, these diseases are very difficult to treat and often lead to disability and even death of the patient.

3. Ecopathogenic impact. This type of impact is created by unfavorable environmental conditions in which we live - polluted air, water, food, radioactive radiation of artificial origin and so on.

Experiments were also conducted with cell phones. The results showed [5] that in those who use mobile phones, the area of the glow decreases or disappears completely in the throat and head. And this is not surprising. Now there are many scientific papers that examine the negative impact on humans, especially on the cardiovascular system, electromagnetic fields, especially from household appliances. It should be noted that the stronger the aura (voltage and area), the less affected by any negative impact, including from cell phones. Music has a positive effect, especially classical [6], and the GDV method was one of those that confirmed that music has healing properties. Experiments have shown [7] that listening to your favorite music for one minute not only restores the aura, but also makes it more powerful. Essential oils also have a positive effect. It is enough to inhale the smell of oil several times, as certain energy centers are activated.

The parameters of the gas-discharge image depend on the properties of the object under study and thus, analyzing the nature of the glow induced by the objects, it is possible to judge the energy state of the object at a particular time.

The GDV method has been successfully tested by many years of practice of using the software and hardware complex "GDV Camera" in various institutions. To date, the GDV method has gained worldwide recognition [8].

The GDV method is used to solve the following solutions [9]:

- Mass screening-diagnosis of diseases (preventive rapid diagnostics). Such a diagnosis can be made as part of professional examinations. This method will identify the most affected organs and systems at the time of examination, as well as potentially dangerous areas of the body.
- Express method of syndromic assessment of patients in hospitals, clinics, dispensaries, sanatoriums, which allows you to sharply limit the scope of diagnostic search.
- Selection of individual treatments based on GDV-gram analysis data. Studies before and after exposure of the human body to allopathic, homeopathic remedies, psychotherapy, physiotherapy and others are envisaged.
- Monitoring the patient's condition during treatment (monitoring the condition of patients) and assessing the effectiveness of treatment involves a dynamic assessment of BEO-grams during treatment.
- Primary disease prevention. Assessing the degree of functional stress of the organs, using the GDV method, you can detect disorders at the stage of "pre-disease" and choosing individual methods of correction (change of work, housing, lifestyle, diet, etc.) to prevent disease.

The method of human research allows to obtain images of gas-discharge images from ten fingers (BEO-grams), as well as to conduct automated computer analysis of BEO-grams.

Automated computer analysis of BEO-grams includes sector diagnostics and parametric analysis of BEO-grams [10].

Sector diagnostics is based on a diagnostic table that links the characteristics of the glow of individual areas of the fingers with the functional state of organs and systems of the body [1]. The diagnostic table is based on the ideas of traditional Chinese medicine, the system of meridians and acupuncture points, as well as empirical experience.

Parametric analysis is based on the assessment of BEO-gram parameters (today GDV-Software calculates more than 30 parameters), factor and correlation analysis. The following groups of parameters are considered [10]: geometric, brightness, structural, fractal, probabilistic.

Assessment of the state of the organism by the GDV method is based on the analysis of the obtained images of GDV-grams, processed by a standard software package.

A promising area is the use of the GDV method in spa practice. Currently, doctors of many leading sanatoriums successfully use in their practice the software and hardware complex "GDV Camera". The successful experience of using the GDV method is due to the possibility of objective analysis of the patient's condition, selection of an individual course of treatment, monitoring of the patient's condition throughout the course of sanatorium treatment. A significant advantage is the low cost of the survey itself.

Advantages of the GDV method [4]:

- objectivity of information: independence from the desire and experience of a particular user;
- safety and complete sterility, removal of information only from the extremities of the patient;
- the ability to monitor the development of processes over time, comparing structural, functional and temporal processes in the body;
- methodological simplicity and convenience: the absence of any special requirements for the premises, environmental conditions, qualifications of the performer;
- the use of modern methods of nonlinear mathematics for processing fractal images and obtaining information about the patient's condition;
- clarity and interpretability of the obtained results, convenience of their storage and processing.
- low cost of the survey.

2. Equipment and methods of research

GDV-gram (BEO-gram) is a complex two-dimensional figure, Fig.1, each pixel of which is characterized by its brightness, encoded with an integer ranging from 0 ("black") to 255 ("white").

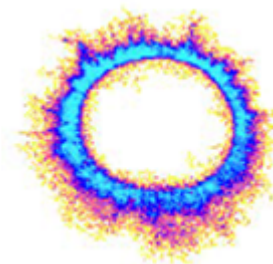


Fig.1. GDV-gram (BEO-gram)

The geometric parameters of GDV are: image area, which is defined as the sum of pixels above a given brightness threshold; width of streamers.

The geometric parameters of GDV-grams carry information about the characteristics of the object. For example, as the concentration of ions in the liquid increases, the illumination area increases and the width of the streamers decreases. To include such data in the structure of a complex biophysical experiment requires quantitative processing of the obtained images.

The principle of image formation is as follows. Between the object under study and the transparent electrode (plate) on which the object is placed, voltage pulses are supplied from the electromagnetic field generator (EMF), for which a transparent conductive coating is applied to the reverse side of the electrode. At high field strength in the gaseous medium of the contact space of the object and the plate develops an avalanche and/or sliding gas discharge, the characteristics of which are determined by the properties of the object.

At the same time, the quality of the GDV-gram spectrum, which, in turn, determines the accuracy of the diagnostic process, is influenced by a number of factors and external factors. The greatest influence is exerted by such external factors as human (correct preparation and conduct of the experiment), climatic (humidity, ambient temperature, guidance of EMF from power devices operating nearby), methodological (incorrectly chosen methods and modes of their conduct) factors.

It is established if the methodological factors can be completely leveled by choosing the correct methodology and modes of its implementation, while external and human factors can only be minimized (complete elimination is impossible by the difficulty of maintaining highly stable climatic conditions in the working area without special measures). Limiting such factors allows to increase the accuracy (by 8-12%), reliability (by 3-5%) and reproducibility (more than 1.8 times) of the results of diagnosis by a device for gas-discharge imaging.

A wide range of devices allows the application of GDV-graphy in various fields of human activity - medicine, professional sports and fitness, spa services, beauty industry, various areas of psychology and psychophysiology, as well as basic and applied research.

Thus, as a result of a systematic analysis of the problem of the use of GDV in human life, the following conclusions are made.

One of the most important directions in the development of the GDV method is the development of methods and adjustment of GDV modes of operation for the most accurate and prompt determination of the psychophysiological state of human health in the field of his professional activity. This is one of the most pressing problems faced by all organizations and educational institutions without exception. Determining a person's ability to cope with certain intellectual tasks, both at the beginning of working hours and at the end of the working day, is necessary for the rational use of human labor and to ensure the quality and efficiency of such an institution. Remembering that the GDV method will never replace the methods of traditional comprehensive diagnosis of the human condition, it should be noted that this method allows to obtain additional objective information about the psychophysiological state of a person under stress.

3. Conducting experimental research

The study was conducted using the television system GDV "Stimer" [10] which allows to obtain consecutive GDV-grams of ten fingers with their subsequent mathematical processing in the software package "GDV Explorer", which includes programs for capturing, processing and analyzing images.

The programs allow you to divide the GDV-gram of each finger into sectors corresponding to a specific organ or system of a person, where the parameters of the glow of the gas discharge are analyzed. Here you can quantify the intensity, perimeter and area of the glow in each sector.

