A Study on Promoting Teachers' Professional Quality to Achieve Sustainable Development Goals

Shu-Ying Guo 1,*, Wen-Chuan Wu 2, and Ai-Ting Cai 3

1College of Mechanical Engineering, Jilin Engineering Normal University, 130052, Changchun, China
2,3Krirk University, Thanon Ram Intra, Khwaeng Anusawari, Khet Bang Khen, Krung Thep Maha Nakhon 10220, Thailand

E-mail: liy15@mails.jlu.edu.cn

Abstract. This paper mainly studies how to promote the realization of sustainable development goals by improving teachers' professional quality. Through the literature review and research of related theories, based on the existing research, and based on the DACUM method, from the three dimensions of economy, environment and society, the structure of teachers' professional quality is connected with 17 sustainable development goals. The results of job analysis show that 13 of the 31 structural connotation items of teachers' professional quality point to the goal of sustainable development. It can be seen that the improvement of teachers' professional quality is of great significance to the realization of the goal of sustainable development. In this paper, 338 teachers are randomly selected as the research samples. The results of quantitative research show that the importance and self-evaluation value of 31 structural connotations of teachers' professional quality are higher than 3.0. Among them, the self-assessment score of the connotation item pointing to the sustainable development goal is low. According to the results of the study, effective methods are selected to improve the level of teachers' professional quality, so as to promote the realization of the goal of sustainable development.

1. Introduction

There are four origins of this study, including research background, research purpose, research significance and contribution, theoretical basis and concept definition.

1.1. Research background

As an important strategy and theory, sustainable development is one of the basic requirements of the scientific outlook on development. This theory was first put forward by the International Union for the conservation of nature, society, ecology and economy in the world resource conservation program (1980), which aims to ensure the sustainable development of the world. From a global perspective, the
concept of sustainable development was first proposed by the United Nations in 1987 in the report "our common future". The concept of sustainable development reappeared in the international environment and development agenda at the 1992 Rio Earth Summit. For the first time, the agenda of the century made clear the importance of education for the realization of sustainable development, called for the reformulation of education policies, the improvement of public awareness and the expansion of training for sustainable development, and proposed to raise the public awareness of building a sustainable society through formal and informal education. Since then, the concept of sustainable development has gradually been deeply rooted in the hearts of the people. In 2015, the United Nations Summit on sustainable development adopted an outcome document "2030 agenda for sustainable development" and 17 sustainable development goals (SDG) jointly reached by 193 member states. SDG covers almost every aspect from human well-being to environmental development. It calls on all countries to prevent climate change, protect the environment and eliminate extreme poverty while promoting economic prosperity through education and action.

SDG is a new goal to continue to guide global development work in 2015-2030 on the basis of MDG (Millennium Development Goals). The SDG integrates three factors of economic development, social equity and environmental sustainability, and lists 17 specific goals: SDG 1 (poverty eradication), SDG 2 (hunger eradication), SDG 3 (good health and well-being), SDG 4 (Quality Education), SDG 5 (gender equality), SDG 6 (clean water and sanitation), SDG 7 (clean energy for economic application), SDG 8 (decent work and economic growth), SDG 9 (industry, innovation and infrastructure), SDG 10 (bridging the gap), SDG 11 (sustainable cities and communities), SDG 12 (responsible consumption and production), SDG 13 (climate action), SDG 14 (underwater Biology), SDG 15 (terrestrial Biology), SDG 16 (peace, justice and strong institutions) and SDG 17 (partnership for goal achievement).

The Chinese government attaches great importance to and actively responds to the call of international organizations, seriously and earnestly fulfils its political commitments in various fields, and practices and promotes the sustainable development of globalization. With the increasingly severe environmental problems and economic and social development, the implementation and implementation of SDG is an important and urgent issue. At present, China's social development has entered a new historical stage. Under the requirements of SDG, with the rapid development of Internet and artificial intelligence, education has also encountered new opportunities and challenges. There are also higher requirements for teachers' professionalism, including the requirements for sustainable development goals [1]. In practice, teachers play an important role in improving the people's awareness of sustainable development. Education is of great significance to the sustainable development of globalization. This concept of educational development has been widely valued by governments, education departments, academia and other social institutions all over the world. The 45th International Education Conference held by UNESCO in 2019 solemnly put forward the importance of teachers' profession and confirmed its role in promoting and promoting world change.

