Natural Sciences Curricula, and their Role in Developing Concepts of Space Technology Visions .... and Goals

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Abstract

This paper deals with the concepts of space technology, and it means technology related to space exploration, and it includes space vehicles, satellites, space stations, remote sensing, and space travel, where the techniques reached by related research such as (NASA) research are applied to explore new horizons for humanity from During the daily applications that contribute to the development and well-being of societies, and the natural sciences curricula are entrusted with addressing the concepts of space technology at all educational levels, and it is a global trend recommended by global projects and international conferences. Students and teachers are familiar with the concepts of space technology, and accordingly this current paper recommended the necessity of integrating the topics of the universe and space with the content of science curricula at all educational levels, as well as including them in teacher preparation programs in the faculties of education, and suggesting appropriate teaching methods that are based on the integration between the branches of natural sciences and technology to teach those concepts; because of its impact on the development of space science enlightenment, science fiction, deductive thinking and creative thinking among learners, which in turn contributes to the development of societies, their development and welfare, and the achievement of sustainable development

Keywords:Natural sciences curricula - concepts of space technology

Introduction:

At the present time, the world is witnessing a rapid scientific and technological development that has affected

all the different areas of life. Science has made tremendous achievements in the field of biological technologies, genetic engineering and other fields.

Extensive research in the field of space has led to the establishment of a science in itself, which is space technology. This science has benefited in the emergence of a new economy accompanying the space economy, and space technology is often exploited and used in activities that improve human life in general on the planet Earth.

Education bears the greatest burden in helping young people to acquire life skills that enable them to deal with the requirements of the technological age, and to interact with its innovations. The American Association for the Advancement of Science (AAAS, 1990) emphasized the need for community members to understand the natural world or the universe in proportion to the continuous development in science and technology by integrating the fields of science, mathematics and technology and their concepts related to space.

The natural sciences curricula, especially physics, are considered one of the most prominent sciences that contribute to the progress and prosperity of countries. Earth and space sciences, are one of the branches of physics concerned with research into the nature of the Earth, its interior, its characteristics, the secrets of rock formation, the study of the universe, space, stars, planets and galaxies, and the interaction in the layers of the atmosphere. And the study of their common characteristics, and the definition of the fossil record, and molecular biology to study the

records of the history of life on Earth, and the study of the various unusual environmental factors on the living organism. futuristic.

Given the importance of the issue of space technology, the current paper will attempt to identify the extent to which space technology concepts are included in all levels of education by answering the following questions: What is space technology? What are the uses of space technology? What are the international standards and projects, and their relationship to space technology? What is the extent to which space technology concepts are included in the content of natural science curricula at the different levels of education? How to include concepts of space technology in natural sciences curricula?

The nature of space technology:

Space technology is that technology related to the entry and recovery of objects from space, and it can be defined as the sum of technologies and techniques of civil and commercial use in the space industry. Also space vehicles, space stations, support infrastructure, equipment and procedures.

Space has always been and remains one of the bets of technical power, both military and civil, as well as revealing the evolution of the balance of political, economic and military forces. The development of the history of space activity in the last fifty years has gone through three stages:

- The first space age (1957-1989): extends since the Soviet Union launched the spacecraft “Sputnik” in

parallel with the American Apollo program, with which humanity took its first steps on the moon's surface on July 21, 1969, and it was a giant step for humanity.

- The second space age (1990-2015): which witnessed the dissemination of space technology for civil purposes. At the level of industries and applications emanating from space technology, television broadcasting spread in the world, and the ground positioning service (GPS), and meteorological monitoring and climate control became dependent on a group from satellites, in addition to tracking hurricanes and tornadoes to warn of them, and monitoring relief work, forest fires and sea pollution.
- The third space age (2015-2030): All indications indicate that China will own a space station and land on the moon in 2030, while Russia will retain enormous capabilities in the field of space technology, and the United States of America will continue to possess exceptional capabilities in the field of space.

It is clear from the three stages of the development of space activity that it is in a continuous and rapid development that tends to serve humans and improve human life through technical activities that promote peoples and develop their economies.

