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Nurturing Scientific Literacy under Sustainable Development Goals in the Teaching of Science

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Abstract: To cope with the global challenges, United Nations came up with 17 sustainable development goals (SDG for short) to eradicate the extreme poverty, education inequality, climate change and other issues concerning to mankind living condition. SDG 4 aims to provide the access to quality education for everyone around the world. Since education plays a crucial role in realizing SDGs, science education is conducive to equip students with scientific literacy to explore the sustainability considering its nature of discipline. This research was conducted in a Chinese senior high school among science teachers, including biology, physics, chemistry, and management staff for a more comprehensive data needed. Based on findings, science education was poorly implemented on scientific literacy-oriented since all disciplines in class are for exam purpose not for overall development of students. Therefore, this research is trying to contribute for well-performed science education teaching mechanism in China in context of sustainability in a long run.

Keywords: sustainable development goals (SDGs), scientific literacy, science teaching

1. Introduction

Globally, a certain number of studies researched on sustainable development in education sector under the guide of United Nations' SDGs as [1] argued that education is vital to prepare people with literacy required by social needs. Science education emerged as an engine to trigger the acceleration of science and technology with its rigorous nature. In China, science is a general subject to learn from grade 1 to grade 6 for ordinary phenomenon in daily life while divided into chemistry, physics, and biology during grade 7 to 12 to deal with their exams respectively [2]. It is well-known for Chinese exam-oriented education, [2,3,4] mentioned that this mode is harmful for balanced development of students in different aspects only meet the demand of entering college as the sole objective neglecting the process in learning. Contrast to exam-oriented education is quality-oriented education, which attached importance on acquisition of knowledge but also cultivation of their scientific literacy, which refers to three areas of knowledge including content, procedure and epistemic. [4,5,6,7].

In Thailand,[4] posed that scientific literacy for junior high school student should involve higher order thinking skills, which contains problem-solving thinking skills, analytical thinking skills, creative thinking skills, and critical thinking skills. According to their test, those higher order skills are greatly enhanced after the scientific literacy learning process. As we all know, scientific conscious and literacy can be greatly improved through practice and real-scene experience by hand. In fact,

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biology is the most discipline that tightly connected with SDGs since it has an independent unit to introduce the relationships among environment, sustainable development, and other biology related content. But for other 2 subjects, like physics and chemistry, it seems like not so relevant to SDGs. That is why this paper come into being, science literacy should be highly valued and prompted in senior high school.

In addition, there are many positive practices to improve scientific literacy, like "green chemistry education" mentioned by [8], which aims to engage students in more "how" and "why" activities and prepare students with corresponding ability and sustainable development awareness gradually. While [9] emphasized the importance of education for sustainable development in teacher education, teacher should apply the sustainable development concepts in pedagogical teaching and then ensure students can follow the rules after by. Those related concepts should contain but not limited like climate change, poverty eradication, zero hunger, and decent jobs and so on. At the same time, [10] pointed out that the importance of outdoors activities toward sustainable biology teaching with critical thinking and problem-based learning skills simultaneously. Furthermore, [11] indicated that science is not the subject to calculate, but also to feel and touch the surroundings with questions and solve them in a systematic and comprehensive way. However, the situation of sustainable development goals related is not optimistic. As [12] addressed that Chinese senior high schools' student has limited information sources and knowledge toward SDGs. How can they be nurtured in a good manner of scientific literacy.

Therefore, this paper aims to contribute to those groups to provide some feasible suggestions. For policy makers, understanding the urgency and importance to make and release sustainability education policies to support teaching become more and more apparently. For administrators, how to design a sound and well-performed curricula and encourage teachers to innovate teaching methods with awards, which should be thought highly of. For teachers, first, it is necessary for them to qualify themselves with sufficient sustainability education theories and practices before teaching.

2. Methodology

This research adopted the qualitative method of group interview to collect the information needed in a Chinese senior high school. The 20 key informants were selected among teachers those who have more than 5 years of experience of teaching biology, physics, chemistry, and management staff with 5 for each as showed in table 1. Qualitative was used to indicate management prerogatives and challenges in the implementation of sustainability education in science education.

Table 1: The Demographic

Category	Total number	Samples
Biology teachers	46	5
Physical teachers	59	5
Chemistry teachers	55	5
Managerial staff	50	5
Total	200	20

The respondents and informants were the teachers and managerial staff in senior high school in Beijing, China. The respondents and key informant were selected among teachers and managerial staff. The full-time teachers are round 150 for now including 15 science teachers. Managerial staff are nearly 50 distributed in different section of school. Therefore, the respondents and informants

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were selected from them to collect the date to interpret. 200 teachers and managerial staff were selected as the respondents by stratified random sampling while 15 science teachers (including 5 biology teachers, 5 physics teachers, and 5 chemistry teachers and 5 managerial staff were selected through total enumeration to be the informants with a total number of 20. Since science literacy is not only related to the teachers those who are teaching the certain disciplines but also the managerial staff those who are responsible to guarantee the implementation and assessment on that note demonstrated in table 1 above.

3. Discussion

It can be drawn from the data above that most of science teachers think that the students should improve their scientific literacy considering the higher order thinking skills. However, through the interview, the science teachers themselves also should raise their awareness in teaching scientific subjects. Some teachers complained that there is no professional training program to strengthen teacher's scientific literacy teaching methods, which cause that teachers have no idea about how to connect practical teaching with SDGs in terms of scientific literacy. Besides, some managerial staff also give their own suggestions that there is no proper recruitment standard and evaluation, and assessment system for teachers.

From the interview, it can be also concluded that students have less engagement in classroom interactions, which was caused by traditional teaching and learning mode with teacher-centered in class while students as the passive receivers. This pointed out that the lack of targets promotion and trainings toward teachers and students related to SDGs.

4. Conclusion

In conclusion, science education should arouse attention among schools, teachers, and students to improve their competence in academic and employment performance. For Chinese high schools, it is an urgency to change the exam-oriented teaching into scientific teaching and learning to cultivate the scientific literacy and practical skills coincided with SDGs for students to survive in the society. For the policy makers, they should attach importance on cultivating both students and teachers with scientific literacy not limited in scientific disciplines but other literal disciplines also.

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