



ECO-ORIENTED MANUFACTURING TECHNOLOGIES IN THE PROFESSIONAL TRAINING OF TILERS

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Abstract

The relevance of this article is dictated by the acuteness of the environmental pollution issue, especially from the construction sector, which presents a challenge both for Ukraine and globally. One of the solutions to this problem is the implementation of green building, which involves the use of environmentally friendly materials, innovative waste-free and low-waste technologies, alternative energy sources, waste recycling, etc. This necessitates new, ecologically oriented approaches in the training of qualified construction workers, particularly tile setters.

Objective: Based on global and national experience in green building, this study aims to investigate the issue of training tile setters in Ukraine using eco-oriented technologies and to develop recommendations for improving the process of integrating these technologies into educational curricula and programs.

Methods: Analysis of domestic and foreign sources on ecological education and green building, empirical research on the practice of applying ecotechnologies by tile setters in Ukraine.

Results: The essence of eco-oriented professional training is revealed, the foreign and national experiences in green building are analyzed; eco-oriented technologies for tile setters are examined; the main ecological requirements for building materials and technologies for tiling works are disclosed; corresponding recommendations for the use of eco-oriented technologies in the professional training of future tile setters are prepared.

Conclusions: Eco-oriented professional training must become an integral part of the professional competence of tile setters, bringing changes both to the content and methods of education. For instance, during tiling works, environmentally friendly hydro insulation membrane materials are used; powerful construction companies that conduct eco-certification of their products have emerged; the use of mastics and adhesives based on dry building mixtures reduces construction waste and, consequently, soil pollution at the construction site; more precise laser measuring devices are increasingly used in tiling works. Therefore, in training tile setters, attention should be paid to studying modern green technologies. The importance of developing normative legal acts on eco-certification of building materials and technologies, and subsequently buildings, is substantiated. It is recommended to revise the National Standard of Professional Education for the profession of tile setter, considering ecological requirements, and for teachers of vocational education institutions to pay special attention to forming ecological competence in future tile setters.

Keywords: *eco-oriented professional training, green building, eco-oriented technologies, ecological certification, ecological competence, tiler.*

Introduction. Before the modern world, particularly Ukraine, stand acute ecological problems, namely: environmental pollution, global warming, waste disposal, military actions, and the like. In this context, the importance of eco-oriented professional training is increasing, which connects students with the surrounding world, teaches them about the natural and artificial environment, increases awareness of problems

affecting the environment, and also about actions that can be taken to preserve and improve it (Greenfield, 2022).

Construction sites themselves are a serious source of environmental pollution. Buildings account for 40% of global energy use and produce more than a third of global greenhouse gas emissions. These impacts are recognized and taken into account in the design and

application of technologies that reduce the environmental impact of construction (Gibberd, 2020). Green technologies, such as solar energy, may seem expensive compared to traditional resources, but over the entire term of use, the consumer ultimately saves on electricity costs (HowStuffWorks.com., 2011).

As noted in the monograph by Jeremy Gibberd (2020), green construction technologies describe methods used in the built environment to affect the environment. Cost and benefit calculations, made in the assessment of a representative house in Hebei province (China) and verified by experts from the Royal Institute of Technology (Stockholm), showed that the benefits of additional investments associated with the application of green construction technologies exceed the corresponding additional costs, and the payback period is approximately 12 years, which is acceptable for residential projects (Chen, 2020, p. 32). As proven by research conducted at the Kyiv National University of Construction and Architecture, green structures are a promising energy-efficient technology that includes thermal insulation and cooling effects, allowing for automatic protection from excessive solar radiation in the warm season (with the conversion of solar energy into biomass, not heat) and, conversely, the maximum transmission of solar rays in the cold season. This reduces the load on air conditioning and heating systems (Tkachenko, 2022).

In 2016, Ukraine joined the World Council on "Green" Building to prepare "green standards in the regulatory and legal field" (Kulishenko, 2016). The construction sector accounts for 37% of global carbon emissions related to energy. It is expected that by 2050, nearly 70% of the world's population will live in cities, which will require a doubling of the construction fund (Investment Attraction Office, 2022). The negative impact of the construction sector is associated with the production and processing of construction materials, as well as the construction and operation of buildings. Therefore, green building practices are a critically important component of the global fight against climate change and environmental protection. The importance of this issue is indicated by the establishment in China of the specialized journal "Low-Carbon Materials and Green Construction" (Xiao, 2023). Recently, construction companies have focused on implementing sustainable development strategies, including green technologies. Thus, the construction sector needs a technological breakthrough and professional staff capable of implementing it.

