Keywords: soft skills, education, formation, development, students.

Поступила в редакцию: 16.02.2024
Одобрена: 13.03.2024
Первая публикация на сайте: 10.05.2025

МРНТИ: 14.01.21

TEACHING STUDENTS ABOUT SAVING NATURAL RESOURCES IN THE MANUFACTURE OF GARMENTS

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Abstract
The modern textile and clothing industry has a significant impact on the environment. The consumption of water, energy, raw materials and waste generation require a revision of the methods of training future specialists. The formation of students' skills in the rational use of natural resources is becoming an essential component of education. Clothing manufacturing is one of the areas where the fair use of materials can significantly reduce the burden on the environment. Teaching students how to use resources economically is the key to developing a responsible approach to production and consumption. The purpose of this article is to examine modern approaches to teaching students how to take care of natural resources in the garment industry and propose effective methods for their use and reuse. The transition to sustainable production requires new forms of training for future garment specialists in the field of environmental responsibility, therefore, educational institutions need to introduce courses on eco-friendly design, textile waste recycling technologies, closed-loop ecology and rational use of resources. Students will understand how important it is to take care of the environment and use innovative methods to minimize the impact of the garment industry. Companies focused on environmentally friendly production gain competitive advantages, ensuring sustainable growth and adaptation to new challenges. Otherwise, they risk facing rising prices for raw materials, increased consumer awareness of environmental issues, and lower prices for products that accumulate in landfills. When clothes go out of use, they can be given a second life by giving them to new owners, recycling materials, or turning them into other useful items. Experimental groups of students who completed this program reduced the amount of tissue waste by an average of one fifth of their previous consumption, and students showed great interest in using environmentally friendly materials. However, difficulties were also identified in the learning process. For example, many students initially experience resistance when working with recycled materials due to their visual and tactile properties. This requires additional motivational work and the introduction of design approaches that emphasize the aesthetic value of such materials. Reducing the negative impact of the fashion industry on nature requires a comprehensive approach at the global level. This includes the introduction of sustainable technologies, transparency of supply, environmentally friendly production and conscious consumption. It is important to form an understanding of environmental responsibility among future specialists, to give them the knowledge and practical skills to create fashion that does not harm the environment. The inclusion of the principles of rational use of natural resources in the educational process will allow students not only to create competitive products, but also to contribute to the sustainable development of the fashion industry. Teaching students how to take care of natural resources in the manufacture of clothing contributes to the formation of environmental responsibility and professional skills. Further research may be aimed at developing new educational programs and integrating digital technologies to improve learning efficiency.
Keywords: sewing, natural resources, waste recycling, ecological fashion, environmental education.

Introduction

The modern textile and clothing industry has a significant impact on the environment. The consumption of water, energy, raw materials, and the generation of waste requires a revision of the

methods to train future specialists. The formation of students' skills in the rational use of natural resources is becoming an essential component of the education. In the context of a global shortage of natural resources, the issue of their conservation is becoming increasingly relevant. Manufacturing clothing and garments is one area wherein conscientious use of materials can significantly reduce the burden on the environment. Teaching students how to economically manage resources is key to shaping a responsible approach to production and consumption. The purpose of this article is to consider modern approaches to educating students to save natural resources in the garment industry and propose effective methods for implementation and reuse.

Clothing production in the garment industry is linked to three key stakeholders: natural resources, personnel, and consumers. These participants should not suffer from the existing production system, leading to future uncontrolled depletion of natural resources and environmental crises. Clothing that embraces the principles of sustainability are environmentally friendly. Transitioning to sustainable production requires new modes of training future garment specialists in environmental responsibility. Therefore, it is essential to introduce courses in environmentally conscious design, textile waste recycling technologies, circular ecologies, and rational use of resources in educational institutions. Students will understand the urgency to care for the environment and use innovative methods to minimize the impact of the garment industry. Companies focused on environmentally savvy production gain competitive advantages, ensuring sustainable growth and adaptation to new challenges. Otherwise, they risk facing rising prices for raw materials, increased consumer awareness of environmental issues, and lower costs for products that pile up in landfills.

According to recent data, the fashion industry is responsible for nearly 20% of global wastewater and 121 million tonnes of greenhouse gas emission in the EU - more than all international flights and shipping combined. The process of dyeing fabrics is one of the largest pollutants of water, and the production of clothing requires a huge amount of natural resources. For example, to create one pair of jeans, a volume of water is used, which is enough to meet human needs for several years. When washing synthetic clothes, microscopic fibers enter the ocean, which negatively affect marine life. In addition, millions of tons of textile waste are sent to landfills or incinerated every year, which exacerbates the problem of environmental pollution. If the situation does not change, the fashion industry will become one of the key factors in the destruction of ecosystems. Obviously, this problem can no longer be ignored. Each participant in the product life cycle should be aware of their responsibility and contribute to the development of environmentally safe production.

