

Environmental Consciousness on Sustainable Development in Contemporary Art Design

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Abstract: In contemporary art design, traditional environmental awareness usually emphasizes waste reduction, resource conservation and environmental protection, but in many cases, it still focuses on short-term problem solving. In contrast, environmental awareness based on sustainability is broader and more integrated. It includes not only resource management and pollution control, but also the broader issues of social equity, sustainable consumption and production, and adaptation to climate change. Research in this field not only helps to promote the integration of art design and Sustainable Development (SD) concepts, but also promotes social awareness of environmental responsibility and sustainability, providing new directions for the role of art in shaping future societies. This paper studies the historical roots of environmental awareness in contemporary art design, and analyzes the intersection of environmental awareness and contemporary art design. Combining the theoretical basis of SD in art design and the realization of environmental protection technology in art design, this paper draws the following conclusions through two sets of controlled experiments. In the product material selection experiment, the number of artworks sold increased by about 22 pieces on average, and in the product packaging design experiment, the sales of products increased by about 12 pieces on average. This shows that environmental awareness based on SD has a positive impact in the packaging of contemporary art design.

1. Introduction

Environmental awareness of SD encourages artists and designers to think about how they can create works related to social, environmental and economic sustainability in order to inspire profound reflection in the audience. It also links the arts to the broader sustainability agenda, enabling the power of the arts to communicate and influence society more effectively to better address today's complex environmental challenges.

There are many theories about environmental awareness of SD and contemporary art design. Marasigan A C analyzed the environmental perception of Filipino students to develop a curriculum design that would promote education for SD in the Philippines. In addition to scientific theoretical concepts, the inclusion of discovery practices is very important in module management [1]. Griffin M documents an attempt by an interdisciplinary team to raise awareness of sustainability in a university environment in the United Arab Emirates, with the aim of raising awareness of sustainability among students, faculty, staff and other university stakeholders [2]. Svetlichnaya I pointed out the visual components of people's external images that affect the translation of social and cultural information, and determined that artistic design methods in modern culture are defined as creative, and finally proposed the choice of artistic design methods [3]. As people's awareness of environmental development increases, Zhang C believes that environmental art design has a new design concept, so he uses ecological design principles to study environmental art design and provides feasible application schemes [4]. Jiang S B advocates the concept of SD to examine the environmental design of ceramic art. According to the benchmark concept of SD, he examines the current environmental design industry of ceramic art, and makes relevant suggestions based on the problems found [5]. The combination of SD and the renewal of the theoretical knowledge of contemporary art design prompts relevant fields to conduct re-optimization research on the realization of environmental protection technology in art design [6]. The above research methods can effectively improve the awareness of SD, but there is a lack of specific experimental analysis.

The research on the realization of environmental protection technology in art design is a major focus of this paper. In this paper, the theoretical basis of SD in art design is discussed, and two sets of controlled experiments on the impact of product material choice and packaging design on consumers' purchase intention are combined. The final results show that consumers are more inclined to buy artworks or products with environmentally friendly packaging and give positive feedback.

2. Historical Roots of Environmental Awareness in Contemporary Art Design

Environmental awareness in contemporary art design is not a new concept, but has deep historical roots. In ancient times, people lived in harmony with nature, and this relationship was reflected in various art and architecture [7-8]. For example, the garden art of ancient China, the architecture of ancient Egypt and the sculpture of ancient Greece all emphasize the relationship with nature. The Industrial Revolution of the late 18th and 19th centuries brought huge productivity gains, but also environmental pollution and over-exploitation of resources. During this period, while art and design focused primarily on mechanical and industrial aesthetics, there were also concerns about the impact of industrialization on the environment. This paper divides the process of environmental awareness into three stages. The historical development of environmental awareness in art and design is summarized as shown in Figure 1:

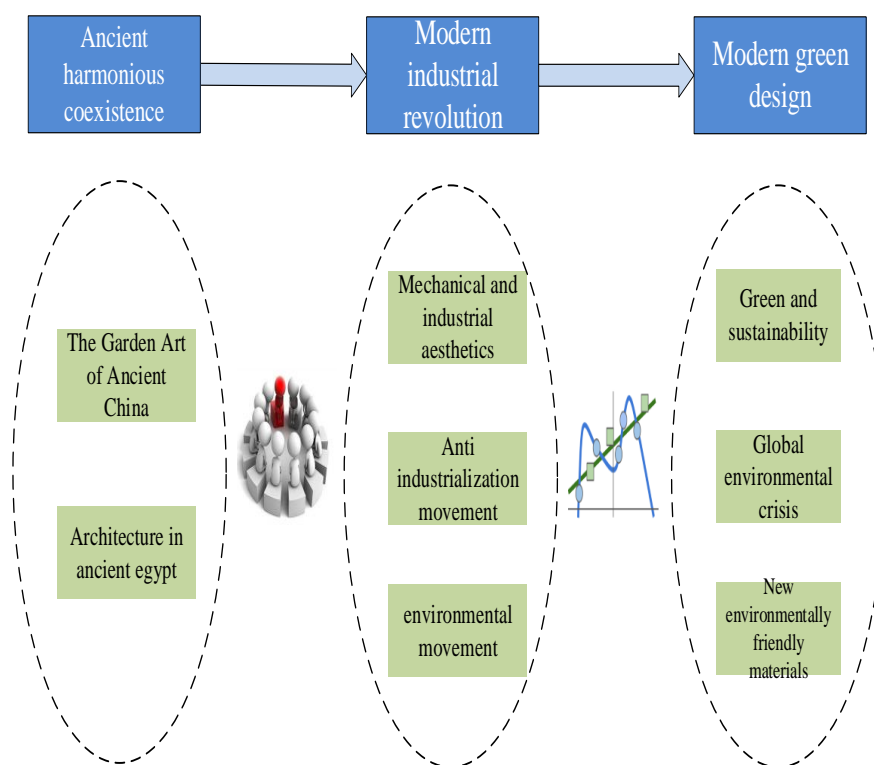


Figure 1. Overview of the historical development of environmental awareness in art design

As can be seen from the above picture, environmental awareness in contemporary art design is based on the long-term relationship between humans and nature, the environmental challenges brought about by industrialization, and the concern for future sustainability. This awareness is not only reflected in the content of art and design, but also in the practice methods and choices of artists and designers [9-10]. In the 1960s and 1970s, environmental protection became the focus of public attention. Artists and designers began to explore how their work could convey environmental messages and raise public awareness of the environment. It was not until the 1980s that designers began to explore green design and sustainable design, which involved choosing environmentally friendly materials, reducing waste and considering the entire life cycle of a product. With the rise of global warming and other environmental issues in the 21st century, artists and designers have become more concerned about environmental issues. They not only express concern for the environment in their work, but also adopt a more environmentally friendly approach in their practice.

3. Exploration of Environmental Awareness of SD In Art Design

3.1. The Intersection of Environmental Awareness and Contemporary Art Design

In contemporary art design, designers are beginning to think more about the use of recyclable or degradable materials to reduce the negative impact on the environment. For example, environmentally friendly materials such as bamboo, wood and recycled plastics can be used to replace traditional non-sustainable materials [11-12]. The intersection of environmental awareness and contemporary art design is reflected in a number of aspects, and the following are some of the main intersection points and their detailed descriptions, as shown in Table 1:

Table 1. Main intersection points of environmental awareness and art design

Intersection point	Elaborate on
The use of sustainable materials	Consider using recyclable or degradable materials to reduce negative environmental impacts
Energy conservation and resource efficiency	Reduce energy consumption and resource waste through innovative design
Circular design	Ensure that each component of the product can be recycled or reused at the end of its service life
Ecosystem thinking	Emphasize the interdependence between human activities and the natural environment
Environmental education and awareness raising	Using art and design works to convey important information about environmental protection
Community and local participation	Contemporary art and design have begun to focus on interaction with local communities and environments

In contemporary art design, designers are beginning to consider the use of recyclable or degradable materials to replace traditional non-sustainable materials in order to reduce the negative impact on the environment. When designing furniture and buildings, it not only reduces the use of materials through innovative design to reduce energy consumption and resource waste, but also takes into account the circular design approach of the product life cycle. This design approach helps to reduce waste and promote resource recycling [13-14]. In order to better emphasize the interdependence between human activities and the natural environment, designers also use simulated natural systems to create designs that can coexist harmoniously with the surrounding environment.

