

# ABSTRACTS

of scientific papers of

**eng. Sonya Kancheva Vachinska-Aleksandrova, PhD**

submitted for participation in a competition for “Associate professor“  
in professional field 5.13. General engineering,  
scientific field „Occupational safety and fire-fighting equipment“,  
announced for the department of “Manufacturing technologies and machine  
tools” in a Faculty of Manufacturing Engineering and Technologies  
at the Technical University of Varna, Bulgaria,  
published in the State Gazette no. 15/ February 19, 2021



2021

## ABSTRACTS OF SCIENTIFIC PAPERS

For the application a total of 17 peer-reviewed scientific papers are presented. A short summary of the papers is shown in Table 1.

**Table 1.** Scientific papers - *indicators*

<b>Indicators type</b>	<b>Number</b>
Habilitation work – monograph [indicator B.3]	1
Scientific publications [indicator Г.7 & Г.8]	16
Papers with full authorship	12
English language papers	4

The presented scientific papers are categorized into three groups – B.3, Г.7 and Г.8, according to the document „**5.2. Minimum national requirements - Annex 1** “

Publications are systematized in the five thematic groups as following:

- **Workplaces organization** (3 publications - Г.8.1, Г.8.2, Г.8.5);
- **Environmental risk factors** (3 publications - Г.7.1, Г.8.3, Г.8.10);
- **Safety and health preventions** (3 publications - Г.8.4, Г.8.6, Г.8.7);
- **Innovative education** (3 publications - Г.8.8, Г.8.9, Г.8.12);
- **Fundamental engineering competencies** (4 publications - Г.8.11, Г.8.13, Г.8.14, Г.8.15).

## **[Indicator B.3]** Habilitation work – monograph:

**[B.3.1.] Vachinska S.,** *HEALTHY AND SAFE WORKPLACES, Work environment risk observation in the related to the management of health and safety at work*, „Tonex Ltd 2000“, 2020, pp. 130, ISBN 978-619-7349-12-2

The subject of the monographic work is the analysis of the health risk in the work environment with daily use of a computer. The object of the analysis is the probability of damage to the workers' health caused by daily, uniform and prolonged working postures, unhealthy movements, irrational organization of work and the subsequent occurrence of pain in muscles, joints, spine and other similar disorders known as musculoskeletal disorder (MSD).

The paper summarizes the main activities for health risk assessment, their need, benefits and specific steps to implement, argues and emphasizes the need to apply good practices in finding solutions to reduce pain, stress or disability due to people's long work in front of the computer.

The presentation focuses on health risk management in a computerized work environment with a special focus on the risk of developing musculoskeletal symptoms (MSS) and the risk of stress caused by work movements, environment and relationships. Summarizing the issues, the following conclusions are made:

- A centralized approach to the human factor in the design and organization of design-engineering work with computer systems is mandatory;
- It is recommended to be create conditions for changing a long-maintained uniform working posture;
- Systematic control and monitoring is required for the presence of MSS risk related to the working posture;
- There is a need to assess the health associated with reducing the stress caused by high-tech computerized workplaces;
- Identifying and analyzing specific problems such as working conditions and health risks at work will help developing health and organizational programs with care for the future of people;
- Investments in improving jobs and preventing diseases caused by the work of people in the digital age will be reflected in increased work efficiency, fewer non-working days due to sick leave, better health insurance, better quality of life, etc.;

- The work and research of specialists in the field of the human factor will be significant and will continue to be relevant until people stop working and their work is completely replaced by high-tech systems.

**[Indicator Г.7.] Scientific publications indexed in internationally recognized databases:**

**[Г.7.1.] Vachinska S., *Assessment study for occupational risk among computer operators in engineering higher education*, Book of International Conference of Biomedical Innovation and Applications, 2019, Varna, p. 85-89, ISBN: 978-1-7281-4754-3 (SCOPUS)**

The article gives analyzed and comprehensive guidance about occupational risk for computer workers in engineering higher education. Long time computer work, people receive injury, damage or disorder of the joints or other tissues in the upper limbs, lower limbs or the back. These are musculoskeletal disorders (MSDs). Weak pain two times per week at the same location during the work is a red alarm for assessing health risk. Study described how to comply with the health and safety regulations and ergonomic equipment importance. Successful risk assessment requires related competence, which should be developed via theoretical and practical learning during higher education at universities.

