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SCIENCE, TECHNOLOGY AND SOCIETY THROUGH THE PRISM OF EDUCATION

CIÊNCIA, TECNOLOGIA E SOCIEDADE ATRAVÉS DO PRISMA DA EDUCAÇÃO

Sergei Pelevin
PhD in Politics
Armavir State Pedagogical University
E-mail: pelevin.s.i@mail.ru

Anatoliy Vasiliev
PhD in Law
Armavir State Pedagogical University
E-mail: anatoliy@mail.ru

Irina Tarasova
PhD in Philology
Armavir State Pedagogical University
E-mail: irina@mail.ru

Natalia Ponarina
Dr in Philosophy
Armavir State Pedagogical University
E-mail: natalia@mail.ru

ABSTRACT

The current article examines various concepts of technology, science, engineering, scientific knowledge, technical knowledge, technical knowledge, empirical knowledge and their respective implications in the social context. Both theoretical and practical knowledge are products of knowledge and are built step by step in the process of social interaction. This knowledge is a cultural heritage of societies and is under constant construction and reconstruction. Science and technology are historical products and social knowledge organized and systematized in continuous creativity. The concepts of science, technology, and society and education as a social institution are closely related, as they both recognize the interconnectedness of technology, society, and education. The STS framework is an interdisciplinary approach that emphasizes the interdependence of scientific knowledge, technological development, and societal values and norms. According to this framework, science and technology are not neutral or objective entities, but are shaped by and shape social, cultural, economic, and political factors. STS scholars argue that understanding the social context of science and technology is essential for developing ethical and effective policies and practices.

Keywords: technologization, technologies, science, society, education, knowledge, development, asset, phenomenon.

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RESUMO

O artigo atual examina vários conceitos de tecnologia, ciência, engenharia, conhecimento científico, conhecimento técnico, conhecimento técnico, conhecimento empírico e suas respectivas implicações no contexto social. Tanto o conhecimento teórico quanto o prático são produtos do conhecimento e são construídos passo a passo no processo de interação social. Este conhecimento é um patrimônio cultural das sociedades e está em constante construção e reconstrução. A ciência e a tecnologia são produtos históricos e conhecimentos sociais organizados e sistematizados em contínua criatividade. Os conceitos de ciência, tecnologia e sociedade e educação como instituição social estão intimamente relacionados, pois ambos reconhecem a interconectividade da tecnologia, sociedade e educação. A estrutura STS é uma abordagem interdisciplinar que enfatiza a interdependência do conhecimento científico, do desenvolvimento tecnológico e dos valores e normas da sociedade. De acordo com esta estrutura, ciência e tecnologia não são entidades neutras ou objetivas, mas são moldadas e moldadas por fatores sociais, culturais, econômicos e políticos. Os estudiosos da STS argumentam que a compreensão do contexto social da ciência e da tecnologia é essencial para o desenvolvimento de políticas e práticas éticas e eficazes.

Palavras-chave: tecnologização, tecnologias, ciência, sociedade, educação, conhecimento, desenvolvimento, patrimônio, fenômeno.

Introduction

Perhaps one of the most relevant phenomena in the modern world is the extraordinary importance that knowledge has acquired as a necessary condition for the development of peoples. According to Toffler (1980), we live in a knowledge society characterized by the fact that the basis of production is data, images, symbols, ideology, values, culture, science and technology. The most valuable asset is not infrastructure, machinery, or equipment, but rather the ability of people to acquire, create, disseminate, and apply knowledge creatively, responsibly, and critically (with wisdom) in an environment where the rapid pace of scientific and technological innovation makes it quickly obsolete.

The idea that people and their knowledge are the most valuable assets of an organization is a widely accepted view in academic circles, and is supported by a broad range of theoretical and empirical research. Intellectual capital (i.e., the knowledge, skills, and experience of employees) was a key driver of organizational performance and competitive advantage in quite a few studies (Edvinsson and Malone, 1997; Subramaniam and Youndt, 2005; Wang and Ahmed, 2007; Li and Liu 2014).

The global educational model has entered a crisis, and the most developed countries of the world are making efforts from different sectors to improve the quality of education systems for both children and adults, even those who have already completed basic formal education or professionally advanced ones. UNESCO (2021a) reports that there are approximately 258 million children and youth who are out of school worldwide, with 59 million of them being of primary school age. Additionally, many of those who are in school are not receiving quality education, with over half of all children and adolescents worldwide not meeting minimum proficiency standards in reading and math. The COVID-19 pandemic has exacerbated existing inequalities in education, with school closures and distance learning exacerbating disparities in access to education and widening the achievement gap. According to UNESCO (2021b), at the height of the pandemic, over 1.6 billion learners were affected by school closures worldwide.

Many educators and experts argue that the current education model is not keeping pace with the changing needs of the 21st century, particularly with regards to the skills and competencies needed for the future workforce. For example, the World Economic Forum (2018) has identified a range of skills that will be essential for the workforce of the future, including creativity, critical thinking, and digital literacy, that are not always prioritized in traditional education models.