To understand the concept of sustainable development in the field of fashion, it is necessary to define the term itself. Sustainable development is a process that can last for a long period without disturbing the ecological balance. Any practice that significantly depletes resources or requires long-term recovery, cannot be considered sustainable. The environmental friendliness of a product is determined by the stability of all processes related to its life cycle. Today, many enterprises adhere to the linear economic model of "take it, use it, throw it away". This leads to the rapid depletion of natural resources and creates serious problems with waste disposal, including burial, incineration and pollution of water resources. Linear products must be produced in limited quantities and processed according to technological capabilities. Whereas, moving to a circular fashion economy based on reusing, repairing, refurbishing, and recycling products including packing and shipping components utilizing compostable materials. This model helps to reuse resources and ensures the mass production of environmentally friendly products.

Preparing students through the study of environmentally friendly production methods is an urgent necessity to develop and maintain sustainable fashion models. Sustainable fashion is the creation of eco-friendly clothes and textiles within a circular economy that extends the lives of the raw materials. Clothing production begins at the design stage, where the design choices and materials directly impact the processing of the product and its affect on the environment. The optimal choice of fabrics and their composition can either facilitate the recycling process or hinder it. At this stage, analyzing environmental criteria and life cycle assessment will facilitate the choice of materials and their

impact. Preference for environmentally natural fabrics, durable designs, and natural dyes will reduce harmful effects on nature and can create a range of designs, as history has shown us.

The raw material processing stage has one of the most significant impacts on the sustainability of the fashion industry. For example, growing cotton requires a lot of water and can lead to soil depletion. However, growing organic cotton under the "Best Cotton" initiative, and other certified varieties minimizes damage and preferences the environment. Transparency of supplies remains an important aspect: regular inspections of manufacturers, cooperation with certified factories and the introduction of environmentally sustainable standards help to control the impact of production on nature.

The process of dyeing and processing fabrics also has a serious impact on the environment. Significant amounts of water are required to dye fabrics, and polluted wastewater is often discharged into reservoirs without treatment. In addition, garment workers are exposed to harmful chemicals. To minimize this harm, enterprises must adhere to international standards such as ISO 14001 (environmental management) and ISO 9001 (quality control), as well as implement advanced chemical management practices.

The production process includes steps such as cutting, sewing, embroidery and various types of finishes. Modern technologies make it possible to replace traditional samples with virtual layouts to reduce resource consumption. Investments in these technologies, improvement of production methods, and optimization of energy consumption minimizes the impact on the environment. Paying special attention working conditions: the health and safety of employees must remain a priority, and essential training for employees in the principles of environmentally friendly work reduces waste and material consumption.

After the clothes reach the consumer, the next important stage of their life cycle begins. Washing, ironing and drying require significant consumption of water and electricity. The detergents used may also contain harmful chemical components. Companies should actively inform customers about the methods of careful care of clothes, offer alternative washing methods and encourage the reuse of products. When clothes go out of use, they can get a second life - by giving them to new owners, recycling materials or transforming them into other useful things, like household rags, homemade quilts, or tote bags, for example; things our grandmothers did. The main task is to reduce the amount of waste ending up in landfills. Clothing return programs to stores, recycling initiatives, and the production of new products from recycled materials play an essential role.

Main body

The garment industry is one of the most resource-intensive industries, which makes the environmentally conscious education of students essential. Future specialists need to be taught environmental responsibility and practical skills in the thoughtful use of natural resources. To do this, educational programs should include both theoretical and practical aspects.

The modern textile and garment industries are facing a number of global environmental problems: the production of raw materials, energy consumption, water pollution, and waste generation. The cultivation of cotton, flax and other natural fibers requires large areas of land, which can lead to deforestation, soil depletion, and water scarcity. Garment factories consume significant amounts of electricity, increasing the carbon footprint of the industry. Chemical treatment of fabrics and dyeing releases pollutants into reservoirs and the air. Waste products such as fabric residues, plastic packaging, and industrial emissions create additional environmental risks and contribute to global disasters.

Raw material processing has a significant impact on the environmental impact of future clothing. Preference should be given to environmentally sustainable fabrics such as organic cotton or recycled materials. Supplier control through personal visits and independent inspections helps to ensure transparency and reduce the negative impact of production on the environment.

Clothing production begins at the stage of design and selection of materials, where the choice of

design and raw materials determines the impact of the product on the environment. Virtual samples can replace traditional tissue samples, reducing waste. A mixture of fibers can both simplify and complicate processing. Using sustainability methods such as life cycle assessment helps to select the most environmentally friendly materials. Preferencing quality, "timeless" design over cheap and trendy fast fashions retrains consumers to think about longevity and durability.

The process of dyeing fabrics consumes a huge amount of water, and the garment industry, as a whole, is associated with serious environmental and social problems. Companies can minimize harm by cooperating with certified suppliers and applying ISO 14001, ISO 9001 and other standards. In addition, technology modernization and optimization of the production process reduce energy consumption and reduce waste.

