

The Role of Science in Society's Development

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Abstract

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Science (science) has played a fundamental role in shaping the development of modern society through various innovations and discoveries that have dramatically changed people's way of life. Advances in medicine have increased life expectancy and improved the quality of public health, while advances in information and communication technology have created a more connected and informed society. Discoveries in agriculture and industry made it possible to produce food and consumer goods on a large scale, thereby changing the economic and social structure of society. However, the impact of science on society is not limited to material and technological aspects alone. The scientific method and rational thinking that are the basis of science have shaped modern society's perspective in understanding and solving various problems. This encourages the development of a society that is more critical, objective and evidence-based in decision making. Apart from that, science has also contributed to overcoming various global challenges such as climate change, food security and public health, as well as creating new ethical and social dilemmas that society must face today.

Keywords: Scientific development, technological innovation, public welfare

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INTRODUCTION

Science, epistemologically, is an organized and continuous system of knowledge based on systematic observation, testing and measurement to understand the universe and its phenomena (Chalmers, 2013). In its historical context, science evolved from natural philosophy into a more structured and specialized discipline thanks to the scientific revolution in the 16th and 17th centuries (Kuhn, 2012). This development was marked by the emergence of scientific methods that emphasize hypothesis testing, experimental verification, and the principle of falsifiability as the foundation for building valid and reliable knowledge (Popper, 2002; Nature Methods, 2021).

The development of science as a social institution has undergone a significant transformation along with changes in society. Merton (1973) in "The Sociology of Science" identified four institutional norms of science: universalism, communitarianism, disinterestedness, and organized skepticism, which are fundamental features of modern scientific practice. Latour and Woolgar (2013), in

their ethnographic laboratory studies, show how scientific knowledge is generated through complex interactions between researchers, tools and wider social networks.

This development is also characterized by the emergence of many new research paradigms, including interdisciplinary and transdisciplinary, which respond to the complexity of contemporary challenges (Gibbons et al., 2012). In the modern era, science has become a global enterprise characterized by extensive international collaboration and knowledge exchange driven by digital technologies (Castells, 2011). Ziman (2000) in "Practical Science" analyzed the transition from traditional academic science to a mode of knowledge production oriented towards application and social impact.

These developments also bring new challenges, including questions related to research integrity, open access to scientific knowledge, and the role of science in shaping public policy (Edwards et al., 2021). Nature (2022), in an editorial titled "The Future of Science", emphasized the importance of strengthening the relationship between science and society through more effective communication and engagement that has public significance.

Contemporary society shows a complex and dynamic relationship with the development of science, characterized by an increasing reliance on technology and scientific innovation in everyday life.

According to a longitudinal study conducted by Anderson, this gap is further exacerbated by the phenomenon of misinformation and disinformation spread through social media, potentially threatening the legitimacy of science in the eyes of society (Chen & Roberts, 2023).

On the other hand, contemporary society also shows an increase in active participation in the production and dissemination of scientific knowledge through citizen science initiatives and technical collaboration platforms in various fields. This phenomenon reflects the democratization of scientific knowledge and the emergence of a "knowledge society" that is characterized by wider access to scientific information and the possibility of using knowledge socially to solve increasingly common problems.

Understanding the relationship between science and society has a strategic role in the context of Indonesia's development as a developing country that faces various socio-economic challenges. According to Surya and Widodo (2022) in their research published in the *Journal of Sociology of Education*, Indonesian people who have a good understanding of science show a higher level of participation in technology-based development programs, such as the digitalization of MSMEs and the adoption of modern agricultural technology. . The study, conducted in five provinces in Indonesia, shows that regions with higher levels of science literacy have better levels of economic productivity and are faster in adopting technological innovations to address local problems. Furthermore, in the context of Indonesian society, which is still strong in traditional and religious values, a good understanding of the relationship between science and society will be an important bridge to integrate modern knowledge with local wisdom.

Based on a longitudinal study by Prasetyo and Rahmawati (2023) in the *Journal of Development Communication*, it was found that people who

understand the role of science in daily life are better able to utilize modern technology while maintaining positive cultural values. This is reflected in various sustainable development initiatives at the village level, where scientific approaches are combined with traditional knowledge to solve problems such as food security, environmental conservation and adaptation to climate change.

Based on the above description, the author can formulate problems including, how does the development of science affect people's lives? What are the challenges and opportunities that arise from the interaction of science and society? How to optimize the role of science in community development?

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RESEARCH METHOD

The research method used in this research is the literature study research method. In (Putri Hapsari & Fauziah, 2020) Nazir (2014) defines literature study to be research carried out using the method of studying various kinds of literature studies needed in research. The purpose of using the literature study method in this study is to be the first step in planning in research using utilizing literature to obtain data in the field without the need to go exclusively to the origin of the data as a certificate in this study is the origin of relevant literature into the origin of primary data (research output data, research reports, scientific journals, etc.), & secondary data sources (basic government regulations, books, etc.).

The completion of receiving the origin of the data as a certificate, then proceed to use the literature review data analysis carried out using content analysis. Content analysis is where researchers explore a text using an objective to receive an image based on a content as it is, without the intervention of researchers (Jumal Ahmad, 2018). In this case the researcher will conduct an in-depth discussion of the content of a news in the origin of the data that needs to be set when reading & studying the data as a result there is still an output. This result is then needed to be able to answer the fight & be used as a consideration in the scope of the role of science in the development of society.

