

CHAPTER 4

Environmental Education in Education Programs

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Introduction

Since the beginning of time, humans have engaged in interactions with the environment. Although the primary goal of this contact was the individual's own gain, it has since changed into an endeavor to manage and control. Humans have begun to encounter environmental issues as a result of their careless exploitation of the environment, which has resulted in devastating damage. The prevalence of these issues has increased as a result of advances in science and technology, particularly in light of the effects of industrialization. The need for food, energy, raw resources, and shelter, as well as the rapid growth of the human population, have all contributed to the challenges' rapid expansion.

Scientists have increased public awareness of the environment and environmental problems as a result of this historical increase in environmental problems. The goal is to raise the proportion of people who are highly aware of the environment. This is so that people can develop the required attitudes and behaviors toward the environment, which are part of environmental consciousness (Erten, 2004). People who have attained this consciousness have high levels of environmental awareness, the ability to comprehend, feel, and know their surroundings, as well as knowledge of the moral standards and regulations that govern the environment (Atasoy, 2006). Successful environmental education can lead to the emergence of these people (Atabek Yigit, 2009).

The first time environmental education was mentioned was in 1948 at the IUCN conference in Paris (Palmer, 1998). A consensus was reached on methods of environmental education and the broad objectives of environmental education twenty-four years later at

the United Nations conference on Man and the Environment in Stockholm. By providing environmental education to adults and the new generation, a declaration was produced (IUCN, 1972). According to Grodzińska-Jurczak et al. (2006) and the IUCN (1972), environmental education is a protracted process through which people develop the essential knowledge, abilities, and attitudes in respect to their biophysical and cultural environments. Given this concept, it is thought to be crucial to provide environmental education at all levels, beginning in the home.

As a result of this knowledge, our nation's curricula now include environmental education gains and modules. In elementary school, social studies, science, and life science curricula all include learning objectives and units for environmental education. It is covered in biology, physics, chemistry, and geography classes in secondary school. Physical education, visual arts, religious culture, and ethical courses are taught in primary schools. Environmental education is mentioned in many course groups in secondary schools. The inclusion of environmental education in the curricula of the more intensively integrated courses will be considered on a program basis in this part, nevertheless.

Environmental Education in Primary Education

Children are intended to learn about sustainability and the environment through environmental education at the primary school level (Gulersoy et al., 2020; Senemoglu, 1997). In the context of this goal, the curriculum is also taken into account. Children's understanding of environmental protection and how to create a sustainable future are intended benefits of this type of teaching. After reviewing the literature, the following categories of fundamental knowledge concerning environmental education in primary school can be made (Alim, 2006; Demir & Yalcin, 2014; Tanriverdi, 2009);

1. Scope: Children's comprehension of environmental challenges and adoption of the values of sustainability and nature conservation are the primary goals of environmental education.
2. Content: Environmental education covers a range of subjects, including biodiversity, climate change, waste management, energy conservation, and comprehending environmental challenges.
3. Learning Methods: Rather than relying solely on texts, environmental education promotes learning through experiences. It is possible to provide students with hands-on learning opportunities including nature hikes, field trips, nature observation, recycling initiatives, and environmental projects.
4. Participation: Students actively engage in conversations and exchanges as part of the environmental education learning approach. It gives pupils the chance to become sensitive to environmental issues and to come up with solutions.
5. Collaboration: Students are encouraged to work together through environmental

education. As a result, they are better able to comprehend the complexity of environmental issues and collaborate when looking for solutions.

6. Values and Attitudes: Environmental education aids children in forming virtuous attitudes and values for the natural world. These attitudes include a sense of obligation, consideration for the environment, and a love of the natural world.
7. Interdisciplinary Approach: Environmental education adopts an interdisciplinary strategy that integrates several academic disciplines, including science, math, the social sciences, and the arts. This guarantees that environmental subjects are included throughout the curriculum.
8. Sustainability: Environmental education highlights the value of using resources to satisfy the requirements of future generations while teaching pupils the concept of sustainability.

Environmental education aims to develop environmentally-conscious children who will help create a more sustainable future. It motivates students to appreciate nature more, protect it, and preserve a livable environment for future generations.

