

Environmental Discourses in Science Education

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# Conceptualizing Environmental Citizenship for 21st Century Education



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# **Environmental Discourses in Science Education**

## **Volume 4**

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# Conceptualizing Environmental Citizenship for 21st Century Education

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# Chapter 5

## Knowledge and Environmental Citizenship



**Marija Smederevac-Lalic, David Finger, Imre Kovách, Mirjana Lenhardt, Jelisaveta Petrovic, Vesna Djikanovic, Daniela Conti, and Jelle Boeve-de Pauw**

### 5.1 Environmental Citizens Need Knowledge

The environmental impacts of modern consumer-oriented societies are jeopardising the high standard of living and have brought humankind to the threshold of Earth-carrying capacity (Goleman 2010; Sagoff 1995). Today we are forced to find ways to overcome the challenge of the overconsumption by humans of the fundamental planetary boundaries that are essential to sustain current human civilisation (Rockström et al. 2009). The sensibility to preserve natural resources is still present

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all over the world, most often in the remote, inaccessible parts of the planet of inborn communities, e.g. the native populations of the Arctic Circle, small villages in Tibet and those who live in the Sahara or on remote islands in the Pacific. These communities survive only by understanding and adapting to the natural systems around them, designing the ways of life that best communicate with these natural systems (Goleman 2010). Modern societies will be forced to reacquire knowledge and ecological intelligence in order to preserve human civilisations. It is the wisdom and ability to adapt to our ecological niche so as to inflict as little damage as possible and relive sustainably (Goleman 2010; Orr 1992).

This wisdom of knowledge is required for Environmental Citizenship and as such should be within the focus of Education for Environmental Citizenship. Citizens are made in a long and complex process of political socialization through education, media and popular culture (Cao 2015). An Environmental Citizen requires the knowledge of holistic and fundamental aspects of environmental sciences (Hay 2002). These sciences investigate the relationships and interactions of living organisms with other living organisms and their surrounding physical environment (adaptations on the habitat conditions). Environmental science is a diverse and complex field that involves all living or non-living things, including physical, chemical and other natural forces. It also includes various habitat conditions where living organisms (biota) find and fulfil their requirements and consists of two components (biotic and abiotic). The term 'ecosystem' describes the ensemble of interactions within the environment in a systematic way (Scholz 2011). The system boundary of an ecosystem can be established by an observer in order to emphasise on specific aspects of an ecosystem, e.g. the whole Earth or a single drop of water (Sachs 1995).

Over the last few decades, the concept of Environmental Citizenship, as an intersection between environment, civil society and the state, has gained prominence in the domain of both environmental policy and academia (Dean 2001). Despite the widespread use in various arenas, this concept still remains a rather vague aggregation of two similarly elusive and contested concepts – environment and citizenship.

Depending on a particular context, Environmental Citizenship is treated as a theoretical ideal-type, a normative concept, a practical tool or even a practice that should be studied upon. The concept becomes even more complex when Environmental Citizenship is observed in relation to the opposing political traditions (liberal, republican, cosmopolitan) or environmental discourses (eco-modernization, ecofeminist, radical ecology, etc.) (Barry 2006; Hay 2002; Valencia Saiz 2005; Hannigan 2014; Cao 2015).

Indeed, a distinction between Environmental Citizenship, as a liberal and reformist articulation of the relationship between citizens and the environment, can be distinguished from the more radical ecological citizenship (Dobson 2003; Cao 2015). Environmental Citizenship can also be defined as 'pro-environmental behaviour' in public and private, driven by a belief in fairness of the distribution of environmental goods, participation and co-creation of sustainability policy (Dobson



2010). It is about the active participation of citizens in moving towards sustainability.