Use of computers starts in schools and continues in universities. Summarised the duration of work in front of a computer through our lifetime is more than 55 years and contain daily uniform activities and postures. In Bulgaria this work is mostly sitting in front of a computer for a long period of time, using keyboard or a mouse and the time is much above that for the average consumer. If work equipment, movements and organization are not designed correctly and organized to protect human health, they start to experience/feel/ different aches, tingling, numbness and stiffness. After years of recurrence, these symptoms develop into injuries or damage to muscles, joints or ligaments, limbs and back, diagnosed as MSD. On the basis of a questionnaire for the

position of the body and limbs when working with a computer and a map of body pain, analyzes were made and the following conclusions were reached:

- The level of knowledge of engineers and their competence for health protection is low, but some of them are not aware of it, and others admit that they would like to be trained;
- Targeted training courses are needed to prevent harmful movements and incorrect postures;
- It is recommended to periodically examine the employees with an in-depth analysis of how to change their way of work and life to a healthier and non-harmful one;
- Prolonged postures and unvaried movements in front of the screens can not lead to physical injury but lead to MSD, and engineers are not physically active enough, lead a sedentary life, which is a prerequisite for injury;
- It is important to introduce a specialized training program in the engineering faculties to create knowledge and skills for healthy work in future engineers.

**[Indicator Г.8.] Scientific publications indexed in non-indexed journals and proceedings**

**[Г.8.1.] Vachinska S.** *Operator's place organization influence and dependence upon manufacturing process*, Report from the MTM'2010 Congress, May 2010, Sofia, Journal Machines, Technologies, Materials, Book 4/119, p. 61-65, ISSN 310-3946

The subject of the paper is description and makes into a system the stages of projection working places. Requires are conform to the rationalization, the comprehensive mechanization, the ergonomics point of view, the security in work, etc. The article indicates general points for design working places and show dependence into sitting or standing situation and production activities on the industry.

The time spent at work is equal to almost a third of the life of the working person. When studying the interaction between man, technology and the work environment, the main emphasis is based on the human-centered approach of designing workplaces. Its own specific features characterize each production, administrative, service or other type of work activity but for each of them the recurring element is the human. Man has great but not unlimited physical and psychological capabilities. In this article, it is made an attempt to systematize the requirements for design and organization of workplaces as the elementary structural unit for each type of activity. When determining the size and organization of the workplace, it is taken into account that in addition to workers, it also contains elements such as materials, raw materials, machines, tools, production equipment, means for labor protection and safety, etc.

When creating and organizing the workplace, it is necessary to observe the following requirements for rationality:

- convenient location of the elements in the workplace;
- optimal completion of the limited work area with the necessary tools - machines, auxiliary equipment, etc.;
- rhythmic supply of the workplace with the necessary materials and raw materials to maintain a uninterrupted work process;
- ensuring safety at work from harmful effects of the environment;
- creating convenience and comfort at the workplace through appropriate sanitary - hygienic, psycho - physiological and aesthetic working conditions;
- technical requirements - modern, serviceable and safe equipment with the necessary equipment, tools, aids and others depending on the specifics of the work process;
- organizational requirements - optimal location of workers taking into account the complexity of work and the capabilities of individuals;
- social - psychological requirements - taking into account the qualifications of employees, their job satisfaction and the formation of a positive psychological climate;
- economic requirements - ensuring high productivity and quality of labor and reducing production costs.

The stricter the requirements, the more comfortable the workplace will be and the more physical and mental effort people will spend on quality work instead of adapting to the inconveniences of the workplace.

[Г.8.2.] **Vachinska S.**, *The ergonomic methods of approach at the work organization into apparel industry*, General textile conference'2010 – Inovation in textile and clothing, Journal Textile and Clothing, no. 2, 2011, Sofia, p. 41-45, ISSN 1013-912X

The article presents a classification of requires the organization on the apparel industry in Bulgaria and stress on the ergonomic point of view in work. There are the basic rules and criteria for making a correct ergonomic working process and manipulations when you organize the clothing production.

An analysis was made for the development of the garment industry for an eight-year period, presenting statistics on the number of employees in the sector, for the production of clothing in cash and in BGN. Growth is associated with various factors, one of which is the low cost of labor in our country. The stages for organization of efficient production of textile garments are presented and the inconveniences of the current production are described as: monotony, long uniform work, use of the same muscle groups, closed and dusty rooms, insufficient lighting, etc.

A classification with the requirements based on the human factor is presented, which can be used as a comparative assessment tool or as a starting point for compiling a safe and ergonomic sewing production. It is a list of indicators related to working postures, work movements, equipment and specifics of the production process, affecting work, human health and productivity. Ergonomic guidelines and recommendations for the selection of human health-friendly labor movements, labor organizations, types of equipment and complete management-organizational and technical-economic solutions are given.

The modern globalization of the world allows creating productions in all continents and countries. Boundaries and distances are not essential. Leading is the quality and low cost of the final product. In the conditions of economic crisis, investors are directed to regions with a stable political system and a flexible economy, such as ours.

In conclusion, when creating a work organization, it is necessary to study the features of the process or operations, which will to be performed in the enterprise, the specific conditions of production, the number of workers, the types of materials, which will to be used, tools and machines, necessary for the implementation of the production

process and then to proceed to the improvement of an existing or to the creation of a new organization of labor.