Environmental Education in Science

2018 Science Curriculum in the special objectives section of the science curriculum (Ministry of National Education [MEB], 2018a);

- To provide basic knowledge about astronomy, biology, physics, chemistry, earth and environmental sciences, science and engineering applications,
- To adopt scientific process skills and scientific research approach in the process of exploring nature and understanding the relationship between human and environment, and to produce solutions to the problems encountered in these areas,
- To recognize the interaction between the individual, the environment and society; to develop awareness of sustainable development of society, economy and natural resources,
- To take responsibility for daily life problems and to use science knowledge, scientific process skills and other life skills to solve these problems,
- To arouse interest and curiosity about the events occurring in nature and its immediate surroundings and to develop attitudes,

through its goals, environmental education makes a direct and indirect point about how important it is.

When the curriculum is looked at, achievements in environmental education begin

in the third grade. The “Human and Environment” unit is featured, particularly in the 4th and 5th grade levels. It is mentioned in many subject-area units in other grade levels. It is clear from the context that this level only directly units environmental education.

In the 2018 Science Curriculum, the acquisitions and units related to environmental education at the grade levels were examined in detail. Information about the 3rd grade science course is given in Table 1.

Table 1
Information for 3rd Grade Science Course

Class	Unit Name	Subject	Acquisitions
3RD G R A D E	Journey to the World of Living Things	Recognize the Things Around Us	*Classifies living and non-living things using examples from their environment. *Presents the results of observation of the life cycle of a plant.
	Journey to the World of Living Things	Me and My Environment	*Recognizes the environment they live in. *Takes an active role in cleaning the environment. *Explains the differences between natural and artificial environment. *Designs an artificial environment. *Realizes the importance of the natural environment for living things. *Proposes solutions by doing research to protect the natural environment.
	Electric Vehicles	Electricity Sources	*Discusses the damages of battery waste to the environment and what to do about it.

There are seven units and 36 acquisitions in the science curriculum for the third grade. Nine of these acquisitions are thought to be connected to environmental education. At this grade level, it was calculated that the advances in environmental education were 19.45%. Table 2 contains details about the scientific curriculum for the fourth grade.

Table 2

Information for 4th Grade Science Course

Class	Unit Name	Subject	Acquisitions
4TH G R A D E	Lighting and Sound Technologies	Light Pollution	*Question the causes of light pollution. *Explains the negative effects of light pollution on natural life and observation of celestial objects. *Produces solutions to reduce light pollution..
	Lighting and Sound Technologies	Sound Technologies from Past to Present	*Researches the positive and negative effects of technological tools with loud sound.
	Lighting and Sound Technologies	Sound Pollution	*Question the causes of sound pollution. *Explains the negative effects of sound pollution on human health and the environment. *Produces solutions to reduce sound pollution.
	Human and Environment	Conscious Consumer	*Demonstrates care to be economical in the use of resources. *Recognizes the importance of recycling and the resources necessary for life.

There are seven units and 46 acquisitions in the science curriculum for the fourth grade. Nine of these acquisitions are thought to be connected to environmental education. The benefits in environmental education were calculated at this grade level to be 19.57% proportionally. Table 3 contains details about the fifth-grade science curriculum.

Table 3
Information for 5th Grade Science Course

Class	Unit Name	Subject	Acquisitions
5TH G R A D E	Human and Environment	Biodiversity	*Question the importance of biodiversity for natural life.
			*Discusses the factors that threaten biodiversity based on research data.
	Human and Environment	Human and Environment Relationship	*Expresses the importance of the interaction between human and environment.
			*Offers suggestions for the solution of an environmental problem in his/her immediate environment or in our country.
			*Makes inferences about environmental problems that may occur in the future as a result of human activities.
			*Discusses benefit and harm situations in human-environment interaction on examples.

When the fifth grade science curriculum is examined, there are 36 acquisitions and seven units in total. It is seen that six of these acquisitions are related to environmental education. Proportionally, it was determined that the gains related to environmental education were 16.66% at this grade level. Information about the 6th grade science course is given in Table 4.