Environmental Citizenship is a notoriously difficult concept to define, and there is no widespread consensus of its meaning. However, in line with Dobson (2010), the European Network for Environmental Citizenship (ENEC) consortium has put forward a shared definition that essentially sees Environmental Citizenship as a specific kind of behaviour: the responsible pro-environmental behaviour of citizens who act and participate in society as agents of change in the private and public sphere, on a local, national and global scale, through individual and collective actions, in the direction of solving contemporary environmental problems, preventing the creation of new environmental problems, achieving sustainability as well as developing a healthy relationship with nature. This includes the exercise of environmental rights and duties, as well as the identification of the underlying structural causes of environmental degradation and environmental problems, the development of the willingness and the competences for critical and active engagement and civic participation to address those structural causes, acting individually and collectively within democratic means and taking into account inter- and intra-generational justice (ENEC 2018). According to the ENEC definition, Environmental Citizenship could be regarded as a specific bundle of environmental rights, duties, responsibilities, knowledge, awareness and willingness to engage for the protection of the common environmental good. This definition of Environmental Citizenship as essential and specific behaviour or set of behaviours within specific context includes environmental as well as citizenship issues and suggests that individuals need both environmental knowledge and citizenship knowledge from these bodies in order to develop their Environmental Citizenship.

## 5.2 Which Knowledge and How to Acquire It?

There is an urgent need to boost transition to those citizens and communities who are informed, who understand the human impact on the world and who are able and feel empowered to act individually and collectively for sustainability (Mortello and Jasanoff 2004; Derzkzen et al. 2017; Ripple et al. 2017).

This transformation requires a formal and non-formal education that is close to reality, one that fosters the understanding of what is happening in our world, develops critical thinking and democratic competencies and reveals universal values (social justice, wisdom, synergy with nature, equality, inner harmony, responsibility, creativity, self-respect, etc.). Together, these elements (reality, understanding, competencies and values) have to be part of the learning process and of the outcome of this education (Russ 2015).

Knowledge is essential, but fostering knowledge alone in Education for Environmental Citizenship, without links to real life, personal experiences, competencies and values, is insufficient and pointless for the sake of a sustainable world. We also want to emphasise that a distinction is needed between knowledge and

understanding. The understanding of an issue is a process that combines and embeds personal, local, strategic and specialized contributions to knowledge. The green critics of science and knowledge confront heuristic understanding with rational science responsible for environmental threats (Hay 2002).

This explains how knowledge is about knowing the facts and understanding is about the insight and experience of how processes work and how the outcome can change accordingly and how processes can make significant changes in individual relationships to the environment. However, we argue that knowledge and understanding are both important and necessary for the development of potential Environmental Citizenship in individuals. This line of thought is developed below, under the heading of 'types of knowledge'. You can teach a person but it still doesn't mean that a person is educated. Only when the acquired knowledge is applied as a daily behavioural model can we say that it is understood and learned. More than to know is necessary to understand, which the latter means knowledge + empathy. Environmental sensitivity is a predisposition to taking an interest in learning about environment, feeling a concern for it and acting to conserve it (Kollmuss and Agyeman 2002). According to Chawla's (1998) research, the most important experiences that define environmental sensitivity are childhood experiences in nature, experiences of pro-environmental destruction, pro-environmental values held by the family, pro-environmental organisations, role models (teachers or friends) and education.

Since the 1980s, environmental education began to be part of citizen education and path of convergence, and nowadays environmental education is often called Education for Environmental Citizenship (Cao 2015). In order to exert environmental rights and perform environmental duties, citizens need to have an adequate understanding of the environmental challenges and the acceptable ways of reducing potential risks and harm (Valdivielso 2005). Therefore, education that focuses on the development of environmental or ecological values, knowledge, skills and competences should be considered as an important factor in development of Environmental Citizenship. Education for Environmental Citizenship needs integrated systems of knowledge which focus on the understanding of human-environment interactions and on the links between knowledge and actions for sustainability (Ergen and Ergen 2011). The process of knowledge production and how it is 'used' in Education for Environmental Citizenship makes the difference to sustainability (Brosius 2006; Russ 2015). However, an increase in knowledge and awareness does not necessarily lead to pro-environmental behaviour (Kollmuss and Agyeman 2002). Environmental knowledge is a subcategory of environmental awareness, and emotional involvement is what shapes environmental awareness and attitude. There are many more factors that influence pro-environmental behaviour, 'situational factors' that include economic constraints, social pressures and opportunities to choose different actions – demographic-external factors (institutional, economic, social, cultural) and internal factors (motivation, environmental knowledge, awareness, values, attitudes, emotion, locus of control, responsibilities, priorities). Different models have been developed to explain pro-environmental behaviour in its complexity (Kollmuss and Agyeman 2002).