Objective: Based on global and domestic experience in "green building," to research the issue of preparing tilers in Ukraine using eco-oriented production technologies, and to develop recommendations for improving the process of implementing these technologies in educational plans and programs.

Methods: Analysis of domestic and foreign sources on eco-oriented professional training and "green" construction, empirical research on the practice of applying ecotechnologies in the training of tilers in Ukraine.

Results and Discussion: Analysis of the content of the current state standard of professional (vocational-technical) education SP(PT)O 7132.F43.33-2017 Tiler 3-7th grade shows that the educational program of the standard does not include "Ecology" as a separate topic, not to mention highlighting ecological issues in teaching individual technologies for performing cladding works. Also, ecological competence is not included in the list of key competencies of the mentioned standard. However, without appropriate ecological education, future tilers will not be able to work effectively in the field of "green building," which most corresponds to the ecological challenges of today.

Green building technology is a broad category that includes everything from energy-efficient appliances to geothermal heating: cool roof, green insulation, biodegradable materials, compacted earth brick, storm-water management, geothermal heating, solar energy, electrochromic smart glass, smart appliances, and zero-energy home (HowStuffWorks.com., 2011).

The main aspects of "green building" include: environmental quality; architectural quality; indoor environment comfort; waste utilization; reduction of greenhouse gas emissions into the atmosphere; rational water use; increasing the share of renewable energy sources in the operation and maintenance of buildings; safety of life activities; and establishing harmony between nature and architecture.

In Figure 1, the main measures comprising ecology in construction are outlined. All listed measures should be anticipated at the pre-project development stage under specific local conditions. safety of life activities; and establishing harmony between nature and architecture.

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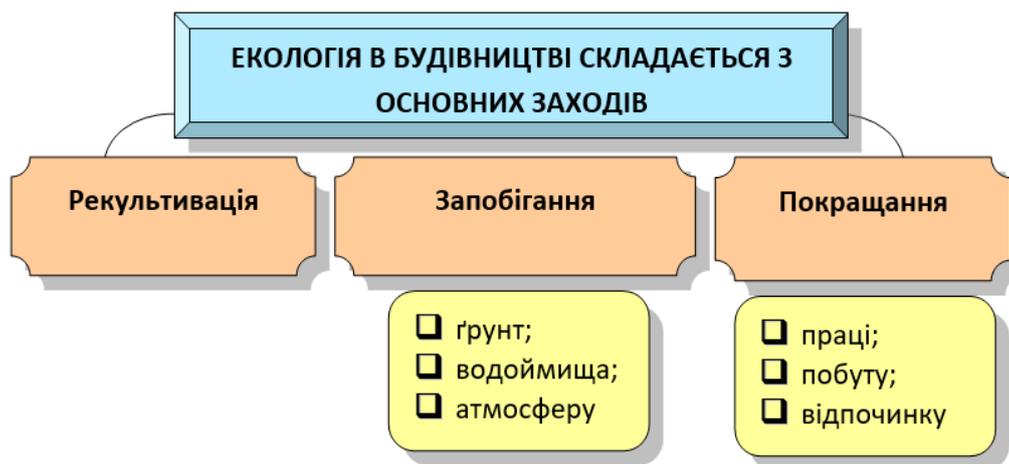


Fig 1. Ecology in Construction

Therefore, "green building" is an innovative and environmentally friendly manufacturing, based on the principles of sustainable development, reuse of raw materials, and conservation of natural resources. Its main goal is to reduce the consumption of energy and material resources throughout the entire life cycle of a building: from site selection, design, construction to operation, repair, and demolition (Dominant, n.d.).

In the USA, "green" buildings on average reduce energy consumption by a quarter, and operation and maintenance costs by 10-20% compared to traditional buildings, thus increasing the potential long-term return on investment. According to the International Finance Corporation, "green" buildings are at least 20% more energy efficient compared to traditional ones that do not have energy-efficient design (Investment Attraction Office, 2022). For example, in Italy (Milan), a "green" skyscraper in the form of a forest-house was even built (Fig.2).