This article aims to consider the science, technology, and society (STS) framework and the concept of education as a social institution and highlight the ways in which science, technology, and education are interconnected and shape one another. Understanding the social and cultural context of science and technology is essential for effective education, and education is a key factor in shaping the ethical and responsible use of science and technology in society.

Science, technology, and society framework

The discussion on interrelation of science, technology and society is based on various concepts of technology, science, technology, scientific knowledge, technical knowledge, technical knowledge, empirical knowledge and their respective implications in a social context. In fact, the considerations, perceptions, arguments, and opinions that the social conglomerate has about the previous categories will denote the cause, essence, and significance of the educational dimension of the topic.

One of the most relevant characteristics of our time is the indisputable importance of technology in all social spheres. For, against, or in the middle, out of technophilia or technophobia, or even pretending to be indifferent, people have something to do with it. Although there are many definitions of technology, and concepts are different and even contradictory, it is considered a key factor in achieving or not achieving social, cultural, economic, and political goals and objectives.

A social idea in relation to technology is found in countless contexts, where its applications or products are revered for being considered socially useful, or cursed for their impact on the environment (Pearce-Higgins et al., 2017; Sierzchula et al., 2014; Cucchiella et al., 2015; Greenwood et al., 2021; Tufekci, 2018). This is how all human tool production, transformed into artefacts, systems, and processes observed from the very moment when humans can be considered human to the present day, is mediated by a discussion about the being, mind, and meaning of technology.

Technology is a multi-valued term that has many interpretations. Its everyday and current use is such that it has become interchangeable with the terms "engineering" and "science", which ultimately makes it difficult to discuss the meaning of technology education.

In the popular consciousness, the term "technology" is synonymous with machines, modern or new things, inventions, and in general the entire spectrum of material products surrounding a person.

The first approach to the term "technology" allows us to find some explanations for the sometimes unintelligible use of the word "technique" as a synonym for technology. Indeed, the etymological meaning of the word "technique" is the Greek *techné*, which Plato refers to in order to distinguish activities carried out on the basis of knowledge obtained as a result of direct relation to objects, from those that require a basis for their implementation. Aristotle is more precise, stating that *techné*–is the ability to capture discursively, that is, by requiring an explicit or explicable basis and by reasoning about the truth of a work.

Despite the above, in modern society it is customary to consider technology from a procedural point of view, closer to the definition of skill (from Lat. *ars*), which is based on the method and ability to develop certain types of activities from experience and practical attitude to business.

In turn, the Greek worldview clearly distinguishes between the contemplative*episteme*and the utilitarian*techneme*. Pure science is*theory,*the unselfish contemplation of essences. The element of science is*logos*, speculative thinking, and not sensuous matter.

Since the 17th century, science has taken a more mundane path with a more technical approach, and interaction between the two has become possible. Galileo Galilei turns a miraculous instrument (the telescope of Flanders) into a navigation tool, and then into another tool for research, with which he manages to make the first drawings of the Moon and other astronomical experiments and observations that have become an important milestone in the history of mankind. Galileo's work made it possible to closely link the theoretical aspect with the practical through experiment. Thus, the product of the technology of that time (the spyglass) was the basis for the development of experimental science; from now on, there will be no science without technology, and technology without science.

Today, people associate the term "technology" with complex artifacts or tools, such as computers and spaceships (Roberts et al., 2003; Meyer, 2015; Joo, Lim, & Kim, 2016). Some definitions come from the etymological structure of the word and represent it as the study of technology, tools, machines, materials (logos*of technical*products). Others understand it as dependent on science, or as the application of scientific knowledge for practical purposes, or as the study of applied sciences with particular emphasis on various procedures for converting raw materials into products for use or consumption (the science of applying knowledge for practical purposes, applied science).

From another point of view, technology is defined as "a way to do something, how something is done", adding why it is done. There are also definitions that emphasize the goals of technology, describing it as " a rational and orderly attempt by humans to control nature."

Broader definitions refer to technology as a creative factor in the production process of everything that a person has developed; as for the basic cultural fact of our species, labor productivity; as a person's attempt to satisfy their needs by influencing physical goals.

A brief overview of the concepts of technology allows us to highlight some recurring and possibly significant points in the broad concept of technology. People, culture, knowledge, needs and needs, labor and tools are somehow mentioned in the concept of technology, where invention is a key factor, and creativity corresponds to both individual and social activities.

In this order of ideas, and not as an end point, but as a starting point in the subsequent approach to the educational problem, this article assumes technology as a set of knowledge inherent in the design and concept of tools (artifacts, systems, processes and environments), created by man throughout his history to meet his personal and collective needs and needs. needs.