After purchase and during operation, clothes continue to have an impact on the environment: water and electricity are required for washing, ironing and caring for them. Companies or the Government should inform consumers about proper clothing care and encourage or model (train) the reuse and recycling of garments. The "Make Due and Mend" campaign of the British Government is one such example. A collaboration between industry and governments could create an infrastructure for the collection and recycling of textiles reduces the amount of waste during the disposal of clothing.

Modern garment production requires awareness of environmental responsibility, therefore, teaching students the principles of sustainable development becomes an integral part of the educational process. It is important not only to transfer theoretical knowledge, but also to provide practical training and skills for future specialists.

Theoretical training for students should study such topics as "Fundamentals of ecology and sustainable development", "Impact of the garment industry on the environment", "Sustainable technologies and materials", "Methods of energy conservation and conservation of water resources".

Practical application of the acquired knowledge from seminar sessions can employ projects aimed at reducing the environmental impact of production, for example: "Making clothes or accessories from recycled fabrics", "Using natural and environmentally friendly organic materials", "Creating author's collections with minimal production waste", "Organizing exhibitions and projects promoting eco-friendly fashion", "Organizing exhibitions and events promoting environmentally friendly production", "Optimizing the cut to minimize waste of fabric", "The study of textile processing processes and the application of this knowledge in practice". Finally, teaching students the fundamental skills of hand sewing and machine sewing will empower them to create their own designs and know how to transform clothing into other usefull objects.

Teaching students the principles of saving natural resources in the manufacture of clothing contributes to the formation of responsible specialists who are ready to introduce environmentally friendly technologies into production and develop circular fashion ecologies and economies.

Literature review

An analysis of current research shows that sustainable production in the garment industry is a global trend. Based on the analysis of scientific publications, it became clear that the problem of rational use of natural resources is being actively studied in different countries. Research confirms that the textile industry consumes significant amounts of water, electricity, and raw materials, as well as produces large amounts of waste. According to the World Health Organization, it takes as much water to make one cotton T-shirt as a person drinks in two and a half years. The scientific literature identifies several areas for minimizing the environmental impact of garment production: the use of recycled materials, optimization of fabric cutting, and the introduction of waste-free production technologies.

However, the issues of developing environmental responsibility among students, the use of environmental responsibility among students, and ways to eliminate problems in this area have not been sufficiently covered.

Implementing a cyclical economy by developing a restorative industrial system is a major challenge.

This study examines the opportunities underlying the cyclical competitive advantages of firms in the Italian textile and clothing industry, which is one of the country's most polluting sectors. The authors [Coppola C. et al., 2023] have developed a structure of dynamic capabilities necessary for a cyclical transition using the theoretical prism of a natural resource-based approach. Using comprehensive research, strategies for pollution prevention, product management, and sustainable development are being explored, as well as related detection, capture, and reconfiguration capabilities. The key factors are internal practices, the role of lower-level participants in the supply chain, the dynamics of co-creation with external participants, and the social potential of a cyclical economy. Managers can also take advantage of our recommendations aimed at improving the environmental efficiency of their companies and scaling up their initially cyclical business.

The authors [Dissanayake K., Pal R., 2022] found that used clothing supply chains are becoming more complex, fragmented, and less transparent due to the growing volumes of discarded clothing and dispersed reverse logistics operations throughout the Global North (GN) and Global South (GS). While this has a promising impact on the circular economy and the growth of international trade, increased exports of used clothing and overcrowded landfills raise some negative concerns about its overall sustainability. This article examines the dichotomy that exists in terms of interpreting the credibility of used clothing supply chains. A systematic literature review was conducted and 55 articles were examined to determine the impact of triple profit (TBL) on the sustainability of used clothing supply chains. The problems of TBL sustainability were identified, reflected through the prism of consideration of natural resources and interpreted in the form of proposals. To address this issue, the authors identify seven TBL sustainability challenges and recommend three sets of strategic resources needed by global used clothing supply chains to address them. These include slowing down the supply chain by addressing issues of poor quality, overproduction and oversupply, improving supply chain logistics/infrastructure and ecosystem engagement, and implementing transparent environmental, social and governance (ESG) measures taken by both value chain participants and regulators to ensure sustainable development at the system level. The value of the study lies in the fact that it is one of the first studies to analyze the sustainability of global used clothing supply chains from north to south. The study is unique in terms of its coverage and contribution to the literature on sustainable supply chains.

According to the author's article [Meng N., 2022], regenerative design is one of the powerful practical directions of sustainable development in this field. This article brings together the theoretical foundations of recyclable clothing design based on the study of examples of recyclable clothing design at home and abroad, as well as practical ways to design recyclable clothing. Focusing on the social reality of protecting environmental resources and excess clothing production capacity, design methods and characteristics of the clothing regeneration process are studied taking into account the concept of sustainable development and in combination with case studies. The work uses a variety of technologies to create creative clothing design, which mainly includes patchwork, deconstruction, decorating with patterns, the hollowing out process, and 3D printing technology. This research is useful for the creation and sustainable development of an environmentally friendly and recyclable model of China's garment industry and has important social significance.