The algorithm for implementing the GDV method (Fig. 2) is as follows:

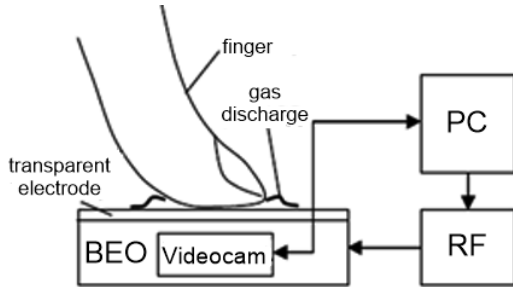


Fig. 2. The scheme of obtaining GDV-grams

- the object under study (finger) is placed on the glass electrode of the device;

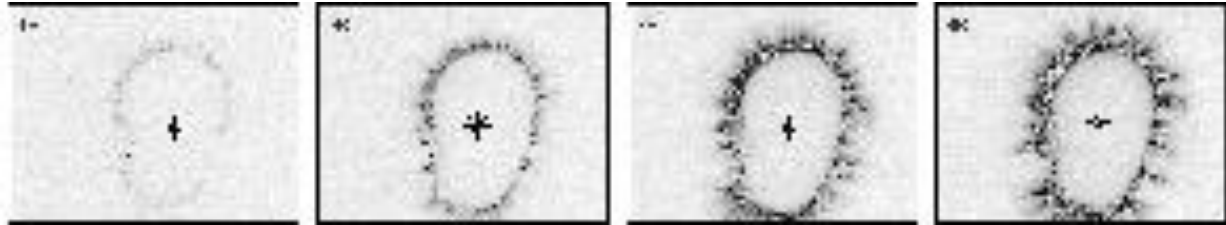


Fig. 3. GDV-gram of the finger at different values of the voltage applied to the electrode (left - right): 107 V; 149 V; 197 V; 219 V

Analysis of GDV-grams of the finger at different values of the voltage applied to the electrode (Fig. 2) showed that at minimum voltage (107 V) the obtained image of GDV-gram has minimal quality, which is due to poor overlap of low-power electromagnetic field (order $B = 9$ mT) on the electromagnetic biofield of man. With increasing voltage, the picture of GDV-gram becomes clearer and more saturated, which is confirmed by the exponential increase in the total induction of the magnetic field (up to $B = 146$ mT).

At the same time, at the highest voltage, a person feels discomfort (tingling in the fingers) at the time of excitation of the gas discharge, which led to the choice of rational operating voltage of the generator, equal to 197 V (Fig. 2, third left image).

- electrical pulses are applied to the transparent electrode of the electron-optical unit (BEO) from the frequency generator (RF), which is controlled by a personal computer (PC);
- at high electromagnetic field strength in the gaseous medium of the contact space of the object and the transparent electrode develops a corona gas discharge, the parameters of which are determined by the properties of the object;
- primary information is obtained in the form of recorded digital images (photographs) of the glow of the fingers, while the emission of photons, electrons and other particles of a biological object stimulated by an electromagnetic field and gas discharge is studied;
- as a result of computer data processing, sector diagnostics is performed, based on a diagnostic table, which connects the glow characteristics of individual areas of the fingers with the functional state of organs and systems of the body and is based on traditional Chinese medicine, meridian system and acupuncture points;
- the brightness of the gas discharge gives an idea of the state of human health in general, and diagnostic information for individual organs and systems are the perimeter (P) and the area of the glow (S).

Since the object of study is a living person, it is very necessary to create an electromagnetic field of a certain intensity, so that its intensity at the same time allows to obtain a clear GDV-gram and does not harm the health of the subjects. Thus, (Fig. 3) shows the GDV-grams of the same finger, obtained at different voltages.

Thus, the most rational mode of operation of the GDV device is the following: operating voltage at the electrode: $U = 197$ V; magnetic field in the working area: $B = 21$ mT (direct polarization); time of action of the magnetic field on the biological object: $t = 1.25$ s.

Analysis of the problems that arise when collecting and interpreting research data with specific recommendations for improving the methodology of research by GDV for adolescents are given in the following table:

Type and brief description of the problem	Recommendation for troubleshooting
Improper orientation of the fingers when receiving the initial information (GDV-images) leads to distortion of diagnostic information	1. Strict observance of the requirement to place your finger in the center of the screen so that the image does not go beyond the window (tilt angle $10-30^\circ$), the direction of installation of the finger should be perpendicular to the front wall of the device. 2. Refixing incorrect images 3. Additional correction at the stage of preparation of images for analysis by their forced centering
The use of variable range parameters in the processing and analysis of data of an individual subject at different times leads to distortion of diagnostic information	The parameters of the optimal range vary from person to person, but for a particular subject should be a constant value to ensure the reliability of the study, and therefore should be recorded in the personal files of the subject.
Changing the brightness of the glow GDV-grams of the subject under the influence of external factors that influenced it, complicates the interpretation of diagnostic information	To resolve this issue, it is recommended to increase the display range of the images to the level that will provide the necessary contrast to complete the centering, perform analysis, and to compare the results of earlier studies return the display range to a constant level for this study level. or excitation of body systems.
The dependence of the received information on the physiological state of the patient on his psycho-emotional state leads to distortion of the picture and complicates the interpretation of diagnostic information (especially adolescents in transition, who are often in a state of psychological disharmony and emotional arousal, which, in turn, leads to excessive sweating palms and image distortion)	1. Keeping the patient's palms clean and dry throughout the study. 2. Degrease the hands and surface of the measuring electrode with a solution of medical alcohol for all patients before each measurement. 3. For psychologically unbalanced subjects with wet hands use special filters. A series of studies have shown that excessive sweating cannot be avoided by using medical gloves or plastic wrap.

4. Discussion of research results

The object of the study was a group of teenagers consisting of ten boys and ten girls aged 15-18.

Measurements were taken at the end of the school week, twice a day: at the beginning and end of classes. During the day, adolescents were engaged mainly in mental work, namely, to listen to or analyze theoretical material and perform calculated practical tasks. The research aimed to record the accumulation of short-term fatigue during the school day and to accumulate information about the formation of long-term overexertion over several months.

According to the results of the research, both individual health problems and common symptoms were identified, which, in the researcher's opinion, may be directly related to the type of activity. It should be noted that due to different temperaments, the subjects' response to mental stress was different.

Study of the impact of mental work in the third week of study.

As can be seen from Fig. 4, all subjects from the first group did not show changes in the emotional sphere, and almost no serious physiological changes were recorded. The problem areas in both subjects were the detection of the endocrine system, coronary vessels, and kidneys. By the end of the lesson, there are changes in the spine, and a slight increase in stress in problem areas, although the overall characteristics of the energy sector is quite positive and has only slight deviations from the spectrum. Therefore, for all subjects during the first month of training no significant changes are observed.

Regarding the research of a group of girls, according to Fig. 5, it is possible to diagnose emotional instability and greater sensitivity to mental load and intellectual work. The problem areas in the heart, coronary vessels, liver and intestines recorded at the beginning of the day were exacerbated, and problems with the genitourinary system were added to them.