[Г.8.3.] **Vachinska S.**, Working environment and ergonomic analysis in apparel industry: A field study Bulgaria, Book from XVI International conference Environmental Ergonomics, Greece, 2011, p. 317-320, ISBN 987-960-489-272-3

The article describes ways to preserve workers' health and prevent risk at work, which are joint responsibilities between government, employer and worker. A ten-year period of development of the sewing industry in Bulgaria is considered and the double increase of the employed in this sector of the light industry is noted. The difficult work in the sector is associated with repetitive hand movements, prolonged sitting or standing positions, high speed and high production rate, short lead times, etc. On the other hand, good working conditions favor labor productivity and reduce the risk to worker health. On the other hand, good working conditions favor labor productivity and reduce the risk to worker health. The aim of the research was to study the working conditions in Bulgarian sewing companies and to assess the conditions with an emphasis on the human factor and the ergonomics of the working environment.

15 sewing enterprises from different economic regions of the country were studied. The expert evaluation method was used. A questionnaire specially developed for the purpose of the research was filled in and the questions were grouped into four groups: A - Characteristics of the working premises; B - Characteristics of workplaces, humane's movements and postures; C - Characteristics of the equipment (machines, equipment, tools, protective equipment); D - Characteristics of other factors: human, social, organizational, etc. A five-point scale from 1 to 5 (1-unsatisfactory, 2-satisfactory, 3-good, 4-very good and 5-excellent) is used to determine the grade.

Our initial hypothesis of poor, uncomfortable and ergonomic working conditions was refuted. The average score for all categories of companies (up to 50 employees, 51-100 employees, 101-200 employees, 201-1000 employees and over 1000 employees) is about good and very good in all studied groups of factors. Therefore, the turnover of workers in the sector is for a different reason than the poor working



environment in the industry. All companies take care and provide good and very good working conditions.

Specific recommendations for improving the working environment as well as schemes with proposals for improving the comfort and safety of workplaces were provided to each of the surveyed companies after analyzing their results. It was found that more and more sewing companies in Bulgaria are aware of the need to constantly improve working conditions and increase comfort in work processes as they are directly related to maintaining good health of workers and people are the most valuable capital of every manufacturer in the industry.

Ergonomic optimization of the working environment is a factor on which largely depends the health of workers, the frequency and duration of general and occupational morbidity, reflecting on the social and economic results of production.

Adherence to certain norms and the creation of suitable working conditions for the worker guarantees longer working capacity, less use of sick days, less staff turnover, better motivation of workers and better labor productivity. All this reflects on the competitiveness of the company in the market and is a condition for lasting positive results.

[Г.8.4.] **Vachinska S.**, Tsoneva Z., *Possibility of worker's health prevention in the apparel industry*, Proceeding from International Scientific Conference – UNITECH'10, Book II, 2010, Gabrovo, p. II-333 – II-338, ISSN 1313-230X

The paper justifies necessary to ergonomically projection work. Working life is changing at an ever-increasing speed, which can give rise to new risk areas or change the way that occupational safety and health needs to be managed. We try to carry out a number of activities about the implication of the 'Good Work' for safety and health at work. Every year, millions of people are injured at work, or have their health seriously harmed in the workplace. For these reasons, it is important that all types and sizes of enterprise are ergonomically based.

In its centuries-long biological and physiological development, the human body has changed gradually to reach the spine to its current upright state. The modern way of life with the mass use of a sitting position for work, begins to create problems by negatively affecting the posture of the body and the position of the spine. Prolonged incorrect sitting, monotonous movements of the arms, immobilization of the legs cause pain in the back, neck, waist, shoulders, arms, etc., which are associated with working movements and prolonged immobilization. As early as the 18th century, doctors noticed that people who had to maintain the same posture for a long time began to have health problems such as musculoskeletal disorders (MSDs).

A list of physical and organizational health risk factors is presented, as well as statistics on the 27 EU Members and reported risks from workers - 62% of workers are exposed to repetitive wrist and hand movements for a quarter or more of their time, 46% - in painful or tiring postures, 35% - in carrying or moving heavy loads. Our country is one of the countries with high risk factors - 67.6% risk of repetitive movements, 71% risk of prolonged postures, according to research by the European Agency for Safety and Health at Work.

Solutions and visual images for correct sitting posture, ways to adjust the equipment according to the individual anthropometric dimensions of the worker and other ways to relieving the workload of people working in the garment industry. In conclusion, the following accents are recommended for health prevention:

- Ergonomic design of work systems in the sewing industry;
- Monitoring the health status of workers;
- Regular training and informing employees on how to protect their health;
- Rehabilitation and integration of workers suffering from MSDs.

[Г.8.5.] **Vachinska S.**, *Approaches for preventing bad working postures in apparel industry*, General textile conference'2011 – Inovation in textile and clothing, Journal Textile and Clothing 1/2012, p. 2-7, Sofia, ISSN 1310-912X

Many work situations in apparel industry require static postures, repetitive hand movements and high speed process. Most of them are associated with the reasons of work

risk and work-related musculoskeletal disorders. This article presents ergonomic recommendation for prevention bad working postures. The position of occupational ergonomics in legislation becomes clear that ergonomics should be part of the occupational safety and health policy in each company.