Durability-based design is known as an eco-design opportunity and can help reduce the environmental impact of non-volatile products. However, extending the service life of products is not always desirable, and attention should be focused on achieving optimal service life. From an operational point of view, recommendations for the durability of a structure are usually related to maintainability, the possibility of modernization, or emotional attachment. The use of high-quality and durable materials is often indicated, although it is not obvious to manufacturers what a high-quality material is. This research, based on the "quality through design" approach, aims to propose a design methodology that ensures optimal durability and is consumer-oriented. To do this, it is necessary to collect data on product quality and production processes, and then introduce consumer knowledge. They combine into data analysis to help identify relationships and the most appropriate quality factors. This methodology is based on three stages: firstly, on a single quality metric that includes

consumer knowledge; secondly, on a multi-level reverse engineering process; and finally, data analysis using the principal component method. The originality of this proposal lies in the fact that it allows you to take into account the knowledge of consumers when determining the appropriate quality indicators. The proposed technique is used in the fashion sector, as it is considered the second highest level of pollution. Moreover, given the vast variety of materials and manufacturing processes available in the textile industry, it is very difficult to choose the most appropriate recommendations for extending the service life. The study presented by the authors [Benkirane R. et al., 2022] covers 29 T-shirts and shows that mechanical advantages are the main factors of quality.

Since repairs can lead to a reduction in the consumption of clothing and textile waste, it is necessary to increase the durability of clothing and achieve savings on turnover. The article identified common barriers preventing clothing repairs, and the study rethinks common obstacles along the way, which include skills, tools, priorities, and estimated costs that may encourage a person to repair themselves. Scientists [McQueen R.H. et al., 2022] conducted a survey of 523 young Canadian consumers (aged 18 to 34 years) in order to study the influence of selected demographic factors and repair resources on their propensity to perform various types of clothing repairs. The independent variables were demographic factors and four repair resources, while the dependent variables were three repair methods. Hierarchical linear regression analysis showed that women are more likely to self-repair, while gender differences in paid and unpaid repairs are not obvious. An increase in the number of cases of self- and paid repairs leads to an increase in the number of cases of self- and unpaid repairs of clothing, while unpaid restoration of clothing is more often used by young consumers. Three resources: skills, tools, and the priority of repair largely determine the possibility of self-repair. The probability of paid repairs is higher if the cost of professional repair services is not perceived as exorbitant. Young consumers who use free repair services without having the necessary skills have access to the tools for this and to qualified specialists with sufficient resources. The results of this study have implications for fashion brands, politics, and communities in terms of promoting and encouraging various forms of repair practices.

In accordance with the concept of a closed-loop economy, the study by the authors [Trejo H.X. et al., 2024] aims to eliminate relevant gaps in research concerning the materials and chemical properties of clothing, as well as its suitability for use in a closed cycle. The main research questions include: what are the material and chemical properties of textile waste obtained as a result of the implementation of the "Return of Fashion" program; which natural textile waste produced by recycling is most suitable for growing natural dyeing plants in a hydroponic system; and is it possible to scale up the use of textile waste after its use in hydroponic systems to support a circular fashion supply chain? This study focuses on the use of wool, cotton, linen, silk, viscose, and Tencel lyocell as substrates for growing purple basil, a natural dyeing plant. Vertical hydroponics is a farming method in which nutrient water is used to grow plants instead of soil throughout the year. The system can be installed indoors, which allows efficient use of limited space, and water is constantly circulating. Standard hydroponic substrates such as peat moss and mineral wool have good porosity for oxygen transport and sufficient moisture retention capacity for nutrient delivery. In this study, we compared the characteristics of standard hydroponic substrates with various textile materials. The effects on water quality, color extraction, moisture absorption, decomposition resistance, and plant survival were used to assess suitability for use. Tencel wool, silk and lyocell have demonstrated good stability in hydroponic systems such as peat moss and mineral wool during the first growth cycle. During the second growth cycle, protein fibers - wool and silk - supported plant survival to a greater extent than Tencel lyocell. Future research may confirm that wool and silk can support plant growth using natural dyes with a larger sample volume. This study meets several objectives of a closed-loop economy and provides a model for future research in support of closed fashion supply chains [Adaeva A.M., 2023].

The idea of creating products from waste fabric is not new in the garment industry. The main idea of the applications is to develop production methods that do not harm people and the environment. There is a growing demand for clothes that do not pollute the environment and take care of natural resources.