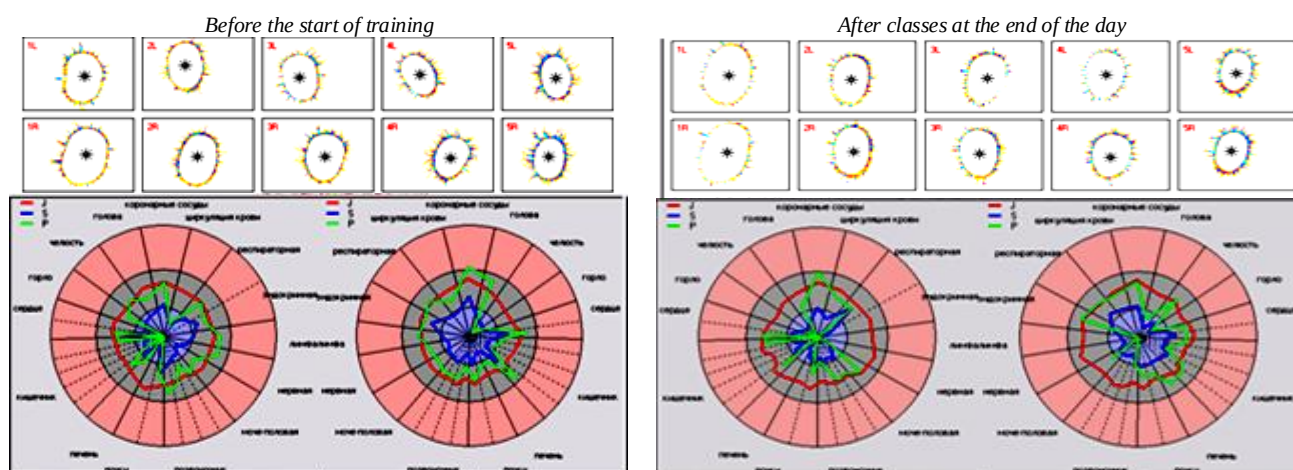


Fig. 4. The results of studies of young men in the third week of training

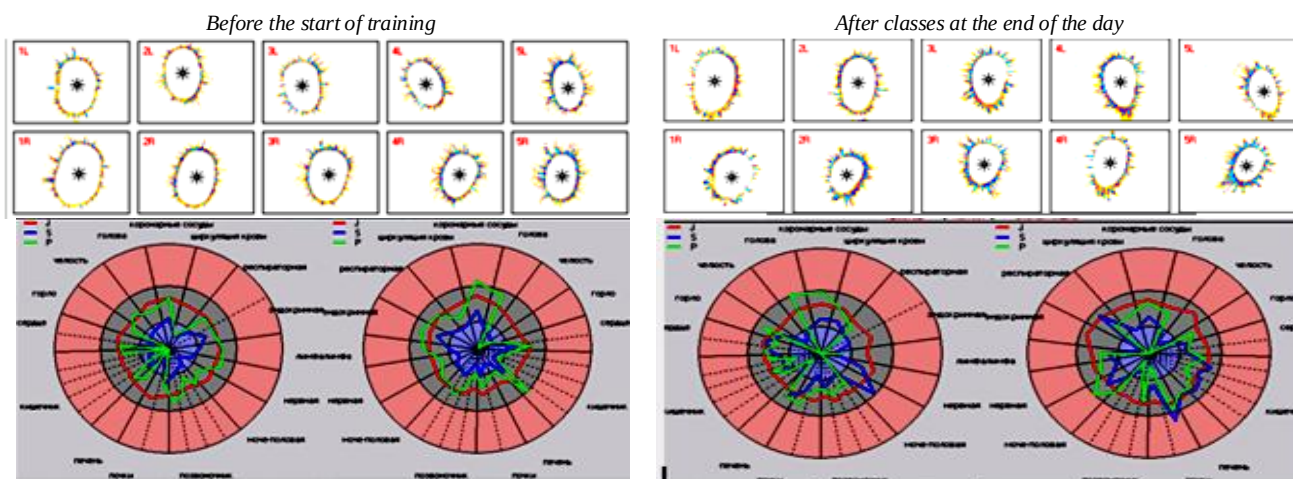


Fig. 5. The results of a study of a group of girls in the third week of training

Studies conducted during the first month of training showed that after a long vacation, mental work and emotional load during classes during the first weeks of training had little effect on the psychophysiological state, both at the beginning and end of the working day for most subjects.

In the energy field, all subjects recorded insignificant loss of spectra, which indicated a certain accumulation of fatigue and the first signs of further depletion of the body.

Study of the impact of mental work in the seventh week of study.

According to Fig. 6, it can be stated that the experimental boys were recorded tense states in the liver, respiratory and genitourinary systems, as well as in the circulatory system, which intensified after exercise. The energy field is relatively flat, but at the end of classes there are gaps in the spine, which indicates an increase in stress and fatigue.

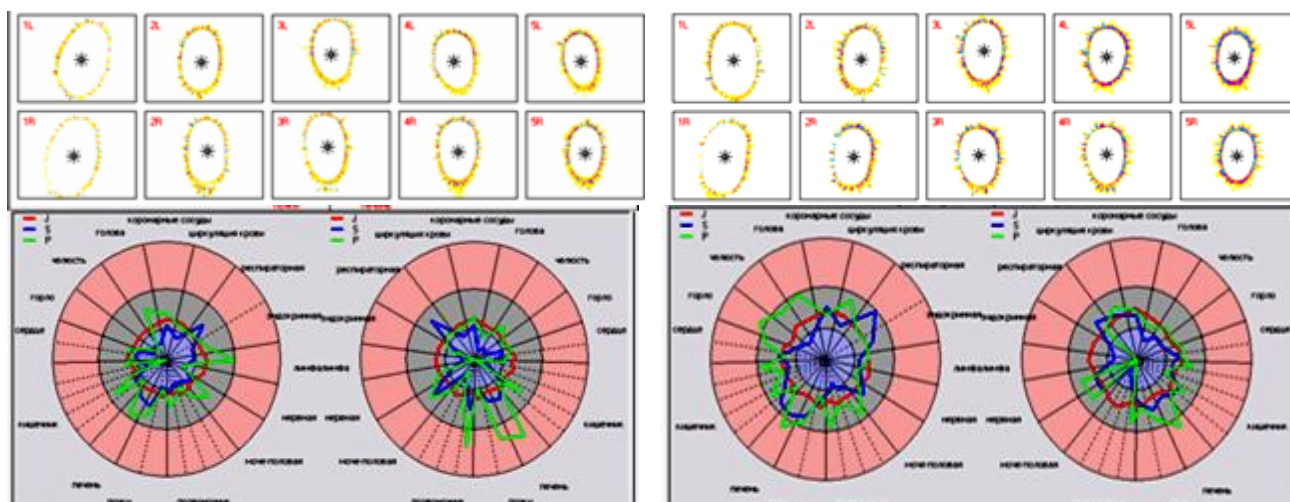
*Before the start of training**After classes at the end of the day*

Fig. 6. The results of the boys' research in the seventh week of training

The results of the diagnosis of the condition of the girls are shown in Fig. 7. From these results it follows that all experimental girls at the first measurement already have signs of accumulated fatigue, which are manifested by tension of the coronary vessels, genitourinary system and cardiovascular system. Under the influence of mental loads, the problem indicators identified at the beginning of the day at the end of the day increased to critical values, and in some cases exceeded the critical values. All the girls

had separate breaks in the energy field and aggressive glow streamers.

The results showed the accumulation of fatigue caused by mental stress. Data obtained at the beginning of the school day - the tension of the coronary vessels, cardiovascular system, at the end of the day increased to critical values, and for the intestine, kidneys and genitourinary system even exceeded them.