For this reason, energy-efficient structures are constructed with environmentally friendly materials, have high energy-saving rates, and use alternative energy sources – solar energy, air, and ground energy. Such buildings are safe, environmentally clean, and improve the condition of the surrounding environment.

For example, environmentally friendly building materials include foam polystyrene insulation, cement-sand mixtures, and concrete made using cement, sand, gravel. Completely environmentally safe ceramic tile, which is distinguished by high strength, reliability, and durability, is also used (Bud-Info, 2019). All plants of the company "Henkel Bautechnik (Ukraine)" that produce Cere-sit adhesives are already certified with ISO 9001, EMAS/ISO14001, and OHSAS18001(9) (Henkel, 2015, p. 24). The certification of buildings is currently a timely issue.



Fig. 2. Forest Building in Milan, Italy.

Ecological certification of buildings has long been mandatory in developed countries, and the oldest and most widespread method of assessing environmental efficiency in Europe is BREEAM. This system has a 30-year history, and during this time, over 0.5 million buildings in 90 countries have been certified. BREEAM experts analyze buildings according to 10 key parameters, including energy efficiency, use of environmentally friendly building materials, waste management technologies, the building's environmental impact, safety for residents and visitors, and accessibility of transportation infrastructure. Importantly, buildings are assessed twice: at the design stage and at the commissioning stage. This virtually eliminates a "formal approach" or the possibility of a promising but unrealized project.

In Ukraine, however, the trend towards eco-development is only emerging. Commercial real estate is gradually beginning to receive international ecological certificates, while residential complexes are still less active in this area (Mind, 2020). Ecological (green) construction is considered an innovative approach to sustainable territorial development. This is associated with the use of the latest technologies and equipment and the supply of environmentally friendly products that do not harm the environment.

In Japan, ecological problems are given priority attention. Every five years, the state conducts environmental research, and each prefecture has its environmental legislation and specific ecological programs. Japan's long-term goal is to reduce carbon dioxide emissions by 80% by 2050 compared to 2013. Additionally, the country is currently moving towards creating an ideal eco-city (Ecobusiness, 2020).

Maximizing a building's adherence to green construction standards is facilitated by eco-technologies, which focus on using natural

materials in construction and finishing (wood, glass, clay, straw, ceramics, etc.), high-quality thermal insulation achieved through the use of natural materials, building structure insulation, alternative energy sources, and efficient use of natural phenomena (e.g., using rainwater for technical needs); and waste utilization.

Post-war reconstruction of our state must occur based on European and global green courses, utilizing advanced ecological tools and new construction technologies. For Ukraine, green construction has significant potential, prospects for economic growth, and a path to sustainable development. Thus, it is evident that the tendency to apply eco-technologies in the construction sector will only strengthen in the near future. Consequently, the issue of "green construction" is one of the important research directions. However, it should be noted that there is insufficient scientific exploration on this matter, especially in the field of specific construction works.

In recent years, we have conducted research on the development and application of ecological technologies in construction during finishing works. On average, such works constitute 14% of the estimated cost of construction and installation works, and in terms of labor intensity - 28% of total labor costs. On average, 46% of finishing works are performed by a tiler (Nikulina et al., 2007, p. 38). One of the important tasks in selecting technologies for facing and other finishing works is the impact of building materials on human health.

Some materials, despite their high quality, well-known brands, and excellent appearance, can undermine the health of house or office residents. They can subtly affect health, provoke chronic diseases, or cause allergic reactions. Below (Fig. 3), we present the main requirements of ecological construction in performing facing works.



Fig. 3. Ecological requirements for the execution of facing works (developed by the author)

As evidenced by the aforementioned ecological requirements, it is crucial to insist that each worker conscientiously adheres to specific ecological norms and rules, that is, to develop their ecological competence through eco-oriented professional training. According to the insightful definition by L. Sauv e, a researcher from the Universit e du Qu ebec   Montr eal, environmental education is "an essential dimension of basic education, focused on the sphere of interaction that lies at the core of personal and social development – the sphere of relations with our environment, with our common 'home of life'" (Sauv e, 2002, p. 1). The task of environmental education is to seek ways to preserve the environment and manage its resources appropriately. With an adequate level of environmental education, vocational education learners not only gain knowledge about the environment but also become aware of their actions and responsibility for the surrounding environment.

