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# Teacher Professional Competencies in Education for Sustainable Development

*Xiaoyao Yue, Ruixuan Ji*

## Abstract

At present, combining sustainable development with education has become one of the school's missions. Students must master sustainable development skills. In order to explore the ideal method of K-12 teachers' professional competence in Education for Sustainable Development and determine the talent leadership strategy can enhance the professional competence of teachers in the 21st century sustainable development education, this study uses content analysis. The author systematically reviewed and analyzed related research work on sustainable development education, teachers' professional abilities and talent leadership strategies. According to the comprehensive results of content analysis, the ideal way for K-12 teachers to achieve professional sustainability is as follows: content focuses on sustainability with 21st century skills, collaboration with peers, active learning, and application of learning sustainability in practice Model, peer guidance, feedback and evaluation, duration, and teacher professional development. In order to achieve the second research goal, the authors found that talent leadership strategies can enhance the sustainable development of K-12 teachers' professional capabilities, including K-12 teacher professional development methods, K-12 teacher professional capabilities, student performance and focus on student performance.

**Keywords:** education for sustainable development, teacher professional competencies, talent leadership strategies

## 1. Introduction

In the 21st century, new trends in technology, economy, and politics affect people's social life, workplace, and lifestyle, especially environmental and resource challenges. In this case, education needs to be changed to adapt to these emerging trends. Traditional K-12 education is not popular, and educators call on us to reform the curriculum and teaching methods to teach students sustainability, such as poverty, citizenship, peace, democracy, security, human rights, social and economic development, health, gender Equality, cultural diversity, environmental protection, natural resource management, urban and rural development, production and consumption patterns, and corporate responsibility. Teachers must master all this knowledge before teaching students. In order to achieve this goal, school leaders must improve teachers' professional abilities to meet students' needs.

2. Literature review

2.1 Related concepts of education for sustainable development

2.1.1 Sustainable development

Sauve and Montreal [1] proposed that education reform should be the main task according to the UNESCO’s sustainable development document. What is Education for Sustainable Development (ESD)? The report of the ESD program was written by McKeown et al. [2], describing the Education for Sustainable Development focusing on the sustainability of the school. Linking education to sustainable development is a central task. Their research summarizes four aspects:

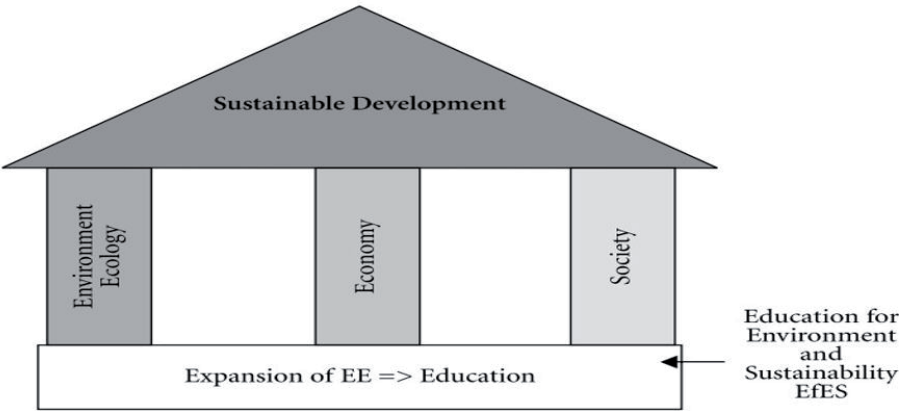
- 1. Promoting basic education
- 2. Re-orienting current direction to promote sustainable development
- 3. Addressing public knowledge and understanding
- 4. Training

This research will develop education through talent leadership strategies to enhance teachers’ professional ability education to achieve sustainable development in the 21st century.

2.1.2 Education and sustainable development

Sustainable development includes three pillars of environmental ecology, economy and society [3]. Education is the most basic element and plays an important role (see **Figure 1**).