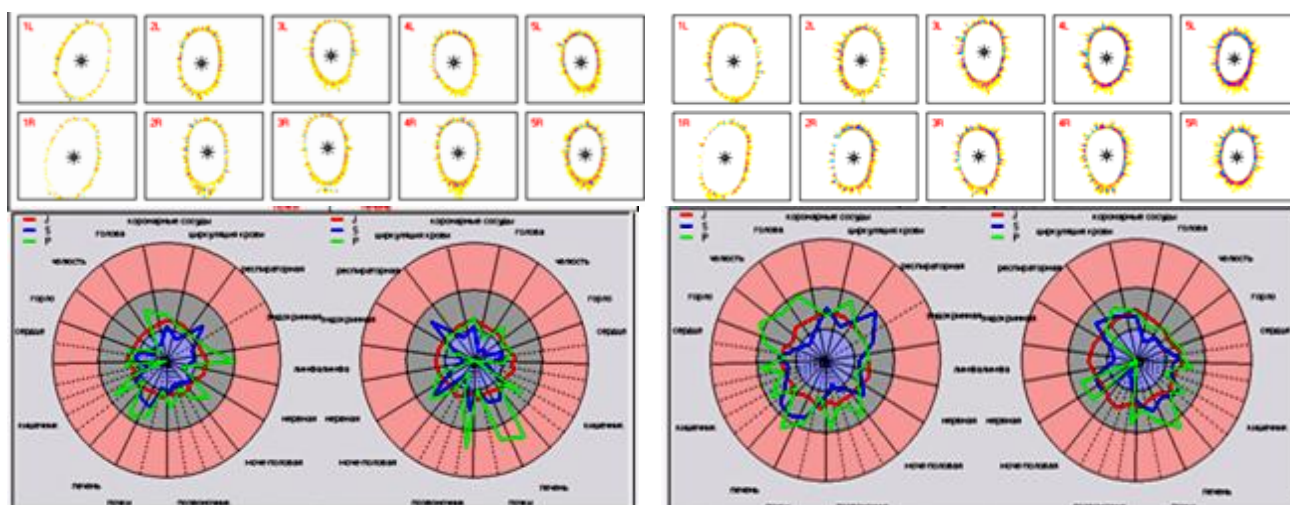
*Before the start of training**After classes at the end of the day*

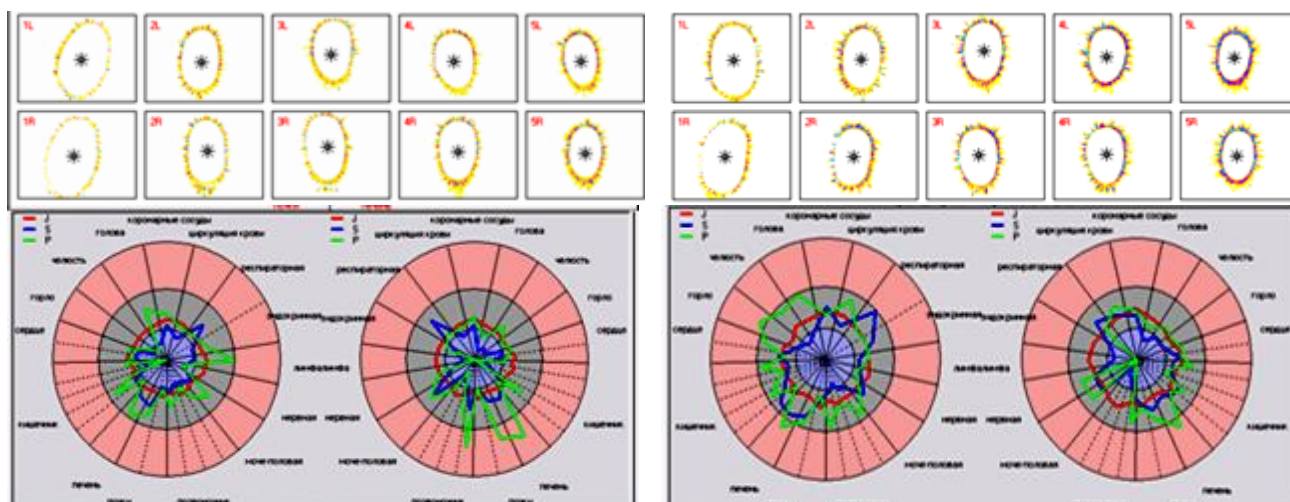
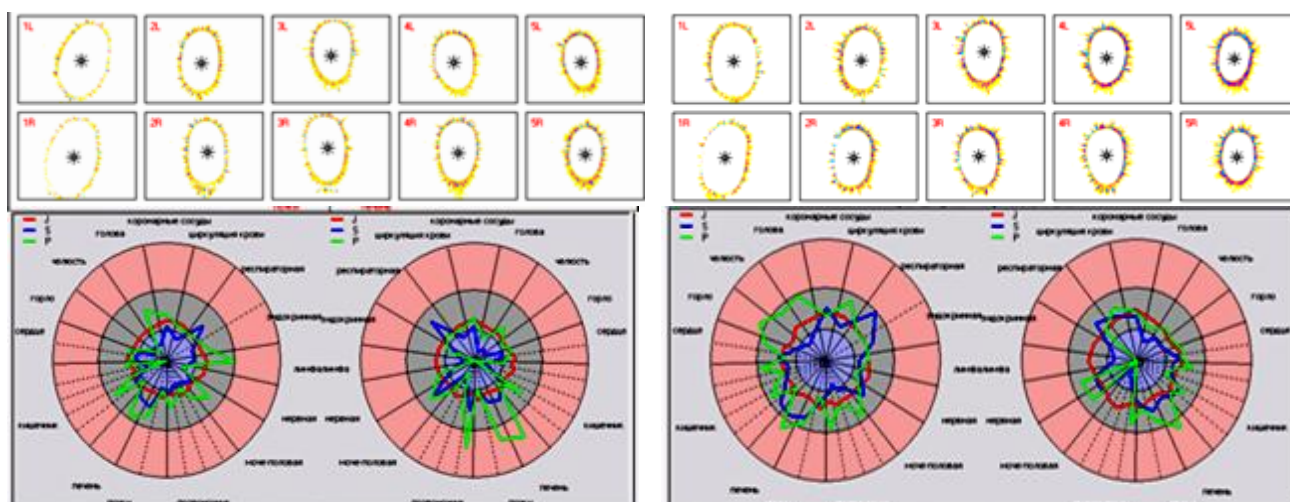
Fig. 7. The results of studies of girls in the seventh week of training

Study of the impact of mental work in the ninth week of study. The results show that the effect of the load associated with mental work, at this stage, leads to greater changes in the psycho-emotional state of the subjects (recorded an increase in aggressive bursts on the brightness chart, and its contour is distorted). The physiological and energetic state of organs and systems, on the other hand, is depressed compared to previous research periods and data obtained at the beginning of this week's classes.

Thus, according to Fig. 8, the experimental boys were recorded significant suppression of the whole organism with increased load on the heart and coronary vessels, as well as an

increase in the level of psychological arousal. The energy field at the end of the school month is partially absent.

The results of research obtained for the female part of the group illustrates Fig. 9. The data obtained during this period indicate an even greater increase in emotional and physical stress. Some indicators of the system voltage are outside the permissible norms, and significant gaps are recorded in the energy field, which confirms the initial assumptions. At the end of the school month, the energy field is almost absent, which confirms the increase in fatigue and exhaustion of the body.

*Before the start of training**After classes at the end of the day***Fig. 8.** The results of the boys' research in the ninth week of training*Before the start of training**After classes at the end of the day***Fig. 9.** The results of studies of girls in the ninth week of training

Summarizing the general results of this study, it can be stated that mental work for a long time leads to a certain psychological imbalance of objects (all subjects were diagnosed with stress) and causes problems not only at the psychosomatic level, but also affects the overall physical condition of objects, because the common problems of all subjects were problems with the cardiovascular system, as well as with various parts of the spine and organs of the gastrointestinal tract.

The last two problems, according to the researcher, may also be related to the fact that people who are engaged in mental work, most of the time are in a sitting position in the workplace, which, in combination with not always a comfortable place to sit and work posture, leads to deformation of the spine and additional pressure on the internal organs located in the lower torso.

For all subjects, a certain pattern of fatigue accumulation was recorded, which consisted of minor psycho-emotional shifts at the beginning of the study, exacerbation of psycho-emotional state and gradual deterioration of physiological state in the middle of the study and sharp suppression of both psycho-emotional and physiological state in the last third semester.