Statistics report an increase in pain associated with the upper limbs, neck, lower back and other aggregates called musculoskeletal disorders (MSDs). Good working posture is a prerequisite for preventing work-related MSDs. This position is good, when is is comfortable and when the joints are in their natural position, the so-called neutral position of the body. The neutral position of the body during work is recommended to reduce the load and tension of the muscles, tendons and skeletal system, thereby the risk of occurrence and development of MSS in workers is reduced, the body's energy expenditure is lower and respectively fatigue comes after a longer period.

The need for good working conditions has been repeatedly discussed and proven from an economic and social point of view. They are directly related to the sick days used, the quality of life of the people, their competitiveness and the quality of their work.

Any work can be designed by engineers and organized by managers in such a way that unhealthy postures are completely avoided or at least kept to a minimum. The general rules for this are:

- applying safety principles in the design of the production process (PP) - too often the consequences of work on the physical load of workers are not taken into account, so it is important to include in the project team specialists familiar with the human factor;
- consideration of the concept of PP and its adjustment according to the specific needs of the specific production;
- consultation with workers in the design of production and work processes (filling out a questionnaire with questions concerning movements and postures at work);
- training and motivating workers to maintain proper posture and work movements;
- periodic control and evaluation of working positures.

Health prevention activities are extremely important, but they are slow and difficult to implement. Many executives believe that significant investments are needed for this and postpone them. Their need is visible and indisputable only when an accident occurs. Solutions are sometimes simple and uncomplicated, but a specialist is needed to compile an assessment chart or list of correct and safe movements, postures, etc., to train people about them and to explain to them how important it is to follow them. The publication provides a detailed list, specially developed for activities in the clothing industry, which

are illustrated with author's photos from the industry. The "correct" and "risky" movements and postures are shown and the general rules for avoiding dangers are described:

- ergonomic approach in designing workplaces and processes;
- adjustability of equipment or of facilities according to individual anthropometry;
- research and listening to the complaints of the employees;
- training and motivation for maintaining health;
- periodic control and risk assessment.

This should be mandatory in any enterprise with a concept for future development because it is the basis of the social policy and labor prevention activities.

[Г.8.6.] **Vachinska S.**, *Checklist for the risk assessment in apparel industry. Work area of tailor to sewing machine*, Proceedings from International Scientific Conference – UNITECH'11, Vol. II, p. II-300 – II-304, 2011, Gabrovo, ISSN 1313-230X

The health of workers in the clothing industry is at risk of exposure to incorrect postures, manual labor and poor environment. The article provides information on the dangers and risks of straight machine operators caused by their work in clothing companies. Good and comfortable posture means the joints of the limbs are in a neutral position and the muscles are neither shortened nor stretched. This prevents tension and stress in them, in the tendons and in the entire skeletal system, which reduces the likelihood of musculoskeletal injuries. Two specialized questionnaires were presented: (1) for risk assessment by an occupational safety specialist and (2) for assessment at the workplace and by the employee with an included body map to indicate painful areas on the body.

Based on logical and didactic analyzes, a person has learned to plan, analyze, anticipate, make various technical and / or organizational decisions to avoid dangers. Danger can cause harm, lead to an accident, illness, injury, death, loss of production, damage to machinery, environmental pollution, etc. The health of workers in the

clothing industry and in particular the operators of straight machines is at high risk of prolonged improper sitting postures, poor microclimate, noise, vibration and more. The article presents two specialized questionnaires for assessing the condition of the operator's workplace. A human factor specialist completes one of the questionnaires and a worker completes the other one. Comparing the results in different places in the production lines, conclusions can be made about where and what changes should be made in order to avoid health risks.

Many European directives on occupational safety and health require risk assessments. In Bulgaria, law on health and safety at work exists but often its application is only formal on paper without real impact on the daily lives of workers. It is good practice to be made periodic risk assessments to be taken effective measures to protect workers' health. The process of prevention of accidents at work begins with the reduction and, if possible, complete elimination of possible risks. This is followed by the implementation of measures for collective prevention and finally the use of personal protective equipment. The key business factors motivating companies to occupational safety and health are:

- presenting the company as a socially responsible and well-managed organization;
- meeting customer expectations regarding safety and health at work;
- reduction of the company's insurance costs;
- maintaining productivity and morality in the company;
- increasing the ability to hire and retain experienced workers;
- reduction of the use of sick days.

The poor state of occupational safety and health has a disproportionate impact on small businesses. About 60% of companies that stop working for more than nine days due to poor working conditions or accidents drop out of the market. Businesses with good occupational safety and health status can realize benefits to increase productivity, such as:

- safer work methods which allows work to be done faster and by fewer people;
- reduced number of accidents, incidents and illnesses (fewer absences due to illness);
- maximum levels of recruitment, motivation and retention of experienced staff.

