sustainability

MDPI

Article

Empowering Future Leaders: Green Logistics Talent Development in Chinese Higher Education

Yuran Jin [1,*], Jieyu Zhao [2], Haiyun Hou [3], Guanghui Fan [4], Xiaolin Zhu [1] and Sainan Zhang [1]

[1] School of Business Administration, University of Science and Technology Liaoning, Anshan 114051, China; zhuxiaolin@ustl.edu.cn (X.Z.); 312365@ustl.edu.cn (S.Z.)
[2] Green Logistics Committee, China Federation of Logistics & Purchasing, Beijing 100037, China; zjy@cflp.org.cn
[3] Anshan Iron and Steel Group Co., Ltd., Anshan 114021, China; houhaiyun@ansteel.com.cn
[4] Jingdong Logistics, Beijing 110000, China; fanguanghui7@jd.com
* Correspondence: jinyuran@ustl.edu.cn; Tel.: +86-13941289982

Abstract: Green logistics talent is becoming increasingly scarce in this era of global sustainability. However, there has been a lack of research on how to develop this. This study explores effective approaches to cultivating green logistics talent within Chinese universities. The University of Science and Technology Liaoning (USTL), a university that has made outstanding achievements in green logistics talent cultivation (GLTC), was reported as a case study. The initiation, processes, and effects of GLTC at the USTL were introduced in detail. The nine processes included establishing cultivation objectives, determining the knowledge system, developing the course named Green Logistics Virtual Simulation Experiment, publishing the textbook *Green Logistics Theory and Experiment*, setting up the global Virtual Office for GLTC, promoting the reform of teaching model, etc. The four effects include 180,000+ people from more than 140 colleges worldwide using the course, a significant improvement in the quality of students' green logistics knowledge and skills, etc. Finally, six successful experiences of GLTC at the USTL were analyzed, and a successful model was constructed. This study provides a comprehensive model for cultivating green logistics talent within higher education, using USTL as a case study, which provides important references for GLTC not only for Chinese universities but also for global universities.

Keywords: green logistics; talent; higher education; virtual simulation; experiment

Citation: Jin, Y.; Zhao, J.; Hou, H.; Fan, G.; Zhu, X.; Zhang, S. Empowering Future Leaders: Green Logistics Talent Development in Chinese Higher Education. *Sustainability* **2024**, *16*, 10966. https://doi.org/10.3390/su162410966

Academic Editor: Mark A. Bonn

Received: 22 October 2024
Revised: 4 December 2024
Accepted: 7 December 2024
Published: 13 December 2024

1. Introduction

Logistics pollution is the main source of environmental pollution [1,2]. The logistics sector is one of the top emitters of greenhouse gases, with transportation alone responsible for nearly 40% of emissions from the end-use sectors [3]. Logistics-induced emissions contribute to global warming, posing ecological, economic, and societal challenges, with over 50% of emission reduction opportunities identified within the sector [4]. In China alone, CO_2 emissions from logistics increased significantly from 2010 to 2020, driven by economic growth and population dynamics [5]. In the European Union, the transport sector accounts for 20% of anthropogenic GHG emissions. The urgency is underscored by the European Commission's goal to cut emissions by 90% by 2050 [3]. As environmental concerns become increasingly prominent, green logistics has emerged as an inevitable trend in the industry [6,7], embodying the organic unity of economic efficiency, environmental protection, and social equity. Cultivating compound talent that has mastered the concept and practical skills of green logistics can not only enhance the competitiveness of enterprises but also promote the green transformation of the entire industry and ultimately achieve the sustainable development of society [8,9]. Therefore, training green logistics talent has become an urgent need for sustainable global development.

Research and practices for cultivating green logistics talent in many countries have become increasingly important as the global emphasis on sustainability grows. For example, the United States has focused on integrating sustainability into logistics education and training [10]. Many universities, such as the University of Washington and the Massachusetts Institute of Technology (MIT), have introduced sustainability-focused logistics courses. MIT's Center for Transportation and Logistics offers programs like the Sustainability Certificate. The Council of Supply Chain Management Professionals (CSCMP) provides green logistics training that focuses on sustainable transportation and supply chain strategies. The United Kingdom has been proactive in integrating green logistics education into higher education and vocational training. Government and educational institutions have partnered to promote green skills [11]. For example, the Chartered Institute of Logistics and Transport (CILT) in the UK offers a range of qualifications in green logistics and supply chain sustainability. The University of Westminster and Cranfield University offer dedicated programs in logistics and transport management, with a focus on sustainability. The French government has implemented initiatives like the "National Strategy for Sustainable Development" which encourages universities and vocational institutions to include green logistics in their curricula [12]. École des Ponts ParisTech offers specialized programs in transportation and logistics, with a strong emphasis on sustainability and environmental impact reduction. Germany is known for its strong focus on vocational training and academic research in sustainable logistics [13,14]. Kühne Logistics University (KLU) and the Fraunhofer Institute for Material Flow and Logistics offer specialized programs to train future professionals in sustainable supply chain management. Japan's approach to green logistics training is driven by both corporate practices and academic programs. Large companies, such as Toyota and Nippon Express, have developed in-house training programs focused on green logistics, such as energy-efficient transportation and reducing carbon footprints [15,16]. Universities such as the Tokyo University of Science offer programs and research opportunities focused on sustainable logistics, particularly within the context of Japan's advanced manufacturing and transportation industries. In China, the problem of logistics pollution has risen to the level of national governance [17,18], for China has become the world's country with the largest CO2 emissions since 2007 [19]. The Chinese government has issued documents such as the "Guiding Opinions on Strengthening the Standardization of Green Packaging for Express Delivery," the "14th Five-Year Plan for the development of modern logistics" and so on to deepen the development of green logistics. Especially of note, the Ministry of Education of China has successively issued the "Action Plan for Carbon-Neutral Technological Innovation in Colleges and Universities", the "Work Plan for Strengthening the Construction of Higher Education Talents Training System for Carbon-Neutralization in Higher Institutions", and the "Construction Implementation Plan of Green and Low-carbon Development of the National Education System" since 2021. Therefore, some Chinese universities such as Beijing Wuzi University, Beijing Jiaotong University, and Shanghai Jiao Tong University have begun to explore the training of green logistics talent.

However, although many countries and organizations are promoting the cultivation of green logistics talents, as of today, we have not found any academic papers on how to cultivate green logistics talent, which represents an obvious theoretical research gap. Based on the above considerations, we studied a typical success story in Chinese universities in green logistics talent cultivation (GLTC), that is, the story of the University of Science and Technology Liaoning (USTL). We provided a conceptual model for GLTC within higher education using USTL as a case study, with the hope of providing references for universities around the world by answering the following questions:

(1) What is the process behind GLTC at USTL?
(2) What successful practices can be identified from USTL's GLTC?
(3) Can a theoretical GLTC model be derived from USTL's experience to guide global universities?

The remainder of this paper is organized as follows: Section 2 presents a literature review on GLTC; Section 3 introduces the launch, three measures, and four effects of GLTC at USTL; and Section 4 discusses six successful experiences of USTL and proposes a theoretical model of GLTC. Finally, Section 5 concludes this study with suggestions for future work.

2. Literature Review and Research Gap

The logistics sector faces increasing pressure to adopt sustainable practices [20,21]. This shift requires professionals who are not only skilled in traditional logistics, but also knowledgeable about environmental sustainability. To identify the gap in green logistics education and its critical role in sustainability, we conducted a literature review of industry demands, skills needed, educational approaches, and educational challenges in cultivating green logistics talent, as demonstrated below.

