



## **Female and male teachers' pro-environmental behaviour, conceptions and attitudes towards nature and the environment do not differ: Ecofeminism put to the test**

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## Contents

- [Abstract](#)
  - [Introduction](#)
    - [Background to the study](#)
    - [Environmental awareness](#)
    - [Ecofeminism](#)
    - [Aim of the study](#)
    - [Research questions](#)
  - [Materials and methods](#)
    - [Participants](#)
    - [Materials](#)
  - [Results](#)
    - [Few significant differences between genders](#)
    - [Main difference between countries](#)
  - [Discussion](#)
    - [Tested categories of ecofeminism](#)
    - [Evaluation of ecofeminism](#)
    - [Comparisons with other studies](#)
    - [Limitations of the study](#)
  - [Conclusion](#)
  - [References](#)
-



## Abstract

Teachers' pro-environmental behaviour, conceptions and attitudes towards nature and the environment were investigated using 47 questions from the BIOHEAD-Citizen questionnaire. The sample included 1,109 pre- and in-service teachers from Sweden and France. Analyses showed only few significant differences between female and male teachers. Forty-one questions were further analysed in terms of ecofeminism. Ecofeminism claims that women and men's conceptions and attitudes towards nature and the environment differ, in the sense that women show higher awareness of environmental issues than men. Our study finds quite poor support for this claim and therefore challenges ecofeminism. This may have implications for environmental education and the perspectives of sustainable development at schools, as our results indicate that there is no reason to fear that male teachers are less engaged with environmental education than female teachers.

**Keywords:** Attitudes; Ecofeminism; Education; Pro-environmental behaviour; Sustainable development; Teachers.

## Introduction

### Background to the study

There have been claims that women show greater concern and responsibility for nature and the environment than men (Besthorn & Pearson McMillen, 2002; d'Eaubonne, 1974; Loots, 2011; Shiva, 1988). This is one of the cornerstones of ecofeminism, a discourse that combines feminist theory and biology (Zell, 1998). If this claim was verified scientifically, it might have an impact on environmental education in schools, in the sense that female teachers would be expected to put more effort into education about environmental dimension of sustainable development, compared to male teachers. Our study should be seen as an attempt to verify or refute this claim.

We had the opportunity to use the questionnaire developed within the European research project BIOHEAD-Citizen (Biology, Health and Environmental Education for Better Citizenship; Carvalho, Clément, Bogner & Caravita, 2008), where one of the topics was pre- and in-service teachers' pro-environmental behaviour,



conceptions and attitudes towards nature and the environment. With a sample of teachers from Sweden and France, it was possible to empirically investigate the claim that women show greater concern and responsibility for nature and the environment, compared to men. Thus, we used the questionnaire and selected questions, which could test pro-environmental behaviour, conceptions and attitudes towards nature and the environment, and analysed these with respect to different perspectives of ecofeminism

### **Environmental awareness**

The concept 'sustainable development' became well-known to the public through the work of the Brundtland Commission in 1987 (United Nations, 1987). The Commissions' definition of sustainable development was: 'development which meets the needs of current generations without compromising the ability of future generations to meet their own needs'. The three dimensions of sustainable development – the economic, social and environmental – should support each other. At United Nations meeting, World Summit on Sustainable Development held in Johannesburg 2002, the concept of sustainable development was recognised as superior principle for the work of the United Nations (United Nations, 2002). Teachers are vital in this process and supposed to promote students in their concern about environmental issues. UNESCO declared 2005 – 2014 as the 'Decade of Education for Sustainable Development' (UNESCO, 2005).

Conceptions that teachers have of nature and the environment have been the object of only a few studies. The gender perspective was investigated by Oerke and Bogner (2010), who studied 367 German pre- and in-service teachers' environmental attitudes within the BIOHEAD-Citizen Project (Carvalho et al., 2008). The authors used Two Major Environmental Models (2-MEV Model) of Bogner and Wiseman (2006), and identified two independent dimensions 'Preservation' (P) and 'Utilization' (U), reflecting ecocentric and anthropocentric concerns, respectively. Preservation characterises enjoyment and protection of nature, while U emphasises human rights to control and utilise nature. As the model permits high scores on both dimensions, it implies that there are no general conflicts between protection and utilisation of nature. The authors reported results from grouping pre- and in-service teachers according to gender, age, educational level and subject. Some significant differences appeared. Concerning gender, scores for U were significantly higher for men, than for women. There was an



increase in scores for both P and U with increasing age for both genders. With increasing age, there was significance for U for the group as a whole, while an increase for P was seen only for women. A characteristic result was that women in the oldest cohort showed significantly high scores for P.

Munoz, Bogner, Clément and Carvalho (2009) presented results from environmental attitudes of approximately 6,400 pre- and in-service teachers from 16 countries. However, no gender perspective was reported. The authors used the 2-MEV model of Bogner and Wiseman (2006). One of their main findings was that there was significant inter-country variation related to the U dimension. Munoz and colleagues (2009) suggested that teachers from less developed countries might be more anthropocentric and more focused on using natural resources.

Zelezny, Chua and Aldrich (2000) described an investigation where environmental attitudes and behaviours of almost 2,160 students from 14 countries were analysed. The study was performed among English- or Spanish-speaking undergraduate students from Europe, Latin America, and the United States, who were participating in social or behavioural courses. They used the New Environmental Paradigm (NEP) theoretical framework (Dunlap & Van Liere, 1978; Dunlap, Van Liere, Mertig, & Jones, 2000) and found that women had significantly stronger New Environmental Paradigm (NEW) scores than men. Women also showed stronger ecocentric environmental attitudes and pro-environmental behaviour than men. The same authors also presented an overview of gender and environmental attitudes and behaviours from 1988 to 1998, which showed that women displayed more general concerns about the environment than men and also demonstrated greater participation in pro-environmental behaviour (Zelezny et al., 2000).

