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Design of a green skills scale for Chinese University students

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Based on the concept of sustainability and the aim of addressing China"s great need for talent with green skills, a green skills scale was designed with the help of Chinese university students. Students from four institutions of higher education who had agreed to the Principles for Responsible Management Education (PRME) participated as research subjects. With reference to the reviewed literature, a green skills scale was developed for Chinese university students. The scale was reviewed by experts and scholars and subjected to a reliability and validity analysis, and 900 students were selected to be included in the sample. The green skills of university students are divided into four dimensions: cognition of green knowledge, mastery of green skills, application of green skills, and green skills development, resulting in a total of 16 questions.The overall reliability of the scale is 0.845, the reliability of the dimensions lies between 0.813 and 0.880, the correlation coefficients between the dimensions lie between 0.185 and 0.497, and the root-mean-square values of the AVE of the corresponding coefficients are all larger than the correlation coefficients of the corresponding row and column variables, demonstrating that the green skills scale for university students has good reliability and validity.

Key words: Chinese institutions of higher education, Chinese university students, green skills, green skills scale for university students.

INTRODUCTION

Green skills are regarded as sustainable skills that are related to the technical skills, knowledge, values, and attitudes needed for businesses, industries, and communities to develop and support sustainable social, economic, and environmental outcomes.China has a large demand for talent with green skills at present, and the implementation of China"s strategy to become a great manufacturing power has further increased the demand. The first factor is the demand for professional talent with green skills. The extensive accumulation of human capital is crucial for the development of emerging green industries. The accumulation of human capital allows the rapid transformation of new ideas, technologies, products, and services into greater direct productivity (Wang et al., 2019). The large gap in professional talent with green skills poses enormous challenges to the development of

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China"s green industries.

Cultivating and expanding the supply of professionals with green skills is imperative (Xu, 2015). The second factor is the demand for general talent with green skills (Tang, 2021). Compared with talent without green skills, those with green skills have a belief in green ideas, actively practice green behaviors, make an effort to master green knowledge and skills, and show higher levels of unconventional analytical skills, besides possessing higher levels of human capital and on-the-job training experience (Consoli et al., 2016b).

However, against the background of China"s urgent demand for talent with green skills, talent with green skills cultivated by higher education is urgently needed by society at present.The concept of talent is also based on the specific cognition and standards required by the goals of talent cultivation in higher education, that is, what kind of qualities and abilities the students are expected to possess (Bagwasi, 2019). The main purpose of cultivating students" green skills is no longer to alleviate graduates" difficulty in finding employment but to fulfill the needs of society and equip students with the ideology of sustainable development. It is believed that in the composition of green skills, knowledge is the basis and values are the backbone, while ability and action are the manifestations (Beringer and Adomssent, 2008).

To achieve the goal of improving the green skills of university students, China"s institutions of higher education offer various types of green skills courses and encourage students to participate in scientific research and social practices related to green topics. The ability to realize sustainable development goals depends on whether students possess green skills. As students" green skills are an integral part of realizing the sustainable development of green education, the development of skills in green education is an important opportunity for students to find a place in the professional service and labor market. (Aithal et al., 2016)

Although scholars have devoted great effort to cultivating students" green skills and helping them find a place in the professional service and labor market, most of the existing green skills scales are designed to measure the abilities of enterprise employees; thus, China still lacks a well-developed scale to measure the green skills of students. This is a gap in research, and in this study we propose to build a green skills scale for university students for this reason.

LITERATURE REVIEW

Research on the development of green skills

Steele (1980) pointed out that green competencies are the ability of people to interact with the immediate environment in a way that is constructive and reflective of immense enthusiasm. First, people must become aware of environmental problems and want to protect the environment; second, they must understand the basic concepts of environmental problems; finally, they must use relevant skills, such as reducing waste and emissions to protect the environment (Steele, 1980). According to Pedersen (1999), green skills include the following: first, the practical skills to protect the environment; second, the individuals" attitudes towards and cognition of environmental protection; third, the desire to increase their knowledge of environmental protection. As higher-order variables, green skills are composed of environmental perceptions, motivations, and attitudes (Corral-Verdugo, 2002; Heonget al., 2016).In the same way, Fraijo-Sing et al. (2010) explained that green skills consist of two key elements, environmental knowledge and skills.

