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Why do French students like fieldwork?

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ABSTRACT

In the teaching of natural science, field trips are a means of bringing students directly into contact with the biological and geological aspects of the environment. The present study explored French students' views of fieldwork and the relationships they establish with the natural environment as a result. We analyzed the responses of 293 primary and secondary school students to a questionnaire administered immediately before and after a fieldwork. Students' interest in fieldwork was based on their affinity for nature and desire to learn, as well as their sensory experience of the natural world and the sense of wellbeing they derived from it. The relationship between affinity, self-interest and situational interest is discussed in terms of how a fieldwork can help to reinforce students' relationship with nature.

KEYWORDS

fieldwork; learning; interest; affinity; nature

Introduction

Research has highlighted a disconnect between humans and nature in every country, even though environmental issues are increasingly pressing and can only be properly understood if people have a firm grasp of the different factors (biological, physical, anthropic, etc.) involved (Ernst & Thiemer, 2011; Louv, 2006). Moreover, the majority of humans now live in urban environments.

Learning in a natural outdoor environment seems to have wide-ranging benefits for students, in terms of their cognitive, emotional and social development (Cooper, 2015; Eaton, 1998; Waite, 2011). The term 'nature' that we use in this article refers to the natural environment as a possible medium for learning biology and geology in school. These terms 'nature' or 'natural environment' are in contrast to man-made environments such as science centers, museums, zoos, etc., which are also the subject of research in outdoor education. This practice of going out into nature was first described in France in the early 20th century, with the emphasis very much on students' actions, as opposed to so-called *traditional* pedagogy (i.e. frontal and expository). This can be seen in the context of Dewey (1859–1952)'s popularization of learning-by-doing and enquiry-based science education (Dewey, 1916). In France, science teaching is based on students' actions, both material (making observations, carrying out experiments, etc.) and intellectual (questioning, testing hypotheses, etc.).

While the learning aims are clear for the Ministry of Education and for the teachers who conduct this fieldwork, we felt it would be interesting to find out what the students themselves think. Hammarsten, Askerlund, Almers, Avery, and Samuelsson (2019, p. 228) recently argued that there is a 'specific need to investigate children's perspectives' on outdoor teaching. We therefore set out to explore how students in primary and secondary school experience fieldwork conducted in the

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natural environment as part of their natural science studies. Our main questions concerned the content, the type of knowledge explored by the students, and their appreciation of this teaching method.

Fieldwork in the French curriculum

We use the generic term 'fieldwork' to designate « undertaking learning activities, often linked with particular curriculum subjects such as science, geography or environmental studies, in outdoor settings such as field study centres, nature centres, farms, parks or gardens » (Rickinson et al., 2004, p. 16). Fieldwork is by definition part of a larger context of 'field trips' that may involve more than one day (with overnight stays). The fieldwork has been part of the French primary school curriculum since the beginning of the 20th century. As early as 1909, a primary school inspector proposed the inclusion of an educational innovation called the *walking class* in the 1923 curriculum (Official Instruction, 1923). Its purpose was to bring 'children into direct contact with the soil and with life,' and it involved regular exploration of the school's immediate environment by students, who were mainly from farming families. Both in this inspector's preliminary remarks (Blanguernon, 1918, p. 224) and subsequently in the 1923 curriculum itself, this approach was described as *active*:

'the teacher always starts from what the children know (. . .). In all teaching, the teacher begins by using sensory objects, making students see and touch things, putting them in the presence of concrete realities, then little by little, he or she exercises them to draw out the abstract idea . . . (Official Instruction, 1923).

The author of this document went on to criticize the traditional, purely image-based approach, because for him, students needed to go out 'into nature itself, to be imbued with its forms, its colours, its sounds, its scents,' so that these concrete observations would enable them to understand and represent things. In describing the practice of the walking class, Freinet (1896–1966), the pedagogue and promoter of *natural methods* behind the Modern School Movement in France, laid the foundations for a fieldwork-based pedagogy. He relied on students' spontaneous observations of fauna and flora to question nature and their relationship with it. Walking classes allowed students to collect data, ask questions and, on returning to the classroom, write an account of their observation or visit.