Table 4
Information for 6th Grade Science Course

Class	Unit Name	Subject	Acquisitions
6TH G R A D E	Matter and Heat	Density	*Discusses the importance of this situation for living things by comparing the densities of solid and liquid states of water.
	Matter and Heat	Matter and Heat	*Discusses the importance of thermal insulation in buildings in terms of family and national economy and effective use of resources.
	Matter and Heat	Fuels	*Discusses the effects of the use of different types of fuels for heat on human and environment

When looking at the sixth grade science curriculum, there are 59 acquisitions and seven units in all. Three of these acquisitions are associated with environmental education. The improvements connected to environmental education were calculated

to be 5.08% at this grade level. Table 5 contains information on the 7th grade science subject.

Table 5

Information for 7th Grade Science Course

Class	Unit Name	Subject	Acquisitions
7TH G R A D E	The Solar System and Beyond	Space Exploration	*Expresses the causes of space pollution and predicts the possible consequences of this pollution.
	Pure Matter and Mixtures	Domestic Waste and Recycling	*Distinguishes recyclable and non-recyclable materials in household wastes. *Designs a project on recycling of domestic solid and liquid wastes. *Questions recycling in terms of effective use of resources. *Pay attention to waste control in their immediate environment.
	Interaction of Light with Matter	Absorption of Light	*Gives examples of innovative applications of solar energy in daily life and technology.

Examining the scientific curriculum for the seventh grade reveals a total of seven units and 67 acquisitions. Six of these acquisitions are thought to be connected to environmental education. At this grade level, it was calculated that the gains related to environmental education were 8.95%. Table 6 contains details about the eighth-grade science curriculum.

Table 6*Information for 8th Grade Science Course*

Class	Unit Name	Subject	Acquisitions
8TH G R A D E	DNA and The Genetic Code	Biotechnology	*Discusses the dilemmas created within the scope of biotechnological applications and the beneficial and harmful aspects of these applications for humanity.
	Matter and Industry	Acids and Bases	*Provides solutions for the prevention of acid rain.
	Energy Conversions and Environmental Science	Material Cycles and Environmental Problems	*Discusses the causes and possible consequences of global climate change.
	Energy Conversions and Environmental Science	Sustainable Development	*Demonstrates care to be economical in the use of resources. *Designs a project for the economical use of resources. *Explains the importance of separating solid wastes for recycling. *Offers solutions by using research data on the contribution of recycling to the national economy. *Suggests solutions by stating the problems that may be encountered in the future if resources are not used economically.
	Electric Charges and Electric Energy	Transformation of Electrical Energy	*Generates ideas about the advantages and disadvantages of power plants. *Discusses the importance of conscious and economical use of electrical energy in terms of family and national economy. *They take care to use electricity economically at home.

When the eighth grade science curriculum is examined, there are 61 acquisitions and seven units in total. It is seen that 11 of these acquisitions are related to environmental education. Proportionally, it was determined that the gains related to environmental education were 18.03% at this grade level.

Environmental Education in Secondary Education

Science courses at secondary level have a great potential for environmental education. These courses provide students with the opportunity to develop an in-depth understanding of environmental issues and develop skills to find solutions to environmental problems (Bowers & Creamer, 2021; Rickinson, 2001; Zachariou et al., 2020).

Environmental education for students has a lot of potential in secondary science courses. These classes can help develop students into thoughtful, informed, and problem-solving persons who are sensitive to environmental issues. When the secondary school biology course curriculum is studied in light of this information, environmental education acquisitions and units are evident. Table 7 contains details on the ninth-grade biology subject.

Table 7

Information for 9th Grade Biology Course (MEB, 2018b)

Class	Unit Name	Subject	Acquisitions
9TH G R A D E	Living World	Diversity and Classification of Living Things	*Explains the importance of classification in understanding the diversity of living things.
	Living World	Living Worlds and Their Properties	*Explains the contributions of living organisms to biological processes, economy and technology with examples. *Explain the general characteristics of viruses.

When the ninth grade biology curriculum is examined, there are 11 acquisitions and three units in total. It is seen that three of these acquisitions are related to environmental education. Proportionally, it was determined that the gains related to environmental education were 27.27% at this grade level. Information about the 10th grade biology course is given in Table 8.