On the other hand, education can contribute to common interests, promote national development, and provide help to families, communities, and communities that remain unchanged. When faced with economic, environmental and social challenges, education is more important in the 21st century than in the past. Whether students are future citizens, employees, managers, parents and leaders, they must face future challenges [4], especially their contribution to sustainable development. Jerald [5] believes that new trends in technology, economy, and



**Figure 1.** Education as the foundation of the three pillars. Source from: Nikolopoulou et al. [3] education for sustainable development. California: Sage.

politics affect people's communities, workplaces, and lifestyles, and sustainable development becomes more and more necessary. Facing all challenges, education needs to be reformed to meet the demands of the world. Traditional education cannot adapt, and educators call on us to innovate courses and teaching to teach students sustainability.

### *2.1.3 Content of education for sustainable development*

According to Nikolopoulou et al. [3] *Education for Sustainable Development*, the content of education for sustainable development is discussed, involving poverty, citizenship, peace, democracy, security, human rights, social and economic development, health, gender equality, and cultural diversity, gender, environmental protection, natural resource management, urban and rural development, production and consumption methods, and corporate responsibility.

### *2.1.4 21st Century skills enhancing sustainability*

For education, student achievement and success are the ultimate goal of education. Kozma [6] believes that if students master 21st century skills, their academic performance will be high. 21st century skills can enhance students' ability to learn sustainable development knowledge. The 21st Century Learning Framework [7] draws the following conclusions: critical thinking and problem-solving skills-students can think critically and have problem solving skills; Intercultural understanding-students learn different cultures and have a good understanding of mixed culture; creativity and innovation ability-students have creativity and innovation ability in future study and work; exchange students can communicate well with others; Information Students know how to search for information and choose useful and effective information. Media literacy students have sufficient media literacy to protect privacy, identify the truth, and prevent being deceived; computers and ICT literacy-students have the ability to understand and use computers, classroom technology, etc. 21st century skills can be used for sustainable development education.

### *2.1.5 Characteristics of sustainable schools*

Students need 21st century skills [8], which can be used for sustainable learning. In order to meet the requirements and needs of sustainable development education in the 21st century, schools must provide teachers with 21st century skills learning sustainability services by providing practice, human resource support and related infrastructure now [9]. Sustainable schools also provide professional development activities to stimulate teacher collaboration [10] to learn sustainability.

## **3. Methods**

This article uses a content analysis method to achieve the goal-to explore the ideal method of K12 teachers' professional ability in the 21st century sustainable development education; determining talent leadership strategies can enhance teachers' professional ability in the 21st century sustainable development education.

The author reviewed the related researches, used the key words to search the published articles since 2000, which in Sage, Eric and Springer, such as, "sustainable development education", "teacher professional competence" and "talent leadership". The keywords determined according to the goal of the thesis are related to the effective K-12 teacher professional competence method in the 21st century

Categories	Sum	Percentage
Professional competencies of K-12 teachers	19	31.7%
Teacher's competences for the 21st century education	14	23.3%
Teacher professional development towards the 21st century education	16	26.7%
Talent leadership towards teacher professional development	11	18.3%
Total	60	100%

**Table 1.**  
*Results of content analysis.*

education. Based on the theme of K-12 teachers’ professional ability method for sustainable development education and talent leadership method, the word frequency count of each identified keyword was collected and classified (**Table 1**). The data was collected and summarized in response to the goal of the paper. Through the analysis of sustainable development education, teachers’ professional ability methods and talent leadership, the 21st century sustainable development education and teacher leadership.

Obviously, in order to answer the first research question, the author has determined the ideal and effective method of teacher professional development in K-12 educational institutions in the 21st century. According to the analysis of online research publications, the ideal way to follow the professional competence of K-12 teachers for sustainable development in the 21st century is as follows: the content focuses on sustainability with 21st century skills, collaboration with peers, active learning, and application in learning Learn sustainability model exercises, peer guidance, feedback and evaluation, duration, and teacher professional development. To answer the second research question, the author found that talent leadership strategies can enhance the professional competence of teachers in the 21st century sustainable development education, including K-12 teacher professional development methods, K-12 teacher professional competence, student performance and student performance attention.