1.2. Research objective

1.2.1. To construct the professional quality structure of university teachers integrated into SDG. Education has two implications for the promotion and Realization of sustainable development goals. The first is to impart sustainable development knowledge and cultivate sustainable development awareness through education for all and lifelong learning, which requires teachers to integrate the concept of sustainable development in terms of faith and character. The second is to promote and promote the sustainable development of education itself (including educational process and educational effectiveness), which requires teachers to integrate the knowledge and ability into the method system of
sustainable development. Teachers' professional development is a dynamic, sustainable and future oriented process. Therefore, integrating SDG into the four dimensions of belief, character, knowledge and ability of teachers' professional quality and building a structural model of teachers' professional quality for SDG are the basis of this study.

1.2.2. To understand the current situation of teachers' Professional Literacy facing SDG. According to the dimensions and structural connotation of College Teachers' professional quality, the measurement tools are designed, and the population sample is selected to carry out the quantitative research by questionnaire method. The focus of this study is to analyze the scores of the connotation items of SDG, to understand the current situation of College Teachers' professional quality and their ability to realize SDG.

1.2.3. To puts forward countermeasures to improve teachers' professional quality facing SDG. The level of teachers' professional quality should meet the needs of personnel training. The concept of sustainable development education and SDG require that under the guidance and training of teachers, students should accept the concept of sustainable development, develop the awareness of sustainable development, master the basic theory of sustainable development, and have professional quality and professional quality to meet the needs of social development and post. According to the goal of personnel training, the fundamental of this study is to study the problems in the professional development of university teachers and the construction and promotion of teachers' professional quality, and to give countermeasures and suggestions for the improvement of University Teachers' professional quality with the goal of SDG.

1.3. Research significance and contribution

Under the guidance of the sustainable development theory and the goal of realizing SDG, this study constructs a structural model of College Teachers' professional quality which is suitable for the needs of social talent training, understands the current situation of College Teachers' professional quality and the problems existing in promoting the realization of SDG, determines the path and method of promoting the professional quality of College Teachers Facing SDG, and gives suggestions and countermeasures.

Teachers play an important role in sustainable development education. Teachers' professional quality affects the effect of teaching practice and is an important force to promote the construction of sustainable development. According to the goal of SDG, the establishment of the evaluation system of the professional quality of university teachers and the promotion of the sustainable development ability of the professional quality of teachers play an important role in the development of teachers and their own professional development, the construction of University Teachers' team, the cultivation of talents for the needs, the sustainable development of the school and society, the promotion of social and economic development, the promotion of ecological environment protection, and the reduction of environmental pollution. It is of great significance to reduce the consumption of resources and energy and maintain the stability of human society.

1.4. Theoretical basis and concept definition

According to the purpose and requirements of the research, through literature analysis and comparative research, the theoretical basis and related concepts of promoting teachers' professional quality to achieve the goal of sustainable development are determined.
1.4.1. Theoretical basis

The main theoretical basis of this study is the theory of sustainable development and the theory of teachers' professional development. SDG is the goal of sustainable development. The realization of the goal depends on the improvement of teachers' professional quality. Teachers' professional development provides necessary guarantee for teachers' professional quality. By introducing the theory of sustainable development into the field of education, the goal, process and result of education can be repositioned. Sustainable development requires that the public have certain knowledge and cognitive ability, have a higher sense of morality and responsibility, and undertake the mission of contributing to the long-term development of human society. This requires that sustainable development education run through the whole process of education to ensure the sustainable development of education itself.

1.4.2. Concept definition

Sustainable development goals (SDG). Sustainable development refers to the development that can meet the needs of contemporary people and does not harm the ability of future generations to meet their needs. SDG is a blueprint to guide global sustainable development. It calls for the world to take action to eradicate poverty, protect the ecological environment and create dignified life and equal opportunities for all people. It applies to all countries and is ensuring that no one is left behind. The SDG has listed 17 specific goals based on three factors: economic development, social equity and environmental sustainability.

Teachers: the teachers in this study refer to the professional teachers in China's regular colleges and universities who have theoretical teaching quality and practical application skills from the two aspects of educational reform and professional development of teachers.

Teachers' professional quality: Teachers' professional quality is the social demand of the times for teachers' professional development, and also the product of the times in the process of professional development of teachers. In this study, teachers' professional quality refers to the sum of teachers' beliefs, character, knowledge and ability facing SDG and aiming at Teachers' professional development.

2. Literature Review

2.1. SDG related literature

By October 28, 2019, the retrieval results are as follows: 89444 journal documents, and the latest one is "review of the winning projects of the 18th Japan green and sustainable development Chemistry Award in 2019" [2]. Among these research results, the research on sustainable development goals only accounts for less than 1%.