The above studies show differences in attitudes and behaviour about nature and environmental concern between women and men, although in different degrees. A common way to explain these gender differences is by means of socialisation theory (Eagly, 1987). According to this theory, women are socialised by gender expectations to become nurturing, cooperative and to be helpful in caregiving roles, while men are socialised to be competitive and independent. Within the feminist framework, the social movement and theoretical discourse ecofeminism gives women special connection to nature. This connection generates assumption that women have positive attitudes towards the environment and environmental conservation (Jackson, 1993). Women are more aware of environmental issues than



men because of their natural closeness to nature (Mies & Shiva, 1993; Shiva, 1988). This assumption has been challenged by Momsen (2000), who argues that women's claim to be more concerned with the environment has not been verified by empirical studies. Our study aims to empirically explore if there is any support to the hypothesis that women are more aware of nature and the environment in view of their alleged natural closeness to nature. This could have consequences for environmental education in schools.

### **Ecofeminism**

Ecofeminism could be regarded as both social movement and theoretical discourse (Kronlid, 2003). The social movement was followed by theoretical discourse at Western universities in the 1970s. The concept 'ecofeminism' was coined by Francoise d'Eaubonne, French writer and feminist, in 1974 in the book *Feminism or Death* (d'Eaubonne, 1974). In this book, she called on all women to lead an ecological revolution to save the planet earth, a revolution that also would give women equal opportunities. The ecofeminist discourse has then changed into being heterogeneous in nature (Warren, 1996). It has been developed by researchers such as the Indian ecofeminist Vandana Shiva (Salleh, 2009) and by the American ecofeminists Ynestra King, Carolyn Merchant and Karen Warren (Kronlid, 2003).

Ecofeminism is defined as a discourse that draws on feminist theory and biology, particularly ecology (Zell, 1998), although primarily on feminist discourse (Li, 2007). The Swedish National Encyclopaedia defines ecofeminism as 'collective denomination of those feminist groups which regard environment as central' (authors' translation; The Swedish National Encyclopaedia, 2014). According to Warren (1994), ecofeminism could be regarded as an umbrella term for different views on the parallel oppression of women and nature. Ynestra King states that 'ecofeminism is about connectedness and wholeness of theory and practice – it sees the devastation of mother earth and human beings by the corporate warriors of feminist concern' (Kamble, 2012, p. 1). Kamble (2012) also talks about difficulties of defining ecofeminism, as it is influenced by different feminisms.

Ecofeminism accentuates that theory and practice are related internally (Buckingham, 2004; Kronlid, 2003; Mallory, 2006). This means that theoretical positions have great impact on practice and that theoretical standpoints ought to be developed in close relationship to different practices. These theoretical standpoints



are not only discussed in terms of a general theory, but also in view of a personal, moral responsibility (Kronlid, 2003). This could be manifested in personal attitudes towards nature in practice, and is perhaps best understood by its personalised interpreter, such as Ynestra King, Carolyn Merchant and Karen Warren (Braidotti, Charkiewicz, Häusler, & Wieringa, 2004).

In his thesis, Kronlid (2003) describes ecofeminism from the perspective of environmental ethics, and ascribes the theoretical basis and the academic discourse of ecofeminism theory to that part of ecophilosophy, which combines environmental issues and gender issues. Kronlid argues that ecofeminism is a complex theory, not sufficiently precise, and hence a vague theory. In the 1990s, the academic discourse ecofeminism remained specialised and marginalised in the fields of women's and environmental studies (Gaard, 1994). In recent years, ecofeminism has put greater effort into ethical and political issues (Li, 2007). Gaard (2010) advocates that in the future ecofeminism will explore the intersections of ecofeminism and the queer theory, ecofeminism and bioregionalism, and ecofeminism and vegetarian and vegan feminist threads.

Some central themes in ecofeminism will be described below. Common to all ecofeminism forms and variants is the assumption that there is a connection between oppression of women and nature (Braidotti et al., 2004; Goldstein, 2006; Kronlid, 2003; Leach, 2007; Mallory, 2006). This is the theme of double oppression, which means that oppression of women is related to non-sustainable exploitation of nature. The grounds for this oppression are the patriarchal society and the power of men (Braidotti et al., 2004; Warren, 2000). The idea of a connection between women and nature can be traced back to pre-industrial periods (Merchant, 1990). The author's view is that nature was idealised as a life-giving mother, and was considered to be 'organic', that is, to be an organism. Women were regarded as being more associated with nature, compared to men because of their birth-giving roles, breast-feeding and child raising. Later on, the view of nature was changed into a more mechanistic one. Nature was considered to be source of resources that could be exploited and something mankind could rule. As women were connected to nature, they were also looked upon as someone that could be ruled (Merchant, 1990). However, there are contemporary ecofeminists, who have taken steps away from this double oppression perspective (Li, 2007). These feminists are more engaged in questions about interrelated ecological, economic and social problems.



Ecofeminism takes an ecocentric or non-anthropocentric view (Braidotti et al., 2004; Kronlid, 2003). There is concern for organisms other than humans, and other organisms have values of their own beyond their potential utility for humans (Loots, 2011; Thompson & Barton, 1994). From this follows that nature ought to be respected. Jackson (1993) writes: 'First, for ecofeminists, life is an interconnected web not a hierarchy. Thus, human life has no greater value than non-human life and forms of nature are not of differential value' (p. 397).

Women's allegedly closer relationship with nature, compared to men's is also discussed in terms of knowledge of nature (Croeser, 2011; Leach, 2007). In traditional societies and former peasant cultures, women have long been regarded as having more knowledge of nature and its different organisms, compared to men (Rocheleau, Thomas-Slayter, & Wangari, 1996). From the ecofeminism perspective, this gives women a special connection to nature, which in turn leads to the assumption that women have positive attitudes towards the environment and environmental conservation (Jackson, 1993). Their natural closeness to nature makes women more aware of environmental issues than men (Besthorn & Pearson McMillen, 2002). From childhood, women are socialised to be family nurturers and caregivers, and this gives expectations that women should be more concerned with environmental issues (Leach, 2007; Mohai, 1992).