Today, the use of fieldwork is mentioned several times in the school curriculum (MEN, 2019, 2020). This practice is particularly advocated for the study of biodiversity and the functioning of particular ecosystems, or as an initial approach to geology. In primary school, teachers are supposed to 'take steps to exploit examples close to the school, based on field studies,' while in secondary school, they must 'give priority to field observations,' and develop students' skill in 'extracting and organizing information from direct observation in the field.' Going out into the field to explore one's environment with the aim of constructing notions in life and earth sciences is a practice recommended by the current curriculum, from kindergarten to secondary school Julien & Chalmeau, (in revision).

In science, biological and ecological notions are targeted by identifying the living beings that live in a given environment and observing their relationship with each other and with this environment.

Moreover, as early as the founding circular on environmental education in 1977 (MEN, 1977) and subsequent circulars on the generalization of education for sustainable development, fieldwork in nature, be they close to the school or further away, are explicitly identified as both a means and an object of learning.

Learning challenges of fieldwork

The main reason for teachers to organize a fieldwork is to bring students into contact with reality and use this immersion to encourage them to question, observe, interact with natural environment to associate and understand biological and geological concepts Julien & Chalmeau, (in revision). In this context, the location of the fieldwork must be carefully chosen so that it becomes a both a means

and an object of study. Examples include an ecosystem to illustrate notions of biodiversity and the relationship between biocenosis and biotope, an ecological approach to the impact of human activities, and a geological site to highlight the processes behind our changing landscapes (Ayotte-Beaudet, Potvin, Lapierre, & Glackin, 2017; Cachelin, Paisly, & Blanchard, 2007; Dimopoulos, Paraskevopoulos, & Pantis, 2008; Fernández-Manzanal, Rodríguez-Barreiro, & Casal-Jiménez, 1999).

In the field, observation is key, bearing in mind that in order to observe, students must be prepared on a conceptual level. Scientific observation is a selective process that requires at the very least a target of attention and a goal (Hodson, 2015). In this respect, to make the most of a fieldwork, teachers need to think about three phases: before, during and after the outing (Bitgood, 1989; Dewitt & Storksdieck, 2008). Fieldwork undertaken by small groups of students alternating between direct observational tasks, the gathering of information about the environment, and the recording of data on a monitoring form, can be resumed in class and supplemented in order to structure the concepts that have been covered. Thus, in addition to the acquisition of biological concepts, the use of the fieldwork can promote problematization by questioning the empirical references common to all students.

In his work characterizing learning in a natural environment, Brody (2005) stated that individuals must interact with others and directly with physical elements of the environment. Learning from others implies doing things together and sharing them, with a particular reliance on the sensory exploration of the environment and living beings. In a study among Swedish lower secondary-school students aged 13–15 years, Fägerstam and Blom (2012) found that students valued the increased interaction with one another during a fieldwork. Although the authors did not observe any differences in the understanding of biological concepts between those students who had gone on the field and those who had learned in class, the former showed better long-term retention of the activities carried out and the biological content.

Possible difficulties encountered by students during fieldwork

As with all teaching methods, the fieldwork alone does not guarantee effective learning (Dewitt & Storksdieck, 2008). The teacher's actions and attitudes are essential to promote a successful encounter with nature, on both cognitive, affective and sensory levels (Ayotte-Beaudet et al., 2017). Although such outings are generally appreciated by teachers and pupils alike, some limitations have been noted in several studies.

First, a balance must be struck between novelty and familiarity with the environment in which the outing takes place. While a little novelty is a positive thing, too little or too much can be an obstacle to the intended learning (Balling & Falk, 1980; Boeve-de-pauw, Van Hoof, & Van Petegem, 2018; Cotton & Cotton, 2009; Falk, 1983). The novelty level can be reduced by repeating outings, especially if the environment is close at hand (e.g. schoolyard), as pupils need time to adapt to the new learning environment (Fägerstam, 2014). Preparing the fieldwork with the students also seems to be beneficial for further learning. In addition, teachers and nature educators need to take account of students' possible fears and phobias, as well as their 'bodily capacities' and previous experiences (Bixler, Carlisle, Hammitt, & Floyd, 1994; Dillon et al., 2006).