The message is clear - providing healthy jobs in garment factories is good for business and it is good for people too.

[Г.8.7.] **Vachinska S.**, *Recommendations for safety and health at workmen in clothing enterprises*, Proceedings from International Scientific Conference – UNITECH'11, Vol. II, p. II-305 – II-310, 2011, Gabrovo, ISSN 1313-230X

One of the most important results for any company policy is the reduction of accidents at work and occupational diseases of the people working in it. The debate on safety and health at work is an important element of the social commitment of managers and is related to the quality of work. Protecting the health of workers is an integral part of corporate social responsibility and is bound to the company's image. Every serious and self-respecting company takes care of its staff. The article emphasizes the role of occupational safety and health boards in each factory, describes the importance and types of occupational risk, ways to prevent accidents and the need to draw up a risk map at work.

Occupational risk exists in every workplace. Its assessment is mandatory under the legislation on health and safety at work. The article presents examples and recommendations for providing safe workplaces to help employers in the sewing industry who want their business to be efficient and competitive. The serious regard towards the health of the workers and the implemented measures in this direction lead to a reduction of accidents at work and absences from work. Workers become more motivated, turnover is reduced, complaints of noise, high or low temperatures are reduced, the working environment is improved and work in awkward positions is avoided. All this is done with the active participation of both interested sides - managers and workers. Their understanding and motivation to control risk at work affect their future economic situation.

The most beneficial is the training of the particular employee and the provision of sufficient and competent information and to what would lead to certain wrong actions or movements for his personal health.

Statistics show that most accidents occur with the youngest and oldest workers and it is more typical of small and medium-sized enterprises (SMEs). The focus on accident prevention is shifting from young and inexperienced employees to those in the 55-65 age group. It is among them, according to Eurostat data, that the most fatal accidents at work occur. Furthermore, older employees and workers are more time absent from work after accidents because they need more time to recover.

A list of the risks in the garment industry has been made and is illustrated with author's photo material of activities in the factory "Denisim" Ltd. Varna. Precautions for the various risks are recommended, which are also illustrated with exemplary smart solutions. An example risk map for each worker is presented, which on the one hand assists the assessor from the safety committee, and on the other hand takes into account the needs of the specific person and leads to the improvement of the situation for the specific workplace. The emphasis is placed on the joint efforts of the employer and the employee for mutual control of the risk in order to preserve the health and long-term working capacity of each person.

[**Г.8.8.**] **Vachinska S.**, Markova V., *Interactive education in Technical University of Varna and how do the students accept it*, International Conference of Arts and Sciences, Journal of Teaching and Education, 2(3):375–381 (Vienna 2013), ISSN: 2165-6266

The establishment of computers (PC) as an aid in all areas of human activity does not miss the classroom. Modern teaching without visualizing the material seems archaic. Is interactive learning necessary at all costs, to what extent should interactive methods be used and what is the benefit of them - these are the questions that motivated us to do the research. Our hypothesis was that students approve and want to learn using interactive techniques and technologies.

The study was conducted among students from TU - Varna, who were conditionally divided into three groups - group A, group B and group C. The first group - A, students who are not taught using an interactive whiteboard or large screen (TV). Students who are taught with interactive technology and personally worked with it (group B) and the third group of students (group C) who learn using interactive technology but do not work directly with it. Special questionnaires were developed for the purposes of the study. A five-point scale from 1 to 5 (1-unsatisfactory, ..., 5-excellent) is used to evaluate the answers. The data collection covers the academic year 2012/2013. More than 130 questionnaires were completed. Data processing included the calculation of some statistical indicators such as average, rms, coefficient of linear

non-uniformity, confidence interval and width of the confidence interval of the arithmetic mean. The aim is to prove with considerable probability the validity of the thesis with their help.

The article presents some of the survey questions as well as information about the participants in the study. The results of a selected set of questions are given in graphical form. The study showed strong approval for the use of technology in the learning process. Students definitely have a positive attitude towards technology and are aware that not only the present but also their future is directly linked to them. Important to note is the fact that when students were given the opportunity to work with the interactive whiteboard, they showed increased interest and this affected their results. And here is the role of the good teacher to find the thin line of balance between the traditional and the new, between the conventional and the innovative, between the modern, visual presentation and the direct connection with the learners.

Traditional teaching that has existed for centuries is preferred by 54% from group A. However, this method of teaching is not enough for more than 60% of students from groups B and C. On this basis, it was concluded that the advantage of interactive techniques is two-sided. The first (direct) advantage is improving the presentation of the material. The other (indirect) advantage is saving time for writing, drawing, etc. and providing more time for discussions and specific explanations, for describing cases and developing those on the studied issues. In conclusion, we summarize that the application, necessity and positive impact of interactive tools are very much approved by students.

