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Competencies in the Study of Psychological Influences of Greening on the Social Quality of Life: A Review

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Abstract

This review article is relevant due to the increasing recognition of how greening processes affect the neuropsychological aspects of social quality of life. It analyzes environmental problems and ecological issues more broadly, focusing on modernization and ecology within the context of greening. Additionally, it studies how these factors influence the development of social quality of life. Importantly, the article examines the link between ecology and economic security as a key component in shaping this concept. The discussion also explores opportunities for acquiring environmental and digital competences, emphasizing their content, target orientation, and importance in forming a new digital personality. Environmental competence and reinterpreted in the context of digital transformation can function not only as a tool to mitigate the challenges and risks of digital communication but also as a personal foundation for digital ecology. Key digital and environmental competences relevant to today's education are outlined. Moreover, the article argues that the effective greening of the economy can promote increased employment and enhance social integration. Finally, it demonstrates the interdependence between ecological sustainability and economic support in shaping social quality of life.

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Keywords

Ecosystems; Modernization; Ecological economics; Natural potential of environment; Labour market; Neuropsychology

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Introduction

Interest in ecological competence is steadily growing, driven by a rising awareness of the need to cultivate environmental

consciousness, ecological attitudes, and ecological culture. This culture encompasses structural elements such as knowledge, values, and behaviour patterns shaped through both cognitive and experiential learning. The emergence of ecological thinking, with its distinctive methodology and foundational concepts, has paved the way for new branches of humanitarian knowledge, including social ecology, anthropoecology, and human ecology. A key feature of ecological philosophy is the link between ecological attitudes and information communication, which presents a valuable opportunity for examining the communication dynamics of today's society. At the same time, the educational landscape is experiencing significant transformation. The increased integration of digital technologies and the shift toward project-based learning signal a move toward competency-based education. These developments necessitate a reevaluation of existing competency systems. Competency-based education, once viewed primarily as a methodological tool of effectiveness, must now adapt to evolving learning environments, namely, immersive, reflective, and networked settings.

Nowadays, ecological and environmental problems in general in the era of postmodernism are firmly entrenched in a set of extreme crises that cannot be ignored longer. The greatest optimists are forced to admit that the balance of ecosystem is constantly being destroyed, and at the same time the material needs of the majority of humanity are not satisfied. The blame lies with the uneven modernization of companies in the era of postmodernism, some of which suffer from overproduction and try to protect their ecology, others from underproduction and often from environmental disasters associated with the dumping of bad technology, hazardous industries. Therefore, addressing ecological competence and adapting educational systems to meet the challenges of environmental sustainability and technological change is crucial for the future development of both individuals and societies.

Methodology

This review article's methodological foundation is an interdisciplinary approach. It integrates ecopsychology, socio-ecological pedagogy, digital pedagogy, and systems analysis. This approach focuses on transforming the educational space in the era of digitalization. The research is grounded in the conceptual framework of the competency-based approach. The latter emphasizes the development of integrated digital and environmental competences in response to current educational demands.

The review work employed qualitative methods, including the following:

- content analysis of scientific literature, digitalization and environmental education strategies, and official documents from the United Nations and the European Union related to sustainable development and digital transformation;
- comparative analysis of educational models that incorporate both and environmental components;
- systematization and generalization of research findings on the formation of environmental awareness and its psychological impact on the quality of social life;
- expert evaluation of digital tools that enhance environmental competence within virtual learning environments;
- reflective analysis of how digital technologies contribute to modelling ecological socialization processes and developing environmental consciousness.

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Digital and Environmental Competencies in Today's Education

Digital and environmental skills are essential components of today's education. They equip students to navigate the challenges and opportunities of the digital world and environmental responsibility. This section focuses on three core concepts: environmental literacy, digital skills, and social quality of life. Environmental competence refers to a combination of knowledge, skills, and value orientations. It enables individuals to understand the state of the environment, make informed decisions, and act in favour of nature conservation and sustainable development. Digital competences are the ability to use digital technologies and tools, such as computers, the Internet, and software, effectively. They include communication, information retrieval, problem-solving in professional and personal contexts, critical content interpretation, and cybersecurity (Zeike *et al.*, 2019). Social quality of life denotes the degree of well-being experienced by individuals or communities. It is shaped by factors such as social integration, economic security, access to quality education, healthcare, social services, civic engagement, and opportunities for self-fulfillment (Al Saqri *et al.*, 2018).