A total of 3789 documents have been retrieved with the title of "sustainable development" and "education", accounting for 4.2% of the total documents of sustainable development research. The latest one is "sustainable development analysis of targeted poverty alleviation and poverty alleviation in Vocational Education" [3]. From the retrieval results, it is found that there are 8 English documents from 1969 to 1993, accounting for 8.2% of the English documents of sustainable development in the same period. The earliest English document retrieved is "the 3D higher education reform -- a new stage in the continuing development of higher education in the German Democratic Republic" (Spear D. In 1969), the earliest Chinese literature was "improving the level of national culture and education is the fundamental guarantee for sustainable development of society" (1994). According to the literature...
retrieval results, the research on Sustainable Development Education in China is 25 years later than that in the world.

Data analysis shows that the number of research on education for sustainable development has increased sharply between 1998 and 2010, and has declined in the past decade, as shown in Figure 1.

![Figure 1. Research trend of sustainable development education](image)

From the analysis of the distribution of statistical data, we can see that the research of sustainable development education mainly focuses on the comprehensive theoretical research. From the perspective of the subject field, there are many research literatures on vocational education.

With the title of "sustainable development" and "teachers", 32 documents can be retrieved, the latest of which is "the cultivation of professional action ability of German university teachers in the context of sustainable development education", From the overall trend analysis of data statistics, it can be seen that the research results of sustainable development with teachers as the main body are less, and the distribution is relatively average.

2.2. Literature on Teachers' professional quality

A total of 473 journal articles were retrieved under the title of "teachers' professional quality" on CNKI, none of which were in English. The latest one is "practical research on synchronous classroom to help teachers improve their professional literacy", and the earliest one is "on two aspects of professional teachers' Professional Literacy" [4].

From the overall trend analysis of data statistics, it can be seen that the number of researches on Teachers' professional literacy has increased significantly in the past decade, which is the opposite of the research trend on sustainable development, as shown in Figure 2.
Figure 2. The general trend of research on Teachers' professional quality

With the title of "professional quality of College Teachers", 6 periodical documents can be retrieved, accounting for 1.3% of the total number of researches on "professional quality of teachers"; with the title of "professional quality of teachers" and "sustainable development", only one document can be retrieved, "Analysis on the sustainable development way of professional quality of Chinese teachers"; no research literature can be retrieved under the title of "sustainable development" and "professional quality of University Teachers".

2.3. Achievements and problems in current research

Through literature search and analysis, we can see that China has made breakthroughs in the research, but there are still the following problems.

First of all, most of the research on sustainable development education is the combination of education and sustainable development, and most of them are the research on the theory of sustainable development education. There are few researches on the integration of SDG into education, especially on the subject of teachers' professional quality. For example, some scholars take ecological teaching mode as the research theme, regard teaching as an ecosystem, and study the ecological relationship between participants and teaching environment in the teaching system [5]. There are also experimental studies to explore the impact of teacher training on teacher professional development and education quality [6].

Secondly, the existing research on the sustainable development of education is more focused on the economic and social goals, while the research on the ecological and environmental goals is rare. It can be seen that many researchers neglect the comprehensive role of education in promoting the realization of the sustainable development goals.

In addition, many researches on Teachers' quality are aimed at a certain subject or influencing factors, for example, considering the characteristics of teachers and teaching decision-making, the relationship between traditional teachers' quality indicators and students' historical knowledge dimension is studied. There are also scholars who have made significant breakthroughs in studying the impact of teachers' professional learning opportunities on improving teaching quality and personal quality [7].
The research on Teachers' professional quality mainly focuses on the past decade, and shows a significant upward trend year by year. However, in the field of sustainable development education research, there are few researches on the professional quality of university teachers, especially on how to promote the realization of SDG through the improvement of teachers' professional quality.

3. Research method

Literature research shows that the commonly used research methods in the field of teacher professional development are experimental method, narrative method and quantitative method. In this study, DACUM (work analysis) method is selected for the research.

3.1. DACUM design

The type of this research is the combination of qualitative and quantitative research. Firstly, through the expert interview, we analyze the research topic and build the "professional quality structure of University Teachers" for SDG, then select samples to verify through questionnaire method, and give scientific countermeasures and suggestions for the sustainable development of teachers' Professional development and the establishment and improvement of teachers' professional quality. This study uses the research results of previous work analysis for reference to design the work analysis process, as shown in Figure 3.