From the above assumptions, it follows that the knowledge involved in engineering and technology is different. In the case of technology, the main axis is accumulated previous experience, achieved through trial and error, success and failure, experience that cannot be communicated either verbally or in writing, but through the activity itself: *"Technical knowledge as empirical knowledge is more experimental than instrumental practice. Empirical or experiential – is not only practice or simple experience, but essentially observation, experimentation, measurement, comprehension, or reasoning as conditions for transforming practice. The reduction of the empirical to the practical, to simple experience, to the instrumental reflects an inadequate use of the concept of empiricism or an underestimation of practical knowledge resulting from the unequal social division between practical work and intellectual work*."

Technological knowledge, on the other hand, has reflexive attributes that support the activity, which gives it an argumentative basis that allows its explanation. Technological knowledge requires an indissoluble connection between theory and practice, a constant collection of information that allows you to create new forms, new methods, new results. It is primarily interdisciplinary, which allows it to redefine its areas and even create new ones. Technical knowledge is characterized by constant transformation. Reflection in technological knowledge is twofold: on the one hand, the causality and truth of the work; on the other hand, there are possible and various alternatives to obtaining these products (technological transformation). Technological knowledge is creativity,

Despite the fact that the myth of the divinity of science is beginning to fade and that humanity is going through a period of profound transformation that runs counter to blind faith in science, questioning its superhuman attributes and qualities, at the threshold of the third millennium, the social image of science as a supreme entity with the attributes of infallibility, objectivity and neutrality reserved for privileged chosen for their special intellectual qualities, dedicated all their lives to study, locked in laboratories and dressed in white coats and a circumspect look: priests of knowledge, scientists, holders of higher knowledge.

Both theoretical and practical knowledge are products of knowledge and are built step by step in the process of social interaction. This knowledge is a cultural heritage of societies and is under constant construction and reconstruction. Science and technology are historical products and social knowledge organized and systematized in continuous creativity. Today, scientific knowledge and technological knowledge are interrelated; we can say that technology is "learned" and science is "technologized"; however, in the construction of science and technology, there is a specialization of theoretical knowledge and practical knowledge.

Knowledge is formed in the process of solving problems. Both theoretical and practical knowledge applied in interpreting and transforming the environment shapes scientific and technological knowledge and provides models for problem solving based on their respective intentions.

One of the most important social functions of education is to provide the young generation with a set of skills that enable them to function properly in a productive society. However, profound and dizzying social transformations mean that this function of education extends to all people, regardless of their age. Continuing education, with its advantages of flexibility, diversity and accessibility in space and time, which goes beyond the distinction between basic education and continuing education and gives people general skills that are adaptable to changes in both the production and everyday environment, is one of the key points.

The world has reached an unimaginable level of difficulty, and with it come challenges and challenges never thought of before. To meet these challenges and challenges, people will need not only a significant base of significant knowledge, but perhaps most importantly, a greater ability to apply it properly. Changes are so rapid that it is no longer possible, as in other times, to learn enough in a few years of formal education to prepare for life. Education is required for the duration of one's existence, and" this is not a distant ideal, but a reality that is increasingly trying to materialize in a complex field of education characterized by a series of mutations that make this option increasingly necessary.

One of the biggest challenges facing young and older generations is the mental organization needed to understand the complexity and depth of the modern world. If we reflect on the fact that much of human knowledge has been achieved in this century, and especially in the last thirty years, we must take into account that education, in its slow process of adaptation, is clearly outdated.

Supportive learning, as its name implies, is aimed at acquiring points of view, fixed rules, fixed methods, and specific skills that are designed to work in known and permanent situations. Its power lies in the fact that it increases our ability to solve existing problems. Innovative learning encourages the subject to test the most ingrained assumptions and look for new perspectives. It is a powerful tool in situations of uncertainty similar to those faced by humanity; it does not shy away from challenges, they provide an opportunity to reinforce innovative learning.; this is an apprenticeship for change and turbulence.

Supportive learning is necessary and will continue to be necessary, but it is far from sufficient to address the challenges of a world shaken by injustice, inequality, and a lack of respect for the environment and life. Today, more than ever, knowledge is meaningless if it is not in context. This is the role of education in general, and it makes sense to talk about technological education as another contribution to the search for these goals.

Conclusion

Modern science and technology is characterized by human dimension, which is expressed through the anthropic principle, which manifests itself in various aspects. For example, in the aspect of understanding the civilizational crisis, the reverse side of the anthropic principle is revealed: there is a limit to the ways and degree of transformation of the surrounding world by a person. Today, more than ever, these limits are palpable: the environmental problem, the danger of nuclear conflicts, and the loss of meaning in life are all visible expressions of these limits. On the other hand, the anthropic principle allows for a new interpretation of the place and role of man in the universe. This kind of "universal man" becomes a factor of "management" of the development of the "society-nature" system, directing the latter towards increasing stability.

The considered signs and features partially describe the transformation of science and technology in the XXI century, and outline possible angles for considering this problem.

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