Education should encompass two types of literacy – ecological literacy and civic literacy. The first can be understood as the ability to use ecological understanding, thinking and habits of mind for living in, enjoying and/or studying the environment. Civic literacy, on the other hand, can be defined as the ability to use an understanding of social (political, economic, etc.) systems, skills and habits of mind for participating in and/or studying society (Berkowitz et al. 2005; Olson and Worsham 2012). This implies that Education for Environmental Citizenship should be interdisciplinary and would have the ability to integrate the knowledge developed within environmental (natural) sciences with the relevant knowledge coming from the realm of social sciences. We explore this issue further, under the heading of ‘topical knowledge’.

Being aware of the complexity of the environmental knowledge, certain authors proposed a digest curriculum that would be comprehensible for the majority of the population. For instance, Berkowitz et al. (2005) were inspired by Paul Risser’s definition proposing the following four elements:

1. Multimedia transport of materials
2. Clarifying the ‘everything is connected to everything’ concept
3. Ecology-culture interactions
4. Familiar ecological field observations based on a specific, local ‘spot’

Berkowitz et al. (2005) developed a framework consisting of three components:

1. *Understanding of five key ecological systems:* (a) one’s home community (ecological neighbourhood) and ecosystem, (b) the ecological basis of human existence, (c) the ecology of the systems that sustain us, (d) the globe as an ecosystem and our impacts on it and (e) genetic/evolutionary systems
2. *Building the disposition, skills, and capacity for ecological thinking* (scientific or evidence-based thinking, systems thinking, transdisciplinary thinking, spatial thinking, temporal, quantitative, creative and empathic thinking)
3. *The nature of ecological science and its interface with society*

On the ‘social’ side (civic literacy) of the knowledge that is important for Environmental Citizenship, it could be argued that concepts and theories developed within the scope of environmental sociology, environmental psychology and environmental political science are of particular value. This body of knowledge consists of, but is not limited to, the following: environmental values, awareness and behaviour, environmental activism and movements, environmental/climate justice, environmental inequality, environmental decision-making, environmental governance, environmental communication and media, risk construction and environmental discourses, etc. (ENEC 2018).

According to M. Boström (2012), the term sustainable development is not a very useful theoretical concept for social scientists to understand the relationship between society and nature or for the study of environmental governance, management and communication. The ‘social’ has to do with the entire relationship between society and nature, which includes economic, cultural, political and institutional structures and processes. It is therefore appropriate and feasible to create a civic sense in the

society about the sustainability issues that are associated with civic citizenship education, civic awareness and civic participation (Awan et al. 2014). The concept of civic sustainability (to be able to think and act) empowers change in society. Education serves for the formation of innovative skills with the key learning goal of understanding that sustainability and sustainable development focus not only on a responsible relationship with nature but on questions of values, justice, equity and our relations with each other (Awan et al. 2014).

Education can be formal, informal and/or non-formal. Formal education is related to the process with environmental courses being a major channel of dissemination of environmental knowledge. Research and environmental initiatives endorsed its importance as a way of educating learners with sound environmental knowledge and achieving behavioural change. Environmental Citizenship can be regarded as a primary goal of formal environmental education. Nevertheless, in spite of its importance, and certain improvements that have occurred in the last few years, environmental education is still in the peripheral position within most education systems across the world (Berkowitz et al. 2005).

Informal education, on the other hand, could be a lifelong process connected to different phases of each individual's life course (Williams 2005). Informal environmental knowledge can be a result of self-teaching and do-it-yourself practices that are typical for individuals who are inclined to environmental topics; it could be a part of work-related socialization (e.g. working for a company that deals with environmental issues) or family socialization (children who have environmental education classes in school can socialize their parents, who perhaps did not receive that kind of formal education, into more environmentally friendly practices); or it could be an outcome of the personal encounter with environmental problems and related environmental activism (Escobar 1998). However, it should be noted that the scope of informal education is rather limited since Environmental Citizenship demands a certain level of civic and ecological literacy. Environmental issues often need adequate expertise and scientific equipment in order to be identified and understood (Yearly 1992; Hannigan 2014). Lay, or ordinary, environmental knowledge is limited to personal experiences and local issues. Informal education refers to the experiences of everyday living from which we learn something. This includes education gained from the value of the Internet, through newspapers, magazines, television, radio or discussions with friends and neighbours, and conversations with children about their environmental learning experiences.