Green skills include instincts and acquired skills. Instinctive green skills are a kind of intrinsic characteristic, while acquired green skills are composed of dimensions such as knowledge, skills, cognition, and behavior related to the environment (Subramanian et al., 2016). Professionals with green skills usually possess cognitive, technical, interpersonal, and introspective skills (Pavlova, 2018). Green skills are also professional skills, which are mainly reflected in the skills, knowledge, values, and attitudes that must be mastered to engage in “green jobs” or “green careers”(Liu, 2016). Although green skills have a significant bearing on green economies and industries (Cabral and Dhar, 2019), there has not been a consensus on what green skills are or their specific connotations, and the definitions are still unclear. Most people are only aware of general, technical, and employability-related skills but are still unfamiliar with the concept of green skills (Zolkifli et al., 2016). Green skills are regarded as sustainable skills that are related to the technical skills, knowledge, values, and attitudes needed for businesses, industries, and communities to develop and support sustainable social, economic, and environmental outcomes (Bremer and Heidegger, 2010; Governments, 2009). Based on existing research, the OECD proposed that green skills are the skills needed to adapt products, services, and processes to address climate change and the related environmental requirements and regulations, and they are needed in all sectors and at all levels of the workforce (OECD, 2014). The categories of green skills include the skills needed to support resource efficiency and low-carbon industries, improve climate adaptability, and protect and manage natural assets (Government, 2011; Sern et al., 2019).

Based on an extensive review of the literature, in this study, we argue that “green skills” refer to the sum of the knowledge, abilities, values, and attitudes needed to live in, develop, and support a society that reduces the impact of human activities on the environment. Taken together, green skills are mainly composed of the following dimensions: knowledge (cognitive dimension), techniques or ability (application dimension), and

attitudes/values (emotional dimension).

The above dimensions are what workers need to promote social, economic, and environmental sustainability. In the cognitive dimension, green awareness, which is usually displayed in the form of environmental protection knowledge, can be regarded as an element of green skills. From an application perspective, “greenskills” refer to the abilities in science, technology, engineering, and mathematics that are related to specific green careers, which include the ability to reduce energy consumption or greenhouse gases. In the emotional dimension, “greenskills” are the motivation of individuals to protect natural resources and the ability to learn green skills and grow (CEDEFOP, 2012; Diep and Hartmann, 2016). Therefore, in this study, green skills was divided into the following four dimensions.

Cognition of green knowledge

“Green knowledge” is defined as “general knowledge about the facts, concepts, and relationships regarding the natural environment and the entire ecosystem” (Fryxell and Lo, 2003). It involves knowledge related to environmental issues and produces solutions to environmental issues by forming green awareness and encouraging green behaviors (Kollmuss and Agyeman, 2002). Green knowledge is generally divided into objective and subjective green knowledge.

The former refers to practical green knowledge about environmental issues, while the latter refers to actions taken by individuals on environmental issues based on their knowledge (Pagiaslis and Krontalis, 2014). The value of green knowledge to employees lies in improving their ecological literacy, that is, their ability to recognize concepts and behaviors related to environmental protection and conservation (Laroche et al., 2001). Previous literature points out that for emerging and developed countries, objective and subjective green knowledge have a great impact on university students" environmental cognition (Vicente-Molina et al., 2013), and such environmental cognition is acquired by students through environmental education (Zsoka et al., 2013).

