TRENDS AND CHALLENGES IN RENEWABLE ENERGY EDUCATION

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https://doi.org/10.5281/zenodo.10434315

ABSTRACT

This article presents the importance of renewable energy today and the trends and challenges associated with renewable energy.

Keywords: Renewable energy, energy, education, teaching material, motivation, regulation, program.

Introduction

Energy is important for economic and social development and for improving the quality of life in all countries. Production and use of cheap and abundant energy availability with minimal environmental risks is one of the most important factors for economic growth as well as expected improvement. Since the quality of life of people living in developing countries, environmental problems are caused by energy-related factors, energy and environment are closely related concepts. Research in recent years predicts that energy education will become the new norm in both developed and developing countries. It is therefore concluded that developing countries in particular should take these studies into account and make some decisions about their energy. Two important strategies are being adopted by a number of neighboring countries. The first strategy is to manage energy demand, which means effectively promoting a variety of products. of energy conservation and efficiency measures. The second approach is to develop and deploy renewable energy technologies on a large scale. Many countries around the world have taken the initiative. The first is to develop and disseminate renewable energy technologies immediately.[1]However, despite the huge programs undertaken by many countries in this direction, the diffusion of these technologies has not met the expectations of planners and implementing organizations. There have been few successful cases of renewable energy technology deployment. The poor diffusion of renewable energy technologies depends on several factors. One important factor is the lack of a systematic framework for energy education in general and renewable energy education in particular. led to the promotion of very expensive and inappropriate designs. Similarly, in other countries, the lack of local technical personnel for initial and ongoing maintenance has led users of on-site systems to opt for other energy sources - technology combinations. Some renewable Energy technologies have not been adopted by end users because they were not aware of their potential benefits and did not know what was required. This and many other similar problems have only one root cause - a lack of adequate knowledge about renewable energy. Many developed and developing countries have changed their energy policies and education to find and develop new energy sources. These countries have also recognized the importance of formal and informal education about clean and renewable energy sources.[2] They also developed energy and environmental education to

make citizens aware of the problem. Therefore, they planned and made the necessary changes in their educational programs to integrate some concepts related to energy and the environment;

As mentioned above, it is important for Uzbekistan to invest in and develop the energy sector. To this end, several new policies are constantly being developed and changed according to the new growth. It is also important to consider environmental and educational factors based on economic requirements and processes in this area. Obviously, one of these policies must be related to research. It is important to provide industry with qualified personnel, to increase energy efficiency, to engage in energy education in order to prevent energy consumption, to inform citizens about the need to protect the environment and to avoid wasting energy. It should not be overlooked that formal educational institutions should play the most important role in achieving all these goals. As energy is closely related to environmental protection, energy education should also include environmental issues [3].

Global Renewable Energy Education

Despite war and economic turmoil, the need for energy education is growing every day. It is important to decide how energy education should be delivered and what should be taught. The problem, however, is that energy education resources and research are limited. In the 1970s and early 1980s, for example, energy curriculum development projects were carried out in the United States. Using the keywords "energy education and country studies" in the ERIC database, eleven papers or articles met these criteria in 1981, and the number rose to 19 the following year.

However, in the last decade, in addition to several studies related to energy education, it can be seen that the number of web sites on the Internet is increasing due to developing technology. Students of other subjects in which energy itself is not considered separately (e.g. mechanics, chemistry, electrical engineering) are taught aspects related to the curriculum (energy capture, conversion), as well as in physics as part of such curricula. However, energy (transmission and distribution, use, etc.) is not included in the curriculum. Not all aspects of energy are covered in these disciplines. Thus, students are not offered independent courses on energy-related issues. Energy is a very specific subject and must be considered as relevant to everyone. It should be studied in depth. Therefore, there is an urgent need to establish a separate energy education system and some proposals should be made for this purpose. Short-term courses and the use of mass media will also help to achieve the above. Diploma level courses should be introduced in production, installation and training of personnel, maintenance of energy technologies and systems. In order to provide regular four-year undergraduate courses in energy, it is necessary to develop a specialization in renewable energy and energy conservation, as well as the necessary manpower to evaluate new technologies. Finally, scientists need to be trained in short-term courses. It should be emphasized that efforts at all the above levels are equally important for initiating and consolidating the effective and large-scale deployment of renewable energy technologies. In some developing countries, especially in rural areas, a focus on renewable energy education in primary schools is particularly important, as this may be the only formal education children receive.[4]