Western natural science is challenged by ecofeminism (Braidotti et al., 2004; Salleh, 2006). Western science highlights its crucial role for the production of science and invalidates all other forms of science (Kumar D'Souza, 1989). In this way, Western science has total control over the truth of reality, and no other forms of knowledge are accepted. The production of science in Western society is closely linked to power institutions, and this is problematic (Foucault, 1980). This Western society framework has been challenged in the ecofeminist debate, where another epistemological framework has been proposed (Kumar D'Souza, 1989). In this new framework, those who are excluded from the dominant scientific patriarchal science system will be included in science and knowledge production. This framework should respect plurality, different cultures and traditions, and especially emphasise the so-called south-north perspective.



## **Aim of the study**

This brief description of ecofeminism points to its characteristics. Ecofeminist principles could be expressed as women's special connection to nature, women's positive conceptions and attitudes towards nature, thus, implicating women's higher awareness of environmental issues than men and a personal moral responsibility followed by responsible practice. If these statements are empirically true, it might have an impact on environmental education in schools, in the sense that female teachers would be expected to put more effort into education about environmental dimension of sustainable development, compared to male teachers.

The aim of this study is to investigate if women's allegedly greater concern and responsibility for nature and the environment compared to men's could be verified in a group of 1,109 Swedish and French pre- and in-service teachers. Moreover, if there are any differences, we will investigate if these can be explained from an ecofeminist perspective.

## **Research questions**

1. Are there any differences between female and male pre- and in-service teachers' conceptions and attitudes towards nature and the environment, which could lead to different pro-environmental behaviour? If there are differences, how can these be described?
2. To what extent can differences, if any, be explained from an ecofeminist perspective?

## **Materials and methods**

### **Participants**

The study sample consisted of pre- and in-service female and male teachers from Sweden and France. The participants were primary school teachers and secondary school subject teachers of biology and language, respectively. Approximately half of the participants were pre-service and half in-service teachers. Within each country, there were about the same number of participants in each of the six groups described above. The Swedish pre-service teachers were recruited from five different universities in Sweden, while the Swedish in-service teachers were



participating in teacher professional development programmes at two of these universities, or worked in or in the vicinity of these university cities. Furthermore, in-service teachers from all over Sweden participating in two national Swedish networks of biology and Swedish language teaching, respectively, answered the questionnaire. In France, the sample consisted of pre-service teachers attending training courses, and in-service teachers in schools or in training workshops on topics different from those of the BIOHEAD-Citizen Project (Castéra & Clément, 2014). Participants came from mixture of rural, regional and urban areas, and were chosen on the basis of convenience and not just randomly.

A total of 1,109 individuals participated: 732 from France and 377 from Sweden. The proportion of women was 74.8% in Sweden, 76.1% in France, and 75.7% in Sweden plus France. When the term 'teachers' is used in this study, it includes both pre- and in-service teachers.

## **Materials**

### *Questionnaire*

A questionnaire developed for the BIOHEAD-Citizen Project (Carvalho et al., 2008) was used. Out of the 173 questions in the questionnaire, responses to 47 questions dealing with pro-environmental behaviour, attitudes towards and conceptions of nature and the environment, were selected and analysed. Of the 47 questions, only 41 were further analysed in terms of an ecofeminist perspective, as six questions were considered as being ambiguous from ecofeminism's views. The forty-one questions were each analysed within the Swedish sample, the French sample and the Swedish plus French sample.

Answers to most questions were given on a Likert-scale (four or five options; Table 1; Likert, 1932). In Sweden, the questionnaire was made available in electronic version (Survey&Report, Artologik) that was distributed by e-mail to participants, and answers were collected automatically. In France, questionnaires were filled in by teachers, anonymously and in the presence of the researcher. Validity and reliability were piloted and tested in the original BIOHEAD-Citizen questionnaire, in France as well as in other countries (Clément, Laurent, & Carvalho, 2007; Carvalho et al., 2008; Munoz et al., 2009). Translations into Swedish were done twice by two different translators from an English reference questionnaire. These two versions were then compared and adjusted to one version. To check for validity,



the questionnaire was translated back into English. Swedish participants were told that the study followed ethical guidelines of the Swedish Research Council throughout the project and that participation was voluntary.

**Table 1.** Questions testing female and male pre- and in-service teachers' pro-environmental behaviour, conceptions and attitudes towards nature and environment, from an ecofeminism perspective

Questions in categories	Rating scale	Significant difference (p-value<0.005)		Supporting or challenging ecofeminism
		Multivariate analyses	Univariate analyses	
<b>Attitudes</b>				
<b>A69, A71-A76</b> ( <i>How do you perceive the notion of 'Environment'</i> )				
<b>A69</b> ('Beautiful' - 'Ugly')	Likert-scale 1-5			
<b>A71</b> ('Wild' - 'Artificial')	Likert-scale 1-5			
<b>A72</b> ('Pleasant' - 'Unpleasant')	Likert-scale 1-5			
<b>A73</b> ('Terrifying' - 'Reassuring')	Likert-scale 1-5			
<b>A74</b> ('Pure' - 'Impure')	Likert-scale 1-5			
<b>A75</b> ('Constructed' - 'Given')	Likert-scale 1-5			
<b>A76</b> ('Good' - 'Bad')	Likert-scale 1-5			
<b>A77, A79-A84</b> ( <i>How do you perceive the notion of 'Nature'</i> )				
<b>A77</b> ('Beautiful' - 'Ugly')	Likert-scale 1-5			
<b>A79</b> ('Wild' - 'Artificial')	Likert-scale 1-5			
<b>A80</b> ('Pleasant' to 'Unpleasant')	Likert-scale 1-5		*	Supporting
<b>A81</b> ('Terrifying' - 'Reassuring')	Likert-scale 1-5			
<b>A82</b> ('Pure' - 'Impure')	Likert-scale 1-5			
<b>A83</b> ('Constructed' - 'Given')	Likert-scale 1-5			
<b>A84</b> ('Good' - 'Bad')	Likert-scale 1-5			
<b>Ecocentric and anthropocentric views</b>				
<b>A1</b> ( <i>We must set aside areas to protect endangered species</i> )	Likert-scale 1-4; 'I agree' - 'I don't'			