Space technology uses:

In light of the technological developments discovered by space research, such as the research of the American Agency (NASA), it has discovered new fields and inventions that are used to develop and facilitate the lives and welfare of peoples, including:

The field of Communications :

The communications revolution began since the launch of the first satellites in 1960, which returned about eight years later, which helped facilitate communication over longer distances, and this development included communication with mobile phones, Internet access to many remote and difficult areas, and the ability to provide Internet during flights, It has become easy to obtain continuous communication from anywhere in the world to any other place through communication satellites of up to 200 satellites, as well as many GPS systems used in many common daily services.

The field of biological research (space medicine):

Many developments in the field of medical research have emerged through the special program of satellites for NASA, and this research has been applied to bacteria, frogs, mice, and amoebas, and to study the effect of zero gravity on each of these organisms, and the research also included other aspects such as testing the interpretation of presence in the space environment. On sleep in humans, as well as direct effects on the immune a large group of scientists have been interested in astrobiology research as an aspect of space technology, and space science has indirectly helped enrich medical sciences. Space on the moon's weak gravitational pull led to a deeper understanding of the nature of human motion system and fluids inside the body.

The task of astrobiology in studying the influence of space flight factors (acceleration, vibration, weight,

breathing, limited movement, pressure) and space itself (vacuum, radiation, intensity of contraction from the magnetic field) is an opportunity to study the impact of the total of unusual environmental factors on the living organism.

Space biological research has expanded to study the smallest cells and know their properties in space, and the development of space medicine and the study of its risks to humans, and the increase in the volume of research on space and its relationship to the human body and bone growth is what opens horizons in the search for the process of genetic transcription and others.

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The field of Weather and climate:

After the launch of the first satellite in 1960, it became possible to observe a cloud as it rotates. Climate monitoring methods have developed, such as accurate weather forecasting, better image capture of clouds, and weather monitoring for twenty-four consecutive hours, including night hours, using infrared radiation. Hurricanes can be predicted, which helps to avoid many problems before they occur, in addition to the ability to monitor the ice in the North and South Pole.

Satellite field:

Scientists have concluded that there are some asteroids that may collide with the Earth at any time and that they collide with the Earth every 10,000 years, which causes many disasters, including the destruction of forests, which leads to famine and disasters, and the benefit of satellites in this area is great because it helps to detonate these objects. Before hitting the ground, it broke it into simple pieces.

The field of medical drugs:

Space technology contributes to the treatment of many diseases and finding solutions to them, such as the treatment of some types of cancer, the treatment of osteoporosis, as well as the great development in the field of medicine and magnetic resonance.

Metal field:

There are many minerals in outer space, which are rare on Earth, such as silver, platinum and gold, which made it necessary to search for other asteroids located in outer space and obtain from them rare minerals such as helium "3", as well as titanium due to its use in some modern fields. Such as: manufacturing solar panels, military applications, and nuclear submarines.

Remote Sensing :

Remote sensing means that it collects information about the surface of the Earth without having direct contact with this surface, and this is done through sensing and recording the emitted or reflected energy, and the subsequent processing, analysis, and application of that information. Oil and gas, exploration for groundwater, surveying works, mapping using satellite images, discovering surface and

subsurface archaeological sites, agricultural applications and early detection of crops injuries, insect raids on agricultural areas, and studying water in the seas and oceans by determining ocean colors and materials The relationship with salt water, the distribution of snow in the seas and oceans, the formation of the atmosphere, the search for sources of wealth in the seas and oceans, the study of the seabed and oceans. Remote sensing is also used to study the thermal insulation of buildings in many cities of the world, as well as preserving the environment and identifying sources of pollution. .

In addition, the main objectives of the NASA Astrophysics Program are to understand the origin and fate of the universe, describe the main laws of physics, and discover the nature and evolution of galaxies, stars, and the solar system.

In the same context, a vital part of NASA's mission to improve the quality of life on Earth is to provide a unique zero-gravity environment for the research that the International Space Shuttle supplies us with. It also works to provide safety for astronauts to carry out long-term missions beyond our solar system, and this type of the research is carried out under the supervision of the Biological and Physical Research Library; As some of the effects of gravity decrease, resulting in a weightless structure known as zero gravity, and progress in zero-gravity research has led to progress in the fields of medical research, biological, biotechnology, synthetic drugs, industrial applications and environmental protection.