This increases environmental sensitivity and consumer awareness. This demand has intensified efforts to assess textile waste using environmentally friendly methods. With each passing day, clothing collections made from waste are becoming more important in the designer-producer-consumer triangle. Currently, the use of natural dyes with fabric waste is being evaluated by fashion designers as a new approach. And the saturated images on the tissue waste that are obtained using these applications. During the study, experiments were conducted with a textile surface with the addition of sage, tea, lime, pear peel, ginger, turmeric and cinnamon on Sile fabric waste using various etching materials. The research methodology was carried out in two stages. At the first stage, recipes for coloring using natural dyes were created. At the second stage, the design processes are integrated into the capsule collection. The collection has been complemented by 3D modeling and prototyping, which are one of the indispensable applications in the industry. The purpose of the collection is to develop a production model with a strong environmental aspect. The results of the study [Sari S., Elibol B., 2024] showed that the clothing design process developed differently than in the production of standard models using natural dyes and fabric waste. The biggest difference is the "uniqueness" brought to the clothing collections.

The article by the authors [Kuleshova A.A. et al., 2023] pays great attention to the search for solutions to environmental problems in the field of fashion design. In the study, the authors present a scientific review of modern methods of innovative clothing design and an analysis of experimental cutting techniques. The author's approaches to the cut are chosen taking into account the maximum saving of natural resources, the humanization of design principles to create a comfortable environment. The comfort conditions for both the body and the emotional state of a person are taken into account. The authors of the study describe the zero waste method in the context of the relationship between modern principles of ecological clothing formation and the philosophy of traditional Japanese costume cut. The article defines the main provisions of the methodology of ecological design of a modern suit, based on a harmonious combination of techniques of experimental and associative-figurative types of emotionally comfortable clothing formation. The authors describe the methods of greening design activities in the author's practices of famous designers in the fashion world to create collections of costumes. In this article, based on a comparative analysis of examples of the use of new ecological principles of shaping and classical methods of harmonizing the shape of a suit in the world practice of famous fashion designers, the creators give a description of traditional and innovative cutting techniques. The authors define the main criteria for the importance of environmental approaches based on the results of using methods of retrospective study of environmental technologies of the late 20^{th} - early 21^{st} century. The researchers substantiate the prospects of upcycling and zero waste technologies as the most universal principles of ecological shaping of exclusive clothing at the current stage of design development. The main features of the ecological cut are formulated and defined. As a result of the conducted research, a conclusion was made about the possibilities of using an ecological approach in the design of a modern costume based on a harmonious combination of experimental and associative-figurative methods of forming emotionally comfortable clothes as an effective way of forming cultural identity. As a result of the conducted research, it was concluded that the search for solutions to a number of problems of fashionable design of an ecological orientation affects the formation of general cultural values of a modern person.

Humanity is faced with the problem of giant plastic waste. This obstacle affects all countries of the world, and urgent measures must be taken to reduce the amount of garbage. One of the relevant areas of business models is the industry of production of "green" clothing [Fedorova E.S., Islamitdinov V.F., 2022; Bagryantseva E.P., Kuzmenkova N.V., 2023]. This kind of direction is considered as an innovative product that will practically minimize the impact of the same fashion industry, since it is the first in terms of the growth rate of waste generation, as well as recycling accumulated plastic that pollutes the ocean. These articles are dedicated to eco-friendly clothing and ecology in general. This topic is very relevant at the moment, since excessive production and consumption are one of the causes of modern environmental crises and barriers to the sustainable development of society.

Promising eco-materials that are used in the production and tailoring of eco-friendly clothing are considered here.

The following article analyzes the organizational and individual driving forces and barriers preventing cyclical business models from being implemented by participants and startups in the workwear industry. It is based on a qualitative study of [Engzell, J., Kambanou, M.L., 2024] 15 organizations in the Swedish workwear industry. It was found that the majority of participants use either long-term models with hybrid elements such as repair work or access models, while cyclical startups have a greater variety of cyclical business models. Internal organizational barriers mostly differ between the two groups; however, external organizational barriers are more significant and widespread, such as the low price of new workwear, lack of demand, and support measures such as government procurement. Several organizational factors were highlighted, such as opportunities to increase consumer value, textile and digital innovations, and environmental concerns. The driving forces and barriers are influenced by both the type of cyclical business models and the type of company.

The works of [Azieva E.V., Musayeva B., 2022] students, undergraduates, postgraduates and scientists devoted to environmental problems and ways to solve them in a particular region, issues of improving environmental culture and expanding the ecological worldview, as well as stimulating the creative potential of young people are presented. The publication is intended for teachers, researchers, schoolchildren, students, undergraduates and postgraduates of universities, as well as for a wide range of readers interested in the problems of the economy and ecology of the region. In the work of the following author [Alexandrova E.D., Pankina M.V., 2023] discusses the environmental consequences of the choice of materials in the manufacture of clothing. The author analyzes the impact of clothing production on nature and human health, and also considers alternative options for clothing production and design. It explains the importance of the environmental responsibility of the designer and the consumer, as well as sustainable approaches to consumption and production.

