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EDITED BY

Lingshi Yin,
Hunan University, China

REVIEWED BY

Nezha Mejjad,
National Centre for Nuclear Energy,
Science and Technology, Morocco

*CORRESPONDENCE

Fangfang Du,
✉ dufangfang_001@126.com

[†]These authors have contributed equally to this work

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Environment education: A first step in solving plastic pollution

Jianli Liu^{1†}, Zhubing Hu^{2†}, Fangfang Du^{3,4*†}, Wei Tang², Siting Zheng², Shanzhou Lu², Lihui An⁵ and Jiannan Ding⁶

¹School of Textile Science and Engineering, Jiangnan University, Wuxi, China, ²Midea Group, Wuxi, China, ³School of Humanities, Jiangnan University, Wuxi, China, ⁴College of Education, Jiangnan University, Wuxi, China, ⁵State Key Laboratory of Environmental Criteria and Risk Assessment, Chinese Research Academy of Environmental Sciences, Beijing, China, ⁶School of Environmental and Civil Engineering, Jiangnan University, Wuxi, China

Plastic pollution has been today's most highly visible environmental problem in the world. How to responsibly manage plastic waste to control and eliminate plastic pollution has been a global challenge. We have begun to address these issues and developed some science-based solutions and emerging technologies. However, tackling such an intractable challenge requires systematic solutions except for science-based and technology-based ones. Environmental education, fostering plastic pollution prevention within society's educational system, will provide a powerful and feasible pathway at a low cost. Within this perspective, the value and the way forward of education in solving plastic pollution are primarily discussed. Environmental education, including school-level education for students, sustainable consumption behavior guidance, and pollution prevention education for the public, is the feasible, effective, and permanent resolution of plastic pollution in the future.

KEYWORDS

plastic pollution, education, environmental awareness, pro-environmental behavior, consumer behavior

1 Introduction

Plastic pollution is among today's most highly concerning environmental grand challenges. The need for efficient and sustainable remediation solutions using today's science and technology is urgent (Schmaltz et al., 2020). So far, however, few technologies can be successfully applied in the world. The researchers at Duke University created the plastic pollution prevention and collect technology inventory that includes 52 technologies falling into the two categories of prevention or collection of plastic pollution (Schmaltz et al., 2020). The majority of these 52 emerging technologies were developed to collect plastic scattered in the environment, especially exemplary ones, such as "Marine Microplastic Removal Tools," "Hoola One" and "TrashTrap" which were successfully implanted for microplastic collection (Schmaltz et al., 2020). Although the large-scale popularization and implementation of these technologies can retard plastic pollution, the financial feasibility and costs are barriers, especially in some developing countries.

What is more feasible, sustainable, and low-cost solutions to plastic pollution except for science-based and technology-based ones? Environmental education is one of the answers to this important and urgent issue. Recently, some related research was carried out. Cordier et al. developed one worldwide socio-economic model to forecast the influence of lack of education plastic pollution by using the data of the World Bank and pointed out that the amount of inadequately managed plastic waste will decrease by 34% compared to the business-as-usual scenario (Cordier et al., 2021). Soares et al. presented a study on the perceived importance of

education and knowledge dissemination strategies on the mitigation of plastic pollution (Soares et al., 2021). This article is one of the few studies currently focusing on the pathway to minimize plastic pollution through environmental education. Additionally, the authors firstly pointed out environmental education should be included in the first 9 years of education (Soares et al., 2021). Undoubtedly, the contribution of these researches provides a permanent solution at low cost to plastic pollution from the perspective of environmental awareness and actual pro-environmental behavior. In this paper, we discussed the value of education in solving plastic pollution inspired by the search of Cordier et al. (2021); Soares et al. (2021).