The energy field of all subjects gradually and steadily deteriorated. There were first single, and then systematic loss of luminescence spectra from the whole energy picture. Moreover, for male subjects, this dependence was more significant over time, i.e. the loss of energy protection in boys is more rapid, and its recovery is longer than in girls.

At the same time, additional daily dependences of the adolescent's psychophysiological state on mental load were obtained, which showed the following: the best indicators of the psychophysiological state are observed in the morning (period from 10-00 to 12-00) in the absence of other physical and intellectual morning load. At the same time, it was found that active rest for 40-60 minutes or change of mental exercise (for 60-90 minutes) after mental load, restores the previous psychophysiological state of the adolescent by 85-90%, while passive rest for 120-150 minutes, allows you to restore the previous psychophysiological state of the adolescent by only 35-45%.

5. Conclusion

In the process of scientific work the method of conducting research of psychophysiological condition of adolescents with the help of a device for gas-discharge visualization by taking into account the psychological characteristics of adolescents with simultaneous adjustment of the device, which allowed to increase accuracy, reliability and reproducibility of diagnostic results by gas-discharge imaging:

1. The features of the study of physiological and psychological state of man, including the characteristics of adolescents, as well as ways to implement such research by gas-discharge imaging, which allowed to establish a number of factors that affect the accuracy of diagnosis by this method.

2. It is established that the most rational mode of operation of the device for gas-discharge visualization is the following: operating voltage at the electrode $U = 197$ V; magnetic field in the working zone $B = 21$ mT (direct polarization); the time of action of the magnetic field on the biological object $t = 1.25$ s, which increased the efficiency of the results of diagnosis by such a device.

3. The ability of a person to perform certain intellectual tasks, both at the beginning of working hours and at the end of the working day, which is necessary for the rational use of mental work and to ensure the quality and efficiency of this work.

4. The factors influencing quality of process of reception and accuracy of processing of the information on a psychophysiological condition of the person by the device for gas-discharge visualization among which the greatest influence are such external factors, as human (correctness of preparation and carrying out experiment), climatic (humidity, temperature) are established and investigated. environment, guidance of electromagnetic fields from power devices operating nearby), elimination, or at least minimization of which allows to increase accuracy (by 8-12%), reliability (by 3-5%) and reproducibility (more than 1.8 times) the results of diagnosing the device for gas-discharge imaging.

5. It has been experimentally established that mental work for a long time leads to a certain psychological imbalance of objects (stress was diagnosed in all subjects) and causes problems not only at the psychosomatic level, but also affects the general physical condition of objects, because common problems of all subjects were problems with the cardiovascular system, as well as with various parts of the spine and organs of the gastrointestinal tract.

6. Problems with various parts of the spine and organs of the gastrointestinal tract, in the opinion of the researcher, may also be due to the fact that people who are engaged in mental work, most of the time are in a sitting position in the workplace, which, in the complex with not always a comfortable place to sit and working posture, leads to deformation of the spine and additional pressure on the internal organs located in the lower torso.

7. For all subjects a certain pattern of accumulation of fatigue was recorded, which consisted of minor psycho-emotional changes at the beginning of the study, exacerbation of psycho-emotional state and gradual deterioration of physiological state in the middle of the study and sharp suppression of both psycho-emotional and physiological state in the last third semester.

8. The energy field of all subjects gradually and steadily deteriorated. There were first single, and then systematic loss of luminescence spectra from the whole energy picture. Moreover, for male subjects, this dependence was more significant over time, ie the loss of energy protection in boys is more rapid, and its recovery is longer than in girls.

9. At the same time, there were additional daily dependences of the psychophysiological state of the adolescent on mental load, which showed the following: the best indicators of psychophysiological state are observed in the morning (period from 10-00 to 12-00) in the absence of other physical and intellectual morning load. At the same time, it was found that active rest for 40-60 minutes or change of mental exercise (for 60-90 minutes) after

mental load, restores the previous psychophysiological state of the adolescent by 85-90%, while passive rest for 120-150 minutes, allows you to restore the previous psychophysiological state of the adolescent by only 35-45%

10. The expediency of using the method of gas-discharge imaging for the purpose of preliminary diagnosis of adolescents is confirmed, which will allow timely preventive measures aimed at preventing and preventing the disease, to adjust their physical and intellectual load in the educational process.

11. Specific guidelines are provided to eliminate problems that may arise during the collection and interpretation of experimental data, which in combination with the simultaneous adjustment of the operating modes of the device formed the basis for improving research methods by GDV and increased accuracy, reliability and reproducibility of gas discharge diagnostics. visualization.

12. Research has also shown that certain subjects (topics) had a positive effect on subjects and did not depend on the time and types of mental stress associated with these subjects (topics). According to the author, such influence is subjective, associated with a special commitment of the subject to the subject (topic) or teacher (teacher). This issue is highlighted as promising and needs further study.

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Christian monuments as a resource in cultural heritage and tourism education. Results from a research project

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Abstract. The paper aims to present the results of field research conducted in different regions and municipalities in Bulgaria and related to the formation of local policies supporting the preservation and promotion of Orthodox Christian monuments. The main emphasis in the exposition is placed on examples of good practices for socialization of the Christian heritage with the active participation of the local population, as well as good practices from cross-border projects. The methods and approaches for integration of the results achieved by the field research in the education in cultural heritage and tourism have been presented. The relevance of the topic is determined by the insufficient knowledge of the local traditions and good practices for preservation, construction and promotion of the Christian monuments in Bulgaria, as part of the national cultural heritage. **Methodology:** A descriptive qualitative method was used in this research. We have also used combined methods for analysis and synthesis. The paper is part of the activities of the research project "Creating a model for Safeguarding, Socialization and Promotion of Christian Monuments in Bulgaria"- ДН 15/4 of 11.12.2017, with the financial support of the Bulgarian Science Fund with the Ministry of Education and Science of the Republic of Bulgaria.

Keywords: CHRISTIAN CULTURAL HERITAGE, SOCIALIZATION, EDUCATION, TRAINING, TOURISM

1. Introduction

The relevance of the topic is determined by the insufficient knowledge of local traditions and good practices for preservation, construction and promotion of Christian monuments in Bulgaria as part of the national cultural heritage. Active actions in this direction by representatives of state and local authorities, representatives of cultural institutions, NGOs, private initiatives, etc. need research, analysis and publicity, which will enable to establish, research and summarize the various local policies and activities for the preservation of Orthodox churches. The purpose of this article is to present the results of field research in the project "Creating a Model for Safeguarding, Promotion and Socialization of Christian Churches in Bulgaria", supported by the National Science Fund at the Ministry of Education, DN 15/4 of 12/11/2017. The main research activity of the project is carried out in the form of field research in selected municipalities - Bolyarovo, Varna, Smolyan and Zlatograd. The criteria for selection of these pilot municipalities are consistent with the specifics of the Bulgarian cultural heritage, which is not concentrated only in large cities such as Sofia, Plovdiv, Varna, Burgas, but has its valuable (including global sites) in small towns, part from which they are far from major centers and do not have good road infrastructure. All this requires a new approach and the creation of a new model that can be applied in the work of local and state authorities, as well as the cultural institutions themselves.

2. Methodology

Research methods and techniques include field research and surveys, polls and in-depth interviews with stakeholder representatives, search and systematization of various bibliographic sources stored in library, community center, archive and museum collections of regional and local cultural institutions, statistics provided by churches, municipalities and cultural institutions. Priority in the methodology is the interdisciplinary nature of scientific research – combining basic research in the field of cultural heritage and the preservation of Orthodox religious monuments with experimental fieldwork in a real environment. The project also includes educational approaches with an emphasis on acquiring new knowledge and improving the quality of student education.