Scholars have studied the types of green awareness related to various environmental issues, such as cognition of air pollution (He and Liu, 2018), cognition ofthe carbon footprint of the process of consumption (Garcia et al., 2019), and cognition of energy consumption in the production process (Shrouf et al., 2017), as well as cognition of environmental risks and cost-effectiveness (Peng and Yang, 2016). Green awareness prompts employees to pay attention to the negative impacts of their personal actions on the environment and urges them to take action to alleviate these negative impacts (Gadenne et al., 2009). Green awareness is regarded as an important factor for organizations when implementing environmental management systems (Perron et al., 2006). Green awareness is also a factor that drives the green purchasing intentions of consumers and affects their behavior and attitude toward green products (Goh et al., 2016). Sakr et al. (2010) pointed out that green awareness plays a key role in supporting the environmental management system of the construction industry and promoting the sustainable development of industry. In a study of Nicaragua"s natural reserves, Somarriba-Chang and Gunnarsdotter (2012) found that green awareness facilitates local communities" participation in biodiversity conservation surrounding ecotourism attractions. Kirstges and Torsten (2002) pointed out that green awareness is a crucial factor in realizing the sustainable development of tourism and guiding tourists in becoming engaged in eco-tourism by displaying green behaviors.

Mastery of green skills

The International Labour Organization (ILO) further divided the skills related to the emerging green economy into general and special skills. Among them, “general skills” refer to the general skills required for all fields related to green jobs; “special skills” refer to the professional skills required for special fields, which can be further subdivided into having green knowledge, mastering green technology, understanding sustainable materials and their production and processing methods, and possessing the ability to produce green products and provide green services (Jeon et al., 2011). divided green skills into transitional vocational skills, general or core employability-related skills, professional or vocational skills, and broad vocational skills (Knibb and Paci, 2013). To explore the special or professional skills needed to build green skills, Sern et al. (2019) used the literature analysis method and obtained academic articles and technical reports related to green skills in various disciplines from databases, including Science Direct, Google Scholar, Research Gate, and Academia. From the existing literature, the study summarized 10 professional skills needed to build green skills. These skills include green design skills (Ragheb et al., 2016); leadership skills (Sern et al., 2019); management skills; urban planning skills; garden planning skills (Stevens et al., 2010); the skills for managing energy, finance, procurement, and waste; and communication skills (Sern et al., 2019).

The mastery of green skills facilitates the smooth construction of an environmental management system, including supporting sustainability education and improving environmentalprotection (Kanyimba et al., 2014). If employees can master green skills, it will have a significant positive impact on facilitating sustainable operations, improving financial performance, and protecting the environment (Wu et al., 2016), as these skills help employees analyze and sort out various

environmental problems and create reasonable solutions based on the green awareness that they have built (Karimzadegan and Meiboudia, 2012).

Application of green skills

The application of green skills is also known as eco-friendly, environmentally sustainable, and responsible environmental behavior (Wang and Yao-Fen, 2016). In organizational environments, the application of green skills is referred to as “green behaviors,” which are defined as the direct or indirect behaviors participated in by employees that contribute to the development of environmental sustainability (Ones and Dilchert, 2012). Paço et al. (2019) described such behaviors as creating green products that are energy efficient, cause the least pollution, and are reusable and recyclable (Laurett et al., 2019). The definition of green behaviors has been extended to include the development of eco-friendly production and regular monitoring of environmental costs, which are conducive to environmental management systems and further improve the financial performance of enterprises (Cheng et al., 2019). Aprile and Fiorillo (2017) discussed the specific environment in which people display green behaviors. Such behaviors are induced because problems such as environmental pollution and resource depletion have threatened their lives and welfare (Aprile and Fiorillo, 2017).

Casalo and Escario (2018) discussed the heterogeneity of green attitudes and behaviors and argued that the stronger the green attitudes toward protecting the environment, the stronger the green behaviors displayed by individuals will be (Casalo and Escario, 2018). Green attitudes, values, and communication are prerequisites for green behaviors. An attitude is the favorable or unfavorable evaluation of a person of the discussed behavior or the degree of the evaluation.

In the context of environmental management, a green attitude is defined as an individual"s cognitive assessment of environmental protection value (Lee, 2008). Ojo et al. (2019) explored the relationship between green attitudes and green behaviors and demonstrated that green attitudes are a key factor that prompts stakeholders to become engaged in environmental protection (Bergin-Seers and Mair, 2009). Therefore, it is necessary to cultivate organizations"and individuals" values and attitudes toward environmental sustainability and green development through environmental education to encourage pro-environmental behaviors among organizations and individuals (Major et al., 2017).