4. Analysis and discussion

4.1 Professional competencies of K-12 teachers

4.1.1 The trend of teacher’s professional competencies

What are competencies? It is certain that people must master the knowledge, skills and experience in daily activities, and can use these knowledge, skills and experience to engage in future work. Another definition is that a person’s knowledge, skills, attitudes, values, motivations and beliefs can convince him or her to succeed in his career [11]. Selvi [12] mentioned that the general content of professional competence includes three parts: inland competence, pedagogy competence and cultural competence. Apart from three main aspects, teachers’ professional abilities are in different fields.

The second model states learning is preparation for the future—the competencies in Education for Sustainable Development (ESD)—this model shows developing teacher profession to meet student needs in the future. Although the two kinds of teacher professional competencies model look very different, they are also effective to improve teacher professional competencies.

Bertschy et al. [13] found that teacher professional competence includes two models. The first one is “Curriculum, Sustainable Development, Competence, Teacher Training (CSCT) Model”. This model illustrates that teachers’ professional abilities can improve the sustainability of the curriculum, stimulate teachers’ abilities and develop teacher training practices. The second model points out that learning is preparing for the future-the ability of sustainable development education (ESD), the model shows the development of teacher careers to meet the needs of future students. Although these two kinds of teacher models look very different, they are also effective for improving teacher professional competences.

#### *4.1.2 Professional competencies of K-12 teachers enhancing students’ learning*

The professional ability of K-12 teachers will affect students’ achievement and motivation. In this regard, Kunter [14] pointed out that it is obvious that teachers have a good understanding of subject content, high quality of beliefs, original motivation and direction, and can control themselves regularly, which will promote student achievement and motivation. In other words, teachers’ knowledge level and constructivist beliefs can predict students’ motivation and achievements. Specifically, teachers’ motivation and self-regulation ability can predict students’ performance and motivation.

### **4.2 Teacher’s competences for the 21st century education**

#### *4.2.1 Teachers’ competencies for the 21st century schools*

Caena [15] pointed out that K-12 teachers’ professional ability content includes the following characteristics: teachers should have tacit and explicit knowledge, practical knowledge and cognitive thinking ability. Especially teachers should have higher motivation, positive beliefs, correct values and be able to handle their emotions. Based on these abilities and skills, teachers can solve more difficult problems and apply them to disciplines to solve teaching problems. These emotional skills will also affect the teacher’s career in different situations, thereby helping the teacher complete the task and meet the requirements. In addition, as we have seen, in the 21st century education, the trend of using technology and information is developing. School leaders require teachers to learn ICT (information, communication, technology) skills [16].

#### *4.2.2 21st Century teachers’ competencies affecting students’ learning outcomes*

Teachers have adopted innovative methods in the curriculum and teaching to provide students with opportunities to improve critical thinking and problem-solving skills. And students can learn content knowledge that can remember a long-life experience [17]. Teachers choose practical learning methods to enter the classroom to teach the subject. For example, there are some new subjects, such as the physics subject, and the new course “Science, Physical Education, and Me.” In this creative course, students can physically check their athletic performance.

Kozma [6] described that students learn the skills and knowledge of the 21st century, which is beneficial to students who have high academic achievements and a better life and work in the future. Teachers with educational capabilities in the 21st century will greatly improve students’ academic performance and achievements. 21st century skills such as critical thinking skills and problem-solving skills are good for students’ academic performance [18].

### **4.3 Teacher professional development towards the 21st century education**

#### *4.3.1 Theories of teacher professional development*

Linda [19] concluded that there is not enough literature discussion on the definition of teacher professional development (TPD), and even experts have tried to find the ideal definition, but this has failed. Some literary works on teacher professional development are called TPD, which are used by teachers to improve their content knowledge, pedagogy knowledge, critical thinking and problem-solving skills. These skills and knowledge can be formed through learning and communication with peer teachers. Therefore, the definition of teacher professional development is the process of improving teacher characteristics. One can grow into a professional process. Teacher professional development is divided into two types: functional development and attitude development.

Attitude development is about the process of the attitude formed by teachers in their work, while functional development is about the process of the transformation of teachers' intelligence and motivation.