	agree'			
<b>A4</b> ( <i>Nature is always able to restore itself</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A7</b> ( <i>Humans will die out if we don't live in harmony with nature</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A8</b> ( <i>People worry too much about pollution</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A11</b> ( <i>Industrial smoke from chimneys makes me angry</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A16</b> ( <i>Our planet has unlimited natural resources</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A17</b> ( <i>Society will continue to solve even the biggest environmental problems</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A18</b> ( <i>Human beings are more important than other living beings</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A22</b> ( <i>I enjoy trips to the countryside</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A23</b> ( <i>We need to clear forests to increase agricultural areas</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A28</b> ( <i>It makes me sad to see the countryside taken over by building sites</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A32</b> ( <i>Humans have the right to change nature as they see fit</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A40</b> ( <i>It is interesting to know what kinds of animals live in ponds or rivers</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A50</b> ( <i>All contemporary plant species should be preserved because they may help in the discovery of new medicines</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A54</b> ( <i>Only plants and animals of economic importance need to be</i>	Likert-scale 1-4; 'I agree' - 'I don't			



<i>protected)</i>	agree'			
<b>A70</b> ( <i>How do you perceive the notions of 'Environment'. Tick the box nearest the word you find the most appropriate to characterise 'Environment'</i> )	Likert-scale; 'To be used' - 'To be preserved'			
<b>A78</b> ( <i>How do you perceive the notion of 'Nature'. Tick the box nearest the word you find the most appropriate to characterise 'Nature'</i> )	Likert-scale; 'To be used' - 'To be preserved'	*		Supporting
<b>Personal standpoints</b>				
<b>P6-P8</b> ( <i>Are you involved in activities pertaining to environmental conservation and/or sustainable development?)</i>				
<b>P6</b> ( <i>At home, in your family, in your local community</i> )	Often - Sometimes - Never			
<b>P7</b> ( <i>In an organisation - formal and informal</i> )	Often - Sometimes - Never			
<b>P8</b> ( <i>Professionally</i> )	Often - Sometimes - Never			
<b>Environmental education</b>				
<b>A61</b> ( <i>In your opinion, the main goal of environmental education in schools should be</i> )	Likert-scale 1-4; 'Providing knowledge' - 'Developing responsible behaviour'			
<b>Genetically modified organisms (GMOs)</b>				
<b>A12</b> ( <i>Genetically modified plants will help to reduce famine in the world</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'	*	*	Challenging
<b>A13</b> ( <i>Genetically modified organisms are contrary to nature</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>A39</b> ( <i>Genetically modified plants are good for the environment because their cultivation will reduce the use of chemical pesticides, e.g. insecticides,</i>	Likert-scale 1-4; 'I agree' - 'I don't agree'			



<i>herbicides)</i>				
<b>A47</b> ( <i>Genetically modified plants are harmful to the environment because they will contaminate other crop plants, menacing their survival</i> )	Likert-scale 1-4; 'I agree' - 'I don't agree'			
<b>Trust in authorities</b>				
<b>A56a</b> ( <i>There is a decision-making process in the implementation of science applications related to environment and biotechnology. Indicate your degree of confidence in different actors to make such decisions</i> )	Likert-scale 1-4; 'Scientist' - 'Members of Parliament'	*	*	Challenging
<b>A56b</b> ( <i>There is a decision-making process in the implementation of science applications related to environment and biotechnology. Indicate your degree of confidence in different actors to make such decisions - tick only one case</i> )	Likert-scale 1-4; 'Science experts of this specific field' - 'Science experts of diverse fields including ethics'			

### **Categories**

The 41 questions were grouped according to different categories in the field of nature and the environment to catch different conceptions, attitudes and behaviour. Sometimes a question could be regarded as belonging to two categories, but was placed in the most appropriate one. The six categories were Attitudes, Ecocentric and anthropocentric views, Personal standpoints, Environmental education, Genetically modified organisms (GMOs), and Trust in authorities (Table 1). The first four are all linked to ecofeminist principles, while other arguments are given for the last two categories to show that these also could evaluate ecofeminism.

### **Attitudes**

The view that there is special relationship between women and nature is a key concept of ecofeminism (Goldstein, 2006; Leach, 2007), and one of the main ecofeminist principles. This special connection to nature leads to the assumption that women have positive attitudes towards the environment and environmental conservation (Jackson, 1993), and women are considered to be more environmentally sensitive because of their traditional caring and nurturing role



(Merchant, 1990). Of the 41 questions, 14 were grouped in the category Attitudes (A69, A71-A77, A79-A84; Table 1) and could be used to test the ecofeminism perspective.

### ***Ecocentric and anthropocentric views***

Ecofeminists have an ecocentric view, in which all living organisms are important for their own sake and have values of their own beyond their potential for humans (Besthorn & Pearson McMillen, 2002; Braidotti et al., 2004; Kronlid, 2003; Loots, 2011). To have an ecocentric view could thus be regarded as embracing one of the ecofeminist principles. Life is regarded as an interconnected web and thus human life is of no greater value than non-human life (Jackson, 1993). The opposite standpoint denotes an anthropocentric view. Thus, answers to the 17 questions about ecocentric (A1, A7, A11, A22, A28 and A40; Table 1) and anthropocentric (A4, A8, A16-A18, A23, A32, A50 and A54; Table 1) views, respectively, could be used to test ecofeminism. Questions A70 and A78 (Table 1) deal with both ecocentric and anthropocentric views.