2.1. Green Logistics Talent

Green logistics talent refers to individuals equipped with the skills and competencies necessary to implement and manage sustainable logistics. Green logistics talent encompasses a range of skills including knowledge of sustainable supply chain practices, proficiency in using green technologies, and the ability to implement eco-friendly logistics strategies. These skills are essential for reducing the carbon footprint and optimizing resource use in logistics operations [22]. The presence of green logistics talent is a significant factor in the development of green logistics. It is considered more influential than other factors, such as economic and environmental considerations [23]. Green logistics talent is essential for implementing strategies that mitigate the environmental impacts of logistics activities such as greenhouse gas emissions and waste management [24].

2.2. Industry Demands on Green Logistics Talent

The logistics sector is one of the largest contributors to global carbon emissions [25]. As the logistics industry evolves, there is an increasing demand for professionals who are not only skilled in traditional logistics practices but also possess a deep understanding of sustainable practices and environmental impact [26]. This dual expertise is essential for companies aiming to reduce their carbon footprints while maintaining efficiency and competitiveness in a rapidly changing market [27,28]. Wang et al. [29] studied the talent development model for low-carbon logistics in response to cross-border e-commerce supply chains, and highlighted the need for collaborative efforts between industry stakeholders, educational institutions, and governmental bodies. This study bridges the gap between theoretical knowledge and practical application of low-carbon logistics talent.

2.3. Skills Needed of Green Logistics Talent

Various authors emphasize the necessity of specialized skills in areas such as supply chain management, waste reduction, and sustainable sourcing, which are becoming increasingly integral to logistics operations [30–32]. The research indicates a diverse set of competencies required by green logistics professionals. These professionals include knowledge of sustainable practices, analytical skills for assessing environmental impacts, and the ability to implement logistics technologies that promote sustainability [33,34]. Green logistics professionals must possess a strong understanding of environmental issues, including climate change, carbon footprints, and resource conservation. This awareness underpins decision-making processes aimed at reducing environmental impact [35,36]. Some scholars further emphasize the importance of soft skills, such as communication and collaboration, in fostering a culture of sustainability within organizations [37,38]. These findings underscore the multifaceted nature of green logistics talent, necessitating a comprehensive approach to education and training. Keuschen and Klumpp [39] highlighted a significant qualification gap in green logistics, indicating that skills needed for green logistics talent in-

clude knowledge of CO_2 measurement standardization, integrated management concepts, and process changes related to new transport modes and propulsion systems.

2.4. Educational Approaches of Cultivating Green Logistics Talent

The literature suggests that traditional logistics education programs must evolve to incorporate sustainability-focused curricula [34,40,41]. Additionally, experiential learning opportunities such as internships and industry collaborations are highlighted as an effective means of cultivating hands-on experience in green logistics practices [42,43]. Recent studies have also advocated interdisciplinary education, combining logistics with environmental science and business management [43]. This interdisciplinary approach widens the perspective of students, thereby equipping them with the holistic understanding necessary for effective decision making. Such educational innovations are crucial in producing graduates who are not only proficient in logistics but also possess a robust understanding of ecological principles. Dudin, Frolova, Kuznetsov, Drobysheva and Krasulya [30] proposed recommendations for developing a new model of professional training that incorporates the latest scientific concepts and meets labor market demands for specialized human resources in green logistics. Wu [44] put forward a creative educational approach named the cultivation model for successful and practical talents. This approach integrates societal needs and sustainability into its educational model.

2.5. Educational Challenges in Cultivating Green Logistics Talent

Curriculum development: Educational institutions that train future professionals must adapt their curricula to reflect the growing importance of green logistics [13,45,46]. Developing comprehensive curricula that cover the multifaceted aspects of green logistics is challenging [6]. Educational institutions must balance theoretical knowledge with practical skills to prepare students effectively for the complexities of sustainable supply chain management. This includes integrating case studies, hands-on projects, and partnerships with industry leaders to ensure that students gain real-world experience in implementing eco-friendly practices [47]. In addition, Parry and Metzger [48] think that many educators feel unprepared to teach sustainability, lacking the necessary competencies and professional development opportunities to effectively integrate sustainability into their curricula; Sa-Couto et al. [49] argue that the collaborative partnerships between educational institutions and industry stakeholders are crucial for sharing resources and expertise, yet these partnerships are often underdeveloped. The lack of strong industry connections can hinder the development of standardized and innovative solutions necessary for sustainable simulation practices; Usheva et al. [50] put forward the high cost of purchasing and maintaining simulation technologies as a significant barrier, especially for institutions with limited financial resources.

Virtual simulation experiment courses and online courses: Online platforms offer flexible learning opportunities for professionals seeking to enhance their skills [51,52]. Virtual simulation experiment courses can enhance students' learning experiences and their ability to innovate and practice [53–55]. Such courses are also needed in the process of cultivating green logistics talents [30,56]. These educational initiatives not only equip individuals with essential knowledge but also foster a community of like-minded professionals dedicated to advancing sustainability in their respective fields.

School–enterprise cooperation: School–enterprise cooperation initiatives play a crucial role in bridging the gap between theoretical knowledge and practical application [57], enabling students to engage directly with industry leaders and gain hands-on experience in sustainable practices [58]. The dynamic nature of the logistics industry requires curricula to quickly adapt to new technologies and practices [59,60]. Maintaining adaptability is a significant challenge for educational providers. Fostering partnerships between academia and industry can promote knowledge exchange and innovation and ensure that emerging talent has the necessary practical skills to deal with the complexity of environmentally responsible logistics operations [61].

Through the above literature review, we found that despite the growing recognition of the importance of green logistics and the increasing demand for qualified professionals in this field, some significant gaps remain in green logistics education, which have hindered the development of green logistics talent. Therefore, there is a clear and pressing need for more comprehensive, universally applicable educational frameworks that cultivate green logistics talent. A standardized educational model that encompasses the diverse competencies required for green logistics is essential for producing well-rounded professionals capable of effectively addressing environmental challenges, which can empower the next generation of logistics professionals to meet the demands of a sustainable future.

3. Reform Practices of GLTC

The USTL has carried out a series of practices contributing to the development of green logistics talent so as to realize the overall goal of GLTC and to achieve consistency with national sustainable development goals.

3.1. The Initiation of GLTC

The USTL is a multidisciplinary university that focuses on engineering. The school has the right to award bachelor's, master's, and doctoral degrees, respectively. It has nine national and more provincial high-level talents, including one academician from the Flexible Introduction Engineering Academy, two foreign academicians, and one Changjiang Scholar. There are five recipients of special government allowances from the State Council. The schools' three disciplines were included in the top 1% of the ESI global rankings. The school attaches great importance to the training of talent in the field of environmental protection and has established research institutes such as "Low-carbon Economy and Smart Business", "Green Low-carbon and Smart Metallurgy", and "Environmental Management". The business administration major of the USTL is a characteristic major of innovation and entrepreneurship in Liaoning Province and a first-class undergraduate education degree major in Liaoning Province. This major offers direction for logistics management and trains senior undergraduate talent in modern logistics management. In line with developments in the environmental protection era, to cultivate new-era logistics management talent who "know environmental protection, understand management, and be able to practice", this major has implemented teaching reforms aimed at cultivating green logistics talent from multiple dimensions since 2010. However, at the beginning of the reform, the USTL actually faced a lot of challenges, such as the lack of theoretical or experimental courses in the field of green logistics, teaching materials, teachers, and internship bases, among others, and a lack of research on the teaching methods for GLTC. At one time, the university faced the dilemma of not being able to promote the training of green logistics talents. In response to these difficulties, the USTL did not stop, but gradually broke through the bottlenecks and encouraged teachers to develop new courses, publish new teaching materials, establish new bases, etc., which eventually placed the USTL at the forefront of GLTC in Chinese universities. After the Chinese government's "dual-carbon" goal, the training of green logistics talent at the USTL embarked on the fast lane. To date, the USLT has achieved a series of developmental results.