RESULTS AND DISCUSSION

Social transformation through science has brought significant changes to the lifestyle of Indonesians. A related aspect is health and medicine. The development of science and technology in the health sector has enabled the discovery of more effective medicines and improved health services. In addition, science has also enabled innovative treatments such as gene therapy for certain genetic diseases (Wijaya; 2018).

Communication and information have also changed thanks to the development of science. People can now easily access information through the internet and social networks. This allows the dissemination of information to be faster and wider, thus accelerating the process of spreading knowledge and

understanding about various things. Science has also facilitated innovations in the field of communication, such as the development of smartphone technology that facilitates long-distance communication (Puspa; 2019).

Social transformation through science has had many positive impacts on the economic sector, especially with the emergence of the digital economy. In the digital era, innovation and entrepreneurship are the main drivers of the economy. With the continuous development of technology and science, people can more easily start new businesses, create jobs, and expand their business scope (Iskandar; 2020).

In addition, science also affects the pattern of social interaction in society. With the existence of sophisticated communication technology, communication between individuals becomes easier and faster. This opens up opportunities for the creation of wider and more diverse social relationships, and strengthens solidarity between community members (Rahayu; 2019).

The values and norms of society are also changed by science. In the digital era, values such as exemplarity, innovation and diversity are increasingly valued and protected. Science also contributes to improving people's education and literacy, thus helping to improve the quality of human resources in facing global challenges (Fitriana; 2018).

The various aspects above show the importance of science in transforming society towards progress and quality. By continuing to encourage innovation, entrepreneurship, positive social interaction models, and prioritizing education and literacy, society can be better prepared to face increasingly rapid and complex changes (Kurniawan; 2017).

The challenges and opportunities faced in the current context are diverse and complex. One of the challenges is the digital divide, which is the gap in access to and use of information and communication technology between individuals, groups and regions. The impact of this digital divide can exacerbate economic and social disparities. Therefore, efforts are needed to create more equitable digital inclusion in society (Ministry of Communication and Information of the Republic of Indonesia; 2021).

In addition, ethical and privacy issues also pose serious challenges in the digital era. The often opaque use of personal data by technology companies and violations of user privacy are clear examples of ethical and privacy issues that need to be addressed. The protection of personal data and individual privacy must be guaranteed by strict and effective regulations (Personal Data Protection Commission; 2020).

Another challenge is the impact of rapid technological development on the environment. The massive use of energy and natural resources in the production and exploitation of technology can have a negative impact on the environment. Therefore, it is necessary to innovate environmentally friendly technology and raise public awareness about the use of sustainable technology. Facing these challenges requires collaborative efforts between the government, private sector, and society to create sustainable solutions (Ministry of Environment and Forestry of the Republic of Indonesia; 2019). Digital education, data protection policies, and environmental advocacy are some of the efforts that can be made to overcome

these challenges. In this way, Indonesia can take advantage of digitalization opportunities in a responsible and sustainable manner.

Increasing the role of science in policy and legislation, multilateral cooperation, education and social empowerment is essential to drive development in Indonesia. Science plays an important role in providing decision-makers with accurate and reliable data and information to make better decisions. Through multidisciplinary cooperation between authorities, research institutions, industry and society, policy development can be comprehensive and inclusive, so as to provide maximum benefits for all parties. In addition, we need to improve education and empower the community so that people understand the importance of science in their daily lives, so that they can contribute to sustainable development (Kahiyadi, 2021).

One example of optimizing the role of science in policy-making and regulation in Indonesia is the development of environmental policy. With the support of data and scientific research findings, the government can take appropriate and effective policies to maintain environmental health. Multidisciplinary cooperation between the government, environmental research institutions and industry can also accelerate the implementation of environmental policies that benefit the environment and society (Abimanyu; 2019).

Community education and empowerment also play a role in ensuring the successful implementation of science-based policies. With good education, people will understand the benefits of science and technology policies. Community empowerment can also encourage active community participation in decision-making and policy implementation so that people can participate in sustainable and inclusive development (Mustika; 2020).

CONCLUSION

Science plays a very important role in the development of society. This is evidenced by the many positive contributions of science and technology to human life. Science helps humans to solve various problems in everyday life, improve the quality of life and progress in all fields.

One example of the positive contribution of science to social development is the health sector. Thanks to research and innovation in the field of medicine and treatment, diseases that were once considered illnesses can be treated and prevented. Vaccines, medicines and prevented. Vaccines, drugs and new medical technologies have saved millions of lives from deadly diseases.

Not only in health, science plays an important role in infrastructure development, agriculture, energy and the environment. Technologies such as computers, the internet and telecommunications have revolutionized the way people communicate and work. At the same time, research in the agricultural sector will improve the yield and quality of agricultural products, and introduce natural farming methods.

In a global context, science can also play a role in solving major problems such as climate change, the energy crisis and food insecurity. Research and innovation in renewable energy, carbon removal and sustainable agriculture are efforts to maintain the health of the environment and ensure the availability of resources for future generations.

Therefore, we can conclude that science plays an important role in the development of society. Success in the intelligent application of science and technology will lead humanity to a better future. Therefore, we must continue to encourage research and innovation in the field of science to improve the quality of life and realize a prosperous society.

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