Table 8
Information for 10th Grade Biology Course

Class	Unit Name	Subject	Acquisitions
10TH G R A D E	Ecosystem Ecology and Current Environmental Problems	Ecosystem Ecology	*Explains the relationship between living and non-living components of the ecosystem. *Analyzes the flow of matter and energy in ecosystems. *Establishes a relationship between material cycles and sustainability of life.
	Ecosystem Ecology and Current Environmental Problems	Current Environmental Problems and Human	*Evaluates the causes and possible consequences of current environmental problems. *As an individual, he/she questions his/her role in the emergence of environmental problems. *Suggests solutions to prevent environmental pollution in local and global contexts
	Ecosystem Ecology and Current Environmental Problems	Natural Resources and Biodiversity Protection	*Explains the importance of sustainability of natural resources. *Question the importance of biological diversity for life. *Suggests solutions for the protection of biological diversity.

Examining the biology curriculum for the tenth grade reveals that there are three units and a total of 17 acquisitions. Nine of these acquisitions are thought to be connected to environmental education. At this grade level, it was calculated that the improvements in environmental education were 52.94% higher proportionately. Table 9 contains details about the biology course for the eleventh grade.

Table 9
Information for 11th Grade Biology Course

Class	Unit Name	Subject	Acquisitions
11TH G R A D E	Community and Population Ecology	Community Ecology	*Explains the factors affecting the structure of the community. *Explains the competition within and between species in the community with examples. *Explains symbiotic relationships between species in a community with examples. *Explains succession in communities with examples.
	Community and Population Ecology	Population Ecology	*Analyzes the factors affecting population dynamics.

There are two units and 34 acquisitions in the biology curriculum for the eleventh grade. Five of these acquisitions are thought to be connected to environmental education. At this grade level, it was calculated that the gains related to environmental education were 14.71%. Table 10 contains details about the biology course for the 12th grade.

Table 10

Information for 12th Grade Biology Course

Class	Unit Name	Subject	Acquisitions
12TH G R A D E	From Gene to Protein	Genetic Code and Protein Synthesis	*Explain the concepts of genetic engineering and biotechnology. *Evaluates the impact of genetic engineering and biotechnology applications on human life.
	Living Things and Environment	Living Things and Environment	*Explains the effect of environmental conditions on the continuity of genetic changes. *Gives examples of artificial selection applications in agriculture and animal husbandry

When the twelfth grade biology curriculum is examined, there are 29 acquisitions and four units in total. It is seen that four of these acquisitions are related to environmental education. Proportionally, it was determined that the gains related to environmental education were 13.79% at this grade level. Examining the chemistry course curriculum reveals acquisitions and units pertaining to environmental education. Table 11 provides details on the ninth-grade chemistry curriculum.

Table 11

Information for 9th Grade Chemistry Course (MEB, 2018c)

Class	Unit Name	Subject	Acquisitions
9TH G R A D E	Chemical Science	Occupational Health and Safety in Chemical Practice	*Explains the effects of chemical substances on human health and the environment.
	States of Matter	Physical States of Matter	*Explains the importance of matter in different states for living things and the environment.
	Nature And Chemistry	Water and Life	*Explains the importance of water for beings. *Develops solutions for saving water and protecting water resources.
	Nature And Chemistry	Environmental Chemistry	*Explains chemical pollutants that cause air, water and soil pollution. *Suggests solutions to reduce the effects of chemical pollutants that harm the environment.

Examining the chemistry curriculum for the ninth grade reveals a total of five units and 38 acquisitions. Six of these acquisitions are thought to be connected to environmental education. The benefits in environmental education were calculated at this grade level to be 15.79% proportionally. Table 12 contains details on the chemistry course for students in the tenth grade.

Table 12
Information for 10th Grade Chemistry Course

Class	Unit Name	Subject	Acquisitions
10TH G R A D E	Acids, Bases and Salts	Reactions of Acids and Bases	* Explains important reactions of acids and bases in terms of daily life.
	Acids, Bases and Salts	Acids and Bases in Our Lives	*Explains the benefits and harms of acids and bases. *Explains the health and safety precautions to be taken when working with acids and bases.
	Chemistry Everywhere	Common Daily Life Chemicals	*Explains the properties of cleaning agents. *Gives examples of the usage areas of common polymers. *Explains the contribution of recycling of polymer, paper, glass and metal materials to the national economy. *Explain the harmful chemicals that cosmetic materials may contain. *Explain the reasons for the use of drugs in different forms.