They develop skills to solve various ecological problems. Therefore, environmental education is a powerful tool for responding to ecological challenges, achieving the goals of nature protection and conservation, and thus, sustainable development.

It is deemed advisable for teachers in vocational education institutions to more frequently include environmental education as an educational objective in their lesson plans. According to our research, ecologically clean materials for finishing works have been identified, which we recommend incorporating into the curriculum instead of outdated information.

Figure 4 illustrates the arrangement of flooring on the ground. For waterproofing, new ecologically clean membrane waterproofing materials, isolite and typar, are used instead of waterproofing with roofing felt and bitumen mastic, which contain carcinogenic substances. The technology of their application is simple and waste-free.

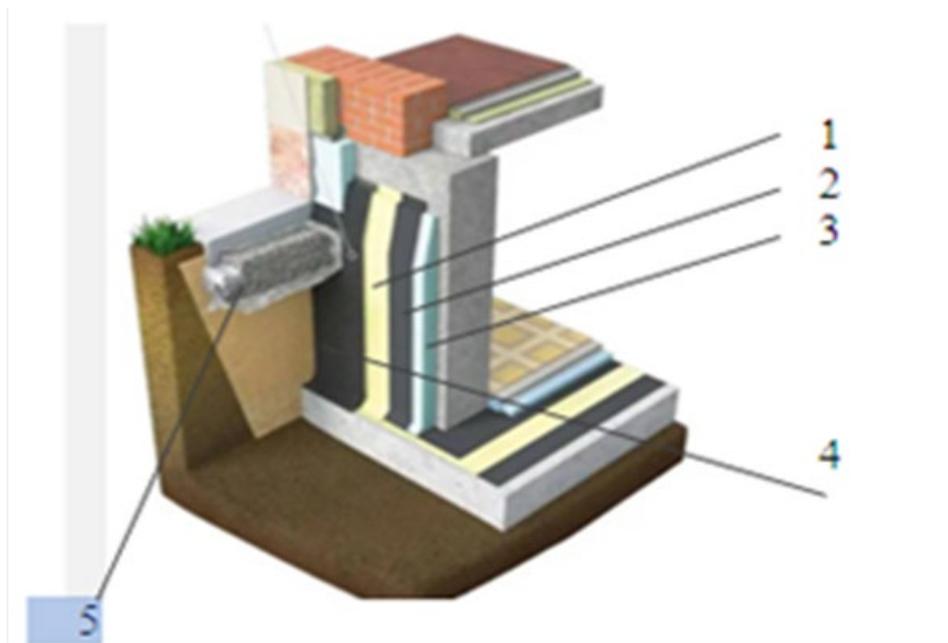


Fig. 4. Foundation of a private strip-type house (ground floor) 1 - waterproofing, 2 - protective geotextile, 3 - thermal insulation, 4 - Izolit, 5 – Typar

Eco-oriented technologies for tiling floors and walls with ceramic tiles involve the use of environmentally friendly materials from the company "KNAUF" - a leveling compound for base leveling, a deep-penetrating primer, and glue based on dry construction mixes. For cladding building facades, such environmentally friendly material as porcelain stoneware is used. Recently, "warm floors" have

become widespread in residential buildings, where the floor covering is made of white ceramic tiles, which helps to reduce the need for artificial lighting. Thus, the impact on both the environment and the health of the residents is minimized. The reduction of waste in construction is facilitated by the use of precise control and measuring instruments: a laser level, etc. (Fig. 5, 6).



Fig. 5. Wall cladding with a laser level.



Fig. 6. Floor installation with a laser level.

We consider it appropriate to include the aforementioned professional information in the curricula and training programs for future tile setters. To better assimilate the material, interactive teaching methods should be used: problem-solving, gaming, small group activities, etc.

We recommend the use of modern innovative web-quest technology, which enables

trainees in professional educational institutions to explore new green building technologies. All of the above will contribute to increasing the motivation of learners to assimilate educational material and ensure their professional competence in green building issues.