Non-formal education refers to organised activities that are outside of educational institutions, such as learning networks, churches and voluntary associations. This includes education that occurs due to participant involvement with government agencies, conservation or environmental groups, zoos and environmental learning centres such as nature centres, parks and science museums (Digby 2010). While local practical knowledge can sometimes be very important in alerting the scientific community to new environmental threats (the local population tends to be the first to notice changes in the local environment, such as the outbreak of the Zika virus), a certain level of expert (global) knowledge is essential for Environmental

Citizenship. This kind of knowledge is primarily acquired through the process of formal education.

Hannigan (2014) talks about the importance of practical knowledge on the environment that often originates from the everyday experiences of, for example, villagers and small farmers. 'This ordinary knowledge is accumulated within local grassroots networks by breathing air, drinking water, tilling soil, harvesting forest produce and fishing rivers, lakes and oceans'. However, 'in contemporary societies, where the media and education penetrate even peripheral regions, local knowledge is a mixture of traditional knowledge, knowledge based on the local people's own observations and popularized science' (Hannigan 2014).

### 5.3 Topical Knowledge

Knowledge provides a precondition for pro-environmental behaviour. There are three different forms of factual environmental knowledge: (i) knowledge about how the environmental system works, (ii) knowledge of how to achieve resource conservation and environmental preservation and (iii) knowledge about the effectiveness of behaviours in terms of achieving best resource conservation. Environmental system knowledge can motivate action-related and effectiveness knowledge that together promote person's environmental behaviour. Environmental knowledge can be divided into environmental system knowledge, action-related knowledge and effectiveness knowledge (Roczen et al. 2014).

Increasing public awareness regarding the importance of environmental sustainability and the promotion of universal values are a way to reinvent knowledge of the environment among the general public, to answer questions about how knowledge about human-environment interactions can be used to develop practical strategies to encourage pro-environmental behaviour and create sustainable environments (interdisciplinary collaboration). We should all have the congenial recognition about work of environmental systems and the operation of natural processes; however, civilisation brought us to live in more artificial surrounding and to lose the sensibility to natural processes understanding. That is the reason for raising awareness of the Environmental Citizenship as a way of integrating the environment into citizenship questions. This is to the extent to which a model of citizenship, centred on the individual, comprehends citizenship as a status that grants individuals legal protection and allows them to pursue their private interests, bearing in mind that critical environmental issues (environmental risks), such as ozone depletion, nuclear waste and climate change, transcend national borders and demand transnational solutions and cooperation (cosmopolitan citizenship).

Natural ecosystem functioning in its original form (ecological or biological approach) would mean a natural system that would be undisturbed by human interventions. This would call for an extensive protection of nature from human use and over-exploitation. Whenever there is a scarcity of resources or if a living (biotic) resource is in danger of deterioration or extinction, conservation should be a reaction to remove

the resource from human use. Economic viability is the most important aspect of sustainability, while social and ecological aspects are realised mainly incidentally.

## 5.4 Types of Knowledge

Several relevant definitions and typologies of knowledge are put forward by different authors. Frick et al. (2004) consider that there are three types of knowledge forms that must work together in promoting conservation behaviour:

- *System knowledge*, or the understanding of the natural states of ecosystems and the processes within them
- *Action-related knowledge*, when people know what can be done about environmental problem
- *Effectiveness knowledge*, or knowledge about the benefit (effectiveness) of environmentally responsible actions