From a learning perspective, students may find it difficult to relate the theoretical dimensions learned in class to the empirical elements discovered during the fieldwork. For example, transferring concepts to a new ecosystem may be problematic (Magntorn & Helldén, 2007; Openshaw & Whittle, 1993). Then again, when Ballantyne and Packer (2002) surveyed 580 Australian students aged 8–17 years, they found that the use of worksheets and note-taking on fieldwork was not *popular*. They suggested that direct contact and interaction with wildlife is a more effective strategy for building environmental literacy.

Another dimension besides the scientific content that can be worked on by teachers and is appreciated by students is group work (Ayotte-Beaudet, Potvin, & Riopel, 2019). The need to maintain social harmony within the group so that it can perform the required task can mean that less time is

devoted to the argumentation, critical thinking, and development of alternative ideas that feed scientific reasoning. Anderson, Thomas, and Nashon (2009) studied the interactions of groups of three or four upper secondary-school students who were supposed to work together to identify and describe different biotic and abiotic factors and the influence of these factors on the adaptation of different organisms. The authors found that students needed to question their differences in order to develop debating skills and become aware that it is possible to make conjectures without damaging friendship and harmony within the group. This potential limitation is not specific to fieldwork, but is a consequence of the group work modality that is often used in this context.

Students' feelings about field trips: interest and affinity for nature

Two key concepts have been highlighted in studies of children's feelings toward outings: interest and affinity for nature. *Interest* is defined as a set of psychological traits that lead individuals to respond to particular activities or experiences (Panizzon, 2015). It represents the more or less lasting relationship between individuals and the objects in their environment. A distinction is usually made between *personal interest*, interpreted as a relatively stable and specific tendency of each person, and *situational interest*, generated mainly by certain external conditions and/or concrete objects in the environment (Krapp, Hidi, & Renninger, 1992). Regardless of level, *interest* describes a state and/or process during an activity. There are three major interrelated dimensions of interest: interest as a *characteristic of a person*, interest as a *characteristic of a learning situation* and, combining the two, interest as a *psychological state*. As for *affinity for nature*, Kals, Schumacher, and Montada (1999) defined it as a category of emotion that embraces nuances ranging from *love of nature* to feeling free and safe in nature, or at one with nature (i.e. part of nature). These authors made a distinction between interest in nature and affinity for nature.

The link between affinity for nature and a pro-environmental attitude has been highlighted in several studies. For example, in Ballantyne and Packer (2002)'s study in Australia, fieldwork was found to be attractive to young people and to enable them to develop pro-environmental attitudes. In Finland, a study of the impact of outdoor activities on 11- to 12-year-olds showed that environmental knowledge and values play a major role in the willingness to act. More specifically, children who have more experience of the countryside display an empathic attitude toward nature and a feeling of being able to act to protect it (Palmberg & Kuru, 2000).

Some researchers have underlined the need for more data on students' views of outdoor education (Ballantyne & Packer, 2002; Clark, 2005; Hammarsten et al., 2019; Merewether, 2015). Moreover, in order to respond to the need for a more complete understanding of the learning processes implemented during a fieldwork, it is essential to explore them from the students' point of view (Humberstone & Stan, 2011; Sjöblom & Svens, 2019). The present study further underscores the need to study children's views as to why they enjoy fieldwork.

Research questions

France's national curriculum and official circulars emphasise the value of fieldwork. The majority of teachers in primary and secondary schools state that they go on field trips, either to places close to their school or to more distant sites Julien & Chalmeau, (in revision).

Based on the research presented in the theoretical framework and the educational issues of field trips, the present study addressed the following research questions:

(1) How do students feel about fieldwork in the natural environment?
(2) What reasons do they give for liking fieldwork?
(3) Do they show an interest in these outings? What do they retain from them?