In summarizing the above, one of the most important benefits of space technology are satellites and remote sensing, and they are considered among the most important indicators of the development of space science; This is because they serve many fields, whether in the field of medicine, meteorology, weather, science, mining and others, which contribute to the development of societies, serving peoples and achieving sustainable development.

Curriculum projects and international standards in the field of cosmic and space sciences:

The interest in the field of universe and space sciences has increased in curricula projects and international standards, and it has become a basic field of science curricula.(9-12), and the issues and topics that were raised in the first phase of the "2061" project under the auspices of the American Association for the Advancement of Science -which emphasized the necessity of addressing Earth and universe topics in science curricula.

As for the inclusion of space science programs for science teachers, whether in service or their preparation institutions, a curriculum in space and Earth sciences has been developed at Harvard University to teach students the topics of space, Earth and the atmosphere for the departments of astronomy and physics.

Grand Valley State University also introduced Earth and space sciences as part of the integrated science program for middle school teachers, and courses in Earth and space sciences were designed for pre-service teachers in faculties of education.

Also, under the auspices of the American Society of Gravity and the Federal Program (NASA) and the Fundamentals of Astrobiology Program, scientific and technological educational materials were provided to teachers and students in astrobiology in a site entitled "Space Bio Net". .

The German Space Agency also carried out an educational project that included three scientific fields identified in cooperation with the scientific community: integrated human physiology and applications of biotechnology in the gravity environment, and the attractiveness of radiobiology.

Many projects have also emerged that focus on the field of cosmic and space sciences, including the space education program implemented by UNESCO in cooperation with space agencies and organizations concerned with space affairs, such as the International Astronautical Union, the International Space University, and non-governmental institutions and links with the United Nations Office for Outer Space Affairs. The program has three majors: space sciences, aeronautical engineering, and space technology applications. The program aims to:

- Improving knowledge of space subjects and specializations in schools and universities, especially in developing countries, through workshops, and encouraging them to integrate subjects into science curricula.

- Providing the opportunity for teachers and educators to develop their knowledge and skills in areas related to space sciences, and helping them to produce educational materials appropriate to their needs.
- Raising the public's awareness of the benefits of space activities in the social, economic and cultural development of society, and spreading the use of space technology as a tool for implementing national, social and economic programs in order to contribute to achieving sustainable development.
- Contributing to the preparation of the next generation of manpower in the field of space, such as: space science specialists, space navigators, and space engineers.

Japan also established a space education center in 2004 to develop educational activities for the development of space, to provide courses for students at all educational levels, and to establish a space school with all facilities for teaching space sciences and support the programs developed by schools and teachers with the aim of including space sciences in the educational stages from the primary stage until High school .

It is evident from the global projects and programs in the field of cosmic and space sciences that they focus on the importance of integrating space science technology programs with the content of science curricula at the various stages of education, in order to prepare a generation of space science specialists; which in turn contributes to the development of societies and their social,

economic and cultural development, which leads to the achievement of sustainable development.

At the Arab level, many astronomical centers and societies have been established and conferences, symposia, meetings and workshops in the field of Earth and space sciences have been held, for example: the International Conference (2006) in Cairo for the development of Earth and space sciences in the Arab world using advanced information technology. The conference recommended the necessity of teaching space and earth sciences at all educational levels and teaching them using multimedia technology.

The Kingdom of Morocco has also been interested in earth sciences through a project carried out by the Ministry of Education (2006) to prepare programs that include science and earth at the primary and intermediate levels, and the Ministry of Education, the Syrian National Committee for Education, Culture and Science and the General Authority for Remote Sensing in cooperation with UNESCO (2009) set up a workshop Work on space education, which aimed to increase the awareness of students and teachers in the field of space science and technology, and stressed the need to teach space science technology to the young generation and remote sensing to secondary school students.

It is clear from all the projects, conferences and meetings that they have taken care of the sciences of the universe and space as one of the main fields that should be included in the science curricula at all levels of education,

and accordingly, the standard levels for most programs in the field of the universe and space were formulated as a main criterion starting from the kindergarten stage until the end of the secondary stage.