### ***Personal standpoints***

Ecofeminism points to the close connection between theory and practice, and the view of personal moral responsibility (Kronlid, 2003). Social movements have great impact on protecting local nature and environment (Jain, 1984; Mallory, 2006). In recent times, ecofeminists have put greater effort into ethical and political issues (Li, 2007). Personal responsibility is thus an important part of ecofeminism and one of the ecofeminist principles, in which women are believed to show increased responsibility compared to men. This can be tested in following three questions P6-P8 (Table 1), and consequently be used to evaluate ecofeminism.

### ***Environmental education***

Responsible practice is one of the main themes that characterise ecofeminism, and thus one of the ecofeminist principles, and is seen in terms of personal moral responsibility (Kronlid, 2003). Ecofeminism sees women as political activists and moral agents (Li, 2007). Question A61 (Table 1) investigates respondents' views of the main goal of environmental education in schools, providing knowledge or developing responsible behaviour, and is thus possible to use in the evaluation of



ecofeminism. The prediction in favour of ecofeminism would be that women acknowledge responsible behaviour to a greater extent than men.

### ***Genetically modified organisms (GMOs)***

Ecofeminism challenges the use of GMOs (Croeser, 2011; Forsey, 2002; Loots, 2011; Orias & Caputi, 2013). The four questions about GMOs were about reducing famine in the world thanks to GMOs (A12; Table 1): if GMOs are contrary to nature (A13; Table 1), if GMOs could reduce usage of pesticides (A39; Table 1), and if GMOs could contaminate other crop plants (A47; Table 1). Ecofeminism does not agree that increasing productivity based on GMOs will reduce famine in the world (The Bonn Declaration on GMOs, as cited in Loots, 2011). Ecofeminists see GMOs as contrary to nature (Croeser, 2011; Forsey, 2002), that GMOs will not reduce amounts of herbicides used in agriculture (Loots, 2011) and that genetically modified plants could contaminate related plants in neighbouring fields (Loots, 2011). Thus, responses to the above four questions about GMOs could evaluate ecofeminism.

### ***Trust in authorities***

Ecofeminism challenges Western science (Besthorn & Pearson McMillen, 2002; Braidotti et al., 2004; Salleh, 2006). Two questions in the questionnaire (A56a and A56b; Table 1) are about degree of confidence in different actors: the first about scientists or members of parliament and the second about science experts in diverse fields including ethics or not. As ecofeminism challenges Western science (Braidotti et al., 2004; Salleh, 2006), women ought to place more trust in members of parliament than scientists for indicating support for ecofeminism. Ethical behaviour is important to ecofeminists (Kheel, 2007); thus, to indicate support for ecofeminism, women ought to trust experts in diverse fields where ethics is included, more than experts in fields without ethics perspectives. Responses to these two questions could thus evaluate ecofeminism.

### **Analyses**

Different multivariate analyses were used, validated for this kind of data (Munoz et al., 2009). All computations were performed using the statistical software 'R' (Ihaka & Gentleman, 1996). In the present work, we mainly used 'Between analyses' (Dolédec & Chessel, 1989) to discriminate between groups of individuals,



e.g. between gender or between countries, in order to analyse which of the teachers' conceptions differed most between groups. Nevertheless, differences between groups can be a single consequence of another significant difference. For instance, gender difference can result from the greater number of biology teachers where there are more men. By using the principal component analysis of the orthogonal instrumental variables (PCAIV), it is possible to suppress the effect of one or several variables (Sabatier, Lebreton, & Chessel, 1989). This analysis, PCAIV, was performed to determine if gender effect was still significant after suppression of other significant effects (countries, groups of teachers, levels of qualification and religions).

A 'Monte-Carlo permutation test' (Romesburg, 1985) was used to test statistical significance of the instrumental variable analyses, to ascertain whether a difference between groups was significant or not. To complete results and to examine differences between groups for one precise question, we also used univariate test ('Pearson's Chi-square test').

## Results

### **Few significant differences between genders**

Several between-class analyses showed significant differences ( $p\text{-value} < 0.005$ ) among groups defined by some instrumental variables: countries, gender, groups of teachers (primary school teachers, and secondary school subject teachers of biology and language), levels of qualification and religions. The gender effect was significant for Swedish sample, French sample and for Swedish plus French sample. Nevertheless, after suppression of other significant effects (PCAIV), gender effect was no more significant for French sample. It was still significant for Swedish sample ( $p\text{-value} < 0.005$ ), but only from responses to questions A12 and A56a (Table 1). It was also significant for Swedish plus French sample ( $p\text{-value} < 0.005$ ), but only from responses to questions A56a and A78 (Table 1). Thus, of the 41 questions analysed in this respect of multivariate analyses, only responses to three questions showed significant differences.

The above results show that female and male teachers differed to a low extent in their pro-environmental behaviour, conceptions and attitudes towards nature and the environment. Nearly the same absence of gender difference emerged from univariate