Haßler [20] pointed out that teachers who apply active learning strategies to the classroom will become reflective practitioners. In this class, students learn content by solving problems, communicating critically, asking questions, and using logical thinking. Therefore, teachers must learn this method by participating in professional development activities. He also suggested that "teacher education" or "teacher professional development" is better than "teacher training". Educators have built a communication learning environment for teachers, conducted high-quality discussions with learners and conducted practical activities. Learners can answer questions openly will actively engage students in the learning process. When learners ask other teachers to speak about their critical thinking, they can obtain useful information from other teachers' thoughts. Usually applying technology in education can enhance interaction and collaboration. Educational technology has the most beneficial impact on students' learning. Schools should support teachers in using technology in the classroom, which requires an adaptable professional development plan.

Another study by Postholm [21] shows that teacher professional development is related to teacher learning. This is how professors learn and how they use knowledge, abilities and skills to teach students how to learn. When teachers participate in coaching or learning activities in school, they can acquire knowledge and skills. They can also improve their professional skills through classroom research and learn from their peers through collaboration. Teachers can learn when attending learning and assessment meetings. When teachers reflect and plan activities in learning teaching and knowledge, they can learn from peer groups.

Linda [22] presented three main research reports from the Stanford Educational Opportunity Policy Research Center of the United States, which introduced teachers' professional development opportunities in learning. First of all, teachers hope to gain more professional learning experience, focusing on disabling students, subject background, classroom leadership and the use of technology. The second is that teachers do not have enough opportunities to participate in professional training of duration (less than 8 hours), nor do they have enough time to participate in seminars. The third report says that the state improves the professional development of teachers, including the following: professional development standards, accountability and supervision of professional development efforts, various intermediary offices that provide infrastructure and support for regional professional development; and schools and Areas can be used to strengthen professional development resources.

Blank [23] determined the content of teacher professional development, which provides teachers with knowledge of subject content and related skills. He also described that active learning methods have been used in teachers' professional development activities, thus providing teachers with opportunities to improve themselves. Generally speaking, teacher professional development requires teachers to learn together with their peers at school; mother tongue courses are also used as learning materials for teacher professional development; sufficient time is important for teacher professional development activities. The final and critical factor is feedback and evaluation. In order to achieve the purpose of feedback and evaluation, these metrics point out that: attention should be paid to the implementation of the quality of the development process; the teacher's knowledge has been increased; the teacher's classroom practice has changed, and the student's performance has also been improved.

To a certain extent, duration plays a vital role in career development education. If the professional study time is short, not dedicated and disorderly, then teachers will not get great help in development activities, just like students. To encourage teachers to change their habits in the classroom, school leaders should provide sufficient time for teachers' professional development [24].

In summary, the keywords for effective teacher professional development are content-focused, active learning, developing collaboration, applying models in practice, providing coaching and expert support, and feedback and evaluation on teacher professionalism and duration [21, 23–26].

#### *4.3.2 Teacher professional development for the 21st century education*

In today's world, education is changing [27]. In the 21st century, society has undergone tremendous changes and stimulated changes in the education system. In the education reform, teacher professional development has become one of the important components. Educators pointed out that the most important thing to note is that teachers work as professional teachers. Professional development is a person's professional role. Teacher professional development is the result of teachers gaining experience and systematically evaluating teaching. Professional development includes formal and informal experience. Effective professional development will profoundly affect the work of teachers in and out of school. Professional development also affects the relationship between teachers' beliefs and behaviors and the quality and practice of teachers in the classroom, thereby affecting students' learning and performance. The higher the degree of professional development, the better the student's performance.

High-quality teacher professional development refers to the main contents of TPD activities, themes, pedagogy and courses, and was discovered by Pedemonte [28]. The author's research implies that the focus on the subject is carried out with a greater degree of collective participation, active learning, collaboration and a longer duration. It is related to classroom practice teaching and is an effective TPD method for teacher reporting. In his research, teachers adopted a method of collective participation, requiring students to do some homework at least within a week, and arrange them into small groups for collaborative learning.