3. Working hypothesis

The working hypothesis is focused on the development of a new conceptual model for safeguarding, socialization and promotion of Christian Orthodox monuments in Bulgaria and their transformation into a resource for the development of cultural tourism. This hypothesis is based on the highlights of the functioning and protection of Christian monuments at the local level on the example of selected pilot sites and the experience of good practices. The aim is for the created theoretical model to be recognized by all stakeholders and applicable in practice. As pilot sites we have preliminarily focused on the Rhodopes, Smolyan region – the

villages along the Chaya River and around the town of Zlatograd, where there are many different Orthodox Christian monuments – cathedrals, monasteries, chapels. Other pilot sites that are in the focus of research are the municipality of Bolyarovo /border area such as the above municipality of Zlatograd/ and the municipality of Varna /approved destination for the development of various types of tourism/.

4. Results and discussion

During the first stage of the project, the research work was carried out on site in the pilot municipalities. In each of them, activities and policies common to the country and specific to the region were revealed, both to the local government and to the business and the population. Lasting contacts were held and working meetings were held with representatives of various institutions in the pilot municipalities, where the specific local problems of preserving the Christian cultural heritage and the activities for their preservation were discussed. Useful connections and contacts were established with representatives of the administration of the municipalities of Bolyarovo, Smolyan and Varna, with mayors and deputy. mayors, the Regional Historical Museums in Varna and Smolyan, with representatives of the Bulgarian Orthodox Church (BOC) and individual citizens. Except with the deputy. Mayors in charge of cultural heritage in the municipalities also held working meetings with business representatives and individual patriotic Bulgarians.

Meetings and interviews were held with the representatives of the municipal authorities (the mayors of the cities of Smolyan, Zlatograd, Varna, Bolyarovo), with the directors of regional historical museums (RHM-Smolyan, RHM-Varna; the curator of Aladzha Monastery); representatives of the Bulgarian Orthodox Church (in Zlatograd and the surrounding villages, in Smolyan and the surrounding villages, in Varna); interviews with representatives of private business who contribute to the development, preservation and promotion of the Orthodox heritage of Bulgaria in the small border regions – Zlatograd and Bolyarovo in order to achieve the main objectives of the project. More details about the meetings and the researched sites can be seen on the project website - www.cho.unibit.bg.

The field research is directly related to the main goal – creating a model for safeguarding, socialization and promotion of Christian Orthodox monuments in Bulgaria, which will find practical application in the relevant parts of the regional and municipal strategic development plans. The Bulgarian good practices related to the protection, socialization and popularization of the Christian Orthodox monuments in the pilot municipalities, which are the basis for creating a working model, were studied in detail in the representative pilot municipalities.

The Bulgarian model for the safeguarding, socialization and promotion of Christian Orthodox monuments is based on the traditional caring attitude of the population towards them. This fact

was confirmed by the historical facts about the construction of the old temples in the country – through donations, selfless work, and more often than not – at the cost of life. There are many examples of such events, especially in the villages in Smolyan District – Pavelsko, Chokmanovo, Shiroka Laka and many others. [1, 2].

The historically established traditions for the protection of prayer houses in the country are still alive today. In many villages in the study areas, locals are rebuilding old, destroyed chapels and building new ones. There are many examples in all pilot municipalities – Varna, Smolyan, in the municipality of Bolyarovo. It is interesting to note that such initiatives are spontaneous and successful everywhere. Very often, with the help of the laity, supported by the local government, and often by the state and the BOC, large temples are repaired, buildings, icons and frescoes are maintained. The most indicative is the example of the repair and maintenance of the cathedral in the center of Varna, for the repair of which the funds are a donation from the state, municipality and citizens of the city.

The construction of new churches is another side of the Bulgarian model for the protection and preservation of Orthodox churches in the country.

Here we will share a small part of the field observations in the municipality of Varna. The municipal leadership of Varna works in very close cooperation with the BOC, and with the Holy Diocese of Varna and Veliko Preslav [3]. Together, the two important institutions are investing and implementing projects for the preservation and promotion of Orthodox churches located on its territory, as well as for the construction of new ones. Currently, the most important and largest project site is the newly built church “St. Procopius of Varna”. (to date, it has already been completed and illuminated – author’s note). The very active participation of the Bulgarian business, the local government, the state and individual representatives of the local population can be noticed in the activities for construction of new temples.

A special place in the field research is occupied by the analysis of the attitude of the Bulgarian business towards the protection and safeguarding of our religious heritage. Impressive is the church “St. Visarion Smolenski” in the center of Smolyan and the business-supported church “St. Procopius of Varna” in the city of Varna. These are the largest constructions, the result of the caring attitude to our Orthodox heritage by the Bulgarian business. There are smaller similar constructions in many different villages and towns in the studied areas.

The restoration of chapels also occupies a significant place in the field research. Here we will give an example from the border municipality of Zlatograd. The caring attitude of the citizens in Zlatograd towards the Orthodox churches deserves special admiration. Despite the fact that a large part of the population professes another religion, everyone, except for faith and age, cares about their Orthodox heritage. Chapel restoration activities are specific to this area. For example, the restoration of the chapel “St. Nedelya”, located not far from the city. The chapel was restored on the initiative of the Molevi family and the other citizens, on the idea and together with the then priest Father Atanas Arolski. It is located above the city, in the forest, and the citizens themselves have built a road there. With the permission of the municipality of Zlatograd, each family had the opportunity to build a “hut” around the chapel and spend their free time there. Many took advantage of the opportunity and now small “huts” (as the locals call them) are erected around the chapel. The chapel itself is very well maintained, the road to it, although steep, is in excellent condition. The whole space around the chapel has been renovated, there are places for rest, for children to play. There is water and electricity [4].

In most municipalities, the local government seeks to assist the local population and the BOC in preserving and multiplying Christian churches. In this respect, the attitude of the municipality of Bolyarovo is indicative, which actively participates in the restoration and construction of various temples on its territory. Bolyarovo Municipality is a crossroads of ancient civilizations, where ethnocultural processes take place from the northwest (Balkan Peninsula, Central and Western Europe) to the southeast

(Asia Minor and the Middle East) and vice versa. This determines the specificity and richness of the cultural heritage of this region, which is a reflection and result of centuries of history – 14 discovered archaeological sites, 5 ancient churches and 5 fortresses testify to a rich and ancient past, which the inhabitants of Bolyarovo are rightly proud of.

The municipality is located in the border areas of Bulgaria - its southeastern part borders the Republic of Turkey. It is known that for various historical reasons, an ethnic Bulgarian population lives on the other side of the border. The clearest evidence are the temples in the town of Kırklareli and the town of Edirne, which are active, they are taken care of not only by the local Christians, but also by the Bulgarian state, patriotic Bulgarians, cultural and educational institutions. Within the cross-border cooperation, the municipality of Elhovo and the municipality of Bolyarovo hold various events and activities that illustrate the good neighborly relations. Here the possibilities of the Program for cross-border cooperation between the Republic of Bulgaria and the Republic of Turkey are used to the maximum, especially for the Orthodox churches left on the territory of Turkey [5]. The development of projects under the European programs for development of municipalities and rural areas, which include temples, is also a very effective policy.

Last but not least, the active position of the Bulgarian population in terms of their religious heritage of local and national importance should be noted. During the field research, meetings and talks were held with dozens of residents who cared for and maintained chapels and temples. In almost all cases, caring for the temple or chapel was seen as a family honor and duty.

In order to promote the goals, tasks and results of the project activity, a project website has been created, located on the ULSIT website. - www.cho.unibit.bg. For its creation, a thematic structure was developed, containing menus, submenus, information texts. It publishes information about the project – goals, results, gallery, publications on the project, issues, etc., and this information is updated according to the stage development of the project.