Roczen et al. (2014) have recently applied this typology of knowledge to their competence model for environmental education. The model itself specifically addresses the relative importance of knowledge in the causation of pro-environmental behaviours and specifies that affective factors (such as connectedness to nature (Frantz and Mayer 2014) and environmental values (Bogner and Wiseman 2004)) are more accurate predictors of such actions. At the same time, the model does give a central role to knowledge, and it clarifies that not all knowledge is equally important. Systems knowledge (or factual knowledge over the environment) in this competence model has no direct effect on the environmental behaviour of individuals. There are the two more applied forms of knowledge that do have an effect: knowing how to perform actions (action-related knowledge) and being able to distinguish between several options. Which one has what impact on the natural environment appears to be an important precondition for environmental action-taking by individuals. These findings have significant implications for the design of the curricula that aim to foster Environmental Citizenship. Such curricula should clearly include important emphases on applied knowledge and allow for learners to acquire knowledge and understanding of possible actions that can contribute to addressing specific environmental problems. Does this then mean that in such curricula there is no need for systems knowledge? If we look back at the competence model for environmental education from Roczen et al. (2014), it becomes clear that while systems knowledge has no direct impact on environmental action-taking by individuals, it does contribute to building both action-related knowledge and effectiveness knowledge. Indeed, while systems knowledge in itself is not enough, the two applied forms of knowledge cannot be built in the absence of systems knowledge.

In addition to the three types of knowledge in the competence model described above, there is also a fourth type: social knowledge. This is occasionally included, chosen individually based on personal preferences, standards and existing social ties (Hanna 1995). According to Frick et al. (2004), knowledge structure is crucial

in practice for designing knowledge-based campaigns and educational curricula. It is explained that the understanding of a problem (system knowledge) can lead to the ability to acquire action-related knowledge, while basic scientific knowledge alone cannot lead to the target behaviour. However, even if a person knows what actions need to be taken, the final decision will be based on effectiveness knowledge, which is in line with the findings of Roczen et al. (2014). Boeve-de Pauw and Van Petegem (2018) show that the lack of impact of the educational programmes on students' environmental actions could be due to an absence of focus on the applied types of knowledge in formal education. According to these conclusions, knowledge-based education should focus on all three knowledge forms. Environmental education aim should be to foster expectations about the impact or effectiveness of individual behaviour as a necessary additional input to promote desired behaviour in the society and surrounding.

## 5.5 Knowledge Use and Production

Bruckmeier and Tovey (2008) proposed four variants of understanding and practising resource management for sustainability and clear differentiation of types of knowledge that will be applied in resolving individual approaches to optimal resource management:

- *Scientific approach* (especially ecological) is used as a *guiding knowledge* in the resource renewal. This approach means managing the renewal of resources during use or after, e.g. sustainable forest management, energy consumption reduction (ecological modernization).
- *Managerial-political knowledge* is guiding knowledge in the quality of life approach. The quality of life approach means the resource is managed to improve some conception of local quality of life (access to water, fuel, landscape, health).
- *Local knowledge* is crucial in the management of a resource to provide improved sustainable local livelihoods.
- Different knowledge forms, scientific, managerial and local become *combined* when the resource is managed through the participation or cooperation of those who have an interest in it being sustained. Participatory resource management including local resource-dependent stakeholders, scientists, global actors and resource-dependent animals all become involved, and there is no longer one generally dominant knowledge form.

While scientific knowledge is mainly explicit, well documented, institutionalized and sequential, local knowledge is experiential, informal, simultaneous and often tacit (lay knowledge) (Rahman 2000; Bruckmeier 2004). Local knowledge sometimes overlaps with traditional knowledge, although the dynamics of the succession of these types are different (Bodorkós et al. 2005). Managerial knowledge is often combined with political-managerial knowledge (Bruckmeier and Tovey 2008).

But we can also distinguish the difference between local and global knowledge (Tovey 2008). Local knowledge is often explained as ‘traditional’, ‘indigenous’ or ‘ethnic’ – the knowledge systems held by local boundary and distinctive cultural groups (Brosius 2006). Global knowledge is identified with the extension of western sciences and technological knowledge into global knowledge. Knowledge in its different forms and combinations can help to reconnect social and natural systems. Knowledge management is the application of knowledge as an element of the larger processes of social interaction, knowledge and social capital building, which aims to unify scientific, managerial and local knowledge (Tovey 2008).

Knowledge use requires a broader view, including generation, codification, dissemination, application and assessment. When these dimensions of knowledge process are included, knowledge becomes visible in action and practice. Knowledge is socially distributed in different and unequal forms and often faces problems associated with achieving successful cooperation (problems of inequality, social exclusion, power differences and conflicts). It is under the conditions of inequalities and unequal opportunities, differentiated ownership and access to and control over resources. The relationship between experts and the lay citizen is also eroded in the public sphere. The inclusion in knowledge to local, lay actors such as consumers, citizens, patients and clients has become a central issue for environmental sustainability projects (Tovey 2008).