The Law of Ukraine adopted on February 28, 2019, "On the Basic Principles (Strategy) of the

State Environmental Policy of Ukraine for the Period up to 2030," introduced a new aspect of vision for goals and strategic tasks in the field of environmental protection, based on identifying the causes of environmental problems in Ukraine and financial possibilities for their resolution. Our research has shown that "green" construction is one of the effective ways to solve these problems. Therefore, special attention should be paid to developing ecological competence in the training program for future builders.

Conclusions. In Ukraine, the process of applying "green" technologies is just beginning. In tiling works, environmentally friendly hydro-insulation membrane materials are used; powerful construction companies have emerged that conduct eco-certification of their products; the use of mastics and adhesives based on dry building mixes reduces construction waste and, consequently, soil pollution at the construction site; more precise laser control and measuring instruments are increasingly

used in tiling works. Therefore, in the training of tile setters, attention should be paid to studying the latest production technologies, especially green ones. Hence, we consider it appropriate to recommend the revision of the State Standard of Professional (Vocational-Technical) Education SP(PT)O 7132.F43.33-2017 Tile Setter 3-7th grade, taking into account ecological requirements, and for teachers of vocational education institutions to pay special attention to developing ecological competence in future tile setters.

Prospects for further research. Development of methodological recommendations for the implementation in the educational process of vocational education institutions of a system of measures for ecological education and the application of modern green construction technologies and environmentally friendly building materials in the training of tile setters.

List of references

- Буд-Інфо (2019, 30 вересня). *Екологічно чисті будівельні матеріали*. <https://bud-info.net.ua/materialy-dlya-budivnytstva-ta-remontu/ekolohichno-chysti-materialy-dlia-budivnytstva/>.
- Вектор ньюз (2016, 8 серпня). Кулішенко, А. «Зелене будівництво» в Україні. Однієї енергоефективності мало. <https://www.vectornews.net/exclusive/19131-zelene-budvnytstvo-v-ukrayin-odnyeyi-energoefektivnost-zamalo.html>.
- Домінант (б. д.). Зелене будівництво і екотехнології. <https://dominant-wood.com.ua/ua/news/285-zelene-budivnytstvo-i-ekotehnologiyi>.
- Екодому – сайт про екологічні будинки. (2023, 15 червня). *Екологічно чисті будівельні матеріали*. <https://ecodoma.in.ua/ecologichnie-strojmateriali.html>.
- Mind (2020, 7 липня). Мехтієв, Р. *Екологічне будівництво: як і навіщо проходити міжнародну сертифікацію*. <https://mind.ua/openmind/20212905-ekologichne-budivnytstvo-yak-i-navishcho-prohoditi-mizhnarodnu-ekosertifikaciyu>.
- Нікуліна, А. С., Заславська, С. І., Ничкало, Н. Г., & Яценко, Л. В. (2007). *Малярні роботи (інтегрований курс модульного навчання): у 3-х частинах. Частина перша*. Київ: Вікторія, 2007, 288 с.
- Офіс залучення інвестицій (UkraineInvest) при Кабінеті Міністрів України. (2022, 31 травня). *Що таке зелене будівництво та чому це важливо?* <https://ukraineinvest.gov.ua/uk/news/31-05-22-2/>.
- Henkel (2015). Системи CeresitCerethetm. Сучасні та надійні рішення. <http://ceresit-pro.net/wp-content/uploads/2015/12/Suchasni-ta-nadiyni-rishennya.-Sistemi-uteplennya-Ceresit.pdf>.
- Ткаченко, Т. М. (2022, 31 травня). Перспективи зеленого будівництва у майбутньому відновленні України. *Децентралізація в Україні*. <https://decentralization.gov.ua/news/15011/20223005>.
- Ecobusiness. (2020, 23 березня). Як Японія вирішує екологічні проблеми <https://ecolog-ua.com/news/yak-yaponiya-vyrishuye-ekologichni-problemy>.
- Chen, J. (2020). *Evaluating the economic feasibility of the Passive House in China*. Stockholm: Royal Institute of Technology. <https://www.diva-portal.org/smash/get/diva2:1447885/FULLTEXT01.pdf>.

HowStuffWorks.com. (2011, 21 March). Fenlon, W. 10 Technologies Used in Green Construction. <https://home.howstuffworks.com/home-improvement/construction/green/10-technologies-used-in-green-construction.htm>.