The mastery of the audience, the prolonged retention of students' attention have been cases that have excited teachers for decades. There is no exact formula for how to capture the learner's attention. Various techniques are used for steering, emphasizing and visualizing the material. The application of an interactive whiteboard in the educational process raises the teacher's rating and keeps the audience's attention for a longer time.



[Г.8.9.] **Vachinska S.**, *Innovative teaching techniques*, Proceeding 4, vol. 4, 9-  
International congress “Machines, Technologies, Materials‘12”, Varna,  
2012, pp.132-135, ISSN 1310-3946

Modern education without the use of technical aids seems archaic. Today's young people easily handle all new devices for data transfer, information, network connection, etc. The field of education is also being modernized with new technical tools and technologies, such as computers, multimedia and interactive whiteboards. The article presents a study among 121 students majoring in "Engineering Design" at TU-Varna on the benefits and the need to use the so-called "touch screen" technologies in the learning process. Data were collected in March-April 2012 by completing questionnaires. Respondents had the opportunity to give personal opinions and comments.

The main goal of the development is based on rich empirical information to draw reasoned conclusions about students' knowledge of innovative techniques and teaching aids, their regard to the application of innovations in interactive technologies.

It is known from history that any new technology is easier to accept by young people and older people are skeptical and more cautious. This sometimes helps, but it should not be a hindrance and any new technique should be evaluated based on science-based research.

Interactive whiteboards have many advantages but they are also different one from another in design, usability of the software, price range, number of simultaneous users, in the way of touch. The surveyed students are mostly with a high grade - 45.5% - very good and 40.1% have an excellent grade. These are awake and well-read young people open to innovations and challenges of modernity. The initial expectation was that they would accept the interactive whiteboard as the child accepts a new toy - with desire and curiosity about its capabilities. After the analysis, the main conclusion was that young people are strongly "for" the use and application of interactive technologies in education but understand that the acquisition of knowledge depends on them. Interactive learning, the systematization of knowledge and the transition from ideas to actions leads to the construction of key competencies for lifelong learning.

[Г.8.10.] **Vachinska S.**, *Acquisition of skills for dealing with the risk of the interior in earthquakes through e-learning*, The Fourth National Conference with International Participation on e-Learning in Higher Education, Collection of reports and summaries, Svishtov, 2012, p. 331-337, ISBN 978-954-23-0747-1

The article describes and argues the need to increase the competencies of people from different target groups in order to prevent injury caused by unstructured elements in buildings (furniture, installation, office equipment, etc.) due to an earthquake. A map of high seismic risk areas in Europe is presented and the countries with the most and strongest earthquakes are indicated. They join forces in the development of e-learning training materials to prevent the risk caused by non-structural elements inside buildings during earthquakes. The types of earthquakes, their frequency and magnitude are statistically illustrated.

Under the leadership of the Kandilli Observatory and Earthquake Research Institute - KOERI from Turkey in partnership with seven other organizations and partners from third countries, a project called SISMILE: Increase vocational skills to face earthquake risk inside of buildings, is being developed. It aims to prepare a pack of e-learning materials for different target groups in order to acquire knowledge and skills to reduce the risk of injury and loss of life. It trains workers in the furniture industry and in the field of safe furniture design techniques with an emphasis on the prevention of the risk caused by non-structural elements inside buildings during earthquakes. The target group from Bulgaria included architects, civil engineers and students from TU-Varna, studying the discipline "Interior Design". The initial hypothesis was related to the belief that all professionals in the industry have enough information and know how to secure the interior of buildings.

After a survey on knowledge and skills for dealing with earthquake risk among 12 specialists with higher education (architects and civil engineers) and 67 students majoring in "Engineering Design" from TU - Varna (bachelor's and master's degrees), it was found that 83 % of graduates and 92% of students have no information about damage to non-structural elements of buildings during an earthquake. Many of them (58% of specialists and 60% of students) believe that they need to increase their knowledge and acquire specific skills for dealing with

risk because they have received no earthquake survival training at home, university or workplace.

It turned out that the programs for the development of professional skills in middle and higher education in our country do not contain a topic for dealing with the risk of the interior of buildings inside earthquakes. The article argues that this should undoubtedly change in order to improve. At present, the training provided in this direction does not cover the needs of the sector for innovation and it focuses on technical issues rather than safe design. Design is paid mainly as part of university education, and the furniture sector is based mainly on small and medium-sized enterprises (SMEs), which cannot hire designers. Thus, the approach to the safe appearance of the respective interior products turned out to be neglected.

There are many disasters in the history of Europe involving the loss of thousands of lives and / or property worth millions of euros. The risk of earthquakes will always exist and will never disappear and the population in earthquake zones is more than 260 million people. The problem of the risk of non-structural elements of buildings (furniture and other interiors) does not concern only one country, and has not been covered in educational programs in our country so far. Through targeted training of people from risk areas, the rate of loss of life, loss of property and injuries or damage caused by earthquakes will be significantly reduced and even avoided.