Green skills development

Green skills development includes the cultivation of problem-solving skills in everyday scenarios (life skills education) and sustainable consumption and lifestyle education, as well as the learning of innovation and entrepreneurship, while seeking to ensure that all workers contribute to environmental, economic, and social sustainability and take on appropriate roles at work and in the wider community (Tang, 2021). Such education efforts also seek to enhance organizational members"and individuals" adaptability and transitional skills to help them learn and apply new techniques in work and life as well as foster their entrepreneurial skills to help them seize opportunities for low-carbon technology development (Li, 2015). The results of practicing green human resource management show that developing employees" green skills is conducive to employees developing other dimensions of green skills (Barry and Gerhart, 2005), prompting them to improve their performance and achieve personal development (Rajiani, 2016). On the one hand, the upgrading of green skills prompts employees to exhibit altruistic behaviors, while, on the other hand, it promotes environmental sustainability in general by encouraging green behaviors among employees (Rajiani, 2016). Although green and sustainable development have increasingly become issues of concern in various countries and among major international organizations, judging from the relevant studies and the reality of some countries, there are still many obstacles barring the development of green skills.

The first is the contradictions between green development and short-term goals. The priorities of solving problems such as rising production costs, increasing competition, and falling profit margins are all higher than those of pursuing technological innovation, skills development, and sustainable practices. Second, green growth, jobs, and skills development are still relatively new concepts, and systematic and effective methods, policies, and paths to achieve green innovation have yet to be implemented(Zubir et al., 2021).

Third, the school system is sluggish in responding to the development of the green economy. Compared to non-green jobs, more formal education, work experience, and on-the-job training are needed to perform green jobs. To support the development of the economy and society, vocational education must respond quickly to industrial technology, and even adopt a forward-thinking approach in planning, to realize the effective development of green skills through teacher training, offering majors related to green techniques and providing integrated courses (Brandt et al., 2019).

Liu (2016) designed a green skills questionnaire based on interviews with experts, research on literature, and field surveys. The questionnaire adopts exploratory and confirmatory factor analysis. The green skills of personnel can be categorized into three dimensions and include six first-order factors covering management, technology, and operations, which include green marketing, self-learning, low-carbon loops, use of environmental protection equipment, use of energy-saving technology, and service

innovation, as well as 23 constituent elements, such as the service process for designing cleaner production methods. Liu"s (2016) survey based on nine major disciplines of vocational education showed that the elements of green skills mainly include sustainable development ability, awareness of energy-saving and environmental protection, safety knowledge, and related operation habits. Green skills development is an effective way for vocational education to facilitate sustainable social development. From the perspectives of the economy, society, and environment, Chen and Li (2017) developed a scale for construction engineering technology, which informed the development results of green management, technology, and operation. It also facilitated the development plans of students from institutions of higher education that specialize in architecture by enabling the building teams of teachers who specialize in green issues andthe offering of green courses as well as enabling the implementation of the development results in teaching.

The green skills questionnaire survey by Lai et al. (2018) was based on responses by 332 lecturers from the engineering department of the Polytechnic Colleges of Malaysia. According to the opinions of the lecturers, the green skills knowledge that should be taught in green skills training courses should mainly include knowledge related to environmental pollution, environmental protection law, energy conservation, renewable energy, environmentally friendly design, solid waste management, water resource utilization, natural resource management, manufacturing processes, sustainable lifestyles, biodiversity, and ecosystems. With reference to the scale development technique proposed by Churchill (1979) and the improvement plan for scales proposed by Hinkin (1995), Cabral and Dhar (2019) developed a green skills scale. Based on the previous research"s conclusions and results, the authors of the study proposed that green skills be composed of various elements including green knowledge, techniques, abilities, attitudes, behavior, and awareness (Cabral and Dhar, 2019). A comprehensive and systematic green skills scale was designed, which provides important theoretical references for subsequent research on green skills. There is a total of 40 items. To adequately integrate green skills into vocational education, as early as 2015, Landward Research Ltd and Aitchiso (2015) designed a green skills questionnaire. Landward Research Ltd and Aitchiso (2015) believed that green skills mainly include the understanding of green knowledge, possession of green skills, application of green skills, and professional growth. Based on the above research on green skills and the green skills that Chinese university students should possess, in this study, we summarize a set of elements that should be included in the green skills scale for university students, including cognition of green knowledge, mastery of green skills, application of green skills, and green skills development ability.