In order to identify possible solutions to the bioethical problem of excessive production and consumption of clothing in environmental, psychological and social aspects, the negative consequences of production and consumption of clothing are highlighted and ways to eliminate them are explored [Mustafa H.G.Z., Smirnova T.V., 2023]. A review of the existing literature and data on the environmental, psychological, and social impacts of clothing was conducted using qualitative and quantitative methods. A survey of international students from a medical university was conducted. The production and disposal of clothing has a significant negative impact on the environment, psychological well-being and social equality. The authors emphasize the harmful effects of clothing on the environment and society and recommend promoting the ethical principles of the fashion industry.

Methods

In the process of teaching students to save resources, the cutting optimization method is used. Students study computer-aided design and cutting programs to minimize fabric loss. Computer programs (for example, "Grazia" or "Optitex") are used to maximize the distribution of product details on the canvas.

Methods of working with alternative materials are given. The training includes hands-on work with recycled fabrics and environmentally friendly materials such as organic cotton, linen and fabrics made from recycled materials. During the training process, the possibilities of using recycled and environmentally friendly materials are considered. Laboratory classes are held where students test the strength and quality of alternative fabrics and study their technological features.

The use of lean manufacturing methods includes process planning training, for example, practical training on working with modern sewing equipment with minimal energy and water consumption, as well as the use of ultrasonic bonding of fabrics and laser cutting.

And using the modular product design method, students develop clothing models that are easily

transformed and adapted, which increases the service life of products. Students develop their own mini-projects to create sewing products with an emphasis on resource conservation. This contributes to the formation of creative thinking and practical skills in conditions of limited resources.

Results and discussion

The results of the implementation of these methods show positive trends. As a result of completing the training programs, students demonstrate a more informed approach to material selection and production planning. Experimental groups of students who completed this program reduced the amount of tissue waste by an average of one fifth of their previous consumption, and students showed great interest in using environmentally friendly materials.

However, difficulties were also identified in the learning process. For example, many students initially experience resistance when working with recycled materials due to their visual and tactile properties. This requires additional motivational work and the introduction of design approaches that emphasize the aesthetic value of such materials.

Conclusion

Reducing the negative impact of the fashion industry on nature requires an integrated approach, globally. This includes the introduction of sustainable technologies, transparency of supply, environmentally friendly production, and conscious consumption. It is important to form an understanding of environmental responsibility among future specialists, to give them the knowledge and practical skills to create fashion that does not harm the environment. The sustainable development of the garment industry is not just a trend, but a necessity for the future of our planet. Teaching students how to take care of natural resources in the garment industry is an important step towards the sustainable development of light industry. The use of modern methods, such as optimizing the cut, working with alternative materials and modular design, allows not only to reduce the amount of waste, but also to form students' environmentally responsible thinking. To further develop this area, it is recommended to develop comprehensive educational programs with the involvement of industry representatives and environmental experts.

Modern technologies make it possible to minimize the amount of fabric residues due to a rational cut, the use of CAD programs, and "zero waste" technologies. Teaching students these approaches helps to reduce the amount of waste.

Teaching how to choose environmentally conscious materials enables future specialists to analyze the composition of fabrics and to employ organic cotton, recycled fabrics, or biodegradable fibers.

Mindful consumption of water and energy. Textile production requires significant resources, especially at the stages of dyeing and processing. It is important to teach students how to reduce water and energy consumption, including dry dyeing technologies, laser processing of fabrics, and the use of energy-efficient equipment.

The concept of eco-friendly fashion requires designers to consider the product lifecycle, recyclability, modular designs that extend the life of clothing, and waste recycling.

Encouraging and rewarding conscious consumption implements the principles of slow fashion and helps students create durable products, thereby reducing excessive consumption and the amount of textile waste.

Thus, the inclusion of the principles of rational use of natural resources in the educational process will allow students not only to create competitive products but also to contribute to the sustainable development of the fashion industry.

The development of students' skills in saving natural resources and in the manufacture of sewing products is possible with an integrated approach to learning. Practical modeling, the study of alternative materials, the use of energy-saving technologies, design activities and product lifecycle analysis contribute to the development of professional competencies and to the formation of

environmentally responsible behavior. Further research may be aimed at developing more advanced methods and software for resource-efficient learning and the impact of artificial intelligence on current practices.

Teaching students how to take care of natural resources in the manufacture of garments contributes to the formation of environmental responsibility and professional skills. Effective methods include project-based learning, skill development, practical optimization of technological processes, and analysis of alternative materials. Further research may be aimed at developing new educational programs and integrating digital technologies to improve learning efficiency.