Both digital and environmental competences belong to a broader category known as system competences. These include instrumental, cognitive, methodological, linguistic, and technological components. The concept of "digital competence," though relatively new to pedagogical practice, has quickly become relevant across multiple disciplines. Its interdisciplinary nature and applicability to various educational challenges make it essential. Importantly, the concept incorporates a specific pedagogical perspective on competence. Building on this, system competences are understood as states of stability – both internal (within the individual) and external (concerning the environment). Today's society is viewed through the lens of circulating information flows. In such information networks, local communities form connections, and virtual communities emerge. This reflects Bae's (2022) actor-network theory, which merges the concepts of actor and structure.

Social competences, a fundamental type of system competence, encompass communicative, reflexive, and network competences. Reflexive competences develop from two skill sets. The first involves cognitive skills, such as abstract thinking, holistic vision, and the ability to identify relationships between system components and their environment. The second involves social skills, including working effectively in individual and group settings, considering others' interests, and motivating peers. According to the co-evolutionary approach, individuals possess a need for self-development and harmonious interaction with their living environment. This need is part of their existential values. In this sense, ecological competence intersects with reflexive competence (Puzyr, 2016).

The foundation of digital education lies in critical thinking. From the standpoint of information culturology, one challenge of digitalization is information noise. Viewed through the perspective of social ecology, this becomes an ecological problem of communication within emerging environments. Moreover, today's living environment is highly heterogeneous. It includes not only biological and social aspects but also virtual dimensions. The digital sphere is now embedded in eco-economic and eco-social systems. Kumpikaitė-Valiūnienė *et al.* (2021) emphasize the complex mechanisms

through which these spheres interact. Digital technologies, lifestyles, and greening processes are interconnected. A central aim of the green economy is achieving sustainable development through a balanced integration of natural, physical (artificial), and human capital. From an economically oriented perspective, the effective management of intellectual capital has become increasingly important. This is particularly relevant in the cultural and information sectors, such as education, where intellectual capital functions as a vital educational resource (Gerasymova *et al.*, 2019).

Digital technologies are at the heart of the digital environment. This environment is defined through binary data, algorithms, and software. It is often described using the concepts of infrastructure, structure, and ultrastructure. The infrastructure includes telecommunications and computing hardware – from supercomputers to smartphones. The structure refers to network protocols, software platforms, and user interfaces. The ultrastructure represents the infosphere, namely, the overarching environment of digital information. Key elements include tools and devices that provide access to this environment (Wang *et al.*, 2021).

An ecological approach to digital interaction emphasizes fundamental skills such as digital consumption and security. Magnusson (2000) proposes that digital literacy should include computer, information, and communication literacy. Building on this, Kumpikaitė-Valiūnienė *et al.* (2021) identify several skill categories that define ecologically responsible digital interaction:

1) *cultural skills* (the ability to engage with diverse technologies and contexts while recognizing social and cognitive diversity);
2) *creative skills* (the capacity to adapt, transform, or create digital objects to meet specific needs);
3) *communication skills* (understanding values and norms in networked environments, contributing to platform creation and digital capital); and
4) *safety skills* (ensuring secure and responsible interactions in digital spaces).

Finally, integrating greening initiatives with digital and green skills is a key element of sustainable urban development. Table 1 outlines several policy recommendations and practical suggestions for national and urban governments, aimed at merging greening strategies with digital education and competences.