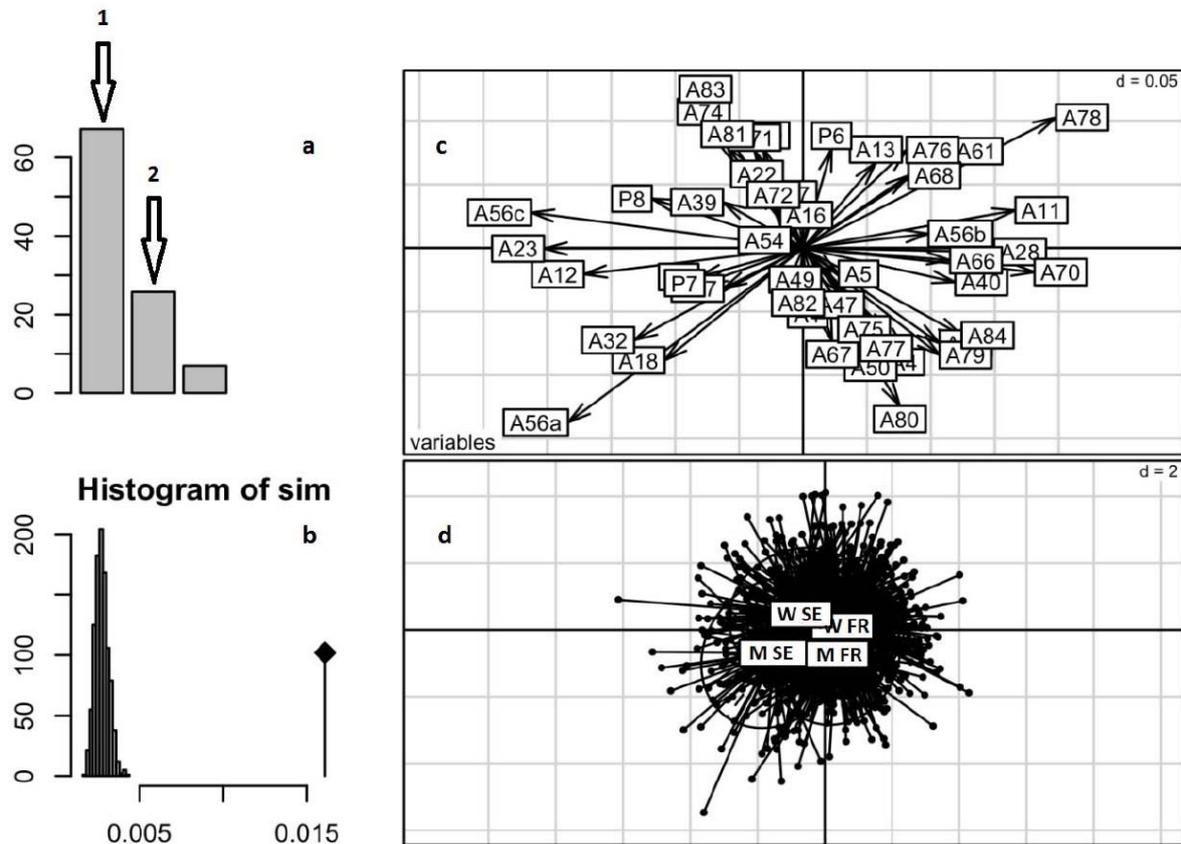
analyses within Swedish, French and Swedish plus French samples. Only three of the 41 questions (A12, A56a and A80) showed significant differences ( $p\text{-value} < 0.005$ ) between female and male teachers (Table 1). The significances were seen in Swedish sample (A12, A56a) and Swedish plus French sample (A56a, A80).

Significant differences in responses from women and men were thus found only for four questions (A12, A56a, A78 and A80; Table 1). Only two of the comparisons, where women to a significantly greater extent than men answered that nature should be preserved (A78) and that nature is pleasant (A80), could be interpreted as support for ecofeminism. The other two significant differences (A12 and A56a) could be interpreted as challenging ecofeminism, as women and men did not answer according to what could be expected from an ecofeminist perspective. Responses to questions that could be interpreted as support for ecofeminism were found in categories Attitudes (A80) and Ecocentric and anthropocentric views (A78), while responses to questions that could be interpreted as challenging ecofeminism were found in categories Genetically modified organisms (A12) and Trust in authorities (A56a).

To summarise, multivariate as well as univariate analyses show that out of the 41 questions analysed, there were no significant differences between answers from women and men for 37 questions. Thus, the vast majority of comparisons between answers from female and male teachers showed no significant difference.

### **Main difference between countries**

A between-class analysis (Fig. 1) discriminated four groups of teachers, female and male teachers in Sweden and France, respectively. The first component exhibited just under 70% of variance (Fig. 1a), and differentiated between the two countries (Fig. 1d). In this paper, we included no research questions about country differences since those have been dealt with elsewhere. Country differences have been shown for 16 countries (Munoz et al., 2009), however not including Sweden, but we would nevertheless like to point out that country differences between Sweden and France were much bigger than gender differences.



**Figure 1.** Between-class analysis of Swedish and French female and male pre- and in-service teachers' pro-environmental behaviour, conceptions and attitudes towards nature and the environment. (a) Histogram showing respective variance of the three components. Arrow 1, the first component (horizontal axis in the graphs at right) corresponds to just under 70% of the total variance, while arrow 2, the second component (vertical axis in the graphs at right) is approximately 25% of the total variance. (b) Monte-Carlo permutation test shows that the observed variance (point at right) is very different from variances obtained randomly (1,000 essays = the histogram at left). (c) Correlation cloud for the 47 variables, showing the meaning of each component: the difference between countries (component 1) and the gender difference (component 2). (d) Overview of all responses: one point for each teacher's conceptions and attitudes relative to the centre of gravity for the four classes of W SE (women Sweden), M SE (men Sweden), W FR (women France) and M FR (men France). The horizontal axis shows the difference between the two countries and the vertical axis the gender difference.

The second component, approximately 25% of total variance (Fig. 1a), placed women at the top (Fig. 1d) and men at the bottom (Fig. 1d), which shows that



differences between the two countries were clearly greater than differences between women and men.

The difference between the four samples is very significant, as shown by the randomisation test Monte Carlo (Fig. 1b:  $p < 0.001$ ). In Fig. 1c, the correlation cloud is seen for the 47 variables, showing the meaning of each component, suggesting that gender differences (vertical axis) are mainly defined by responses to questions A56a, A80, A83, A74 and A78. Nevertheless, the PCAIV showed (see above) that differences related to questions A83, A74 and perhaps also A80 are more a consequence of other effects than the gender effect.

Results presented here indicate that female and male teachers' pro-environmental behaviour, conceptions and attitudes towards nature and the environment showed only very little difference. Statistical differences were bigger and more frequent between the two countries than between women and men.