### **4.4 Talent leadership towards teacher professional development**

#### *4.4.1 Talent leadership theory*

Talent management and leadership skills seem to be one of the most important themes of organizations in the 21st century. Obviously, research on talent leadership in organizations is limited. In fact, talent management often draws attention to industrial organization (I-O) theory and human resources (HR) professional fields,

which include identifying, selecting, and developing and retaining high-quality and suitable employees [29]. Talent is a key element of school success. Those who change their organizational performance through short-term work or long-term development of the best potential and values [30, 31]. As the organization discovers, leads and develops current and future members, talent management can be determined [30, 31]. Talent leadership theory mentions that in school planning, leaders should explore strategies for organizational performance to meet current and future needs and establish the necessary processes to measure the school's ability [32].

4.4.2 Talent leadership enhancing teacher professional development

The Organization for Economic Co-operation and Development (OECD) has broadly determined the professional development of teachers, which is a process of improving teachers' skills, knowledge, practices and other areas. Professional leadership should respond to teachers' major career transformations, develop their talents, and strength professionally [33]. Indeed, focusing on talent leadership can help teachers determine their talents and put them into practice. The American Institute presents a talent development framework that mentions three key elements: school leaders should meet the requirements of your students by arranging enough talents in their careers; school leaders should develop future talents Teachers and administration prepare to meet student needs; school leaders can support your student needs with support, and retain teachers who can continue to maintain high-quality teaching and use their talents for practice. In addition, the Ministry of Education and Training stated that school leaders should establish a link between high-quality teaching and student achievement and promote educational skills and knowledge in the development of professional teachers. As an education leader, designing and implementing effective professional development is their main job [22].

4.5 Deming circle

Deming circles are used to implementing quality management and continuous improvement. W.E. found this method of organization. Deming (Deming) and named PDCA (Planned Examination Action) circle [34]. Planning to develop a vision is the mission of the organization. Do the steps, methods, strategies to achieve the goal. Check the assessment and access the results. The bill identifies areas for improvement (Figure 2).

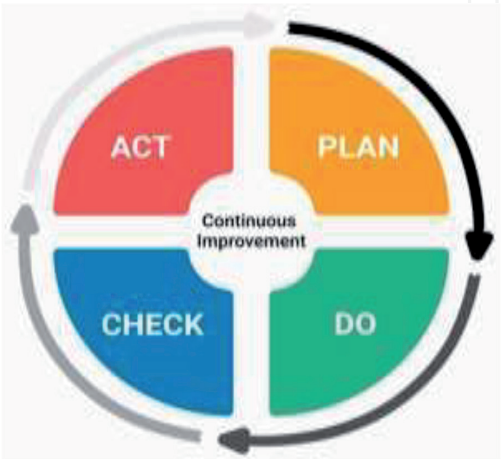


Figure 2.  
Advanced PDCA circle. Source: <https://kanbanize.com/lean-management/improvement/what-is-pdca-cycle>.

5. Results

In the 21st century, it is expected that K-12 students will learn the skills of the 21st century. School leaders should find appropriate educational leaders to develop teachers’ professional abilities. School leaders will develop personal talents, skills and 21st century skills to meet students’ current needs and future needs. In **Table 1**, K-12 school leaders enable each teacher’s 21st century skills, abilities and knowledge to make the school a success. Talent leadership school leaders use these seven methods to improve teachers’ professional abilities (**Figure 3**).

5.1 For answering the first research question

Based on the comprehensive results of content analysis, the ideal method for K-12 teachers’ professional abilities in 21st century education is as follows: content focuses on 21st century skills, collaboration with peers, active learning, model exercises to learn 21st century skills, coaching, feedback and evaluation, duration. Content Focus on Sustainability of 21st Century Skills Focusing on the main content and teaching strategy models of 21st century skills are the key to teachers’ professional development, helping teachers master the sustainability of 21st century skills and how to teach students.