When the tenth grade chemistry curriculum is examined, there are 23 acquisitions and four units in total. It is seen that eight of these acquisitions are related to environmental education. Proportionally, it was determined that the gains related to environmental education were 34.78% at this grade level. When the 11th grade units and acquisitions were analyzed, it was determined that there was no emphasis on environmental education. Information on the 12th grade chemistry course is given in Table 13.

Table 13
Information for 12th Grade Chemistry Course

Class	Unit Name	Subject	Acquisitions
12T H G R A D E	Chemistry and Electricity	Corrosion	*Explain the electrochemical basis of corrosion prevention methods.
	Energy Resources and Scientific Developments	Fossil Fuels	*Suggests solutions to reduce the harmful effects of fossil fuels on the environment.
	Energy Resources and Scientific Developments	Alternative Energy Sources	*Recognizes alternative energy sources.
			*Evaluates the use of nuclear energy in terms of science, society, technology, environment and economy.
	Energy Resources and Scientific Developments	Sustainability	*Explains the importance of sustainable life and development for society and environment by associating it with chemistry
	Energy Resources and Scientific Developments	Nanotechnology	*Evaluates the developments in the field of nanotechnology in terms of their effects on science, society, technology, environment and economy.

When looking at the twelfth grade chemistry curriculum, there are 31 acquisitions and four units in all. Eight of these acquisitions are associated with environmental education. At this grade level, the improvements attributable to environmental education were calculated to be 19.35%.

Environmental Education in Life Science

The Life Science Curriculum is based on the General Objectives and Basic Principles of Turkish National Education as stated in Basic Law No. 1739 on National Education. The program's fundamental goal is to grow persons who know themselves, live a healthy and safe existence, internalize the values of the society in which they live, are sensitive to nature and the environment, research, produce, and love their nation (MEB, 2018). Some of the specific objectives of the life science course are as follows;

- Recognizes himself/herself and his/her environment.
- Develops the ability to use resources efficiently.
- Be sensitive to nature and the environment.

When the acquisitions and units for environmental education in the Life Sciences course are examined, it is seen that it is included both on the basis of the unit and on the basis of the acquisitions. Information on the 1st, 2nd and 3rd grade life science course is given in Table 14.

Table 14*Information for 1st, 2nd and 3rd Grade Life Science Course (MEB, 2018d)*

Class	Unit Name	Acquisitions
1ST G R A D E	Life at Home	*Uses resources at home efficiently.
	Life in Nature	*Observes the animals in their immediate surroundings. *Observes the plants in their immediate surroundings. *Takes care to protect the animals and plants in their immediate surroundings. *Be sensitive about keeping nature and the environment clean. *Recognizes materials that can be recycled.
	Life in Nature	*Compare the conditions necessary for the survival of plants and animals. *Recognizes the importance of growing plants and feeding animals. *Gives examples of the effects of natural elements in the immediate environment on human life. *Contributes to the recycling of consumed materials. *Recognizes natural phenomena. *Gives examples of natural disasters. *Explains the precautions that can be taken against natural events and natural disasters.
	Life at Home	*They fulfill their duties and responsibilities at home. *Makes original suggestions for effective and efficient use of resources at home.
	Life in our country	*Introduces the features of historical, natural and touristic places in the immediate vicinity.
2ND G R A D E	Life in Nature	*Understands the importance of plants and animals in terms of human life. *Takes responsibility for protecting nature and the environment. *Gives examples of the contribution of recycling to himself/herself and the environment he/she lives in.
	Life in Nature	
3RD G R A D E	Life in Nature	
	Life in Nature	

When looking at the first grade life science curriculum, there are 53 acquisitions and six units in all. Six of these acquisitions are associated with environmental education. At this grade level, the improvements attributable to environmental education were calculated to be 11.32%. When the second grade curriculum is analyzed, 50 acquisitions and six units are discovered. Seven of these acquisitions were linked to environmental education (14%). Finally, when the third grade is examined, 45 acquisitions and six units are identified. Six acquisitions are related to environmental education at this grade level (13.33%).

Environmental Education in Social Studies

Social Studies Curriculum and students;

- To recognize the general geographical features of the world and the environment in which they live, to explain the interaction between human beings and the environment and to develop their ability to perceive space,
- To realize the limitations of the natural environment and

resources, to try to protect natural resources with environmental sensitivity and to have a sustainable environmental understanding,

Environmental education is directly included in its specific objectives. From the fourth to the eighth grade, units and acquisitions for environmental education are included in the curriculum. Information on environmental education in the 4th to 7th grade curriculum is given in Table 15.