## Discussion

This study reports on an investigation of 1,109 Swedish and French female and male pre- and in-service teachers' pro-environmental behaviour, conceptions and attitudes towards nature and the environment. The aim of the study was to investigate if female and male pre- and in-service teachers' responses were significantly different on these issues. If this was the case, it might have implications for environmental education in schools, as sustainable development, where the environmental dimension is important, is recognised by the United Nations, as a superior principle for the work in schools (United Nations, 2002).

As pointed out above, there are different perspectives and views within ecofeminism. Our test of ecofeminism relates to one of its main ideas, specifically, that women have special connection to nature, and that this connection leads to assumption that women have positive attitudes towards environment and environmental conservation (Braidotti et al., 2004; Besthorn & Pearson McMillen, 2002). Ecofeminism also points to personal moral responsibility and responsible practice (Kronlid, 2003), in which women are believed to show increased pro-environmental behaviour, compared to men. If these claims are correct, then the results of a survey testing pro-environmental behaviour, conceptions and attitudes towards nature and the environment ought to indicate this. We have studied if female teachers, pre- and



in-service, are more engaged in issues of nature and environmental concern than pre- and in-service male teachers, and if the results correspond to ecofeminism claims. There were hardly any significant differences in responses from women and men indicating differences in conceptions, attitudes and behaviour. From the responses for the four questions that showed significant differences, only responses to two questions could be interpreted as supporting ecofeminism, while responses to the other two could be interpreted as challenging it (Table 1). The main conclusion is that our results challenge ecofeminism, at least for a group of 1,109 Swedish and French pre- and in-service teachers.

### **Tested categories of ecofeminism**

The results are discussed below from an ecofeminism perspective for each category.

In summary, the results of thirteen questions about *Attitudes* towards nature and our environment indicate no support for ecofeminism, while the results of one question can be interpreted as supporting it (Table 1). From an ecofeminism perspective, women's natural closeness to nature makes women more aware of environmental issues than men (Besthorn & Pearson McMillen, 2002). As no significant differences emerged between women and men, the results of these thirteen questions about attitudes indicate no support for ecofeminism.

The results of question A80 (Table 1) shows, albeit from univariate analyses, that women to a significantly greater extent than men thought that nature was pleasant, which could be interpreted as support for ecofeminism.

In summary, the results of sixteen questions about women's and men's *Ecocentric and anthropocentric* views could be interpreted as not supporting ecofeminism, while one question (A78; Table 1) could be interpreted as doing so. Question A78 shows significant difference between women and men, however, only in the multivariate analyses, where women to a higher degree than men consider 'Nature' to be 'Preserved'. Ecofeminism embraces the ecocentric view (Braidotti et al., 2004); thus, the results of this question could be interpreted as supporting ecofeminism.

In summary, the results of three questions about *Personal standpoints* can be interpreted as not supporting ecofeminism. Questions P6-P8 (Table 1) deal with personal engagement with environmental conservation and/or sustainable development. Respondents were asked to estimate how often they are involved in



environmental conservation and/or sustainable development activities. Personal moral responsibility is important in ecofeminism (Kronlid, 2003). As responses to these questions yielded no significant difference between women and men, it could be interpreted that ecofeminism is not supported by this result.

In summary, the results of one question about *Environmental education* can be interpreted as not supporting ecofeminism. Question A61 (Table 1) investigated respondents' views on the main goal of environmental education in schools, that is, providing knowledge or developing responsible behaviour. The question about responsibility is dealt with in ecofeminism, as responsible practice is one of the ecofeminist principles (Kronlid, 2003). As there was no significant difference between responses from women and men, question A61 cannot be interpreted as supporting ecofeminism.

In summary, the results of four questions on *Genetically modified organisms (GMOs)* indicate no support for ecofeminism (Table 1). On the contrary, the results of one of these (A12) could be interpreted as challenging it. The results of questions A13, A39 and A47 do not show any significant difference between women and men. Question A13 is about respondents' views on GMOs as contrary to nature, A39 is about reduction of chemical pesticides, and A47 about contamination of other crop plants. Ecofeminists challenge the use of GMOs (Croeser, 2011; Forsey, 2002; Loots, 2011; Orias & Caputi, 2013), and as there were no differences between responses from women and men, the results of these three questions about GMOs indicate no support for ecofeminism.

The results of question A12 (Table 1) show a significant difference between women and men, both with multivariate and univariate analyses, but contrary to the expected one from an ecofeminism perspective. In the Swedish sample, women agreed that genetically modified plants could help reduce famine in the world, to a greater extent than men. Ecofeminists do not agree that increasing productivity due to GMOs will reduce famine in the world (The Bonn Declaration on GMOs, as cited in Loots, 2011). This result can be interpreted as challenging ecofeminism.

In summary, the results of two questions about *Trust in authorities* indicate no support for ecofeminism. For one of the questions, significance can be interpreted as challenging it, as both multivariate and univariate analyses show significant differences between women and men. The results of question A56a (Table 1) show



that women relied on scientists compared to members of parliament, to a significantly higher degree than men. As ecofeminism challenges Western science (Besthorn & Pearson McMillen, 2002; Salleh, 2006) and its thoughts on having total control of the truth of reality (Braidotti et al., 2004; Kumar D'Souza, 1989), it is difficult to support the female teachers' responses from an ecofeminism perspective. The results of question A56a about trust in authorities can thus be interpreted as challenging ecofeminism.

Question A56b (Table 1) refers to degree of trust respondents have in different science experts, whose science fields include ethics or not. As ethical behaviour is important to ecofeminists (Kheel, 2007), to indicate support of ecofeminism, women should give more trust to experts in fields where ethics is included, compared to fields where it is not. As responses did not yield any significant difference, ecofeminism is not supported by the results of this question.