[F.8.11.] **Vachinska S.**, Naumov V., *Contemporary ways of teaching Applied Geometry and Engineering Graphics by distance education*, RU\$SU'13, Ruse, 2013, Proceedings Vol. 52, book 4, p. 148-153, ISSN 1311-3321

This paper presents the necessity of modernizing educational methods in order to explain basics of engineering design and graphics. As part of the project “New electronic forms of training at the Technical University of Varna” an e-learning course - “Applied geometry and engineering graphics” was designed and uploaded on the LMS (Learning Management System) of the project. A specific scheme has been chosen how to structure lectures and exercises for blended learning methods. Distance education is

a new area for many Bulgarian teachers. This article introduces the advantages of e-Learning and provides guidelines to teachers and students how to use electronic type of training in the specific application.

A comparative analysis of the so-called classical face-to-face training and distance learning and the need to compile their capabilities is argued. Modern learning without the use of computer systems and "smart devices" looks and will continue to look archaic. People's attitudes to learning and their sources of information are presented - 24% indicate online sources and 23% learn by reading professional books.

The article describes the structure of an online course in the discipline "Applied Geometry and Engineering Graphics", which is basic for students of mechanical engineering. The benefits of having this type of learning opportunity under the 24/7 scheme (24 hours 7 days a week) are emphasized, when each student can choose the right time for learning, the quick opportunity to change the content, the opportunities for video and audio surveillance of the material, etc.

Expectations of a positive effect in training are high but significant efforts are required in the preparation of online training-based materials. Distance learning is more time consuming for the teacher in terms of preparing the materials but allows more information to be provided per lesson. On the other hand, it may have a lower cost and it can change the content faster and check the knowledge through tests, etc. The main unknown here is the degree and long-term acquisition and comprehension of knowledge by the trainees. Only time will show how sustainable and high-quality distance learning is in the field of technical sciences.

[F.8.12.] Naumov V., **Vachinska S.**, *Sharing Technical University of Varna experience in the field of blended learning technologies*, Book from Fifth National Conference on E-learning in Universities, Ruse, p. 67-74, ISBN-978-954-712-611-4 - the report received an award "The best paper"

This article presents a diversity of blended learning projects with the participation of the Technical university of Varna. The diversity relates not only the methodology, tools, ICT platforms etc. used, but to the involved end users as well, such as managers

of SMEs, children, young dyslexia people, designers etc. A variety of e-learning courses had been designed and created offline and online accessible, based on different ICT technology. The aim of this publication is to share the experience of the University in the creation of a generalised vision of possibilities for blended learning in engineering, social sciences and university training in general.

Eight training platforms are shown developed on projects with the participation of the Technical University - Varna in all four areas of the mixed training courses. The different possibilities of the portals and the great variety of target groups of learners are described:

- children and adolescents with dyslexia;
- management teams of small and medium enterprises;
- beneficiaries and users of electronic auctions;
- people under stress;
- foreigners learning Bulgarian language;
- training to prevent injury with furniture in case of an earthquake;
- students studying technical sciences.

It is convincingly proven that through blended education people with disabilities can be educated, can be trained the senses of young people with dyslexia, business owners can be informed in innovative management, people can be taught how to participate in e-auctions, can be assessed the level of stress at work as well as methods for its reduction, a person can be taught how to determine the risk of non-structural elements in earthquakes, can be leared a foreign languages and much more. In all these trainings, the programs are tailored to the needs of the learners and can combine different types of seminars, individual or team work.

[F.8.13.] **Vachinska S.**, *Did the mouse eat the pencil? or graphic competencies analysis of the students from the Digital Age*, Proceedings of University of Ruse Conference RU&SU'2015, Vol. 54, book 4, p. 152-157, ISSN 1311-3321

The paper present author's observation to first year students in work in "Technical documentation" classes. It is in need new engineer to draw by hand or it is enough to draw only by computer. Paper present SWOT analysis of the situation in class and

research what students think about manual drawing. The three main styles of learning in terms of perceptions are described - visual, auditory and motor, emphasizing the widespread use of only one of them. The specific thing in the drawing-graphic engineering disciplines is the need to use all three in combination for complete and correct assimilation of the new knowledge, because it is subject to many standards, rules and requirements for depicting the information in the drawings.

The study is based on a survey of 101 first-year students studying the discipline of “Technical documentation” in the academic year 2014/2015. A higher percentage of respondents are men - 84%, compared to women - 16%, which is traditional for technical sciences. Mostly young people start studying immediately after graduating from high school (57%) but those who worked before becoming students show better learning outcomes. There is no clear preference for their textbook to be paper or electronic - 38% for paper versus 37% for electronic but more than half of the students want more hours of practice. A common problem for young people is the slow manual elaboration of drawing tasks and the many rules of observance that are new to them. The tendency to neglect rules and norms among freshmen is one of the reasons for achieving average results in the discipline. Graphic competencies are the basis of engineering design and without their knowledge and training future engineers would have trouble in their professional realization.