In seeking to answer these three questions, we were keen to identify differences and similarities between students in primary, lower and upper secondary school.

Materials and Methods

Context and data collection

In order to answer our research questions, we developed pre- and post-fieldwork questionnaires for primary and secondary-school students (Table 1).

A two-page document containing questions in a variety of formats (open-ended, closed, non-ordered and ordered categories), was handed to each student either in class or on the bus before a fieldwork. The questions on the first page had to be answered before the fieldwork, and those on the second page at the end of the fieldwork (Table 2). Responses were anonymized.

First, before the fieldwork, we asked for general information on the reasons they gave for liking field trips in nature and whether they had memories of previous school natural fieldworks (questions 1 & 2). We used the terms *nature* or *natural* without actually providing a definition or asking the students for their own definition of nature (which would have required another study; see, for example, Hess, 2013). This terms simply allowed us, by using the common and implicit meaning of nature, to situate our questioning in the field of natural science. We hypothesize that it is this implicit meaning that predominates in students' minds when we ask them about nature.

Then, after the outing, we followed and observed, we asked what they appreciated and learned about the outing, and the level of interest they report in the outing (questions 3, 4 & 5). We combined the qualitative data obtained from the responses to these questionnaires with quantitative data obtained by aggregating responses for grade level comparisons. We used a classic mixed-methods design (quantitative and qualitative data collection, analyses and inferences) with deductive (exploratory) research questions (Johnson, Onwuegbuzie, & Turner, 2007).

Table 1. Questions asked before and after a fieldwork.

Before	After
1- Feelings about nature field trips in general	3- Dimensions appreciated by the students
Q.1.1. Do you like going out into nature?	*Q.3.1. What did you like during the fieldwork?*
Q.1.2. If yes, why? If no, why?	4- Learning
2- Memory of previous experiences of school outings	*Q.4.1. Did you learn anything new?**
	Q.4.2. Did you get to understand something better during the outing?
Q.2.1. Do you remember any previous school nature fieldwork?	5- Interest in the fieldwork
Q.2.2. If yes, what do you remember?	*Q.5.1. Did you find the fieldwork very interesting/interesting/not very interesting/not at all interesting?*

*question asked only to secondary students

Table 2. Participants' (n = 293) grade level, age and number, and location and theme of fieldwork.

	Grade level	Age in years	Number of students	Location of fieldwork (theme)
Primary school	3rd-4th	8–10	22	Forest (ecosystem)
n = 65	2nd-3rd-4th	7–10	43	Forest (ecosystem and orienteering)
Lower secondary school	6th	11–12	89	Farm, forest and meadow (agriculture, biodiversity)
n = 89				
Upper secondary school	10th	15–16	28	Gardens of a Natural History Museum (botanic)
	11th	16–17	44	Granitic massif (geology)
n = 139	12th	17–18	67	Natural canyon area (geology, botanic, rock climbing and water sports)

Participants

Teachers participation was based on informed consent. Students participants were 293 and aged 7–18 years. They all attended schools in the southwest of France, which is also where the outings took place (Table 2). From a methodological point of view, the comparison of outputs with different content may seem questionable. We made this choice considering that even if the theme of the fieldwork is different (i.e. based on different chapters of the biology and geology curriculum), the questions asked should allow us, independently of the specific concepts worked on, to analyze which dimensions of the fieldwork are emphasized by the students.

Data analysis

The categories formed to analyze the different open-ended responses were defined through an iterative process between the literature presented in the theoretical framework and the data analysis. For the data processing, the nonparametric tests we used to compare results according to grade and school level were Pearson's chi-squared for nominal variables, and the Kruskal-Wallis test for ordinal variables.

Categorization of responses before the fieldwork

The reasons given by students for liking fieldwork in nature (Question 1) fell into three categories: learning, feeling of wellbeing, and affinity for nature (Table 3).