RESEARCH METHODS

Based on the literature review and with reference to previous scholars" research on green skills, for this study, a green skills scale and questions was designed. As shown in the appendix 1. To accurately reconstruct the scenarios faced by Chinese university students, the questions were assessed using a content validity test based on experts" opinions before the scale and questions were determined.The questionnaire and questions were also reviewed and scored by experts. The initially designed questionnaire was modified according to the comments of the experts to ensure that the questions in the questionnaire could be used to collect the required information effectively.

Expert assessment

Based on the literature review, in this study, green skills was divided into four categories: understanding of green knowledge, mastery of green skills, application of green skills, and green skills development. Experts were invited to evaluate the dimensions of the questionnaire in this study to explore whether the questionnaire was comprehensive and reasonable for the measurement of green skills. Copies of the expert assessment questionnaire were distributed to five experts. If a question was assessed as appropriate, it would be retained. If a question was assessed as requiring amendment, it would be revised according to the experts" opinions.If one of the experts recommended itbe changed, the question would be revised. If one of the experts regarded a question asinappropriate, it would be deleted.

After the assessment and review by experts, the green skills scale for university students was adjusted and revised based on their opinions. In the final version, the dimensions of the green skills scale for university students include understanding of green knowledge, mastery of green skills, application of green skills, and green skills development. The questions on the dimension of understanding of green knowledge were designed with reference to Fryxell and Lo (2003), Kollmuss and Agyeman (2002), Pagiaslis and Krontalis (2014), Vicente-Molina et al. (2013), and Zsoka et al. (2013). The questions on the dimension of mastery of green skills were designed with reference to Knibb and Paci (2013), Kanyimba et al.(2014), Wu et al.(2016), and Karimzadegan and Meiboudia (2012). The questions on the dimension of application of green skills were designed with reference to Wang and Yao-Fen (2016), Ones and Dilchert(2012), Bergin-Seers and Mair (2009), and Major et al. (2017). The questions of the dimension of green skills development were designed with reference to Tang (2021), Barry and Gerhart (2005), Rajiani(2016), and Brandt et al. (2019). There are four questions on understanding of green knowledge, four on mastery of green skills, four on application of green skills, and four on green skills development, for a total of 16 questions.

Research objects and sampling method

The United Nations Principles for Responsible Management Education (PRME) were formally established in 2007 at the Geneva Global Compact Leaders Summit. As of May 2022, including Tsinghua University School of Economics and Management, a total of 29 institutions in China (including Hong Kong and Macao) hadjoined the organization (PRME, 2022). Therefore, undergraduate students from four Chinese institutions of higher education that had joined the PREM organization were selected to be included in the sample.

In the pre-test, the selected participants to be included in the sample included students from four Chinese institutions of higher

Table 1. Fit index of the model.

Parameter	Standard of excellence	Value of the model	Quality of the parameter	Up to standard or not
CMIN		103.936		
CMIN/DF	3.	1.061	Excellence	Yes
GFI	>0.9	0.986	Excellence	Yes
AGFI	>0.9	0.980	Excellence	Yes
NFI	>0.9	0.985	Excellence	Yes
IFI	>0.9	0.999	Excellence	Yes
TLI	>0.9	0.999	Excellence	Yes
CFI	>0.9	0.999	Excellence	Yes
RMSEA	<0.05	0.023	Excellence	Yes

Source: Author

education. Two hundred and fifty-eight copies of the questionnaire were distributed to them, from which 200 valid questionnaires were recovered, with an effective rate of recovery of 77.5%. Reliability and exploratory factor analysis were performed. As for the factor analysis, the factor loading ratios of all the items were greater than 0.7, indicating good validity. For reliability, the Cronbach"s alpha values of the four dimensions were all greater than 0.7 (Nunnally, 1978), indicating good reliability.