Figure 3. Work analysis flow chart

According to the principle of work analysis, 10 expert groups are selected from Jiangsu, Hebei, Jiangxi and Jilin, all of which are full-time outstanding backbone teachers with good professional representation, appropriate proportion of gender and title, and teaching age of 8-25 years.

3.2. DACUM implementation
Members of the expert group participated in a 2-day webinar on job analysis, brainstorming, task determination and job analysis.

3.2.1. DACUM task

Through DACUM task analysis, the expert group determined that teachers should have sustainable development education ability to promote SDG. See Table 1 for specific description.

Table 1. The task and ability of sustainable development education

| Task                      | Teachers' ability                                                                 |
|---------------------------|----------------------------------------------------------------------------------|
| Subject exploration       | To construct the subject status of students in environmental, population health and sustainable development thematic education activities, and strive to cultivate the spirit and ability of subject inquiry needed by students in lifelong learning and development. |
| Focus on society          | Teachers and students pay close attention to environmental protection, population health, social sustainable development and other important issues, and actively put forward suggestions to solve relevant problems under the guidance of EPD. |
| Cooperative experience    | Guide students to carry out the cooperation among students, teachers, parents, students and society students, and improve the relevant level of knowledge and ability in participating in the practice and experience of relevant departments to solve the sustainable development problems of environment, population, economy and society. |
| Innovation-driven development | Through the activities of environmental education and population health education, this paper analyzes the cultivation of students' multi-faceted scientific innovation spirit and ability, and promotes their multi-faceted development. |

3.2.2. Goal setting

Analyze the 17 objectives of SDG, establish links with the four sustainable development tasks of subject exploration, focus on society, cooperation experience and innovation development according to its connotation, and complete the goal setting. See Table 2 for the specific operation.
Table 2. The task and goal of sustainable development education

| Task | SDG target items |
|------|------------------|
| 1    | Subject exploration | DG 3 (good health and wellbeing), SDG 4 (Quality Education), SDG 6 (clean water and sanitation facilities), SDG 7 (clean energy for economic application) |
| 2    | Focus on society | on SDG 1 (poverty eradication), SDG 2 (hunger eradication), SDG 5 (gender equality), SDG 6 (clean, water and sanitation facilities), SDG 7 (clean energy and resources for economic application), SDG 10 (gap reduction), SDG 11 (sustainable cities and communities), SDG 12 (responsible consumption and production), SDG 13 (climate action), SDG 14 (underwater organisms), SDG 15 (terrestrial organisms) |
| 3    | Cooperative experience | SDG 11 (sustainable cities and communities), SDG 16 (peace, justice and strong institutions), SDG 17 (partnership for achieving goals) |
| 4    | Innovation-driven development | SDG 8 (decent work and economic growth), SDG 9 (industry, innovation and infrastructure) |

3.2.3. Goal integration and analysis of teachers' professional quality structure

First of all, the 17 objectives of sustainable development are analyzed, and the SDG objectives are integrated into the structure of teachers' professional quality. Through literature research, brainstorming and expert interviews, the "structure of teachers' professional quality in Colleges and universities" is constructed. see Table 3 for details.

Table 3. The structure of professional quality of University Teachers

| First-order dimension | Second-order dimension | SDG target items |
|-----------------------|------------------------|-----------------|
| Belief accomplishment  | Cognitive beliefs       | SDG 1           |
|                       | Emotional belief        | SDG 2           |
|                       | Will belief             | SDG 3           |
|                       |                         | SDG 5           |
|                       |                         | SDG 10          |
|                       |                         | SDG 13          |
|                       |                         | SDG 14          |
|                       |                         | SDG 15          |
3.3. DACUM verification

The questionnaire method was used to evaluate the professional quality of teachers. According to the research purpose, a two-dimensional measurement tool was developed to measure the importance and satisfaction of teachers' professional quality: the current situation survey scale of University Teachers' professional quality, which was used to evaluate the cognition and level of teachers' professional quality. The scale included 4 first level dimensions, 13 second level dimensions, and a total of 31 topics (including 13 topics integrated into SDG implications). It can not only evaluate the respondents' cognition and expectation of teachers' professional quality, but also evaluate the current level of teachers' professional quality.