Table 15

Information on environmental education in the curriculum from 4th to 7th grade (MEB, 2018e)

Class	Unit Name	Acquisitions	Environmental Education Acquisitions(%)
4TH G R A D E	People, Places and Environments	*Distinguishes natural and human elements in the environment they live in. *Makes necessary preparations for natural disasters.	18.18%
	Science, Technology and Society	*Uses technological products without harming themselves, others and nature.	
	Production, Distribution and Consumption	*Distinguish between wants and needs and make conscious choices between the two. *Exhibits conscious consumer behavior as a responsible individual. *Uses the resources around them without wasting them.	
5TH G R A D E	People, Places and Environments	*Explains the landforms of the place and its surroundings on maps in general. * Explains the effects of climate on human activities by giving examples from daily life. *Gives examples of the effects of natural features and human features on population and settlement. *Question the causes of disasters and environmental problems in their environment. *Explains the effects of natural disasters on community life with examples.	15.15%
6TH G R A D E	People, Places and Environments	*Describes the geographical location of the continents, oceans and our country using concepts related to location. *Examines the basic physical geography features of Turkey's landforms, climate characteristics and vegetation on the relevant maps. * Shows the basic human geography features of Turkey on the relevant maps. *Makes inferences about climate characteristics based on human experiences in different natural environments of the world.	11.76%
7TH G R A D E	People, Places and Environments	*Makes inferences about the factors affecting settlement from past to present through case studies. *Discusses the causes and consequences of migration through case studies.	6.45%

Conclusion

When the acquisitions in the curricula are analyzed, it is discovered that the fourth grade has the highest amount of environmental education in the scientific course. In terms of the amount of acquisitions, it was concluded that the eighth grade had the most. In their study, Erten et al. (2022) also found that this grade level has the highest number of achievements in the science curriculum of our country. The sixth grade was discovered to have the lowest amount of attention on environmental education, both proportionally and in terms of the number of objectives. There are 305 acquisitions in the science course at the primary school level. 44 of these acquisitions were found to be relevant to environmental education. This means that the program covers 14.43% of the environmental education acquisitions. On the basis of rate and number, it is seen that the emphasis on environmental education is quite low. The fact that it is high at certain grade levels and low at others reveals many deficiencies in terms of achieving the purpose of environmental education (Artun, 2013). Preventing the increase in environmental problems encountered today or preventing the emergence of these problems can be achieved directly through environmental education. This can be achieved by increasing both the number of achievements and the number of qualified units in the curriculum. When the acquisitions related to environmental education at the secondary education level were analyzed, it was determined that 21 acquisitions out of a total of 91 acquisitions in the biology course were related to environmental education. It constitutes 23.08% of the acquisitions in the biology curriculum. In chemistry course, 22 acquisitions out of 127 learning outcomes are related to environmental education, which represents 17.32% of the total acquisitions. Both curricula emphasize environmental education more than the science course at the primary education level. This could indicate that environmental education, which should be provided earlier in stage, is not adequately covered in the curriculum. Environmental education is represented by 19 of the 148 learning outcomes in the life science course. This accounts for 12.84% of the total results. Environmental education was found to be associated to 17 out of 131 outcomes in the social studies course. This accounts for 12.98% of the entire outcome. It might be argued that environmental education is undervalued in both life science and social studies courses at the primary level. Looking at the courses reviewed within the scope of the study, it is clear that the life science course places the least emphasis on environmental education. When the course content is studied, it is clear that there are numerous courses and units relevant to the environment, but achievement levels have remained low. It is suggested that all courses, particularly this one, be examined in this context (Bahar et al., 2013).

Curricula include environmental education acquisitions and units. However, due to the density of curricula and other factors, environmental education is not given adequate attention. Subjects at specific grade levels are regarded to generate weaknesses in both theory and practice when placed in a course. The necessity for a distinct course on

environmental education is evident in this setting. With good environmental education, we can remove or prevent the environmental challenges that we will face today and in the future. In light of this information, a committee comprised of governmental officials and relevant scientists (Ozkaya, 2021) can be constituted to add to the achievements in the field.

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