The memories cited by students in response to Question 2 were divided into those indicating place (where?), time (when?), and content (what?), as well as any learning, activity, or element of nature (e.g. animal, rock). The first three items allow us to know if the students have memories of where, when and what for a quantitative analysis. Then, a qualitative analysis of the content of the memories is carried out using three categories that are not mutually exclusive. A student's memories may indeed concern learning (e.g. discovering the phenomenon of erosion, learning to recognize flowers) and/or an activity (e.g. we rode a bike, we did an orienteering race, we looked for fossils, we observed animals) and/or a particular element of nature is cited without an action verb (e.g. rocks, the forest, frogs).

Categorization of responses after a field trip

To characterize what the students liked during the fieldwork (Question 3), we used the following categories: overall (e.g. 'I liked everything'), nature or an element of the environment (e.g. trees, animals, fossils), an action or physical activity (e.g. orienteering, rock climbing), a sensory experience or feeling of wellbeing (e.g. breathe of fresh air), and a learning experience (e.g. discovering rocks, learning how to measure a tree, learning the names of trees). A single response may be relevant to more than one category.

For Question 4 on learning for secondary students, we carried out a content analysis by distinguishing negative responses from overall positive responses, and categorizing those who specifically named learning as either a scientific concept or a procedure.

Table 3. Categorization of reasons for liking fieldwork.

Category	Examples of responses
Learning: the natural environment is seen as a place or medium for learning.	*because you learn a lot, to discover other things, to explore, because I learn a lot about nature . . .*
Wellbeing: the students' comments are egocentric, and emphasize the sensory dimension.	*because you can breathe the air in the woods, because it's nice to hear the sounds of nature, it's because I like to walk, to get some fresh air, to get a change of air . . .*
Affinity: the students express an affective attitude toward nature.	*because I prefer nature to the city, because I love nature, I love nature and animals are so beautiful, because nature is beautiful, because it's nice, because it's good . . .*

Finally, we explored possible relationships between students' interest in the fieldwork (Question 5) and the reasons they had given for liking fieldwork (Question 1).

Results

Before the outing: why do students like fieldwork in nature?

The vast majority (90%) of students replied that they liked going out into nature. This was true for all age groups, with a slight variation between grade levels (84–95%). Figure 1 shows the reasons given, divided into three categories: learning, wellbeing, and affinity.

To justify why they liked going on field, students were slightly more likely to emphasize the wellbeing experienced during an outing than either their affinity for nature or the pleasure of learning new things. Whereas primary-school students were evenly distributed across these categories, this was not the case for secondary-school students, who exhibited a more contrasted distribution. When we compared primary-, lower and upper secondary-school students, we observed significant differences (Pearson's chi^2 test, $q_{obs} = 21.98$, $p < 0.001$). Almost half the lower secondary-school students cited learning as the main reason for enjoying fieldwork, whereas the majority of upper secondary-school students put arguments linked to a feeling of overall wellbeing (change of air, getting fresh air, being in the peace and quiet, etc.) ahead of cognitive interest linked to scientific learning and affinity for nature.

Among the minority of students (22 students from all levels i.e. around 10%) who did not like fieldwork, some referred to animals they were afraid of (e.g. insects, small animals, snakes), and others to a lack of interest in nature in general and a preference for the city. This represents 7% in primary school, 9% in lower secondary-school and 11% in upper secondary-school.

Memories of previous school fieldwork in nature

With grade level, more and more students mentioned memories of previous school outings in response to Question 2. Among primary- and lower secondary-school students, one in two had memories (53%), and slightly fewer of them provided descriptions (46%). Among upper secondary-school students, 72% responded that they had memories, and 70% wrote down which ones. The