Gibberd, J. (2020). Green Building Technologies. In: Yang, P., ed. *Cases on Green Energy and Sustainable Development*. Hershey, PA: IGI Global, 2020. <https://doi.org/10.4018/978-1-5225-8559-6>.

Greenfield E. (2022, September 26). Need and Importance of Environmental Education. *Sigma Earth*. <https://sigmaearth.com/need-and-importance-of-environmental-education/>

Sauvé, L. (2002). Environmental education: possibilities and constraints. *Connect. UNESCO International Science, Technology & Environmental Education Newsletter*, 27(1-2):1-4.

Xiao, X., Shah, S. P., & Xiao, J. (2023). Editorial: Low-carbon Materials and Green Construction. *Low-carbon Mater. Green Constr*, 1. <https://doi.org/10.1007/s44242-022-00009-9>.

Translated & Transliterated

Bud-Info. (2019, September 30). Ekolohichno chysti budivelni materialy [Environmentally friendly building materials]. <https://bud-info.net.ua/materialy-dlya-budivnytstva-ta-remontu/ekolohichno-chysti-materialy-dlia-budivnytstva/>, [in Ukrainian].

Vector News. (2016, August 8). Kulishenko, A. «Zelenebudivnytstvo» v Ukraini. Odniei enerhoefektyvnosti malo [“Green Construction” in Ukraine. Energy efficiency alone is not enough.]. <https://www.vectornews.net/exclusive/19131-zelene-budvnictvo-v-ukrayin-odnyeyi-energoefektivnost-zamalo.html>, [in Ukrainian].

Dominant (n.d.). Zelenebudivnytstvo i ekotekhnologii [Green construction and ecotechnologies]. <https://dominant-wood.com.ua/ua/news/285-zelene-budivnytstvo-i-ekotekhnologiyi>, [in Ukrainian].

Ekodoma – sait pro ekolohichni budynky. (2023, June 15). Ekolohichnochysti budivelni materialy [Ecologically clean building materials.]. <https://ecodoma.in.ua/ecologichnie-strojmateriali.html>, [in Ukrainian].

Mind. (2020, July 7). Mekhtiiev, R. Ekolohichne budivnytstvo: yak i navishcho prokhodyty mizhnarodnu sertyfikatsiiu [Ecological construction: how and why to pass international certification.]. <https://mind.ua/openmind/20212905-ekologichne-budivnictvo-yak-i-navishcho-prohoditi-mizhnarodnu-ekosertifikatsiyi>, [in Ukrainian].

Nikulina, A. S., Zaslavska, S. I., Nychkalo, N. H., & Yatsenko, L. V. (2007). Maliarni roboty (intehrovanyi kurs modulnoho navchannia): u 3-kh chastynakh. Chastyna persha [Painting works (integrated course of modular training): in 3 parts. Part one]. Kyiv: Viktoriia, 288 pp., [in Ukrainian].

Investment Promotion Office (UkraineInvest) at the Cabinet of Ministers of Ukraine (2022, May 31). Shcho take zelene budivnytstvo ta chomu tse vazhlyvo? [What is green construction and why is it important?]. <https://ukraineinvest.gov.ua/uk/news/31-05-22-2/>, [in Ukrainian].

Henkel (2015). Systemy Ceresit Cerethetm. Suchasni ta nadiini rishennia [Ceresit Cerethetm Systems. Modern and reliable solutions], 176 pp. <http://ceresit-pro.net/wp-content/uploads/2015/12/Suchasni-ta-nadiyni-rishennya.-Sistemi-uteplennya-Ceresit.pdf>, [in Ukrainian].

Tkachenko, T. M. (2022, May 31). Perspektyvy zelenoho budivnytstva u maibutnomu vidnovlenni Ukrainy [Prospects for green construction in the future reconstruction of Ukraine]. Detsentralizatsiia v Ukraini [Decentralization in Ukraine]. <https://decentralization.gov.ua/news/15011/20223005>, [in Ukrainian].

Ecobusiness (2020, March 23). Yak Yaponiia vyrishuie ekolohichni problem [How Japan solves environmental problems]. <https://ecolog-ua.com/news/yak-yaponiya-vyrishuye-ekologichni-problemy>, [in Ukrainian].

Chen, J. (2020). Evaluating the economic feasibility of the Passive House in China. Stockholm: Royal Institute of Technology, 36 pp., [in English].