Learning about energy at this stage can have a profound effect not only on the students, but also on their parents, who can monitor their children's school work and directly influence

the improvement of mutual understanding. The general public, for example, on firewood issues and stove design, the need for innovation in solar crop drying techniques, and other renewable energy issues. In many developing countries, secondary education is used to teach vocational skills. technical schools should introduce designs for local needs and materials. This will not only provide the community with the skilled technical personnel needed to implement renewable energy, but also the skills to generate income for a new era of energy use. Renewable energy issues should also be presented as part of higher education. The whole energy picture and energy issues in general should be placed in the context of development, both rural and urban. There are several reasons for this. Desirable features of an energy education program include: It should include all energy resources (renewable and non-renewable) with special emphasis on local needs. It should cover all aspects of energy technologies, such as resource assessment, technology, economics and energy, socio-cultural issues, ecological and environmental impacts. Separate curricula should be developed for different levels (school, polytechnic, university) and different audiences. Although energy education programs can to some extent meet local, site-specific needs, they must also be aligned with national, regional and international priorities and requirements. It should be flexible and dynamic so that we can improve the future if we want to.[5] It should provide a balance between theory and practice and include all aspects of education/training, including lectures, laboratories, demonstrations, practical training, design, production, troubleshooting, etc. It should be able to provide energy education to all - in the shortest possible time and in an economically viable way.

Renewable energy education on the scale of Uzbekistan

- Decree of the President of the Republic of Uzbekistan No. PF-60 of 28 January 2022 "On the Development Strategy of the New Uzbekistan for 2022-2026",
- PQ-4779 dated 10 July 2020 "On additional measures to increase the energy efficiency of the economy and reduce the dependence of economic sectors on fuel and energy products by using available resources",
- PQ-5063 of 9 April 2021 "On measures to develop renewable and hydrogen energy in the Republic of Uzbekistan",
- PQ-3855 dated 17 July 2018 "On additional measures to increase the efficiency of commercialization of the results of scientific and technical activities",
- PQ-3899 dated 6 August 2018 "On measures to increase the efficiency of the system of integration of scientific and innovative activities",
- PQ-5032 of 19 March 2021 "On measures to improve the quality of education and develop scientific research in the field of physics".
- Support for the use of clean and renewable energy sources and passive solar energy
- Energy applications
- Decentralization of energy production
- Optimizing the stability of energy supply and environmental costs
- Setting integrated energy consumption targets for organized industrial zones
- organizing energy saving training in educational centres

As mentioned above, it is important for Uzbekistan to invest in and develop the energy sector. To this end, a number of new policies have been continuously developed and modified in line with new economic economic needs in this sector. Environmental and educational

factors are also important to consider in this process. It can be seen that one of these developed policies is related to research. Providing qualified personnel for the field, improving energy efficiency, engaging in energy education to prevent energy waste and making citizens aware of the need to protect the environment. should not be overlooked. Formal education has the most important role to play in achieving all these objectives. As energy is closely linked to environmental protection, energy Education must include environmental issues. In recent decades, efforts in renewable energy education have been primarily at the doctoral level. There are several other undergraduate engineering programs in renewable resources. In addition to a large number of courses, short-term training and refresher courses are also offered. Seminars, symposia and conferences on renewable energy and related topics are organized every year.

Conclusion

We aim to raise awareness among young people about the environment and renewable energy for sustainable development, and to develop innovative approaches to problem analysis and solutions. The project provides training in environmental and energy management methods in vocational schools. It improves methodology, enhances students' skills and supports their transition from school to working life. Modern internet-based learning methods and tools are very attractive for students and teachers. Teachers are given in-depth advice and guidance on web-based didactics. The environmental and energy management system is a professional management tool and is regularly implemented. The school organization as well as the processes and activities in the school are oriented towards environmentally friendly actions. All environmental resources and material flows in schools are made transparent and the environmental awareness of those involved is improved. Young people learn to be environmentally friendly in their everyday environment and develop a positive attitude towards active citizenship through resources and extra-curricular activities.

It is essential to develop and implement a well-designed energy education program, including formal and non-formal education, in cooperation with all environment-related funds to promote energy education before it is too late. A careful analysis of the course content of many new science curricula should show that renewable energy curricula are often experiential. The laboratory component of renewable energy courses should provide students with adequate practical training.

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