According to the conditions of the selected samples, 9 professional curriculum teachers from Jilin Province, Shandong Province, Hainan Province, Beijing City, Nanjing city and other provinces were selected as the research objects. The teachers involved in the survey were 13 majors, 338 questionnaires were issued, 338 questionnaires were recovered and 297 questionnaires were valid. See Table 4 for survey sample information.

| variable       | group      | frequency | Percent% | Total | Missing values |
|----------------|------------|-----------|----------|-------|----------------|
| Gender         | male       | 112       | 37.7     | 294   | 3              |
|                | female     | 182       | 61.3     |       |                |
| Teaching age   | 6-10 years | 56        | 18.9     | 288   | 9              |
|                | 11-20 years| 143       | 48.1     |       |                |
|                | More than 21 years | 89 | 30.0 |       |                |
| Education      | Undergraduate | 37 | 12.5 | 293 | 4               |
|                | master     | 164       | 55.2     |       |                |
|                | doctor     | 92        | 31.0     |       |                |

Table 4. Sample basic information table (valid sample 297)
The scale consists of three parts: introduction, personal information and specific items. There are 31 specific items. From the perspective of teachers' professional quality, it is divided into four dimensions of teachers' professional quality: belief quality, personality quality, knowledge quality and ability quality. The questionnaire was tested by experts to make sure that the topic design was reasonable. Item 1-6 is the "belief" dimension; item 7-17 is the "character" dimension; item 19-20 is the "knowledge" dimension; item 21-31 is the "ability" dimension; each item in the questionnaire has two kinds of questions, one is the degree of importance, the other is the degree of self-evaluation satisfaction. In this questionnaire, the 5-level scoring method in Likert scale is adopted, in which the "very important" and "very satisfied" options represent 5 points; "important" and "satisfied" options represent 4 points; "general" options represent 3 points; "unimportant" and "dissatisfied" options represent 2 points; "very unimportant" and "very dissatisfied" options represent 1 point.

4. Data analysis

This study for the importance of professional quality of college teachers and self-evaluation of the two items measured data after job analysis, as follows.

First, the importance score is analyzed. The importance scores of 31 options are higher than 3.5 points, and the importance scores of 29 items except "elegant taste" and "good character" are higher than 4.0 points, which shows that the structure of teachers' professional quality conforms to the standard of determining to retain a certain task (Norton e Robert), and the work analysis table reflects the structural connotation of University Teachers' professional quality. From the results of data analysis, we can see that the scores of measurement items related to sags are all higher than 4 points. From the perspective of teachers' cognition, we can see that the quality of sustainable development has an important role and significance.

Then, the self-assessment scores were analyzed. The self-assessment scores of 31 structural items of teachers' professional literacy are all higher than 3.0. From the self-assessment scores of various quality indicators, we can see that the total self-assessment scores of teachers' professional literacy are lower than the total importance scores. It can be seen that most teachers recognize the importance of each structural item of Teachers' professional literacy, but they also recognize their own shortcomings. Among them, the structural items with scores lower than 3.5 are: teaching sustainable development ability, self-development, teaching research and development ability, scientific research and development ability, social practice promotion and development ability, each of which directly refers to the sustainable development goal of teachers' professional literacy. From the results of teachers' self-assessment, it can be seen that quite a number of teachers think that their professional literacy level is not enough to promote their professional literacy SDG implementation.

5. Conclusions, strategies, and suggestions

5.1. Conclusion of the study

The conclusion is as follows: the four dimensions of belief, character, knowledge and ability of teachers' professional quality structure are consistent with the goal of sustainable development; the integration of SDG into the research and evaluation of teachers' professional quality is an important way to achieve the goal of sustainable development; college teachers generally believe that the connotation of SDG is an important teacher. At present, teachers in Colleges and universities generally believe that there are still many difficulties and problems in promoting the sustainable development goals, and lack of awareness of applying the concept of sustainable development to educational practice.
5.2. The cultivation and promotion of teachers’ professional quality

According to the conclusion of the study, the strategies of training and promoting teachers' professional quality are put forward as follows:

First, integrate the theory of sustainable development into the training of teachers' professional development to improve the theoretical and systematic nature of teachers' cognition.

Secondly, SDG should be integrated into the teachers' professional quality improvement plan, and the sense of mission of teachers' community of human destiny should be developed from the aspects of environment, society and economy.

Third, we should strengthen the investigation of teachers' development needs, and monitor the role of teachers' educational behaviour in promoting SDG through scientific and systematic evaluation.

5.3. Suggestions for future research

The main achievement of this study is to discuss the consistency between the professional quality of university teachers and the SDG goal from the perspective of the realization of the sustainable development goal. On this basis, the structure model of the professional quality of university teachers is constructed and verified. The research conclusion has certain limitations in the practical application. Therefore, it is suggested to subdivide the SDG goal in the future research in this field and select one or one of the SDG goals Class goals are integrated into the education process, and the promotion methods and approaches of teaching links for the realization of the specific goals of sustainable development are studied.

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