In addition, virtual and augmented reality offer new possibilities for environmentally friendly design. With these digital technologies, designers can reduce material waste and create more environmentally friendly products. At the same time, with the formulation of environmental laws and standards, designers are encouraged or required to follow more environmentally friendly design guidelines, which promotes the application and development of environmental awareness in contemporary art design. These intersections show how environmental awareness has influenced and shaped many aspects of contemporary art and design, while also reflecting the important role of art and design in promoting SD and environmental protection.

3.2. Theoretical Basis of SD in Art Design

The theoretical basis of environmental awareness in art design involves many disciplines, including ecology, sociology and design. Ecological aesthetics is a branch of philosophy that studies the beauty of natural environments. In design, ecological aesthetics encourages the use of natural materials and the imitation of natural forms. Sustainable design theory emphasizes that design should consider the three dimensions of environment, society and economy [15-16]. Designers should choose renewable and recyclable materials, reduce waste, and consider the entire life cycle of the product. Most importantly, the sociological concept of green consumerism emphasizes that consumers can support sustainability by purchasing environmentally friendly products. According to the data of an aesthetic art design company, the number of artworks using environmentally

friendly materials and traditional materials in the past five years is as shown in Figure 2:

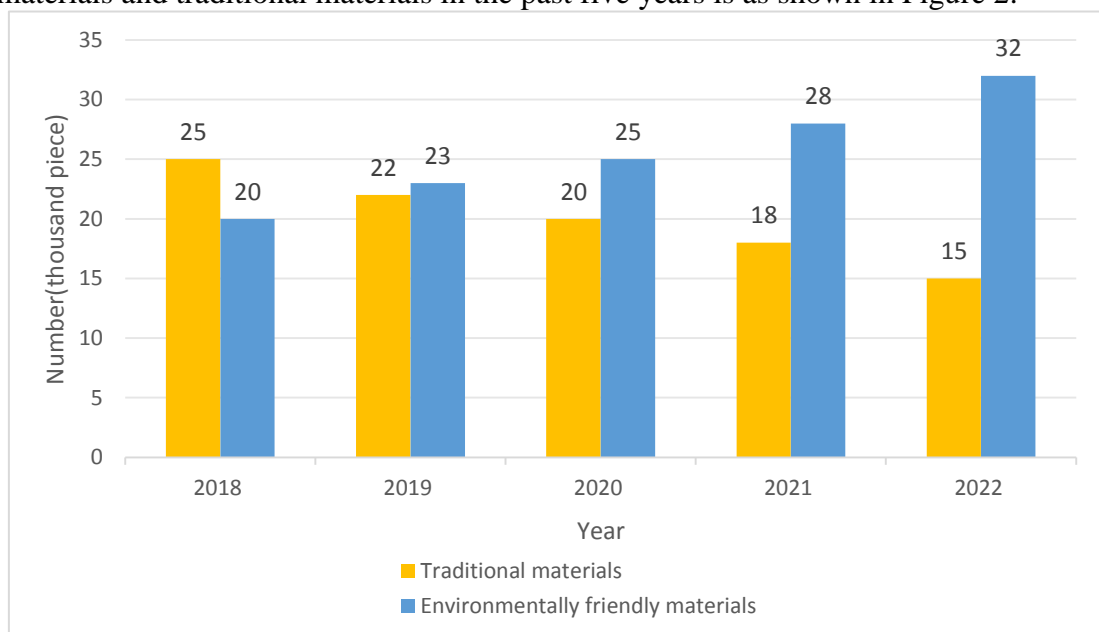


Figure 2. Statistical chart of artwork quantity in recent five years

As can be seen from the above chart, in the past five years, more and more artworks using environmentally friendly materials, while less and less artworks using traditional materials. This may be because SD emphasizes the sustainable use of resources, encourages artists to use environmentally friendly materials and technologies, reduces dependence on limited resources, and helps to protect the natural environment [17-18]. Most importantly, this design approach not only helps to make artworks innovative and aesthetically breakthrough, but also combines art with the idea of sustainability. This can send a positive message to society, prompting people to think and take more sustainable actions [19-20].