3.2. The Measures of GLTC

3.2.1. Establishing Talent Cultivation Objectives

In the process of cultivating green logistics talent, the USTL first defined the following goals of talent training, as shown in Figure 1:

Objective 1: Training students to master green logistics knowledge. According to a school survey among students majoring in logistics, 76.5% of students have only a "slight understanding" of green logistics, and 100% look forward to further understanding green logistics. Considering that the talent cultivation orientation of USTL is senior-applied talent, cultivating students' systematic cognition of green logistics has been identified by the USTL as the basic goal of GLTC.

Objective 2: Cultivating students to have practical and innovative abilities to solve problems related to logistics pollution. Green logistics is an emerging and complex issue. To improve the professionalism and strength of students, the ability to solve key issues of green logistics (such as the estimation of logistics air pollution, greenhouse gas emissions, and carbon emissions) must be cultivated to comprehensively evaluate the innovation spirit and practical ability of students.

Objective 3: Cultivating students to have a sense of social responsibility. Students' deep understanding of logistics pollution should be comprehensively enhanced, their identification with the concept of green logistics should be enhanced, and their sense of social responsibility should be trained to cultivate high-quality talent with a sense of responsibility for society.

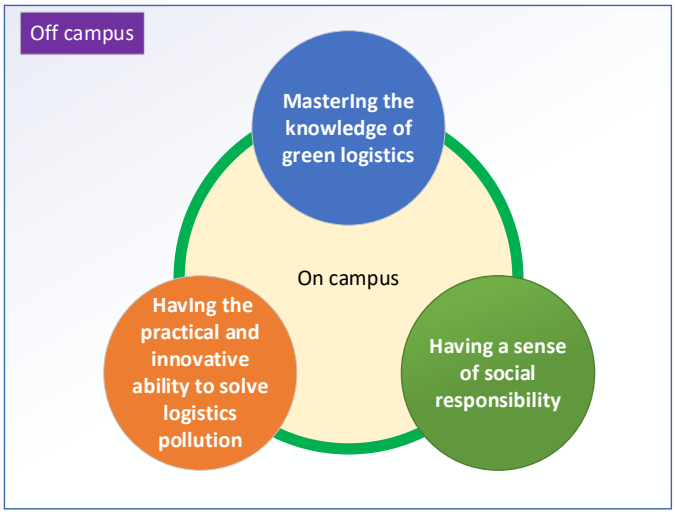

Figure 1. Talent cultivation objectives of green logistics at USTL.

The achievement of the above teaching objectives will help students quickly adapt to work in green logistics management, green production, environmental management and other fields or engage in relevant scientific research after graduation. It lays an important foundation for the growth of graduates into high-level application-oriented "new liberal arts" talent.

3.2.2. Determining the Knowledge System for Talent Cultivation

To enable students to have a comprehensive knowledge of green logistics, the USTL has determined a new knowledge system of green logistics. It includes 55 knowledge points in 10 categories, including green warehousing, green packaging, green distribution, green loading and unloading and handling, green distribution and processing, logistics informatization, "sound, light, water and dust" pollution, logistics air pollution, logistics greenhouse gas emissions, and green logistics management system. The main basis for our selection of 55 green logistics indicators is China's national standard *Green Logistics Indicators and Accounting Methods*. At the same time, in order to make these knowledge points highly relevant to current industry practices and challenges, we have had multiple rounds of communication with the Green Logistics Branch of the China Federation of Logistics and Purchasing and more than 20 logistics companies. Finally, the knowledge system was constructed. The knowledge system for talent cultivation effectively supports the fulfilment of Objective 1. The main knowledge system is illustrated in Figure 2.

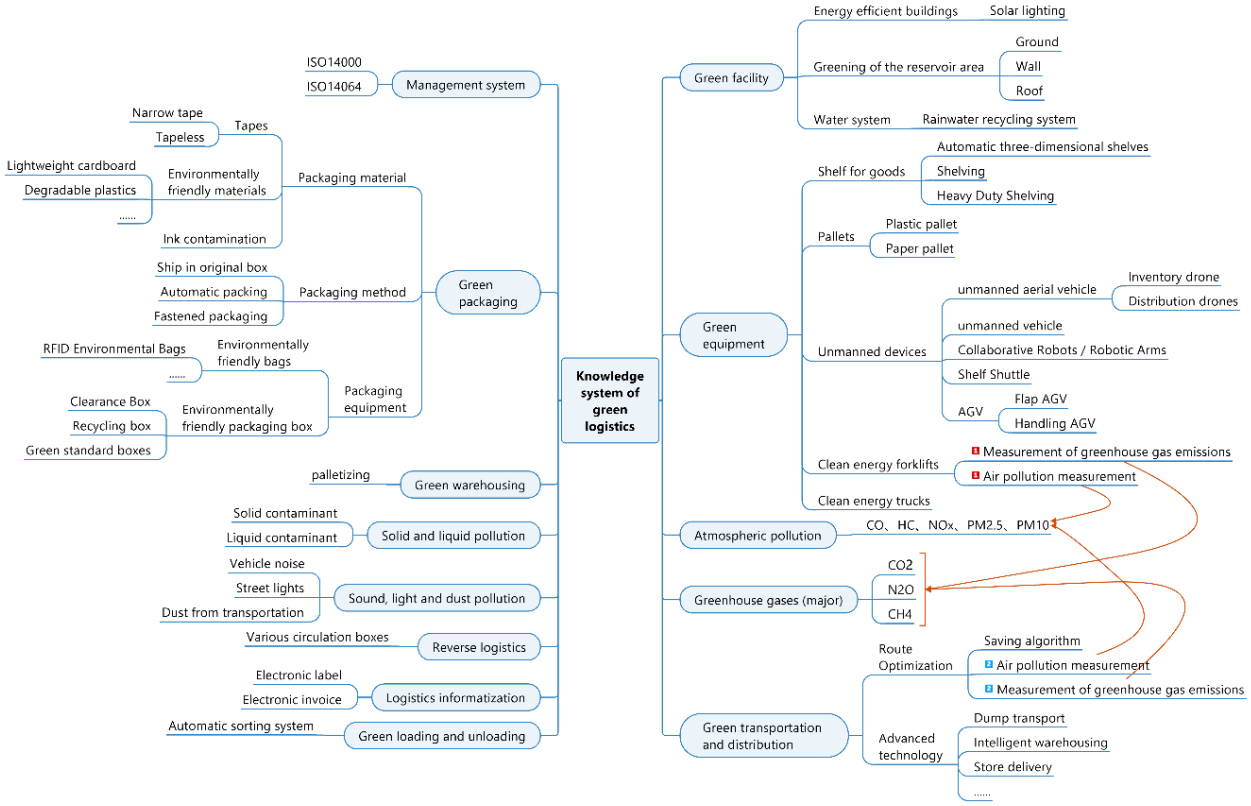

Figure 2. Knowledge system of green logistics.

3.2.3. Implementing Seven Important Measures for GLTC

The course Green Logistics Virtual Simulation Experiment was developed. The following prominent problems exist in the practical training of green logistics talent. First, there are still few green logistics enterprises, which cannot meet the practical needs of a large number of students. Second, among the few enterprises that have implemented green logistics, these can seldom cover all the logistics pollution problems. Third, during the internship process, the complicated logistics environment often leads to greater safety risk. In general, practice education in GLTC is limited by time, space and conditions, and practice education has "few opportunities, high cost, high risk, and poor effects". To this end, the USTL and enterprises such as JD Logistics have jointly developed a large-scale green logistics virtual simulation experiment course for free online learning (Course website: https://www.ilab-x.com/details/page?id=12619&isView=true (accessed on 7 October 2024)) so as to train students' knowledge, quality and ability of green logistics in one platform. The web interface of the course is shown in Figure 3. The developed course Green Logistics Virtual Simulation Experiment simultaneously supports the fulfilment of Objectives 1, 2, and 3.