5. Conclusions and summary

One of the main priority areas of the project research is the popularization of Orthodox churches in places, at regional and national level. In the process of conducting field research on the project in the pilot municipalities of Varna, Smolyan, Zlatograd and Bolyarovo were established quite stable patterns, which with their effectiveness and efficiency give grounds to derive a common model for the promotion of Orthodox churches. In this model the main subjects are:

- BOC,
- the state with its cultural institutions,
- local authorities,
- businesses,
- and individual citizens outside the above groups.

Each of these entities is active, and very often they work in sync with the others.

The promotion and socialization of Orthodox churches in the country is a rather complex and complicated process. In this regard, there is an active participation of the population and municipal authorities. In every settlement the temple holiday is the biggest local holiday celebrated not only by the locals, but also by many guests. Naturally, the temple is a major place of interest. Very often in connection with the celebration of the holiday the municipality allocates funds for small current repairs.

Another very important form of promotion and socialization of temples is their inclusion in tourist routes. However, if we look in more detail which of the Bulgarian churches and monasteries are subject to cultural tourism, we will find that these are the large and famous monasteries – Rila, Bachkovo, Troyan and other famous churches in Sofia, Veliko Tarnovo, Plovdiv, the “Golden Church” – part of the National Historical and Archaeological Reserve Veliko Preslav, as well as churches in other cities, which are deservedly objects of constant tourist interest. Many temples remain away from the tourist routes and their

uniqueness, historical and cultural significance for the specific region and for our country remain unknown to tourists.

Apart from being historical monuments, Orthodox churches can also be the subject of organized religious and pilgrimage tourism. Such organized trips are offered not only for purely religious purposes. They provide an opportunity for tourists to join the local history as part of the general Bulgarian, as well as the beauty of nature. The end result of religiously motivated tourism is the enrichment of our tourism industry with new, atypical to date resources for use.

The achieved results and the developed scientific products are integrated in the educational process and create conditions for encouraging the exchange of scientific and practical experience between educational, scientific and cultural institutions.

The areas of application of the results are related to the information environment for stimulating interdisciplinary research and improving the quality of education in the field of cultural heritage.

The achieved results and the developed scientific products are applicable for updating the curricula and programs in the specialties in ULSIT – “Cultural Tourism” and “Cultural and Historical Heritage” in the Bachelor’s degree and “Historical Heritage and Cultural Institutions” in the Master’s degree. The scientific results achieved by the implementation of the project are also integrated in the developed new master’s program “Heritage and Museums in the Information Environment”, which started in the academic year 2020-2021.

The work on the implementation of the scientific project “Creating a model of Safeguarding, Socialization and Promotion of Christian Monuments in Bulgaria”, which includes specific field research in pilot municipalities – Varna, Smolyan and Bolyarovo Municipality showed that in our country there are many Orthodox temples that deserve to be studied not only as cult monuments and architectural landmarks, but also as an object of constant care of the local population, municipal authorities, BOC and business for their maintenance, restoration and multiplication.

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Second language learning and technology: research on second language vocabulary learning

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Abstract: Language learning and technology has now become an interesting field of inquiry for many research scholars and professionals in the field of second language acquisition. Advances in information technology have affected second language teaching and learning as well. A plethora of research on the development of second language skills has surged especially in the last two decades. A number of studies employing various research designs and methodological approaches have provided some evidence on the effectiveness of technology on second language learning and teaching. However, much of research has shown mixed findings and inconclusive results. Hence, research community is encouraging further studies on the pursuit of finding out for whom and under what conditions is technology rather effective in language learning and teaching. This paper presents a brief review of previous studies and some preliminary research on the effects of technology, i.e. multimedia annotations/glossing on second language vocabulary learning. This paper draws on Mayer's *Cognitive Theory of Multimedia Learning* (2009) and examines the impact of multimedia annotations on second language vocabulary learning. Preliminary research shows that certain multimedia annotation modes yield positive evidence on enhancing second language reading comprehension and vocabulary learning.

Keywords: COMPUTER-ASSISTED LANGUAGE LEARNING, TECHNOLOGY, MULTIMEDIA ANNOTATION, VOCABULARY, LEARNER AUTONOMY

1. Introduction

1.1 A brief history of Computer-Assisted Language Learning (CALL)

Language learning and technology is a phrase that has already occupied an important place in the field of SLA. The beginnings of using computers for language learning purposes date back to the early use of computers mainly in institutional form, for example, by some universities in the USA. The development of CALL has been closely linked to technological advancements that date back to the 1950s. Therefore, trying to have a more representative definition of the field of CALL has not been an easy task due to its ever-changing nature, hence, producing terminology that has not survived the time [16], [3], [4], [9], [13]. Despite the difficult task of defining and dividing the field into stages of development, distinct from each other, the literature so far distinguishes the division offered by Warschauer [15] and Bax [3]. CALL is divided into three main periods [18] where each of them has corresponded to a certain level of technological development and also to certain pedagogical approaches. The first period was called the behavioristic CALL which was conceived in the fifties of the twentieth century and was implemented in the sixties and seventies. A characteristic of this period was that the computer did not provide sufficient interaction opportunities and mainly provided tasks and programs for repetitive exercises that were often described in derogatory (pejorative) language such as tedious and monotonous activities. The second phase, known as the communicative CALL, emerged in the 1970s and 1980s, at a time when behaviorist approaches to language teaching were gradually diminished in both the theoretical and pedagogical levels, especially by taking advantage of the opportunities offered by personal computers. Learning at this stage coincided with cognitive theories that emphasized that learning was "a process of discovery, expression, and development" [16]. Meanwhile, the third phase known as the integrated CALL that emerged strongly in the early twenty-first century, resulted in the shift from the cognitive point of view of communicative teaching to the social or socio-cognitive point of view which focused on the use of language in authentic social contexts by integrating technology into the language learning process and thus developing key language skills such as listening, speaking, reading and writing. Thus, the computer with multimedia capacities and networking offers not only fast and multidimensional opportunities in the function of language development, but, already, it has become an imperative for use in the developed world. Of course, these three stages of development cannot be divided into strict timelines because while a new stage has emerged the previous stage has continued for a while until the accommodation of the new stage. On the other hand, Bax [3] makes a critical analysis of the

division of periods that Warschauer makes by offering a different perspective. Bax makes a slightly different classification by dividing the CALL development periods into the limited, open, and integrated period. Bax, according to Healey [9] argues that the early use of technology for teaching purposes was not necessarily with a behavioral approach but was limited in opportunity and consequently calls it a limited phase. Meanwhile, with technological advancements and the use of the internet with a multitude of possibilities it offers we have reached the stage that Bax calls the open CALL that lies between the limited and the integrated. While Bax classifies the third phase as an integrated CALL, the same as Warschauer, but which differs in the sense of the definition that according to him, the integrated CALL, will appear when it is 'normalized' in terms of use. The concept of the normalization of technology in teaching and learning [3] means "the time when technology is invisible, not even considered as technology but as something real in everyday life", as is common now when we use a piece of paper and a pencil to write on it, these tools that were once technologically advanced tools but that do not look like them now due to full integration into everyday life. These are the three main periods of CALL development where the latter already includes the use of hypermedia annotations to develop reading competence and to learn vocabulary in the second language.