RESULTS

Undergraduate students from four Chinese institutions of higher education that had joined the PREM organization were selected to be included in the sample. Two hundred and forty students from each of the institutions were selected to be included in the sample, and a total of 960 copies of the questionnaire were distributed. Finally, 900 valid questionnaires were recovered. In the collected sample for the green skills scale, the ratio of male to female students was 435:465. The students were under the age of 18 (18%), 18 to 20 years old (39.3%), 21 to 23 years old (15.2%), 24 to 26 years old (16.1%), and over 26 years old (11.3%). The collected information underwent reliability, validity, and confirmatory factor analysis in statistical software.

Reliability analysis

There were four variables in the green education section of the questionnaire in this research. Using the above mentioned methods, the sample collected during the pre-experiment underwent internal consistency and reverse internal consistency analysis. The results show that the reliability of each variable did not increase significantly after deleting a question. In addition, the reliability of this study was 0.845, and the reliabilities of dimensions were between 0.813 and 0.880, indicating that the scale and dimensions of the study had high reliability, good stability, and good consistency.

Confirmatory factor analysis

Confirmatory factor analysis is a type of factor analysis. Different from exploratory factor analysis, confirmatory factor analysis is used to verify the reliability of the existing results of theoretical analysis (Lin et al., 2003). Confirmatory factor analysis is composed of three aspects, construct validity, combined reliability, and convergent validity, as well as discriminant validity. In this section, AMOS will first be used to analyze the construct validity of the model. The fit index includes GFI=0.986, AGFI=0.980, RMSEA=0.023, CFI=0.999, and the results are shown in Table 1. Figure 1 shows the Confirmatory factor analysis of green skills.

It can be seen from Table 1 that all parameters of the model reached a reasonable standard, indicating that the model"s fitness met the standard and was acceptable.

Then, an estimation test was performed on the path coefficients, that is, we sought to judge in advance whether the regression coefficients were equal to 0. The criterion was whether the result was significant. If it was significant ($p<0.05$), it indicated that the regression coefficient was not equal to 0. The results are shown in Table 2. It can be seen from Table 2 that all the variables reached the significance standard of 0.001, indicating that the coefficients were significantly different from 0.

Third, the convergent validity analysis was conducted, and the results are shown in Table 3. It can be seen from Table 3 that the factor loadings of the variables lie between 0.692 and 0.985; the convergent validities lie between 0.813 and 0.883; and the average variance extracted values lie between 0.522 and 0.658. The results indicate that all the parameters meet the parameter standards of the structural model and that the convergent validity of the model is ideal. Lastly, the average of variance extracted recommended by Fornell was adopted to perform a test, that is, the discriminant validity analysis was conducted. The assessment standard is that if the mean variance of the variables exceeds 0.5, the convergent validity passes the test and