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Студенттерді киім өндіру кезінде табиғи ресурстарды үнемдеу әдістеріне үйрету

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Андатпа

Қазіргі тоқыма және тігін өнеркәсібі қоршаған ортаға айтарлықтай әсер етеді. Суды, энергияны, шикізатты тұтыну және қалдықтарды шығару болашақ мамандарды даярлау әдістерін қайта қарауды талап етеді. Оқушылардың табиғи ресурстарды ұтымды пайдалану дағдыларын қалыптастыру білім берудің маңызды құрамдас бөлігіне айналады. Киім өндірісі-материалдарды әділ пайдалану қоршаған ортаға жүктемені айтарлықтай төмендететін салалардың бірі. Студенттерді ресурстарды үнемді пайдалануға үйрету өндіріс пен тұтынуға жауапкершілікпен қарауды дамытудың кілті болып табылады. Бұл мақаланың мақсаты-студенттерге тігін өнеркәсібіндегі табиғи ресурстарға қалай күтім жасау керектігін үйретудің заманауи тәсілдерін зерттеу және оларды пайдалану мен қайта пайдаланудың тиімді жолдарын ұсыну. Тұрақты өндіріске көшу экологиялық жауапкершілік саласында болашақ тігін мамандарын даярлаудың жаңа нысандарын талап етеді, сондықтан білім беру мекемелері экологиялық дизайн, тоқыма қалдықтарын қайта өңдеу технологиялары, тұйық экология және ресурстарды ұтымды пайдалану бойынша курстарды енгізуі қажет.. Студенттер қоршаған ортаға қамқорлық жасаудың және тігін өнеркәсібінің әсерін азайту үшін инновациялық әдістерді қолданудың қаншалықты маңызды екенін түсінеді. Экологиялық таза өндіріске бағытталған компаниялар тұрақты

өсу мен жаңа қиындықтарға бейімделуді қамтамасыз ете отырып, бәсекелестік артықшылықтарға ие болады. Әйтпесе, олар шикізат бағасының өсуіне, тұтынушылардың экологиялық мәселелер туралы хабардарлығының артуына және полигондарда жиналған өнім бағасының төмендеуіне тап болу қаупі бар. Киім жарамсыз болған кезде, оны жаңа иелеріне беру, материалдарды қайта өңдеу немесе басқа пайдалы заттарға айналдыру арқылы екінші өмірге ауыстыруға болады. Бағдарламаны аяқтаған студенттердің эксперименттік топтары тіндердің қалдықтарын алдыңғы тұтынудың орта есеппен бестен біріне азайтты және студенттер экологиялық таза материалдарды пайдалануға үлкен қызығушылық танытты. Алайда оқу процесінде қиындықтар да анықталды. Мысалы, көптеген студенттер визуалды және тактильді қасиеттеріне байланысты қайта өңделген материалдармен жұмыс істегенде қарсылықты сезінеді. Бұл қосымша мотивациялық жұмысты және осындай материалдардың эстетикалық құндылығын көрсететін дизайн әдістерін енгізуді талап етеді. Сән индустриясының табиғатқа теріс әсерін азайту жаһандық деңгейде кешенді тәсілді қажет етеді. Бұған тұрақты технологияларды енгізу, ұсыныстың ашықтығы, экологиялық таза өндіріс және саналы тұтыну кіреді. Болашақ мамандарда экологиялық жауапкершілік туралы түсінік қалыптастыру, оларға экологиялық таза сән жасау үшін білім мен практикалық дағдылар беру маңызды. Оқу процесіне табиғи ресурстарды ұтымды пайдалану қағидаттарын енгізу студенттерге бәсекеге қабілетті өнім шығаруға ғана емес, сонымен қатар сән индустриясының тұрақты дамуына үлес қосуға мүмкіндік береді. Студенттерге киім өндірісіндегі табиғи ресурстарға қалай қамқорлық жасау керектігін үйрету экологиялық жауапкершілік пен кәсібилікті қалыптастыруға ықпал етеді. Қосымша зерттеулер оқытудың тиімділігін арттыру үшін жаңа білім беру бағдарламаларын әзірлеуге және цифрлық технологияларды біріктіруге бағытталуы мүмкін.

Түйін сөздер: тігін, табиғи ресурстар, қайта өңдеу, экологиялық сән, экологиялық білім.

Обучение студентов методам экономии природных ресурсов при производстве одежды

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Аннотация

Современная текстильная и швейная промышленность оказывает значительное влияние на окружающую среду. Потребление воды, энергии, сырья и образование отходов требуют пересмотра методов подготовки будущих специалистов. Формирование у студентов навыков рационального использования природных ресурсов становится важнейшей составляющей образования. Производство одежды - одна из областей, где добросовестное использование материалов может значительно снизить нагрузку на окружающую среду. Обучение студентов экономному использованию ресурсов является ключом к формированию ответственного подхода к производству и потреблению. Цель данной статьи - рассмотреть современные подходы к обучению студентов бережному отношению к природным ресурсам в швейной промышленности и предложить эффективные методы их использования и повторного использования повторно. Переход к устойчивому производству требует новых форм подготовки будущих специалистов по швейным изделиям в области экологической ответственности, поэтому учебным заведениям необходимо внедрять курсы по экологичному дизайну, технологиям переработки текстильных отходов, экологии замкнутого цикла и рациональному использованию ресурсов. Студенты поймут, насколько важно заботиться об окружающей среде и использовать инновационные методы для минимизации воздействия швейной промышленности. Компании, ориентированные на экологически чистое производство, получают конкурентные преимущества, обеспечивая устойчивый рост и адаптацию к новым вызовам. В противном случае они рискуют столкнуться с ростом цен на сырье, повышением осведомленности потребителей об экологических проблемах и снижением цен на продукцию, которая накапливается на свалках. Когда одежда выходит из употребления, ей можно дать вторую жизнь, передав ее новым владельцам, переработав материалы или превратив в другие полезные предметы. Экспериментальные группы студентов, которые прошли эту программу, сократили количество отходов тканей в среднем на одну пятую от их предыдущего потребления, и студенты проявили большой интерес к использованию экологически чистых материалов. Однако в процессе обучения также были выявлены трудности. Например, многие студенты поначалу испытывают сопротивление при работе с переработанными материалами из-за их визуальных и тактильных свойств. Это требует дополнительной мотивационной работы и внедрения дизайнерских подходов, подчеркивающих эстетическую ценность таких материалов. Снижение