A SWOT analysis was made to determine the strengths and weaknesses, opportunities and threats of studying in basic engineering discipline such as technical documentation and the conclusion was made about the need to combine conservative and modern application of knowledge through manual and computer drawing.

[F.8.14.] **Vachinska S.**, *About fundamental engineering courses and contemporary students*, Proceedings from International Scientific Conference UNITECH'15, 2015, Vol. 4, p. IV374 – IV 379, ISSN 1313-230X

The article presents the main difficulties that met first year student at Technical Universities. Emphasis is one of the fundamental technical disciplines such as technical documentation and engineering graphics. The need for quality staff for the industry and

the lack of tools to motivate young people to learn a profession related to industry is described. The real outflow of candidate students in the technical specialty, the aging teaching staff, the low financial evaluation of the work of scientists, the deteriorating quality of secondary education and the low score of admitted students put the universities to serious tests.

No engineer would be a good specialist if he did not know the "alphabet" of design and could not make drawings or understand the product depicted in a particular drawing. Based on six-year analyzes of the average score in disciplines related to engineering graphics for electrical engineers and a student score of 3.15 to a good 4.45, a free online textbook and sample materials were provided with the hope of increasing success. At the end of the academic year 2014/2015, all trained students in electrical engineering were asked to voluntarily fill out a questionnaire with questions concerning their view to the discipline. Out of total 150-trained students, only 61 responded and filled in the survey, which is 40.7% of the flow and the sample can be considered representative. After analyzing the results, it became clear that everyone is aware of the importance of the material studied for their future development as specialists but this does not motivate them to attend lectures. Despite being provided with free online materials (textbook and sample drawing tasks), most respondents did not download the textbook (43%) and did not know where to download it (21%). This shows underdeveloped habits from middle school to reading comprehension because information is given to them but few first-year students manage to make sense of it and use it. The need for more hours of exercise is emphasized by a "definite yes" -43% and "rather yes" -16%. Through more exercise students rely on learning everything they have missed from the lecture course. The first semester at the university turned out to be difficult to adapt especially among young people with good and average results in mathematics from school (53%).

The article provides criteria for assessing the graphic abilities of students at the end of the first year of study. A list of indicators for self-assessment is proposed and measures with development recommendations are described.

[Г.8.15.] **Vachinska S.**, *Technical university of varna teaching on technical documentation and engineering graphics*, Proceedings from International Scientific Conference UNITECH'15, 2015, Vol. 4, p. IV 374 - IV 379, ISSN 1313-230X

The article presents an analysis of teaching developments and problems on subject “Technical Documentation” and “Engineering Graphics” at the Technical University of Varna for the last few academic years. There are given a comparison with curricula similar disciplines at the Kaunas University of Technology - Lithuania and the Koszalin University of Technolog - Poland. A comparative analysis of the birth rate and the number of higher education institutions has been made as well as a comparison of the preferences of young people for different educational areas. Technical sciences and technical professions are in fourth place by choice among freshmen for 2014/2015. The reasons for the outflow of "mathematical brains" by their attraction by European or American universities and the inability of Bulgarian universities to compete with them are given.

Based on the analyzes of the learning outcomes, it can be seen that the students from the Faculty of Electrical Engineering have higher results than those in the Faculty of Mechanical Engineering which is directly related to the higher admission score of these students. In general, the first year of study is difficult for young people and they show good results in mastering basic engineering disciplines. The provision of e-learning or paper materials does not affect their results. The problems accumulated over the years in secondary education are transferred to the higher course and show a lack of learning habits, lack of logical thinking, lack of motivation and easy giving up at the slightest difficulty.

The comparison with the other two European technical universities clearly shows the reduced number of students in them – 8-10 in a group, the study of the disciplines in two semesters and the obligatory passing of an exam. In Lithuania, students studying Engineering Graphics have more hours to practice which allows them to overcome difficulties under the supervision of a teacher. In our country, the classes in basic engineering sciences are reduced with the pretext that software products are used but the fact that the software itself does not work without a competent and qualified professional using the product is not taken into account.



In conclusion, it can be said that the reasons for the average to good success of students in the disciplines “Technical Documentation”, “Engineering Graphics” and “Applied Geometry and Engineering Graphics” are due to several things:

- Low competition and admission of students with low entrance score;
- Insufficient graphic skills in young people as a result of which exercise hours are too short;
- Frequent absences from lectures or attendance without taking notes;
- Students do not take the form of assessment seriously enough and they are not prepared enough.

Unless serious measures are taken to increase the criteria for selection or to improve the knowledge in high school, it will be more and more difficult and young people will have less and less will for to study technical sciences as a result of which the hunger for such staff in the labor market will grow.

Prepared by:

Assist. Prof. Sonya Vachinska-Aleksandrova, PhD, Eng.