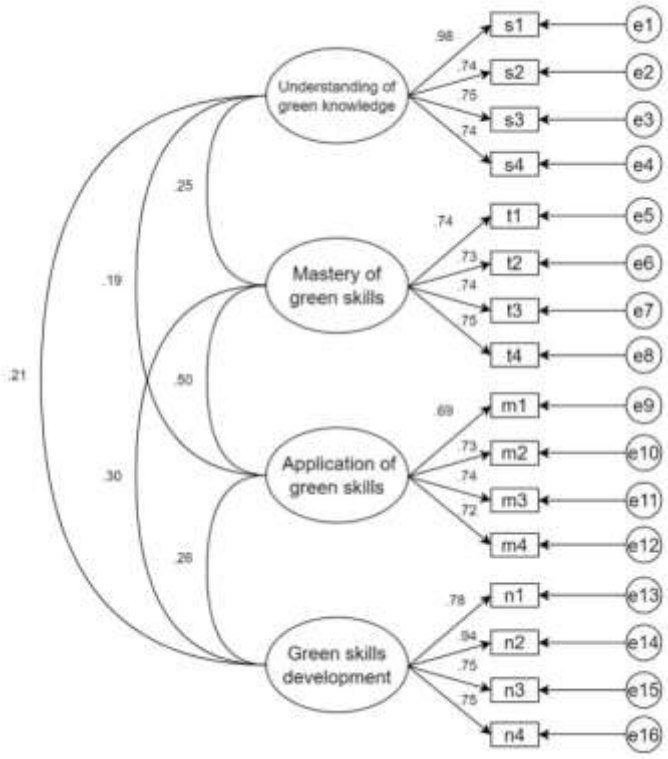

Figure 1. Confirmatory factor analysis of green skills
Source: Author

Table 2. Path coefficients of green skills.

Path			Estimate	S.E.	C.R.	*p*
s1	<---	Understanding of knowledge	1			
s2	<---	Understanding of knowledge	0.721	0.025	29	0.000
s3	<---	Understanding of knowledge	0.723	0.024	29.725	0.000
s4	<---	Understanding of knowledge	0.706	0.025	28.583	0.000
t1	<---	Mastery of skills	1			
t2	<---	Mastery of skills	1.003	0.051	19.548	0.000
t3	<---	Mastery of skills	0.984	0.049	19.898	0.000
t4	<---	Mastery of skills	1.001	0.051	19.58	0.000
m1	<---	Application of skills	1			
m2	<---	Application of skills	1.081	0.059	18.25	0.000
m3	<---	Application of skills	1.116	0.06	18.458	0.000
m4	<---	Application of skills	1.055	0.059	17.989	0.000
n1	<---	Skills development	1			
n2	<---	Skills development	1.217	0.041	29.444	0.000
n3	<---	Skills development	0.973	0.041	23.9	0.000
n4	<---	Skills development	0.96	0.04	23.796	0.000

Source: Author

if the square root of the AVE of any variable is larger than the Pearson correlation coefficient between it and other variables, the discriminant validity passes the test. The test results are shown in Table 4, and it can be seen from Table 4 that the correlation coefficients between the four variables, understanding of knowledge, mastery of skills,

Table 3. Factor loadings.

			Estimate	CR	AVE
s1	<---	Understanding of knowledge	0.985	0.883	0.658
s2	<---	Understanding of knowledge	0.743		
s3	<---	Understanding of knowledge	0.754		
s4	<---	Understanding of knowledge	0.737		
t1	<---	Mastery of skills	0.742	0.824	0.539
t2	<---	Mastery of skills	0.726		
t3	<---	Mastery of skills	0.741		
t4	<---	Mastery of skills	0.727		
m1	<---	Application of skills	0.692	0.813	0.522
m2	<---	Application of skills	0.733		
m3	<---	Application of skills	0.745		
m4	<---	Application of skills	0.718		
n1	<---	Skills development	0.778	0.882	0.654
n2	<---	Skills development	0.938		
n3	<---	Skills development	0.754		
n4	<---	Skills development	0.751		

Source: Author

Table 4. Discriminant validity.

	Understanding of knowledge	Mastery of skills	Application of skills	Skills development
Understanding of knowledge	0.811			
Mastery of skills	0.248***	0.734		
Application of skills	0.185***	0.497***	0.722	
Skills development	0.212**	0.300*	0.256*	0.809

*p<0.05, **p<0.01, ***p<0.001; the bold font indicates the root-mean-square values of the AVE of the variables.
Source: Author

application of skills, and skills development, lie between 0.185 and 0.497.The root-mean-square values of the AVE of the corresponding coefficients are all larger than the correlation coefficients of the corresponding row and column variables, demonstrating good discriminant validity.