### **Evaluation of ecofeminism**

To our knowledge, this is the first time an empirical investigation is performed on women and men's allegedly different concerns and responsibilities for nature and the environment from ecofeminism perspective. Ecofeminism is one of the most prominent movements that link gender to an environmental action agenda (Braidotti et al., 2004; Kronlid, 2003), and consequently an interesting perspective when discussing female and male teachers' behaviour, conceptions and attitudes towards nature and the environment. A higher degree of pro-environmental behaviour for women could have implications for environmental education. The results display very few significant differences between teachers' pro-environmental behaviour, conceptions and attitudes towards nature and the environment. For the few significant differences found, it could be interpreted that only two out of four support ecofeminism, while the other two could be interpreted as challenging it. Given the very low number of questions yielding significant differences, combined with the fact that significances could be interpreted as both supporting and challenging ecofeminism, the results indicate no support for ecofeminism. To summarise, our study challenges ecofeminism.

The questions that yielded significant differences were scattered among categories, as they were found in four out of six categories (Table 1). There is thus no special field that emerged as having a significant difference between women and men. Items



that yielded possible significance in support of ecofeminism were in the categories Attitudes and Ecocentric and anthropocentric views (Table 1). Although this result could be interpreted as support for ecofeminist principles, when all data were taken together, there was hardly any support for ecofeminism. The conclusion is robust: our study challenges ecofeminism.

Ecofeminism could be regarded as both social movement and theoretical discourse, and it contains different variants and forms (Kronlid, 2003; Warren, 1996). This is also evident on the ecofeminism website eve online (eve online, 2014), where different perspectives are discussed. The website stresses that ecofeminism ought to be constantly evolving, and different perspectives are welcome. This vouches for ecofeminism trying to keep up with social development. Also, authors from within the ecofeminism movement try to revisit ecofeminism (Gaard, 2011; Li, 2007; Salleh, 2009).

Not all perspectives of ecofeminism have been evaluated in this study, only the most prominent ones. Suggestions for further studies could be to consider the south-north perspective and new social movements. The website eve online (eve online, 2014) invites discussions within the framework of ecofeminism and gives the impression of following up-to-date issues. New techniques, such as mobile phones, and the fact that far more girls than before attend schools, have in some respects changed the conditions for the gender debate.

### **Comparisons with other studies**

Teachers' environmental attitudes have rarely been investigated (Oerke & Bogner, 2010). However, Oerke and Bogner (2010) presented a study with 367 German pre- and in-service teachers' environmental attitudes within the BIOHEAD-Citizen Project. They used the 2-MEV Model of Bogner and Wiseman (2006) and identified two independent dimensions P and U, reflecting ecocentric and anthropocentric concerns, respectively (Thompson & Barton, 1994). A few significant results appeared, among others that scores for U were significantly higher for men than for women. Our study does not confirm this result, as only one question out of seventeen testing dimensions P, ecocentric, and U, anthropocentric, yielded significant differences between women and men. One disparity between our study and that of Oerke and Bogner (2010) is that the same analyses were not performed.



Environmental attitudes and behaviours have been investigated from a gender perspective by Zelezny et al. (2000). The study was performed among 2,160 undergraduate students participating in social and behavioural courses. The authors found that women showed significantly stronger New Environmental Paradigm (NEW) scores (Dunlap et al., 2000) than men, indicating that women showed stronger ecocentric environmental attitudes and pro-environmental behaviour than men. However, it was argued that use of traditional one-dimensional analysis using variance technique could blur the results and fail to reveal nuances that are evident in two-dimensional analysis (Boeve-de Pauw, Jacobs, & Van Petegem, 2014). Boeve-de Pauw et al. (2014) claimed that one-dimensional analysis showed greater score differences between women and men, indicating a more ecocentric perspective for women, compared to two-dimensional analysis. Thus, gender differences could be blurred with one-dimensional analyses, and the use of two-dimensional analyses might nuance the picture and show lesser difference between genders. Our study does not confirm the results of Zelezny et al. (2000). However, the samples of the two studies are not fully compatible, as not only students (pre-service teachers) but also in-service teachers were included in our study.

Momsen (2000) reported on a study from fieldworks in the so-called South, where only small differences in environmental concern between the genders were presented. When differences appeared, they did not show any consistent pattern. Sometimes men showed higher concern for environmental issues and sometimes women. The author speculated that changing gender roles, wider access to education, and contemporary economic development pressures on natural resources have undermined the long-established notions of women's special care for nature and environment, which is one of the cornerstones of ecofeminism. Momsen (2000) even argued that differences have perhaps not existed, and pointed to the fact that women's allegedly higher degree of concern for the environment has not been validated by empirical studies. One of the goals of our study was to try to answer this question.

### **Limitations of the study**

It should be pointed out that ecofeminism is an umbrella term and cannot be reduced to one perspective or view (Warren, 1994). However, we have tried to provide a broader view of ecofeminism and have focused on its main characteristics, which we



have evaluated. Thus, there are perspectives of ecofeminism we have not touched upon.

The results should be interpreted in light of only pre- and in-service teachers participating in the study. They all came from two European countries with rather high standard of living and cultural similarities. Despite the fact that over 1,100 teachers participated, it is still a limited sample. The BIOHEAD questionnaire is rather comprehensive, and it could be argued that participants did not answer properly, as it demanded rather great effort. However, the questionnaire has been tested for validity and reliability in France as well as in other countries (Clément et al., 2007; Carvalho et al., 2008; Munoz et al., 2009).

## Conclusion

Responses to 41 questions out of total of 173 in the BIOHEAD-Citizen questionnaire were selected and analysed in relation to ecofeminism, as ecofeminism is one of the most prominent movements that link gender to an environmental action agenda. Only a very few of these questions showed any significant differences from female and male pre- and in-service teachers. Only in two cases, significance could be interpreted as supporting ecofeminism, but in another two, it could be interpreted as challenging it. Altogether, our study challenges ecofeminism. The study does not confirm that female pre- and in-service teachers are more engaged in issues about nature and the environmental dimension of sustainable development than are male pre- and in-service teachers. According to our study, there is no reason to fear that male teachers are less engaged in environmental education than female teachers, and that they show less pro-environmental behaviour than women.

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