Table 1: Policy recommendations for integrating greening initiatives with digital and environmental competences

Category	*Policy recommendations*	*Practical suggestions*
Digitalization of green zone management	Implementing smart systems to monitor and manage green spaces.	Using soil moisture sensors, drones for mapping, and AI analytics to assess green area conditions.
Public participation through digital technologies	Engaging citizens in green zone management through digital platforms.	Developing mobile applications for reporting green space conditions and platforms for crowdsourcing eco-projects.
Education and environmental literacy	Integrating environmental and	Offering online courses and mobile applications for

	digital competences into educational curricula.	interactive learning about green management.
Smart lighting and energy efficiency	Using digital solutions to reduce energy consumption in public green spaces.	Installing LED lighting with motion sensors and solar panels for autonomous power supply.
Green mobility and transport	Incorporating greenery into transport infrastructure.	Developing “green” bus stops, creating vertical gardens along roads, and providing interactive maps of “green” routes.
Urban planning using big data	Analyzing urban environmental data with digital technologies.	Using geospatial analysis to pinpoint areas for greening and to address urban “heat islands.”
Financial support and investments	Providing grants and preferential tax incentives for green startups.	Establishing co-financing programmes for smart eco-projects in cities.
An ecosystem of “smart” green spaces	Integrating urban farms and vertical greening into infrastructure.	Creating urban agricultural parks and implementing IoT technologies for crop monitoring.

In the context of this article, environmental competence is intrinsically connected to digital competence, with this relationship significantly shaping the conceptualization of environmental competence. This approach is firmly grounded in an environmental perspective, emphasizing the interplay between ecological awareness and digital skills.

The Impact of Environmental Modernization on Social Quality of Life

Environmental problems arising from modernization are particularly relevant in the postmodern era. As production intensifies, the threat to nature grows. However, the slow pace of development prevents meeting the needs of people. Radical ecological debates on modernization criticize the introduction of less harmful technologies and argue that truly sustainable, closed production cycles are still rare. Many spontaneous environmental movements oppose the growth of production, separating economic needs from nature protection, which is seen as the primary concern. Theoretical and scientific perspectives offer a more nuanced view of the issue. Several studies have explored the psychological effects of ecological modernization on the social quality of life in today’s society. Meagher (2019) identifies key psychological impacts of the ecologization process on social quality of life, including:

- the challenge of accepting diminishing growth limits in Western countries,
- the focus on increasing production despite obstacles in non-Western countries,
- criticism of catch-up modernization and the search for alternatives,
- the concept of sustainable development, often used to justify the status quo,
- the hope for globalization in some countries, alongside fears in others.

This unequal development has led to the division between Western and non-Western societies, which are now referred to as modern and traditional, respectively. Traditional

societies, the first to emerge historically, are based on tradition and past experiences for legitimacy (Bratman, Hamilton and Daily, 2012). They differ from modern societies in several ways: 1) lack of deferred demand (production is focused on immediate needs, not future growth); 2) pre-economic, pre-industrial nature (there is no mass education, and mental activity is more passive); 3) emphasis on worldview knowledge over scientific knowledge; and 4) local rather than universal focus (Al Saqri *et al.*, 2018). The attitude towards nature in traditional societies is mainly appropriative, reflecting the agricultural stage of development. Even in these societies, environmental issues arise, such as unregulated hunting and epidemics.

In traditional societies, individuals occupy fixed roles, and social behaviour is influenced by particularism and diffusion of responsibilities. Gerlich (2025) believes that a key feature of these societies is the lack of individual expression. This is a result of tradition's dominance, as there is little social demand for individuality. The demand for individuality in today's societies is driven by the need for creative actors who can innovate. In traditional societies, tradition tends to overpower innovation. Another significant characteristic of traditional societies is the religious or mythological justification of tradition. These belief systems block rapid transformation, and any attempts at modernization often lead to a reversal, creating a cyclical pattern of development. This cyclical nature is typical of traditional societies. The inseparability of individuals in these societies is not only due to a lack of interest in innovation but also stems from the collectivist nature of religious and mythological ideas.

Traditional cultures prioritize collective ideas over individual expression. The individual does not act as a political unit; instead, their behaviour is governed by the norms set by tradition, religion, and the community. As a result, traditional societies uphold authoritarian values rooted in collectivist ideals. There is no clear separation between instrumental values (daily behaviour regulation) and worldview values (perceptions of the world). In these societies, instrumental values are subordinated to worldview values, and there is strict control over these worldviews (Calvo-Mora, Leal and Roldan, 2005). Internal and external censorship of behaviour and thinking in traditional societies leads to political authoritarianism, the establishment of authority, and a lack of personal freedoms. The structure of consciousness, culture, and power in these societies ensures the reproduction of old ways, with people living according to past economic systems.