негативного воздействия индустрии моды на природу требует комплексного подхода на глобальном уровне. Это включает в себя внедрение устойчивых технологий, прозрачность поставок, экологически чистое производство и осознанное потребление. Важно сформировать у будущих специалистов понимание экологической ответственности, дать им знания и практические навыки для создания одежды, которая не наносит вреда окружающей среде. Включение принципов рационального использования природных ресурсов в образовательный процесс позволит студентам не только создавать конкурентоспособную продукцию, но и внести свой вклад в устойчивое развитие индустрии моды. Обучение студентов бережному отношению к природным ресурсам при производстве одежды способствует формированию экологической ответственности и профессиональных навыков. Дальнейшие исследования могут быть направлены на разработку новых образовательных программ и интеграцию цифровых технологий для повышения эффективности обучения.
Ключевые слова: пошив, природные ресурсы, переработка отходов, экологическая мода, экологическое просвещение.

Поступила в редакцию: 14.04.2025
Одобрена: 30.04.2025
Первая публикация на сайте: 08.05.2025

МРНТИ: 14.35.07

БОЛАШАҚ БАСТАУЫШ БІЛІМ БЕРУ МҰҒАЛІМДЕРІНІҢ КӘСІБИ МОТИВАЦИЯСЫН ПЕДАГОГИКАЛЫҚ ПРОЦЕСТЕ ДАМЫТУ МӘСЕЛЕСІ

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Аңдатпа
Мақала мамандық таңдаудың сәттілігіне, сонымен қатар кәсіби дамуға да әсер ететін маңызды фактор ретінде болашақ бастауыш білім беру мұғалімдерінің кәсіптік мотивациясын дамыту мәселесіне арналған. Мақалада болашақ мұғалімдерді педагогикалық қызметке дайындауда жоғары білім беру ұйымының мотивациялық қызметінің маңыздылығы атап өтіледі. Мақаланың зерттеу бөлімінде авторлармен 6В01301 - «Бастауышта оқытудың педагогикасы мен әдістемесі» білім беру бағдарламасының білім алушыларының болашақ қызметті таңдауына қанағаттануын анықтау мақсатында сауалнама ұсынылады және болашақ педагогтардың мотивациялық қызметінің деңгейін анықтауға мүмкіндік беретін әдістер қолданылады. Жүргізілген сауалнама нәтижелері талданған және болашақ бастауыш оқыту мұғалімдерінің кәсіби уәждемесін дамыту тәсілдері, дайындық процесін түзетуге, болашақ мамандықтың оң имиджін қалыптастыруға әсер етуге мүмкіндік беретін іс-шаралар түрлері ұсынылған. Авторлар университеттің педагогикалық процесінің белсенді реакциясын болашақ мұғалімдерді даярлаудың маңызды үлгісі ретінде қарастырады.
Түйін сөздер: жоғары білім беру ұйымы, бастауыш білім беру, кәсіби мотивация, болашақ мұғалімдерді даярлау, мұғалімдік мамандыққа даярлау, педагогикалық қызмет, мотивациялық қызмет.

Кіріспе

Қазақстан Республикасында Білім беру жүйесін реформалау және оның мазмұнын жаңарту жағдайында бастауыш сынып мұғалімін даярлауға, оның кәсіби құзыреттеріне жаңа талаптар қойылады. Әлеуметтік тапсырыспен шартталған бастауыш сынып мұғалімдерін кәсіптік даярлаудың стратегиялық мақсаттары, міндеттері және қызметі мемлекеттік деңгейде «Білім туралы» Қазақстан Республикасының Заңымен, Жоғары білімнің мемлекеттік жалпыға міндетті стандартымен, «Педагог» кәсіптік стандартымен және басқа да нормативтік-құқықтық құжаттармен реттелетін жоғары білім беру жүйесінде іске асырылады. Өз кезегінде жоғары білім беру жүйесінің алдында «ұлттық және жалпыадамзаттық құндылықтар, ғылым