3.3. Realization of Environmental Protection Technology in Art Design

SD environmental protection technology focuses on the effective use of resources and environmental protection, through the use of renewable energy, degradable materials and other environmental protection technology, to reduce the negative impact on the environment. The application of these technologies in art design can reduce the consumption of natural resources, reduce the production of waste and pollutants, and thus protect and improve the quality of the environment. At the same time, the application of sustainable environmental protection technology brings new creativity and possibilities to art design. Renewable energy installations can be used to power the artwork, which can create dynamic and interactive effects that are different from traditional art. Artworks or installations can be constructed using biodegradable materials, which can display unique materials and forms, presenting a different aesthetic feeling from traditional materials.

The realization of environmental technology in art and design involves a range of techniques, methods and tools aimed at creating more sustainable and environmentally friendly design solutions. The main ways to achieve this are: the use of renewable and recyclable materials, bio-imitative design, digital and virtual technologies, green building technologies, low VOC (volatile organic compounds) and non-toxic coatings, life cycle assessment tools, and reuse and recycling. In addition, the realization of environmental protection technology in art design involves a variety of

factors. This paper mainly analyzes it from the perspective of materials and energy saving. The total carbon footprint of materials of the entire design project is calculated as follows:

$$C_T = \sum_{i=1}^n C_i \times M_i \quad (1)$$

C_i is the carbon footprint of each material (the amount of carbon emitted per unit of material produced), and M_i is the amount used per material. Consider that a design project has implemented a certain energy-saving technology, and the energy-saving effect is calculated as follows:

$$S = \left(\frac{E_1 - E_2}{E_1} \right) \times 100\% \quad (2)$$

E_1 indicates the original energy consumption, and E_2 indicates the energy consumption after energy-saving technology. These two formulas can help designers quantify the environmental impact of their designs to make more environmentally friendly design decisions.

4. Experiment of Art Design Products

Research on the application of environmental awareness based on SD in contemporary art design is an important topic. In order to better understand how this awareness affects design and consumer reaction, two sets of controlled experiments are designed in this paper, which respectively study the influence of product material selection and packaging design on consumer purchase intention. The operating system used in the experiment was Windows 11 and the programming language was Python, version 2.8.12. For data storage, this article uses Elasticsearch 2.5.2.

The purpose of the product material selection experiment is to study the impact of the difference between the use of sustainable materials and traditional materials in art design products on consumer choice. In this experiment, six works of art were selected as sample parameters and named as art A, art B, art C, art D, art E and art F. The experimental method was as follows: the experimental group designed the artwork using completely sustainable and environmentally friendly materials, and the control group designed a product with the same appearance and function as the experimental group using traditional materials (non-recycled plastic or metal). In an art exhibition, different products are displayed at the same time, and the number of products in each group is 100, and the source of materials and environmental protection characteristics are clearly marked, and the purchase choice of consumers is recorded. If consumers are more inclined to buy products with sustainable materials, this indicates that environmental awareness has a positive impact on contemporary art design. The experimental results are shown in Figure 3.

The black line represents the number of sales of sustainable and environmentally friendly materials, and the red line represents the number of sales of traditional materials. It can be seen that artworks using sustainable and environmentally friendly materials generally sell more than those using traditional materials, and the increase in the number of sales from left to right is 22, 24, 20, 22, 26, 20. The number of artworks sold increased by an average of 22. According to this, the use of sustainable environmentally friendly materials is an improved solution for the artwork.

After discussing the above product material selection experiment, this paper continues the packaging design experiment. The purpose of this experiment is to study the impact of differences between simplified and environmentally friendly packaging and traditional packaging on consumer choice in art design products. The same experimental group used degradable or recyclable real products packaging. The complexity and size of the package could be minimized, while the control group designed a package similar in appearance and size to the experimental group using traditional and possibly less environmentally friendly materials. In this paper, six different experimental

samples were named Product a, Product b, Product c, Product d, product e and product f. Finally, the sales volume of the experimental group minus the sales volume of the control group was calculated, as shown in Figure 4.