The textbook "Green Logistics: Theory and Experiment" has been published. The textbook, published by Tsinghua University Press in 2023 as Figure 4 shows, is the first characteristic textbook jointly compiled by a university–enterprise–association–society, which combines the cutting-edge theory of green logistics and virtual simulation experiments at home and abroad. The textbook was approved by the China Federation of Logistics and Purchasing, the New Liberal Arts Construction Working Group of the Ministry of Education, the Teaching Steering Committee of Logistics Management and Engineering Professionals in Colleges and Universities of the Ministry of Education. It was also recommended by Wang Junjie (the general manager of supplier management of Maersk Greater China), Jianfeng Zhang (the vice president of technological innovation of GLP Research Institute, Li Hou (Head of Asia-Pacific Integrated Logistics Safety and Assurance of Covestro), Haoyuan Li (General Manager of Sustainable Development Department of Sinotrans, Chao Fan (Senior

Algorithm Expert of JD Logistics), and others. The book effectively supports the fulfilment of Objectives 1 and 3.

Figure 3. The interface of the Green Logistics Virtual Simulation Experiment course.

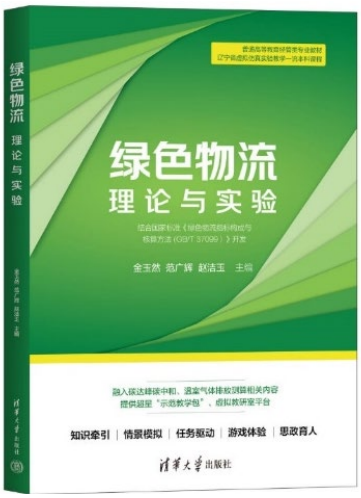

Figure 4. The textbook Green Logistics Theory and Experiment.

A global "Virtual Office for Green Logistics Personnel Training" was established. This faculty is composed of domestic and international teachers, scholars, entrepreneurs, government officials, and experts from industry associations and societies. Currently, there are 22 member units. The members have closely cooperated in the fields of faculty, courses, textbooks, practice bases, laboratories, student employment, enterprise employee training, and the development of national standards. The aim is to develop a first-class "government-industry-university-research-application" virtual teaching community in the field of green logistics. The Virtual Office for Green Logistics Training is labeled, as shown in Figure 5. The creation of the virtual office has supported the achievement of Objectives 1 and 3.

Figure 5. Virtual Office for Green Logistics Personnel Training.

Establish internships and training bases with advanced green logistics enterprises. The school conducted school–enterprise cooperation with 12 well-known green logistics enterprises, such as JD Logistics, Suning Logistics, Trawind shipping Logistics, and Ansteel Logistics, and signed internship training agreements with them. This provides rich practical training opportunities to improve the practical abilities of school students. The knowledge acquired by students in school is applied in real scenarios, which greatly improves the students' practical and innovation abilities. Establishing internships and training bases contributes to the fulfilment of Objective 2.

A mixed teaching team, comprising internal and external teachers, was assembled. More than 20 experts from government, enterprises, universities and associations were invited to join the teaching team of GLTC, including Haiyun Hou (a drafter of the Chinese national standard "Green Logistics Indicators and Accounting Methods", a member of the National Logistics Standardization Technical Committee and deputy chief engineer of Anshan Iron and Steel Group Co., Ltd.), Dr. Jieyu Zhao (the Secretary-General of the Green Logistics Branch of China Federation of Logistics and Purchasing), Guanghui Fan (the vice president of Science and Technology in JD logistics), Shengming He (an assistant to the general manager of Trawind Shipping Logistics), and others. Setting up the mixed teaching team helps to achieve Objectives 1 and 2.

Promote reform of the green logistics teaching model. The school requires teachers to abandon the traditional theory-based teaching mode and adopt a teaching mode based on practice and experiments that is problem-driven and project-driven. Teachers are required to attach importance to inspiring education and to encourage the use of online and offline blended teaching, virtual simulation teaching, and case-based teaching to stimulate the students' enthusiasm for learning and improve the quality of talent training. In the past five years, the relevant teachers have been approved for 12 teaching model reform projects and have published more than 20 teaching reform papers. The reform of the teaching mode has made students more interested in learning green logistics knowledge points, resulting in better learning outcomes and greater attention to national sustainable development, all of which synergistically contribute to the simultaneous fulfilment of Objectives 1, 2, and 3.

Students are encouraged to participate in green logistics-related projects and competitions. Many students have participated in theoretical or practical research projects with teachers in the field of green logistics. More than 50 people have participated in teaching or scientific research projects related to green logistics, such as the national standard projects of green logistics, the teaching reform projects of Liaoning Provincial Department of Education, the first-class curriculum construction projects of Liaoning Province, the teaching reform projects of USTL, and the philosophy and social science research projects of Liaoning Province. The students were approved for 12 projects in the College Student Innovation and Entrepreneurship Competition, published more than 50 papers, and won more than 30 awards in various competitions. The USTL established a feedback mechanism for students to collect their experiences and suggestions for reform through the information

system. Feedback from students can be received by course instructors, department chairs, associate deans for teaching and learning, and heads of teaching supervisory teams. Their feedback contributed well to the implementation of GLTC. The students' participation in green logistics-related projects and competitions makes them more capable of practicing green logistics, which greatly supports the fulfilment of Objective 2.

3.3. The Effects of GLTC

3.3.1. A Course from GLTC Benefited More than 180,000 Students and 140 Universities in the World

Since the course "Green Logistics Virtual Simulation Experiment" was launched in 2019, it has received much attention from college students and social enterprises, and it was upgraded to a Chinese–English bilingual version in 2024, which is open to the world and has generally received acclaim. The course was awarded the first-class course of virtual simulation experimental teaching in Liaoning Province in 2021 and was recommended as a national first-class course in China in 2024. At present, more than 140 universities around the world are involved, such as Tsinghua University, Chinese Academy of Sciences, Fudan University, Wuhan University, Harbin University of Technology, Renmin University of China, Nankai University, Beijing Institute of Materials, Zhejiang Industrial and Commercial University, University of São Paulo, Kangwon National University, Universiti Selangor, and JD Logistics, Suning Logistics and six other enterprises, and a total of 180.000 users visited and studied this course.

3.3.2. GLTC Has Obtained Great Attention from the Green Logistics Branch of China Federation of Logistics and Purchasing

The green logistics talent-training measures of USTL have been highly valued by the Green Logistics Branch of the China Federation of Logistics and Purchasing. In 2021, Hao Jiang, the executive vice president of the Green Logistics Branch of the China Federation of Logistics and Purchasing, led a special trip to the USTL to investigate it and commended it. He expected the USTL to play a greater role in promoting the development of China's green logistics industry, personnel training, and enterprise training. The attention received from the Green Logistics Branch shows that the achievements of GLTC in the USTL have been highly recognized by the industry, and have made positive contributions to the cultivation of green logistics talents and sustainable development in China. At the same time, it also provides the possibility of obtaining more funding or policy support for the future training of green logistics talents for the USTL through mutual cooperation.

3.3.3. The Experience of GLTC Was Introduced at Several National Meetings

In 2021, Professor Yuran Jin, director of GLTC, was invited to attend the national seminar "Green Logistics Standard System and Talent Training", which was jointly organized by the National Development and Reform Commission of China and the China Federation of Logistics and Purchasing. The experience in training green logistics talent shared at the conference was highly recognized by experts from the China Society of Logistics, Beijing Green Exchange, Smart Fright Center, etc. At the first "Green Logistics and Supply Chain Development Conference" held in 2023 in China, more than 800 industry leaders, experts, scholars, and business elites from Lenovo, Budweiser, IKEA, Shanghai Jiao Tong University, and Beijing Jiao Tong University from all over the country participated. Those leading the GLTC experience of the USTL were invited to give a report at the conference and it was recommended to the entire country. The GLTC experience was shared at two national conferences, as shown in Figure 6. The insights shared at the national meetings have pushed many colleges and universities, such as the Hebei Institute of Environmental Engineering, to start green logistics virtual simulation experimental courses for GLTC, promoted a group of new logistics industry enterprises such as Cartongirl Packaging Technology (Jiangsu) Co. LTD to start training green logistics talents, and made other countries outside of China understand China's new progress in GLTC.