**Collaboration with peers.** Cooperation with colleagues and subordinates. Each teacher has his own talents, learn from the same learn, and preside over the demonstration class; management team cooperation and discussion, the teacher can also discuss the work of students with other teachers. Apply technology in interaction, collaboration, and work. **Active learning.** Active learning methods have been used in teachers’ professional development activities, thus providing teachers with better opportunities for self-improvement. **Apply learning sustainability models in practice.** Teachers apply teaching theories, concepts and models of sustainable development skills to actual classrooms. They must learn how to teach students the skills of the 21st century. **Peer guidance.** In talent leadership strategies, leaders use peer guidance rather than traditional expert guidance. Some teachers have 21st century skills. Some people dominate critical thinking and problem solving, some shine in creativity and innovation, and some do well in computing and ICT literacy. These teachers may be tutors. **Feedback and evaluation.** The feedback and evaluation

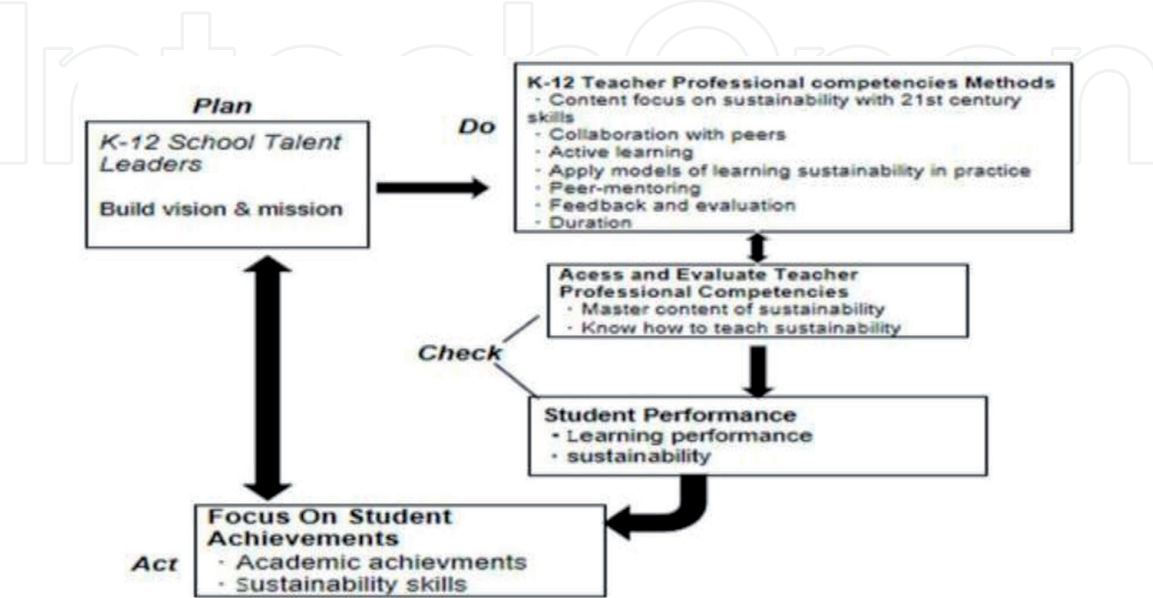


Figure 3.  
Talent leadership strategies enhance teacher’s professional competencies in 21st century education for sustainable development.

of TPD is very important. The purpose of feedback is to achieve the quality and efficiency of TPD. In addition, the feedback should confirm that the teacher's ability has been developed, the teacher's classroom practice has been changed, and the student's performance has been improved. Sufficient time is essential for teachers' professional development activities. Teachers should have enough opportunities to participate in professional training of continuous duration (for example, more than 8 hours), and have enough time to participate in seminars.

## **5.2 For answering the second research question**

Talent leadership strategies include K-12 teacher professional development methods, K-12 teacher professional capabilities, student performance, and attention to student achievement. K-12 teachers' professional development process is inefficient, they must improve their professional abilities, master the content of sustainable development skills, and know how to teach students sustainable development skills. Students master it and show better academic performance. Of course, students' academic achievement and sustainability skills will be improved. Students' grades reflect the value of the model.

## **6. Conclusion and implication**

K-12 school leaders can use these effective methods to develop the professional skills of K-12 teachers to develop sustainability with 21st century skills, including focusing on the sustainability of 21st century skills and collaborating with peers, active learning, applying learning sustainability model in practice, peer guidance, feedback and evaluation, duration. Teacher professional development. Teachers participate in open subject content courses at professional development schools to provide content knowledge mastered by teachers. Talent leadership strategies for K-12 teachers' ESD professional capabilities, including K-12 teachers' professional development methods, K-12 teachers' professional capabilities, student performance, and attention to student performance.

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