Natural sciences curricula and universe and space science standards:

The global interest in the education of cosmic and space sciences has had an impact on our educational system. The project aimed at including space technology and earth sciences in science curricula in public education within the framework of the cooperation protocol signed between the National Center for Educational Research and Development and the National Authority for Remote Sensing and Space Sciences, signed in (2009) research How to include space technology and earth science applications in general education curricula by proposing educational activities and programs, and preparing proposed national standards to include space technology and earth sciences in science curricula in public education stages.

Within the framework of the project, many studies were conducted. The first study was from the year (2007-2009). A program for the secondary stage in Earth and space sciences was developed through the interface sciences with the National Authority for Remote Sensing and Space Sciences. Teachers were trained on the educational program and were tested on some of its units initially. The second study was from (2010-2012) and to complement the research project, in (2013-2014) a proposed program was prepared for the development of concepts of space

technology and Earth sciences in the primary stage, and in (2014-2015) to (2015-2016), a research was conducted on remote sensing and space science applications. Activities for remote sensing applications in local Egyptian environments were proposed for preparatory stage students, and they were applied to find out their impact on developing middle school students' awareness of environmental issues in Egypt. The third stage of the project came from the year (2016-2019). Preparing national standards to include Earth sciences and space technology applications in secondary school science curricula.

Despite the global interest in the study of astronomy and the universe, and its essential role in developing concepts of space technology and students; However, many studies indicated that the natural sciences curricula (environmental sciences - geology - biology - chemistry - physics) in the secondary stage did not address these concepts in addition to the existence of a misunderstanding among students regarding the main concepts of astronomy and space technology.(Eltahan & Al-Olayani, 2018)(Ambo saidi & Al-Hinai, 2011) (Afifi , 2010) (Abdel-Radi, 2006) (Marshall, 2003) (Dov, 2002) (Trumper,2oo2) (Henriqes , 2000).

In light of what international studies and projects have called for, the importance of including space and universe science standards in teacher preparation programs in faculties of education, in addition to the standard academic standards approved by the National Authority for Quality Assurance of Education and Accreditation, and the National Document for Standards for Evaluating Colleges

of Education in Egypt, emphasized the need to include science standards Space and the universe in the science teacher preparation programs. However, the results of some studies, whether at the international level or at the local level in Egypt, indicate that there are shortcomings in addressing the concepts of universe and space sciences in the science teacher preparation programs, and the presence of misconceptions that they have about space technology, including a study (Hani, 2016). (Al-Masry, 2014) (Bulunuz, 2009) (Abdul Latif, 2010) (Dal, 2009) (Fouda, & Ali 2008) (Eric & Jason, 2005) (Ghanim, 2006) (Al-Shafi, 2003) (Al-Attar, 2002).

Based on the foregoing, it has become necessary to include the topics of space and universe sciences in all stages of public education in addition to including them at the university level, in addition to practicing appropriate teaching methods that are based on the integration between the branches of natural sciences with technology to teach concepts related to the topics of space technology, and the concepts of physics it includes astronomy, cosmology, space biology, and space medicine) and their applications; Which contributes to the development of space science enlightenment, science fiction, creative thinking and future thinking among learners, which in turn is reflected in the development of their societies, and the achievement of sustainable development.

In light of what was previously presented and in response to the results of previous studies, projects and programs, the current paper recommends the following:

- The need to reconsider the content of science curricula in the general education stages to include the topics of the universe and space to develop the space science enlightenment among students.
- The need to develop science curricula at all levels of public education, especially the secondary stage, in light of the standard of space technology.
- The necessity to reconsider the academic preparation program for science teachers at the College of Education to address the dimensions of space technology.
- Holding training courses for science teachers in service to familiarize them with the concepts of space technology and its applications.
- Inclusion in the educational preparation program for science teachers at the College of Education for appropriate teaching methods for teaching space technology, which are based on the integration between the various branches of natural sciences, mathematics, engineering, and technology.

Providing the appropriate materials, tools and learning resources to learn the concepts of the universe and space in all schools for the different educational stages.

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