2. Learning Autonomy and CALL

Student-centered pedagogical approaches and methods in the language learning process have been conceived and developed in different periods. Pedagogical practices that have aimed at shifting from teacher-centered teaching to student-centered teaching have led to the gradual achievement of what is known as learning autonomy. The implementation of pedagogical approaches with a focus on the student dates back to the fifties of the twentieth century when educational psychology placed special emphasis on the role that the individual plays in the learning process, i.e. as an active participant in this process shaping the learning experience itself [13]. Similarly, constructivism placed special emphasis on the student, focusing not on the knowledge to be transmitted but on the process of constructing, organizing and sharing that knowledge, developments that have influenced new methodological approaches to teaching, mainly shifting from teacher-centered classroom to student-centered classroom [13]. However, the authors note that despite the vital role of technology in the language learning process, there is still a lack of clarity and terminological consistency between the objectives, i.e. the development of learning autonomy, and the means to reach this stage, e.g. internet etc. In fact, it has long been mistakenly thought that technology would independently enable users to control and develop the learning process without the help of the teacher [13]. The interconnectedness of CALL and

learning autonomy has attracted the attention of many researchers [6], [12], [13], [4]. Language learning and technology are often associated with learning autonomy because of the opportunities that technology offers for continuous learning outside the school by providing space for self-study, based on student's interest and also independently of the teacher [4]. [4] computers consistently offer greater autonomy, and unlike teachers, are also available outside of school and accessible at any place and time, opportunities that are limited in relation to qualified teachers but that however they offer many modalities that the book does not offer, for example. And in this sense, Beatty, emphasizes the increasing role of the school to promote the autonomy of learning beyond the classroom, enabling students not only simple benefit and knowledge building but also tools and ways to enrich and expand the knowledge acquired from formal education [4]. Especially due to the differences and special characteristics of students, including different levels of linguistic development, autonomy in the process of learning through technology offers users a variety of opportunities and modalities. Another important issue related to the autonomy of learning is the way of presenting the teaching material in a digital environment as opposed to the physical material. The opportunities offered by the digital learning environment, due to the nonlinear organization of the material, are at a great advantage over the traditional learning environment. Unlike learning in a traditional environment, e.g. from the book where it usually happens that information and material are organized linearly, learning in the digital environment is more attractive and offers greater autonomy and control in the learning process and also encourages and develops critical thinking [4]. In this sense, the use of hypermedia annotations for the purpose of improving vocabulary learning the second language significantly affects the independence of students from the teacher on the one hand and the promotion of learning autonomy on the other.

3. Technology and vocabulary learning

Some of the key studies investigating the relationship between annotation use and vocabulary learning are the following: Al-Seghayer [2], Chun & Plass [7], Akbulut [1], Yanguas [17], Ko [8], Varol & Erçetin [14], Yoshii [19], Yeh & Wang [18], Yoshii & Flaitz [20], Ramazenali & Faez [11] etc. In this regard, the utilization of multimedia annotations for the enhancement of vocabulary learning have received a particular interest from the research community, therefore serving as an interesting and important research area for many scholars and practitioners.

Our review of literature will, inevitably, have to start with Chun and Plass who did some pioneering research on the topic of multimedia annotations and vocabulary acquisition, which later served as an interesting area of inquiry for many scholars along the advancement of technology and the emergence of digital learning environments. The study intended to identify effects of different annotation modes and modalities for vocabulary learning while using a computer program for L2 reading. "The results showed a higher rate of incidental learning than expected (25% accuracy on production tests, 77% on recognition tests), significantly higher scores for words that were annotated with pictures + text than for those with video + text or text only [7]. Chun and Plass employed a within-subjects design in their study, however, they recommended between-subjects design in future studies.

Some years later, Al-Seghayer [2], in a study consisting of 30 participants using a within-subject design examined effects of three annotation conditions, namely text alone, text + picture, and text + video, on vocabulary learning. Surprisingly, this study "yielded the conclusion that a video clip is more effective in teaching unknown vocabulary words than a still picture. Among the suggested factors that explain such a result are that video better builds a mental image, better creates curiosity leading to increased concentration".

Ko [8] investigated the relationship between second language proficiency and annotation mode in incidental vocabulary learning. Four groups under different annotation conditions, i.e., no annotation, L1 annotation, L2 annotation, and L1 + L2 annotation,

were used in the study. Findings of the study showed that L1 annotation and L1 + L2 annotation were effective for lower-level learners whereas L2 annotation and L1+L2 annotation were effective for higher-level learners.

Similarly, Yanguas studied the effects of different types of multimedia annotations, namely textual, pictorial and textual + pictorial, on comprehension of the text and vocabulary learning. "Results of quantitative and qualitative analyses of the data gathered showed first that all multimedia gloss groups noticed and recognized significantly more of the target words than the control group" [17].

Yoshii examined effects of L1 and L2 annotations on incidental vocabulary learning in a multimedia learning environment and found that "both L1 and L2 glosses are effective for incidental vocabulary learning, but long-term retention may differ between the two types" [19].

Akbulut [1] investigated the effectiveness of different annotation modes, namely definitions of words, definition + picture and definition + video, on incidental vocabulary learning and reading comprehension. "Results showed that the groups that had access to definitions along with both types of visuals had significantly higher vocabulary scores on both immediate and delayed posttests than the definition only group. However, no differences were observed on the reading comprehension test".

Varol and Erçetin went on further and studied the effects of working memory, annotation mode, and incidental vocabulary learning. Using a between groups experimental design, the study found "a significant relationship between working memory and reading comprehension regardless of treatment condition and immediate positive effects of glosses on incidental vocabulary learning" [14].

Ramazenali and Faez conducted research on vocabulary learning with the help of multimedia annotations. The study drew on Mayer's cognitive theory of multimedia learning which is the theoretical framework for this present study, as well. Their study intended to identify which annotation modes, namely L2 definition, aural, and video animation, are effective in enhancing vocabulary learning and retention. "The quantitative findings revealed that dual glossing modes were more effective than single glossing modes for many test sessions. . . and that learners preferred the dual glossing mode of L2 definition and video animation" [11]. In a similar fashion to the present study, yet with distinct socio-cultural setting and methodological approach, Yeh & Wang, [18] investigated effects of three annotation modes, namely text annotation only, text plus picture, and text + picture coupled with sound. Findings of the study revealed that text + picture was the most effective mode in vocabulary learning.

Yoshii and Falitz [20] examined the effect of annotation mode on incidental vocabulary retention. 151 beginner and intermediate adult learners of English participated in the study and read a story under different annotation conditions, namely text-only, picture only, and a combination of text and picture.

Each of the studies described above was conducted in different research settings and circumstances, therefore producing mixed results. For example, Chun and Plass [7] reported that text + picture is more effective than text + video for incidental vocabulary learning in contrast to Al-Seghayer's study whose findings revealed the opposite. This could be caused by a number of factors such as the socio-cultural and language background of participants, age difference, second language proficiency, as well as research design and data collection instruments. The research community is continually encouraging other studies similar to the above-mentioned ones. Hence, this present study aims to contribute to the current body of knowledge by conducting research in a specific setting, therefore, aiming to produce first-hand findings and insights.

4. Conclusions

Obviously, vocabulary learning in a second language is a complex process. People process information through different verbal channels in different languages, however, all people, no matter what language they speak, have a common non-verbal system or what Paivio calls the imagery system. Furthermore, Mayer [9] states that “people learn better from words and pictures than from words alone - made possible through multimedia instruction - however, the question is how can we design multimedia instruction that improves learner understanding of presented material?”

As for the pedagogical implications, we can conclude that annotating second language texts on different modes can improve vocabulary learning. Therefore, the use of multimedia annotations in second language vocabulary learning is recommended as a useful pedagogical tool.

This study was limited to a certain age group and English proficiency as well as a specific research design, methodology and cultural setting. It was also limited to investigating only incidental vocabulary learning. Future studies are recommended using different first language backgrounds and cultures, different age groups and different methodological and study perspectives.

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