Figure 6. Sharing the experience of GLTC at several national conferences.

3.3.4. Students' Knowledge, Quality and Ability in Green Logistics Are Significantly Improved

A survey of 556 students involved in the training of green logistics talent shows that 100% of the students think that their knowledge of green logistics has been significantly enriched, 95% think that they have a more specific understanding of carbon emissions in the field of logistics, 93% think that their practical ability of green logistics has been improved, 92% think that their innovative ability to solve the problem of logistics pollution has been improved, and 90% think that the comprehensive quality of green logistics has been improved. A survey of 20 graduate employment units shows that 100% of graduates who have received green logistics education have a wider and deeper understanding of logistics pollution, logistics carbon emissions, and other problems than previous graduates, and 92% of employment units believe that graduates with green logistics education have shown good problem-solving ability and innovation ability in solving logistics pollution problems.

4. Discussion

4.1. Successful Experiences of GLTC

Combined with the development process of cultivating green logistics talent, six successful experiences can be summarized. They play a fundamental role in the training of green logistics talent.

4.1.1. Clear Cultivation Objectives and Knowledge System Are Important Foundations

The training objectives of green logistics talent in the USTL clearly define the direction and foothold of green logistics talent, reflect the professional qualities and abilities that green logistics talent should possess, provide a basis for teachers to design teaching links and assessment methods, and help teachers develop realistic curricula and teaching content. The practices of the USTL in GLTC realize a strong support for its cultivation objectives, and its intrinsic relationship can be summarized as in the matrix in Table 1 below. The USTL has also established a complete knowledge system for GLTC. This knowledge system covers the theoretical basis, key technologies, and best practices of green logistics, and can lay a solid professional knowledge foundation for students. Obviously, clear talent-training objectives and sound knowledge systems can lay an important foundation for GLTC in colleges and universities.

4.1.2. Development of Teaching Resources for GLTC Is Very Necessary

Talent training in any field is inseparable from the support of teaching resources [62,63]. Although green logistics has garnered increasing attention in the education field, relevant teaching resources in the field of green logistics, such as specialized green logistics theoretical courses, green logistics practical training courses, green logistics textbooks, green logistics teaching teachers, and green logistics teaching software are still lacking. Obviously, the USTL has carried out a large amount of work in these areas, including the development of courses, textbooks, teachers, and bases, and has achieved many significant results. These achievements provide valuable teaching resources not only for the USTL but also for the training of green logistics talent in various fields worldwide. From the USTL's experience

in conducting GLTCs, it is necessary to explore potential partnerships with industry stakeholders to enhance resource development and ensure that the teaching materials reflect real-world practices and needs.

Table 1. Matrix of training objectives and practice initiatives.

Measures of GLTC	Training Objective 1	Training Objective 2	Training Objective 3
	Mastering Green Logistics Knowledge	Having Practical and Innovative Abilities	Having a Sense of Social Responsibility
Determining the knowledge system for talent cultivation	•		
Developing the course Green Logistics Virtual Simulation Experiment	•	•	•
Publishing the textbook *Green Logistics: Theory and Experiment*	•		•
Establishing a global "Virtual Office for Green Logistics Personnel Training"	•		•
Establishing internships and training bases		•	
Assembling a mixed teaching team	•	•	
Promoting reform of the green logistics teaching model	•	•	•
Encouraging students to participate in green logistics-related projects and competitions		•	

4.1.3. Three-Dimensional Virtual Simulation Experimental Teaching Is an Important Path for GLTC

The fact that the green logistics virtual simulation experiment course developed by the USTL has been used online by more than 180,000 people worldwide is a clear indication of the high global recognition of 3D virtual simulation courses in the training of green logistics talent. Since 3D virtual simulation teaching has an experiential teaching effect that cannot be replaced by ordinary classroom theoretical teaching and can clearly stimulate students' enthusiasm for learning, this teaching method is suitable for the training of green logistics talent in the logistics industry with complex scene characteristics. It is worth being adopted by more schools and enterprises.

4.1.4. Virtual Faculty Is Conducive to Promoting GLTC

The virtual teaching and research office is a teacher community based on a modern information technology platform that is dynamically organized by teachers from different regions, schools, disciplines, or majors to jointly conduct collaborative teaching research and reform practices. The Ministry of Education of China began the pilot construction of virtual teaching and research offices in 2020, striving to build a group of virtual teaching and research offices with advanced concepts, comprehensive coverage, and complete functions, forge a group of high-level teaching teams, and comprehensively enhance the teaching ability of teachers. The construction of the "Virtual Office for Green Logistics Personnel Training" at the USTL has received active participation and support from all individuals of walks of life, which shows that the virtual teaching and research office has played a pivotal role in promoting the GLTC. Today, with the highly developed Internet, an increasing number of colleges and universities can use the model of virtual teaching and research offices more extensively to promote the training of green logistics talent.

4.1.5. Classroom Teaching Reform Is Necessary for GLTC

Classroom teaching is the core channel for university talent training [64,65]. Modern logistics is characterized as technology-intensive, information-intensive, capital-intensive,

service-oriented, green, and intelligent. The traditional classroom teaching mode can hardly meet the training needs of compound and innovative talent in the field of green logistics; therefore, teaching reform is imperative. The results of the teaching model reform of USTL in the training process of green logistics talent show that the cultivation of green logistics talent is inseparable from the in-depth reform and innovation of classroom teaching modes. The innovative teaching methods in GLTC from the USTL, such as the teaching mode based on practice and experiments that is problem-driven and project-driven, online and offline blended teaching, virtual simulation teaching, and case-based teaching, are helpful to stimulate students' enthusiasm for learning and improve the quality of talent training. However, these methods may not be applicable to all students either. In the process of conducting green logistics talent training, relevant colleges and universities can continuously optimize or innovate classroom teaching models according to their respective talent training positions to train more specialized and characteristic green logistics talent.

4.1.6. Students' Participation in Research and Competitions Is an Enabler of GLTC

The logistics industry is not an emerging industry, but its development has always been full of challenges. Graduates working in the logistics field must have good innovation abilities [66,67]. Participation in scientific research projects and competitions is an important way to improve students' innovation ability [68]. In the process of cultivating green logistics talent, the USTL encouraged many students to participate in scientific research projects and competitions related to green logistics. In particular, some students also participated in the development of China's national standards for green logistics, participated in many provincial and high-quality scientific research projects related to green logistics, and published high-quality academic papers, which have greatly enhanced students' ability to innovate in green logistics. This is also one of the important reasons why these graduates are highly recognized by their employers after graduation. We have also found that student feedback has been important in positively contributing to GLTC reform at USDL. Therefore, it is important for institutions to develop mechanisms for students to voice their experiences and suggest improvements to the teaching model; after all, the experience of those who have lived through the reforms is better than the rhetoric of the discussion.

4.2. Successful Model of Green Logistics Talent Training

Based on the analysis of the successful experience of USTL in GLTC, we constructed a GLTC model, as shown in Figure 7. The model consists of four levels. The first level is the goal level of the GLTC, which emphasizes the top-level design of the GLTC. A clear training goal is the basis of green logistics talent training. Under the guidance of talent training objectives, the task at the second level is that green logistics talent training institutes need to clarify the green logistics knowledge system that needs to be taught to students based on their own characteristics. The third level emphasizes the relevant educational resources required for the GLTC. Currently, teaching resources for training green logistics talent are still lacking worldwide. Therefore, at this stage, schools need to confirm whether there are already existing resources that can be used to carry out relevant teaching. If these resources are unavailable, schools may have to develop them. These teaching resources can ensure effective training of green logistics talent. The next stage, the fourth level, refers mainly to teaching reform in GLTC. There are two main dimensions here. The first dimension refers to teachers' reforms in classroom teaching, such as problem-based teaching and case-based teaching; the second dimension is aimed at students' learning reforms in the process of mastering green logistics, including encouraging students to participate in scientific research projects, publish papers, participate in various green competitions, and so on. The green triangle in the figure below indicates that new resources may be needed to effectively implement GLTC after the teaching reform.