The neuropsychological benefits of green spaces are significant for social quality of life. Studies show that contact with nature, such as through parks, green spaces, and water bodies, reduces cortisol levels (the stress hormone) and improves mood. An ecologically clean environment, which reduces noise and chemical pollution, positively affects the nervous system. Walking in green spaces boosts memory, concentration, and decision-making. Reduced exposure to toxic substances in air and water improves cognitive development in children and lowers the risk of neurodegenerative diseases in adults. People who live in areas with abundant greenery are less likely to experience depression and burnout (Dzhambov *et al.*, 2021).

Engaging with nature and participating in environmental initiatives, such as gardening and volunteering, increases serotonin and dopamine levels, which contribute to happiness. Public green spaces foster social interaction, trust, and mutual support among

residents. Environmental activities, such as waste sorting and community gardens, bring people together and raise environmental awareness (Al Saqri *et al.*, 2018). Access to clean air and green spaces also encourages physical activity, which improves physical and mental health. Regular exercise enhances neuroplasticity in the brain, positively impacting cognitive abilities. Therefore, environmental greening has a multifaceted neuropsychological effect, improving social quality of life, mental health, and social relationships.

The Greening of the Economy to Increase Employment and Socialization

The process of greening the economy can lead to an increase in employment. The transition to a sustainable economy has already resulted in a rise in the number of green jobs. These jobs are vital for the "greening" of businesses and the economy as a whole. "Green" jobs focus on protecting the ecosystem and biodiversity, as well as reducing waste and pollution. They are often linked to specific sectors that provide environmental services. However, these sectors represent only a small portion of the overall workforce, making up about 1% of total employees. The main task of workers in these sectors is to reduce human impact on the environment. Green jobs are typically characterized by productive employment, opportunities for social protection, decent wages, and respect for workers' rights (van den Bosch and Ode Sang, 2017). Entrepreneurship and innovation play a key role in creating green jobs. Governments, businesses, workers, and their associations are crucial in building a sustainable green ecosystem through institutional frameworks and other measures. For instance, financial investments in forest conservation and restoration could increase official employment by 20% by 2050. Additionally, investments in energy efficiency in buildings could create 2-3.5 million new jobs in Europe and the United States alone.

Several trends contribute to the greening of the economy and the growth of new employment opportunities. These include the development of new economic activities aimed at preserving the natural environment and the rational use of natural and energy resources. They also involve reducing greenhouse gas emissions, advancing environmental technologies, recycling, and waste management. Additionally, environmental entrepreneurship plays a key role (Hu and Zheng, 2023). The introduction of green innovations should also improve efficiency and competitiveness across many industries. However, the environmental, economic, and social benefits of transitioning to a sustainable green growth model can sometimes be contradictory. On the one hand, environmental protection measures contribute to the creation of new jobs. On the other hand, insufficient business interest and lack of comprehensive state tools for promoting the green economy can negatively affect the labour market. This, in turn, impacts participation in paid socially useful activities. Green jobs are often marked by unfavourable working conditions, and employment in industries such as recycling, construction, or biofuel production is often informal.

Neuro-Influence of Greening Processes on Social Quality of Life

The psychological neuro-influences of ecologization on social quality of life explore the relationship between environmental changes, neuropsychological processes, and their impact on society's well-being. This field is crucial in understanding how greening

processes shape the quality of life through various psychological and neuropsychological mechanisms. Capaldi, Dopko and Zelenski (2014) highlight several key aspects of these influences:

- Neuropsychological mechanisms of greening. Studies show that natural landscapes, clean air, and green infrastructure positively affect emotional states. These environmental changes activate areas of the brain, especially the prefrontal cortex, which is responsible for emotional well-being, stress reduction, and overall life satisfaction.
- Psychological effects of green infrastructure. Introducing green spaces in cities, such as parks and public gardens, fosters a sense of safety and well-being. These spaces activate dopaminergic pathways that improve mood and reduce depression.
- Ecological space and social quality of life. Greening urban areas brings people together, fostering communication and positive interactions. It also activates the "social brain", namely, networks of neurons linked to empathy, social understanding, and mutual support.
- Sense of responsibility for the environment. Psychological studies show that incorporating environmental practices into daily life strengthens a sense of responsibility for nature. This practice encourages the development of collective environmental consciousness and prosocial behaviour.
- Environmental awareness and quality of life. Environmental education focused on sustainable development fosters a new mindset. Increased environmental awareness is positively correlated with a higher quality of life, as it contributes to resource conservation and ecological balance.
- Impact on mental health. People engaged in environmental protection report higher psychological comfort and confidence. This is due to the activation of the dopamine system, which enhances motivation and satisfaction from personal and collective efforts.

Therefore, studies of neuro-influences on social quality of life show a complex interaction between environmental conditions, neuropsychological processes, and social well-being. Improved environmental conditions enhance emotional well-being, social interactions, and mental health, collectively improving the quality of life (White *et al.*, 2013). Future research should focus on understanding these relationships to develop more effective greening strategies that consider human neuropsychological responses to environmental change.

Relationship between Ecology and Economic Resource Allocation

The relationship between ecology and the economic supply of natural resources has often been overlooked at the international level. This dependence became more apparent in the latter half of the 20th century when the rapid growth of the economy caused significant damage to natural systems. Starting in the late 1970s, the world economy began developing the theoretical and methodological foundations for a "green economy" aimed at reducing environmental harm and addressing the environmental deficit (Simon, 2010). During this period, the concept of greening the economy to improve social quality of life emerged, emphasizing the importance of nature in people's lives. The energy crisis of 1973-1974 is often cited as the key trigger for this shift. In response, the

European Union began implementing policies focused on resource conservation, ecological production technologies, and economic methods to encourage environmental protection and rational energy consumption (Berto, 2014).

Greening the economy involves integrating environmental factors into economic development indicators. This includes methods to account for economic losses resulting from environmental degradation and efforts to minimize these losses. A major aspect of this process is developing an ethical attitude toward nature, which drives changes in society's ecological consciousness (Vedovello, 1997). This process can be understood from two perspectives. On the one hand, it involves actions aimed at preventing environmental and economic disparities. On the other, it encompasses technical, technological, and organizational measures to optimize natural resource use for social quality of life. Furthermore, the level of greening in the economy is an integrated quantitative indicator that determines the qualitative development of this process. Consequently, recognizing the greening of the economy is crucial, as it significantly enhances the competitiveness of both production processes and products within the economy.

As noted by Panizzut *et al.* (2021), key components of this phenomenon in the postmodern era include:

- revising the investment system to favour nature-oriented sectors of the economy;
- shifting the economy toward environmental constraints and the principle of sustainable resource use;
- transitioning to a production strategy focused on qualitative growth, supported by industry restructuring and technological modernization while strengthening ecological control over product quality;
- enhancing the payment system for environmental management and adopting current pricing structures that consider ecological factors, losses, and risks;
- strengthening economic incentives for economic actors who effectively use natural raw materials and produce high-value goods and services.

The greening of the economy, aimed at improving the social quality of life in the postmodern era, focuses on reducing the use of natural materials in production. This shift moves the economic analysis focus from costs and intermediate results to final economic indicators, such as gross domestic product and national product, and future development forecasts. This process influences the formation and development of an innovative economy and the modernization of all aspects of society. The main principles of greening the economy to improve social quality of life in the postmodern era are as follows:

- ecological and economic realism, recognizing the inevitability of limiting the transformation of nature during economic activity;
- accounting for starting conditions, such as pollution levels and public health, in regions where businesses operate;
- balancing market and non-market regulation;
- infrastructural and institutional prosperity, forming the basis for environmentally oriented business activities;
- prevention, shifting regulatory burdens to the early stages of the production cycle;
- alternatives, developing multiple solutions to problems;

- eco-innovation, creating projects and programmes based on development priorities, resource availability, and environmental capacity (Pabian, 2024).