2 The value of education on plastic pollution

Environmental education has been considered as one of the important factors in the research about the socioeconomic impact on plastic pollution, although the related researches are scarce. Vicente-Molina et al. (2013) concluded that a 1% increase in individual environmental knowledge leads to a 0.4% increase in environmental behavior among university students through model estimation. Gifford and Nilsson concluded that individuals with more education are more concerned about environmental issues, which directly supports the hypothesized relationship between environmental awareness of individuals, especially pro-environmental concern and behavior, and education (Gifford and Nilsson, 2014). Hidalgo-Ruz et al. (2018) also found out a tendency of anthropogenic marine debris abundances to increase in the country with the lowest Education Index (Mean and Expected Years of Schooling) and pointed out that the environmental awareness and pro-environmental concern and behavior of the public will be increased through an educational program, such as environmental campaigns, and the changes of plastic pollution over time might be related to the educational conditions of a country. The prediction model developed by Mateo Cordier and coauthors indicated that the amount of inadequately managed plastic waste decreases by 34% in the “extending education” scenario when compared with the business-as-usual scenario in 2050 (Cordier et al., 2021). Soares et al. (2021) concluded that a higher level of education is significantly and directly related to the environmental awareness of and actual pro-environmental behavior in plastic problems, though a clear causal relationship among them has not been established. Education has been identified as a critical factor to explain high levels of environmental behavior in research, which might be a promising solution to plastic pollution (Cordier et al., 2021).

Environmental education, especially nature-based environmental education related to ecosystem preservation in primary and secondary schools, is a first step in solving the planet’s environmental problems, which provides a promising solution to mitigate plastic pollution among young people (Hammami et al., 2017) (Mandrikas et al., 2021; Soares et al., 2021). For example, a program called Plastic Free Schools aims to measurably reduce plastic pollution in a global community of schools, colleges, and universities. Plastic straws, disposable plastic shopping bags, plastic delivery packaging, plastic bottles will be gradually reduced and ultimately eliminated in participating schools. In the program, environmental education programs and campaigns will inspire students to investigate the plastic waste stream in daily life, which will gradually promote more responsible behaviors in young citizens. Correspondingly, environmental awareness and behavior rather

than knowledge alone are incorporated through curriculum innovation design by educators, which will tenderly and subtly turn the tide on plastic pollution at a low cost in the future (Hartley et al., 2018). Further, education administrators are willing to make policy changes.

However, school education is not the only form of environmental education. Consumption behavior guidance and eco-friendly tips for the public on reuse and recycling instead of throwaway culture and fast fashion are important pre-consumption and post-consumption efforts. In pre-consumption guidance, the reduction, and replacement of disposable products in daily life are swift and effective solutions to plastic pollution at the usage stage. By contrast, the solutions to plastic waste management including disposal, collection, and recycling for individuals through environmental education is more effective to reduce microplastic pollution. The research of Borrelle et al. and Lau et al. both indicated that pre-consumption and post-consumption strategies achieve a reduction of plastic pollution by more than 50% when applied individually compared to the business-as-usual scenario (Borrelle et al., 2020; Lau et al., 2020).

3 The way forward

It will be a long and difficult way to thoroughly eliminate plastic pollution on the Earth. The capacity to prevent plastic pollution on a large-scale through emerging technology solely is very limited. However, the time for mitigation of plastic pollution with multidisciplinary solutions in our world is now. Environmental education is the permanent resolution of plastic pollution, which should be and will be a vital and indispensable section of science-based and technology-based solutions to plastic pollution. How to mitigate and minimize plastic pollution through environmental education is a novel challenge not only for educators but the public, indeed the whole human. Environmental education at multilevel, such as family, school, and social education through holistic methods, even a cross-regional, and global education cooperation to address plastic pollution are the next steps in the future. Lastly, reconnecting with nature to value its biodiversity and benefits provided through education may further help to mitigate plastic pollution.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary Material, further inquiries can be directed to the corresponding author.

Author contributions

JL, ZH, and FD led the project planning and study design. WT, SZ, JL, and LA wrote the article in collaboration with all other authors. SL, FD, and JD corrected and edited the manuscript.

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Conflict of interest

ZH, WT, SZ, and SL were employed by the company Midea Group.

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