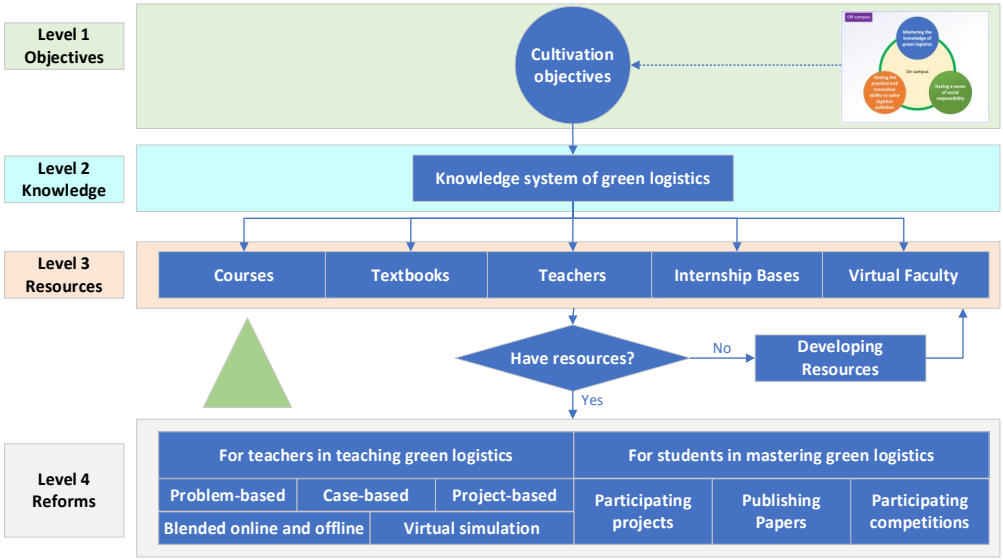

Figure 7. GLTC model.

5. Conclusions

Currently, the global call for environmental protection and energy conservation is becoming increasingly strong. To achieve sustainable social and economic development, a large amount of professional talent that has mastered the concept and technology of green logistics is required. The United States, China, the United Kingdom, France, Germany, Japan and many other countries around the world, as well as some universities, institutions and companies such as the University of Washington, MIT, CSCMP, CILT, University of Westminster, Cranfield University, École des Ponts ParisTech, KLU, Fraunhofer Institute for Material Flow and Logistics, Toyota and Nippon Express are promoting GLTC. However, as of today, no academic papers have been found on how to train green logistics talent. Based on the above considerations, the USTL, one of the most successful universities in carrying out GLTC in China, was studied by us as a case study. We answered the question of what the process of GLTC is at the USTL, what the successful experiences of GLTC are at the USTL, and what the theoretical model of GLTC is at the USTL.

As the experiencers taking part in GLTC at the USTL, the initiation of GLTC, the process of GLTC, and the effect of GLTC were summarized by us first. After that, six successful experiences were fully discussed. We found that clear cultivation objectives and perfect knowledge systems, the development of teaching resources for GLTC, 3D virtual simulation experimental teaching, the construction of a virtual faculty, classroom teaching reform, and student participation in research and competitions have played an important role in GLTC. Finally, a GLTC model was put forward successfully by us by summarizing the process of GLTC and integrating the successful experiences.

In theory, the GLTC model proposed in this study is the first to systematically reveal how to cultivate green logistics talent in Chinese universities. It reveals the important links and mechanisms of GLTC as a whole. It has theoretical reference value for green logistics education all over the world. In practice, in view of the interconnection of course teaching, the successful experiences and model of GLTC will have many reference values, not only for Chinese universities but also for other universities in the world. It may make a positive contribution to improving the teaching quality of global green logistics education. In addition, this study can provide a practical reference for the global industry to cultivate green logistics talent so as to develop in a low-carbon way.

Based on the experiences of GLTC at the USTL, we predict that over the next five to ten years, educational programs for green logistics talents should focus on equipping students with interdisciplinary knowledge, practical abilities, and critical skills to address environmental challenges in supply chains. Core knowledge areas should include sustainability

principles, green technologies, climate science, and global environmental policies while fostering abilities such as strategic thinking, data analysis, innovation, and leadership. Technical skills, such as lifecycle costing, carbon accounting, renewable energy integration, and supply chain design should be paired with soft skills, such as ethical leadership, adaptability, and effective communication. Programs must emphasize experiential learning through internships, case studies, and projects while integrating emerging technologies such as AI, IoT, and renewable systems. Collaboration with industry and continuous professional development through certifications and hybrid learning options will ensure that graduates are prepared to drive innovation, reduce environmental impact, and lead organizations toward sustainable logistics goals. This forward-thinking approach will help shape a generation of professionals capable of transforming logistics into a greener and more efficient sector.

Author Contributions: Conceptualization, Y.J.; data curation, Y.J., X.Z. and S.Z.; formal analysis, Y.J.; investigation, Y.J., J.Z., H.H. and G.F.; project administration, Y.J.; resources, Y.J., H.H. and G.F.; software, Y.J.; supervision, Y.J.; validation, Y.J.; visualization, Y.J.; writing—original draft, Y.J.; writing—review and editing, Y.J. All authors have read and agreed to the published version of the manuscript.

Funding: This work was supported by the Special Project for Young and Middle-aged Backbone in Education and Research in Liaoning Province (No: LN2024), the 2024 Special Funding for Basic Research Operating Expenses of Universities in Liaoning Province (No: LJ122410146071), the research project of undergraduate teaching reform of general higher education in Liaoning Province in 2022 entitled "Research and practice of personnel training system of New Liberal Arts' carbon peak and carbon neutralization" (No: 220), a high-quality project of ideological and political work in colleges and universities of the Ministry of Education in 2022 entitled "Ideological and political practice and innovation of environmental management course" (No: 2022), and the research project of undergraduate teaching reform of general higher education in Liaoning Province in 2021 entitled "Research and practice of excellent management personnel training mode under the mechanism of dual link and dual education" (No: 2021).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The original contributions presented in this study are included in this article; further inquiries can be directed to the corresponding author.

Conflicts of Interest: Author Haiyun Hou was employed by the company Anshan Iron and Steel Group Co., Ltd. Author Guanghui Fan was employed by the company Jingdong Logistics. The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

References

1. McKinnon, A.C. Logistics and the environment. In *Handbook of Transport and the Environment*; Emerald Group Publishing Limited: Bradford, UK, 2003; pp. 665–685.
2. Zhang, W.; Zhang, X.; Zhang, M.; Li, W. How to coordinate economic, logistics and ecological environment? Evidences from 30 provinces and cities in China. *Sustainability* **2020**, *12*, 1058. [CrossRef]
3. Fancello, G.; Vitiello, D.M.; Serra, P. *Evaluating the Environmental Sustainability of an Intermodal Freight Logistic Chain Using the GLEC Framework*; Springer Nature Switzerland: Cham, Switzerland, 2023; pp. 563–576.
4. Wang, X.; Ding, H.; Wang, W.; Zhang, L.; Xue, Y. A review of carbon emission management from the perspective of logistics industry. In *Proceedings of the 2012 IEEE International Conference on Service Operations and Logistics, and Informatics, Suzhou, China, 8–10 July 2012*; IEEE: Suzhou, China, 2012; pp. 312–317.
5. Jabbar, K.A.; Sharif, H.; Haroon, N.H.; Mohsin, S.K.; Khalid, R. Studying the Factors that Affect the Synergy between Logistics' Benefits and the Environment's Outcomes. In *Proceedings of the 2023 International Conference on Emerging Research in Computational Science (ICERCS), Coimbatore, India, 7–9 December 2023*; IEEE: Coimbatore, India, 2023; pp. 1–6.
6. Wang, H.; Jin, Y.; Zhao, J.; Hou, H.; Fan, G.; Zhu, X.; Zhang, X. Chinese virtual simulation golden course: A case report. *Heliyon* **2023**, *9*, e17159. [CrossRef]
7. Hu, W.; Dong, J.; Hwang, B.-g.; Ren, R.; Chen, Z. A scientometrics review on city logistics literature: Research trends, advanced theory and practice. *Sustainability* **2019**, *11*, 2724. [CrossRef]