At the same time, the management of the greening process in the postmodern era requires attention to specific features. For example, to minimize environmental damage, a region should focus on producing one type of product. If a wider range of products is needed, waste-free technologies and efficient cleaning systems must be developed to reuse by-products and waste. This underscores the importance of reviewing technological processes that harm the biosphere. Effective management of greening in the postmodern era should incorporate administrative, economic, socio-political, psychological, and moral management tools (Kuo, 2015). Ecological-economic activities aim to increase the production of biological products and improve living standards. However, uncontrolled production and mass construction often disrupt ecological balance.

To address these contradictions, stronger control measures are needed, including bans, regulations, environmental protection efforts, and natural system improvements. In addition, the primary challenges in managing the greening of the economy for social quality of life in the postmodern era include:

- ineffective management of environmental structures and the distribution of powers in environmental protection, especially in protected areas;
- lack of a targeted policy for managing ecological-economic systems;
- imperfect systems for accounting and evaluating natural resources;
- inadequate legislation for air pollution assessment and the use of environmental audits in businesses;
- insufficient research and design for implementing environmental policies;
- weak information and analytical support for nature management systems;
- low international cooperation in protecting and using natural resources (Rennings, 2000).

Conclusions

Therefore, this article analyzes environmental issues in the era of postmodernism, focusing on modernization, ecology, and the process of greening. It examines their impact on the formation of social quality of life and explores the relationship between ecology and the economy's supply of natural resources in shaping social well-being. The article reviews works by theorists and scientists who approach the problem comprehensively, drawing on a range of studies to justify the need for research into the psychological effects of greening on social quality of life in contemporary society. These prior studies provide valuable insights that inform the current research. The article also highlights that processes related to the green economy can significantly increase employment and promote socialization. It demonstrates that the green economy creates more "green" jobs, contributing to the transition to a sustainable economy.

As a result, the greening of the economy can be seen as a complex, multifaceted phenomenon that addresses economic, environmental, and social issues. It represents one of the most critical challenges of today. This process involves a comprehensive, systematic approach to the environment and a deeper understanding of nature's role in human life. It focuses on preserving the environment's natural potential, improving

quality of life, and fostering economic growth. Additionally, the greening of the economy in the postmodern era presents several challenges, particularly the lack of effective regulation in environmental management. There is also a need to balance economic and environmental development. Effective and rational management of the greening process is a key criterion for sustainable development. It is essential for achieving high production results while reducing anthropogenic environmental impacts. This article also examines how environmental changes affect psychophysiological processes in the human brain and their link to social quality of life. Understanding the neuro-influences of greening helps explain how green infrastructure, natural environments, and ecological awareness contribute to psychological comfort, health, and social connections.

The study's results confirm that developing digital competences is crucial for fostering environmental awareness among the population. This, in turn, positively impacts social quality of life and supports the ecological modernization of society. Analyzing current educational trends reveals that integrating digital and environmental skills into curricula is essential for cultivating a responsible attitude toward the environment. This approach equips citizens with the tools to use digital technologies effectively for environmental development. The article also demonstrates that the greening of the economy not only improves the state of the environment but also enhances employment, thereby promoting socialization. The relationship between economic development and the environment highlights the need for a balanced approach to implementing environmental initiatives. Corporate environmental responsibility and citizens' digital literacy are crucial factors in shaping social quality of life.

Finally, the article emphasizes the importance of developing digital competences as part of society's ecological transformation. Future research should focus on strategies to increase digital literacy and environmental awareness among citizens to ensure the sustainable development of society.

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Authors' Declarations and Essential Ethical Compliances

Authors' Contributions (in accordance with ICMJE criteria for authorship)

Contribution	*Author 1*	*Author 2*	*Author 3*	*Author 4*	*Author 5*	*Author 6*	*Author 7*
Conceived and designed the research or analysis	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Collected the data	Yes	Yes	No	No	No	No	No
Contributed to data analysis & interpretation	No	Yes	No	Yes	No	No	No
Wrote the article/paper	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Critical revision of the article/paper	Yes	No	No	Yes	Yes	Yes	Yes
Editing of the article/paper	No	Yes	Yes	No	No	No	No
Supervision	Yes	No	No	Yes	No	No	No
Project Administration	Yes	No	No	No	No	No	No
Funding Acquisition	No	No	No	No	No	No	No
Overall Contribution Proportion (%)	15	15	15	15	15	15	10

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