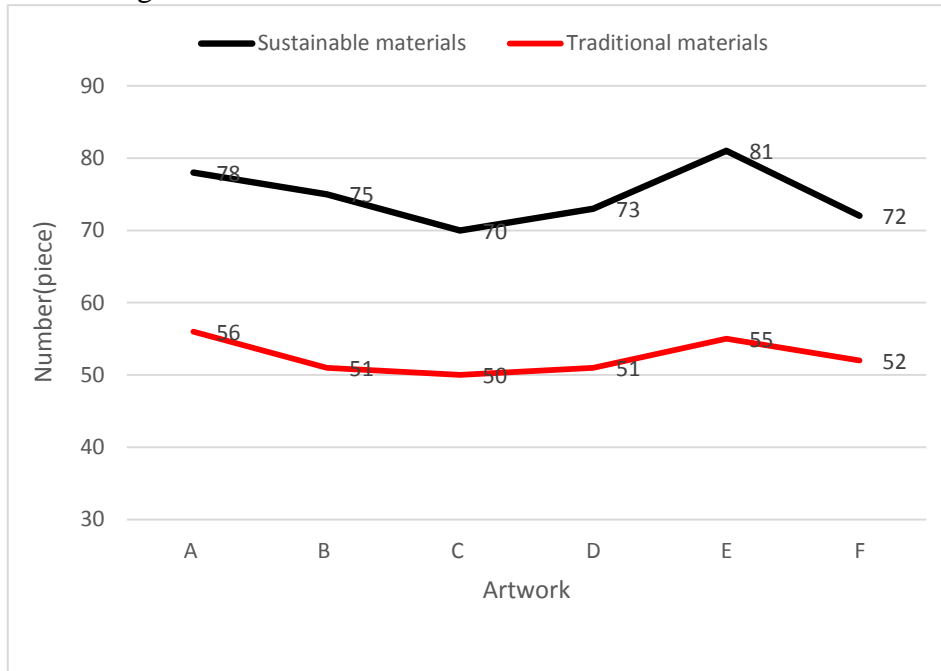


Figure 3. Experimental results of product material selection

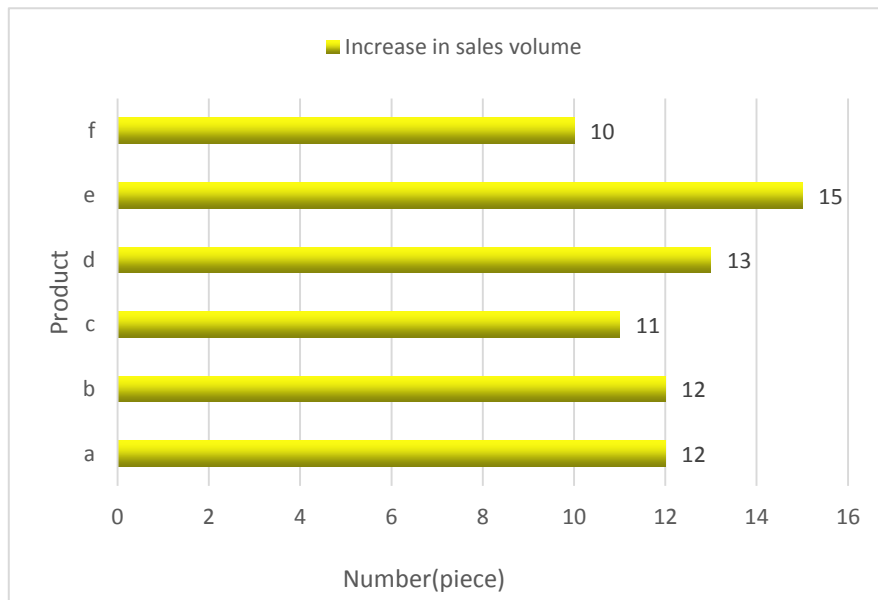


Figure 4. Experimental results of product packaging design

Figure 4 shows the increase in product sales in the experimental group compared to the control group. It can be seen that after the use of degradable or recyclable real supplies packaging, the number of sales has increased. In each group of different samples, the increase rate from bottom to top was 12, 12, 11, 13, 15 and 10, and the average sales volume of comprehensive products increased by about 12 after improving the awareness of SD and environmental protection. This shows that consumers are more inclined to buy products with environmentally friendly packaging

and give positive feedback.

5. Conclusions

Contemporary art design is paying more and more attention to the environmental awareness of SD, reflecting the growing concern of society for environmental issues. The research, which stems from the increasing problems of global climate change, resource depletion and ecosystem destruction, has driven artists and designers to actively explore how to do this through creative means. Incorporating sustainability principles into their work can convey the message of environmental protection and sustainability, provoking the audience to think and act on these important issues. Through the study of the historical roots of environmental awareness in contemporary art design and the theoretical basis of SD in art design, this paper hopes to provide China with the realization of environmental protection technology in art design. Due to the small number of artwork samples selected and the incomplete analysis of the intersection point between environmental awareness and contemporary art design, there are still many defects and deficiencies in the application research of environmental awareness in contemporary art design in this paper, which would be further perfected and improved in the future research.