8. Al-Minhas, U.; Ndubisi, N.O.; Barrane, F.Z. Corporate environmental management: A review and integration of green human resource management and green logistics. *Manag. Environ. Qual. Int. J.* **2020**, *31*, 431–450. [CrossRef]
9. Zhang, W.; Zhang, M.; Zhang, W.; Zhou, Q.; Zhang, X. What influences the effectiveness of green logistics policies? A grounded theory analysis. *Sci. Total Environ.* **2020**, *714*, 136731. [CrossRef] [PubMed]
10. Cvahte Ojsteršek, T.; Šinko, S.; Gajšek, B. Determining Learning Outcomes Relevant for Logistics Higher Education on Sustainability and Industry 4.0. *Teh. Glas.* **2023**, *17*, 447–454. [CrossRef]
11. McKinnon, A.; Flöthmann, C.; Hoberg, K.; Busch, C. *Logistics Competencies, Skills, and Training*; 1464811407; The World Bank Group: London, UK, 2017.
12. Brodhag, C.; Talière, S. *Sustainable Development Strategies: Tools for Policy Coherence*; Nat. Resour. Forum, 2006; Wiley Online Library: Hoboken, NJ, USA, 2006; pp. 136–145.
13. Lukman, R.K.; Omahne, V.; Sheikh, L.T.E.; Glavič, P. Integrating Sustainability into Logistics Oriented Education in Europe. *Sustainability* **2021**, *13*, 1667. [CrossRef]
14. García, C.; Bertelmann-Angenendt, F.; Bricteux, C.; Chpiliotoff, N.; Frey, C.; Kuzma, V.; Laroche, V.; Longmuss, J.; Palatinus, A.; Pavan, L. *Green Growth: Towards the Decarbonisation of the Construction Sector Through Vocational Education and Training*; ICERI2022 Proceedings, 2022; IATED: Seville, Spain, 2022; pp. 1455–1462.
15. Zhang, N.; Williams, I.; Kemp, S.; Smith, N. Greening academia: Developing sustainable waste management at Higher Education Institutions. *Waste Manag.* **2011**, *31*, 1606–1616. [CrossRef]
16. Jim Wu, Y.C. Contemporary logistics education: An international perspective. *Int. J. Phys. Distrib. Logist. Manag.* **2007**, *37*, 504–528. [CrossRef]
17. Lin, C.-Y.; Ho, Y.-H. Determinants of green practice adoption for logistics companies in China. *J Bus. Ethics* **2011**, *98*, 67–83. [CrossRef]
18. He, Z.; Chen, P.; Liu, H.; Guo, Z. Performance measurement system and strategies for developing low-carbon logistics: A case study in China. *J. Cleaner Prod.* **2017**, *156*, 395–405. [CrossRef]
19. Yan, X.; Fang, Y.-p. CO_2 emissions and mitigation potential of the Chinese manufacturing industry. *J. Clean. Prod.* **2015**, *103*, 759–773. [CrossRef]
20. McKinnon, A.; Browne, M.; Whiteing, A. *Green Logistics: Improving the Environmental Sustainability of Logistics*; Kogan Page Publishers: London, UK, 2012.
21. Evangelista, P.; Colicchia, C.; Creazza, A. Is environmental sustainability a strategic priority for logistics service providers? *J. Environ. Manag.* **2017**, *198*, 353–362. [CrossRef] [PubMed]
22. Torres-Salazar, M.D.C.; Escalante-Ferrer, A.E.; Olivares-Benítez, E.; Pérez-García, J.C. Talento verde: Caracterización y búsqueda. *Nova Sci.* **2015**, *7*, 694–709. [CrossRef]
23. Zhang, M.; Sun, M.; Bi, D.; Liu, T. Green logistics development decision-making: Factor identification and hierarchical framework construction. *IEEE Access* **2020**, *8*, 127897–127912. [CrossRef]
24. Blanco, E.E.; Sheffi, Y. Green logistics. In *Sustainable Supply Chains: A Research-Based Textbook on Operations and Strategy*; Springer: Berlin/Heidelberg, Germany, 2024; pp. 101–141.
25. Dong, J. Carbon emission scenario forecast and emission reduction path of China's logistics industry from the perspective of green supply chain management. *Highlights Sci. Eng. Technol.* **2022**, *25*, 318–326. [CrossRef]
26. Leung, T.C.H.; Guan, J.; Lau, Y.-Y. Exploring environmental sustainability and green management practices: Evidence from logistics service providers. *Sustain. Account. Manag. Policy J.* **2023**, *14*, 461–489. [CrossRef]
27. Noorliza, K. Determinants of an environmentally sustainable model for competitiveness. *Sustainability* **2023**, *15*, 1444. [CrossRef]
28. Dekker, R.; Bloemhof, J.; Mallidis, I. Operations Research for green logistics–An overview of aspects, issues, contributions and challenges. *Eur. J. Oper. Res.* **2012**, *219*, 671–679. [CrossRef]
29. Wang, Z.; Li, M.; Qian, Y. A Study on the Talent Development Model for Low-Carbon Logistics in Response to Cross-border E-commerce Supply Chains. *J. Hum. Resour. Dev.* **2023**, *5*, 26–34.
30. Dudin, M.N.; Frolova, E.E.; Kuznetsov, M.N.; Drobysheva, L.V.e.; Krasulya, E.V. " Green" Logistics as an Instrument for Putting Together a New Model for Professional and Career-Broadening Training in Global Economic Space. *Int. J. Environ. Sci. Educ.* **2016**, *11*, 8693–8705.
31. Mathur, V. Skilling for Sustainability. In *Infrastructure Development–Theory, Practice and Policy*; Routledge: London, UK, 2022; pp. 66–68.
32. Pradeep, A.; Alisherova, Z. Green Logistics and E-commerce. In *Proceedings of the 2023 International Conference on Computational Intelligence and Knowledge Economy (ICCIKE), Dubai, United Arab Emirates, 9–10 March 2023*; Chauhan, A.K., Chauhan, A., Eds.; IEEE: Dubai, United Arab Emirates, 2023; pp. 97–101.
33. Adams, F.G.; Gabler, C.B.; Landers, V.M. The hiearchical resource nature of green logistics competency. *J. Bus. Ind. Mark.* **2021**, *36*, 1474–1485. [CrossRef]
34. McKinnon, A.; Browne, M.; Whiteing, A.; Piecyk, M. *Green Logistics: Improving the Environmental Sustainability of Logistics*; Kogan Page Publishers: London, UK, 2015.
35. Smokers, R.; Tavasszy, L.; Chen, M.; Guis, E. Options for competitive and sustainable logistics. In *Sustainable Logistics*; Emerald Group Publishing Limited: Bradford, UK, 2014; pp. 1–30.