DISCUSSION

Few studies have examined green skills in China, and quantitative research on the green skills of university students is particularly lacking. To assess the green skills of university students and conduct relevant quantitative research, the present study built upon the green skills evaluation indexes developed by Landward Research Ltd. and Aitchiso (2015), summarized green skills-related literature to develop a preliminary green skills scale, and conducted expert evaluation and pre-testing to formulate a formal green skills scale. The scale consists of four categories: understanding of green knowledge, mastery of green skills, application of green skills, and green skills development. Understanding of green knowledge is defined as the ability to gain general knowledge about facts, concepts, and relationships about the natural environment and the ecosystem as a whole and to produce green behaviors and problemsolutions (Fryxell and Lo, 2003; Kollmuss and Agyeman, 2002), and comprises four items. Mastery of green skills refers to the possession of specific skills related to emerging green technologies, namely specialized skills required in specific areas (Jeon et al., 2011) or generic skills such as those related to environmental protection and sustainability (Knibb and Paci, 2013) and contains four

items.

Application of green skills refers to eco-friendly, environmentally sustainable, and responsible environmental behaviors (Wang and Yao-Fen, 2016) that are often called green behaviors in organizational settings (Ones and Dilchert, 2012) and comprises four items. Green skills development is the development of problem-solving skills, sustainable consumption and lifestyle education, and innovation and entrepreneurship learning in everyday situations (life skills education) and includes fouritems. These four green skills categories and items are used to measure the green skills of Chinese university students.

Conclusion

According to the research statistics, the model"s parameters in construct validity, combined reliability, and convergent validity, as well as discriminant validity, all meet reasonable standards, indicating that the model is acceptable. The construction of the green skills questionnaire for university students also verifies that the green skills of university students are composed of four dimensions, namely cognition of green knowledge, mastery of green skills, application of green skills, and green skills development, with a total of 16 questions. Against the background of China"s urgent demand for talent with green skills, talent with green skills cultivated by higher education is urgently needed by society. China"s higher education has highlighted the key points forfostering the green skills of university students. When educational institutions offer courses to cultivate talent with green skills, they should start from the cognition of green knowledge so that students can gain in-depth knowledge and understanding of green skills.More practical courses should also be added to strengthen students" mastery of green skills and their application. Only then can Chinese university students make better use of green skills and become the talent with green skills that is urgently needed by society. Based on the above research, this study also provides guidelines for scholars to study the green skills of Chinese university students.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Appendix 1. Green skills questionnaire for University students.

Dimension	Question for measurement	Options
Understanding of green knowledge	1 I understand what environmental protection is.	1 2 3 4 5
	2 I possess professional knowledge of topics such as energy, waste, resource efficiency, and sustainable development.	1 2 3 4 5
	3 I possess knowledge of topics such as energy conservation and ecosystem protection.	1 2 3 4 5
	4 I possess knowledge of environmental management responsibility.	1 2 3 4 5
Mastery of green skills	1 I possess knowledge of environmental protection skills.	1 2 3 4 5
	2 I possess management or work skills related to energy, waste, resource efficiency, and sustainable development.	1 2 3 4 5
	3 I possess skills related to energy conservation and ecosystem protection.	1 2 3 4 5
	4 I possess skills related to environmental management responsibility.	1 2 3 4 5
Application of green skills	1 I can use environmental skills effectively in my studies and life.	1 2 3 4 5
	2 I can apply the knowledge and skills related to energy, waste, resource efficiency, and sustainable development in management or at work.	1 2 3 4 5
	3 I can apply the skills related to energy conservation and ecosystem protection in my studies and life.	1 2 3 4 5
	4 I can apply the skills related to environmental management responsibility in my studies and life.	1 2 3 4 5
Green skills development	1 My professional knowledge continues to improve.	1 2 3 4 5
	2 My professional skills continue to improve.	1 2 3 4 5
	3 The resources of the school are effectively helping me grow professionally.	1 2 3 4 5
	4 The diverse and sufficient platforms, as well as the opportunities provided by the school, are sharpening my ability in professional practices.	1 2 3 4 5