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If any, should be placed before the references section without numbering.

Data Availability

The datasets used during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

The author states that this article has no conflict of interest.

References

- [1] Marasigan A C, Manzano V U, Kim, et al. A Study on the Sustainable Education Development in Environmental Awareness of Philippine. *Journal of Asian Studies*, 2018, 21(3):85-111.
- [2] Griffin M, Barona J, Gutierrez C F. Strategies to Increase Sustainability Awareness in Higher Education: Experiences from Abu Dhabi Women's College. *International journal of sustainable development and planning: Encouraging the unified approach to achieve sustainability*, 2022, 17(6):1831-1838.
- [3] Svetlichnaya I. Methods of Art Design in the Design of the External Image of a Person. *Scientific Research and Development Modern Communication Studies*, 2020, 9(4):68-75.
- [4] Zhang C. Application of Ecological Development Concept in Environmental Art Design. *Global premiere*, 2019, 1(7):186-186.
- [5] Jiang S B, Huang L. Research on Ceramic Art Environment Design Based on the Concept of Sustainable Development. *Ceramic Science and Art*, 2023, 57(4):118-119.
- [6] Zhu Y, Qiu T, Miao W. Interactive Art Design Based on Intelligent Sensors and Information Fusion Technology. *Wireless Communications and Mobile Computing*, 2022, 2022(16):1-13.
- [7] GAO Y. Study on the Mechanism of Production-education Integration of Digital Media Art Design Specialty. *Foreign language version: Education Science*, 2022, 1(2):185-188.

- [8] Anderson S. *Thinking Machines: Art and Design in the Computer Age, 1959-1989*. *Technology Architecture + Design*, 2018, 2(2):252-254.
- [9] Xiong Taotao. *Research on Sustainable Design Methods for Special Booths*. *Art and Design: Theoretical Edition*, 2018, 2018(3):54-57.
- [10] Maggie T. *The Joining of the Arts: Danish Art and Design, 1880–1910*. *Journal of Design History*, 2022, 35(2):196-198.
- [11] Grogan B. *Shanghai Art Week What to Expect from Art021 and West Bund Art & Design*. *City Walk (Shanghai version, English)*, 2019, 2(11):34-35.
- [12] Farrell J. *Richard Schierloh: The Art of Car Design*. *Collectible automobile*, 2019, 36(4):76-84.
- [13] Franinovi K, Kirschner R. *Material Activity in Art and Design Practices*. *Zeitschrift für Kunstgeschichte*, 2020, 83(3):310-319.
- [14] Zhang Xiawei, Guo Yingjie. *Research on takeout packaging design under the concept of sustainable development*. *Art Technology*, 2023, 36 (5): 174-176.
- [15] Malik M S K, Qi Z, Iqbal M, et al. *Education for sustainable development: Secondary school teacher's awareness and perception of integration*. *Sustainable Development*, 2023, 31(3): 1515-1525.
- [16] Atmaca A, Kiray S A, Colakoglu M H. *An Examination of Teachers' Sustainable Development Awareness In Terms Of Branches, Genders, Ages and Years of Service*. *Problems of Education in the 21st Century*, 2020, 78(3):342-358.
- [17] Wided R. *University Social Responsibility and Sustainable Development Awareness: The Mediating Effect of Corporate Social Responsibility Case of Qassim University*. *Journal of Social Science Studies*, 2020, 7(1):60-75.
- [18] Soni M, Dawar S, Soni A. *Probing Consumer Awareness & Barriers Towards Consumer Social Responsibility: A Novel Sustainable Development Approach*. *International journal of sustainable development and planning: Encouraging the unified approach to achieve sustainability*, 2021, 16(1):89-96.
- [19] Green S, Pace P. *Sustainable Development Awareness and Policy Making in Malta*. *Journal of Education for Sustainable Development*, 2019, 13(2):152-167.
- [20] Manolis E N, Manoli E N. *Raising awareness of the Sustainable Development Goals through Ecological Projects in Higher Education*. *Journal of Cleaner Production*, 2020, 279(1):1-12.