36. Rossolov, A.; Lobashov, O.; Kopytkov, D.; Botsman, A.; Lyfenko, S. A two-echelon green supply chain for urban delivery. *Наука Техника* **2019**, *18*, 495–503.
37. Adams, F.G.; Gabler, C.B.; Myles Landers, V. Green logistics competency: A resource hierarchy view of supply chain sustainability. In *Marketing Transformation: Marketing Practice in an Ever Changing World: Proceedings of the 2017 Academy of Marketing Science (AMS) World Marketing Congress (WMC), 2018*; Springer: Berlin/Heidelberg, Germany, 2018; pp. 31–40.
38. Maurya, A.M.; Padval, B.; Kumar, M.; Pant, A. To study and explore the adoption of green logistic practices and performance in manufacturing industries in India. *IMIB J. Innov. Manag.* **2023**, *1*, 207–232. [CrossRef]
39. Keuschen, T.; Klumpp, M. *Green Logistics Qualifikation in der Logistikpraxis*; FOM Hochschule für Oekonomie & Management, Institut für Logistik-& Dienstleistungsmanagement (ild): Essen, Germany, 2011.
40. Aini, E.K.; Yuliaji, E.S. Making ecopreneurs: Developing sustainable entrepreneurship. In *Fostering Sustainable Entrepreneurship in Emerging Market: An Interdisciplinary Perspective*; Nuralam, I.P., Putri, N.V.W., Eds.; FSH-PH Publications: Subic, Philippines, 2023; pp. 221–239.
41. Munawar, S.; Yousaf, H.Q.; Ahmed, M.; Rehman, S. The influence of online entrepreneurial education on entrepreneurial success: An empirical study in Pakistan. *Int. J. Manag. Educ.* **2023**, *21*, 100752. [CrossRef]
42. Salinas-Navarro, D.E.; Mejia-Argueta, C.; Montesinos, L.; Rodriguez-Calvo, E.Z. Experiential learning for sustainability in supply chain management education. *Sustainability* **2022**, *14*, 13133. [CrossRef]
43. Angolia, M.G.; Pagliari, L.R. Experiential learning for logistics and supply chain management using an SAP ERP software simulation. *Decis. Sci. J. Innov. Educ.* **2018**, *16*, 104–125. [CrossRef]
44. Wu, G. A new concept of green education: The cultivation model for successful and practical talents. *Int. Forum Teach. Stud.* **2011**, *7*, 45–48.
45. Xiong, H.; Fu, D.; Duan, C.; Chang'E, L.; Yang, X.; Wang, R. Current status of green curriculum in higher education of Mainland China. *J. Clean. Prod.* **2013**, *61*, 100–105. [CrossRef]
46. Acosta Castellanos, P.M.; Queiruga-Dios, A. From environmental education to education for sustainable development in higher education: A systematic review. *Int. J. Sustain. High. Educ.* **2022**, *23*, 622–644. [CrossRef]
47. Annan-Diab, F.; Molinari, C. Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals. *Int. J. Manag. Educ.* **2017**, *15*, 73–83.
48. Parry, S.; Metzger, E. Barriers to learning for sustainability: A teacher perspective. *Sustain. Earth Rev.* **2023**, *6*, 2.
49. Sa-Couto, C.; Alinier, G.; Buttery, A.; Laws-Chapman, C. ASPiH Conference 2023–sustainable simulation. *Int. J. Healthc. Simul.* **2023**, *3*, A1–A2. [CrossRef]
50. Usheva, N.; Bliznakova, K.; Grancharov, D. Barriers to the application of simulation technologies in the education of health care students. *Eur. J. Public Health* **2024**, *34* (Suppl. S3), ckae144.1889.
51. Klein, D.; Ware, M. E-learning: New opportunities in continuing professional development. *Learn. Publ.* **2003**, *16*, 34–46.
52. Svyrydiuk, O.; Balokha, A.; Myshkarova, S.; Kulyk, N.; Vakulenko, S. Empowering independent learning: The key role of online platforms. *Amazon. Investig.* **2024**, *13*, 107–122. [CrossRef]
53. Chen, D.; Kong, X.; Wei, Q. Design and development of psychological virtual simulation experiment teaching system. *Comput. Appl. Eng. Educ.* **2021**, *29*, 481–490.
54. Xie, X.; Guo, X. Influencing Factors of Virtual Simulation Experiment Teaching Effect Based on SEM. *Int. J. Emerg. Technol. Learn.* **2022**, *17*, 89–102.
55. Ely, A.V. Experiential learning in "innovation for sustainability" An evaluation of teaching and learning activities (TLAs) in an international masters course. *Int. J. Sustain. High. Educ.* **2018**, *19*, 1204–1219. [CrossRef]
56. Moura-Leite, R.C.; Lopes, J.C.D.J.; Yamazaki, C. Brazilian federal universities and their sustainable practices based on sustainable logistics management plan. *Int. J. Sustain. High. Educ.* **2023**, *24*, 932–947.
57. Jazairy, A.; Pohjosenperä, T.; Prataviera, L.; Juntunen, J. Innovators and Transformers Revisiting the gap between academia and practice: Insights from the green logistics phenomenon. *Int. J. Phys. Distrib. Logist. Manag.* 2024; *ahead-of-print*. 1–20.
58. Fokdal, J.; Čolić, R.; Milovanović Rodić, D. Integrating sustainability in higher planning education through international cooperation: Assessment of a pedagogical model and learning outcomes from the students' perspective. *Int. J. Sustain. High. Educ.* **2020**, *21*, 1–17. [CrossRef]
59. Gravier, M.J.; Theodore Farris, M. An analysis of logistics pedagogical literature: Past and future trends in curriculum, content, and pedagogy. *Int. J. Logist. Manag.* **2008**, *19*, 233–253. [CrossRef]
60. Pacher, C.; Woschank, M.; Zunk, B.M. The role of competence profiles in industry 5.0-related vocational education and training: Exemplary development of a competence profile for industrial logistics engineering education. *Appl. Sci.* **2023**, *13*, 3280. [CrossRef]
61. Rosi, M.; Obrecht, M. Sustainability Topics Integration in Supply Chain and Logistics Higher Education: Where Is the Middle East? *Sustainability* **2023**, *15*, 6955. [CrossRef]
62. Wang, H. Research on the talent cultivation model of the integration of production and education in higher vocational education under the background of "Internet+". In *Proceedings of the 2021 16th International Conference on Computer Science & Education (ICCSE), Virtual, 17–19 August 2021*; IEEE: Piscataway, NJ, USA, 2021; pp. 943–946.
63. Liu, Y. An innovative talent training mechanism for maker education in colleges and universities based on the IPSO-BP-enabled technique. *J. Innov. Knowl.* **2023**, *8*, 100424. [CrossRef]

64. Nguyen, L.T.; Kanjug, I.; Lowatcharin, G.; Manakul, T.; Poonpon, K.; Sarakorn, W.; Somabut, A.; Srisawasdi, N.; Traiyarach, S.; Tuamsuk, K. How teachers manage their classroom in the digital learning environment—Experiences from the University Smart Learning Project. *Heliyon* **2022**, *8*, e10817. [CrossRef]
65. Hu, X. The role of deep learning in the innovation of smart classroom teaching mode under the background of internet of things and fuzzy control. *Heliyon* **2023**, *9*, e18594. [CrossRef] [PubMed]
66. Van Hoek, R.I. Logistics education: Achieving market and research driven skill development. *Int. J. Phys. Distrib. Logist. Manag.* **2001**, *31*, 505–519. [CrossRef]
67. Klumpp, M. Logistics Qualification: Best-Practice for a Knowledge-Intensive Service Industry. In *Logistics and Supply Chain Innovation: Bridging the Gap Between Theory and Practice*; Zijm, H., Klumpp, M., Clausen, U., Hompel, M.T., Eds.; Springer International Publishing: Cham, Switzerland, 2016; pp. 391–411.
68. Qi, Y.; Wang, J. A talent cultivation model for improving the innovation ability of college students in scientific research. *Int. J. Emerg. Technol. Learn. (iJET)* **2020**, *15*, 151–164. [CrossRef]