Fenlon, W. (2011, 21 March). 10 Technologies Used in Green Construction. HowStuffWorks.com. <https://home.howstuffworks.com/home-improvement/construction/green/10-technologies-used-in-green-construction.htm>, [in English].

Gibberd, J. (2020). Green Building Technologies. In: Yang, Peter, ed. Cases on Green Energy and Sustainable Development. Hershey, PA: IGI Global, 2020. <https://doi.org/10.4018/978-1-5225-8559-6>, [in English].

Greenfield E. (2022, September 26). Need and Importance of Environmental Education. Sigma Earth. <https://sigmaearth.com/need-and-importance-of-environmental-education/>, [in English].

Sauvé, L. (2002). Environmental education: possibilities and constraints. Connect. UNESCO International Science, Technology & Environmental Education Newsletter, 27(1-2):1-4, [in English].

Xiao, X., Shah, S.P., & Xiao, J. Editorial: Low-carbon Materials and Green Construction. Low-carbon Mater. Green Constr. 1, 1 (2023). <https://doi.org/10.1007/s44242-022-00009-9>, [in English].

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ЕКООРІЄНТОВАНІ ВИРОБНИЧІ ТЕХНОЛОГІЇ У ПРОФЕСІЙНІЙ ПІДГОТОВЦІ ЛИЦЮВАЛЬНИКІВ-ПЛИТОЧНИКІВ

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Реферат:

Актуальність статті обумовлюється гостротою проблеми забруднення навколишнього середовища, особливо з боку будівельного сектору, що постає як перед Україною, так і в глобальному вимірі. Одним із напрямів розв'язання цієї проблеми є впровадження зеленого будівництва, що передбачає використання екологічно чистих матеріалів, інноваційних безвідходних та маловідходних технологій, альтернативних джерел енергії, утилізацію відходів тощо. Це вимагає нових, екологічно орієнтованих підходів при підготовці кваліфікованих робітничих кадрів для будівельної галузі, зокрема лицювальників-плиточників.

Мета: на базі світового та вітчизняного досвіду зеленого будівництва дослідити проблематику підготовки лицювальників-плиточників в Україні з використанням екоорієнтованих технологій, розробити рекомендації щодо вдосконалення процесу впровадження зазначених технологій в навчальні плани та програми.

Методи: аналіз вітчизняних та іноземних джерел з питань екологічної освіти та зеленого будівництва, емпіричне дослідження практики застосування екологічних технологій лицювальниками-плиточниками в Україні.

Результати: розкрито суть екоорієнтованої професійної підготовки, проаналізовано зарубіжний та вітчизняний досвід із питань зеленого будівництва; розглянуто екоорієнтовані технології для лицювальників-плиточників; розкрито основні екологічні вимоги до будівельних матеріалів та технологій виконання облицювальних робіт; підготовлено відповідні рекомендації з використання екоорієнтованих технологій у професійній підготовці майбутніх лицювальників-плиточників.

Висновки: екоорієнтована професійна підготовка повинна стати невід'ємною часткою професійної компетентності лицювальників-плиточників, вносячи корективи як у зміст, так і методи навчання. Так, при виконанні облицювальних робіт застосовуються екологічно чисті гідроізоляційні мембранні матеріали; з'явилися потужні будівельні компанії, що проводять екосертифікацію своєї продукції; застосування мастик та клеїв на основі сухих будівельних сумішей знижує будівельні відходи і, як наслідок, забруднення ґрунтів на будівельному об'єкті; при виконанні облицювальних робіт все частіше застосовують точні лазерні контрольні-вимірювальні прилади. Таким чином, при підготовці лицювальників-плиточників слід приділяти увагу вивченню новітніх зелених технологій. Обґрунтовано важливість розроблення нормативно-правових актів із питань екосертифікації будівельних матеріалів та технологій виконання робіт, а надалі – і будівель. Рекомендовано доопрацювання Державного стандарту професійної освіти на професію лицювальника-плиточника з урахуванням екологічних вимог, а викладачам закладів професійної освіти – звернути особливу увагу на формування екологічної компетентності у майбутніх лицювальників-плиточників.

Ключові слова: *екоорієнтована професійна підготовка, зелене будівництво, екоорієнтовані технології, екологічна сертифікація, екологічна компетентність, лицьовальник-плиточник.*

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