Environmental knowledge should be produced as an interdisciplinary or transdisciplinary approach that uses a diversity of methods to provoke citizen-environment interactions and to build a natural environment influence on citizen and citizen behaviour to make positive changes in the environment. The process of the production of knowledge in Education for Environmental Citizenship encompasses a transdisciplinary approach:

- A bottom-up approach – co-production of knowledge (experts and citizens)
- Participatory process (allows the network of knowledge holders – from local knowledge to shared knowledge)

Education for Environmental Citizenship could unify environmental education, education for sustainability, science education and citizenship education, so the knowledge included in the focus of Education for Environmental Citizenship should come from these different types of educations.

Environmentology as a new term can be explained as a science discipline that includes a complex of other sciences (biology, ecology, sociology, environmental sciences, economy, politics, psychology, etc.) and brings a multidisciplinary approach to understanding and acting pro-environmentally. It includes empathy and concerns natural and cultural heritage for the future of the planet and its inhabitants.

Co-creation between the expert and the lay citizen is central to the idea of a participatory approach to the production of knowledge (Weber and Khademian 2008). It could manifest itself as a new form of action research of natural resource governance. It replaces the traditional politics of expertise with the recognition that there are multiple ways of knowing, evaluating and acting towards socio-natural



systems over time. Sustainability is strongly shaped by differences in culture, historical experience and economic and environmental conditions. The four pillars approach for social, economic, cultural and ecological (or environmental) sustainability aims for the achievement of balanced economic development, social inclusion and environmental protection (Bruckmeier and Tovey 2008; Boström 2012). Interdisciplinary collaboration provides a different view on the phenomenon, while in combination they provide a comprehensive picture on the problem (architecture, geography, social and cognitive psychology, environmental science). Sustainability can be seen as a guiding idea rather than as a target point of development (Kelemen et al. 2008). Sustainability planning requires the involvement of a wide range of actors with different forms of knowledge, interests and value commitments, and in an ideal situation knowledge-sharing among these actors may become the source of community learning. The participatory approach to knowledge production and the development of expertise is a platform of interaction between participants in sustainability planning and combining different types of knowledge to assure the above-mentioned sustainability (expert, scientific, managerial, tacit or lay) flows into the same project (Csurgó et al. 2008).

## 5.6 Conclusion

The concept of Environmental Citizenship includes knowledge, awareness, responsibility, consciousness, ability and respectful behaviour towards the environment both at an individual level and a societal level. It should therefore be perceived as the guiding lifestyle option for future generations. However, in order to adopt such a lifestyle, Environmental Citizenship should be clearly defined, while at the same time misconceptions such as ‘the environment only concerns ecology’ should be abolished. There has been a growing concern throughout the last few decades about the damage that human activities have caused to the environment. No single person gets up in the morning and decides to intentionally contribute to climate change, destruction of the ozone layer, deforestation, etc. What appear to be harmless daily decisions/actions often have far-reaching consequences on the planet. The aim should be to make everyone aware of their ecological footprint (defined as the influence of the everyday activities of every individual person on the planet Earth) through Environmental Citizenship. The goal of this chapter is to emphasise the need to establish an Education for Environmental Citizenship that includes basic knowledge from the very beginning of our educational system. This would be achieved by focusing the knowledge gained in these two pillars: (i) relevant knowledge to Environmental Citizenship and (ii) which instrument decides on the knowledge gained through (formal and non-formal) Education for Environmental Citizenship.

An education programme with an emphasis on ‘environmentology’ could provide a conceptual conscientious approach to life and the planet’s resources. It should

also emphasise the need for in-depth environmental scientific knowledge and understanding so that sustainable solutions are provided. It should also highlight the inherent diverse nature of the environment and its different aspects in every scientific and social field. The knowledge gained should assist in the application of environmental ethics in every human activity. Physical boundaries should not inhibit the application of environmentology but rather enhance its implementation in everyday life in order to preserve natural and cultural heritage for the future generations.

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