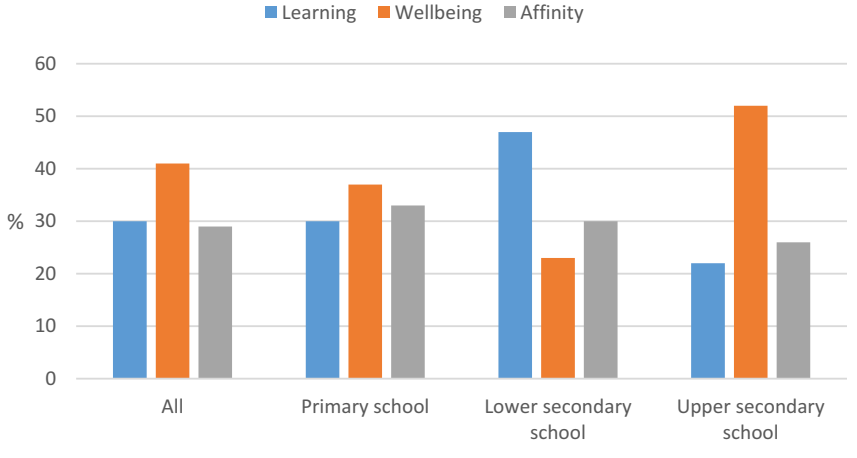

Figure 1. Percentages of reasons given for liking fieldwork by all students ($n = 227$) and those in primary-school ($n = 60$), and lower ($n = 53$) and upper ($n = 114$) secondary-school.

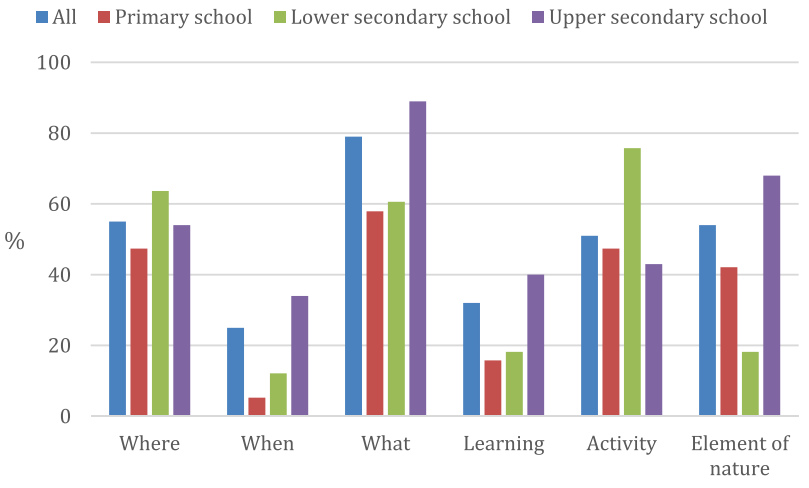

Figure 2. Features of memories of fieldwork (in percentage) for all the students (n = 150) and primary-school (n = 19), and lower (n = 33) and upper (n = 98) secondary-school students taken separately.

memories of these 150 students, all levels considered, are classified according to information about the place, date, and theme of the outing, as well as information about learning, activities, and elements of nature that remain in their memory (see Figure 2).

The oldest students were the ones who answered the most, and who provided the most precise answers (significant differences between the three levels, Pearson's chi^2 test, $q_{obs} = 64.41$, $p < 0.001$). More than three quarters remembered the purpose of the outing (what) and could associate it with a memory of an activity or learning experience, or simply indicate something they had observed during the fieldwork (an element of nature).

Overall, half of them provided a specific memory of an activity or an element of nature, with a higher proportion of lower secondary-school students citing an activity and a higher proportion of upper secondary-school students citing an element of nature. In terms of activities, memories included 'we planted trees' (fourth grade), 'we went for a walk in the forest' (sixth grade), and 'we observed rocks' (11th grade). In terms of elements of nature, memories included 'we went to a farm and I saw lots of animals' (fourth grade), 'I remember animals, hay' (sixth grade) and 'seeing animals' (10th grade). For the older students, there were many references to the compulsory geology trip, with the students quoting 'rocks, stones' in 11th and 12th grades.

After the outing: what did the students like?

Regarding what students said they liked about the fieldwork (Question 3), some responses fell into more than one category. Of the 269 responses given by students, 223 fell into one category, 43 into two categories, and three into three categories.

Different students liked different things about the fieldwork. Some of them were more likely to focus on the dimensions of learning and discovery (46% upper secondary-school students; 32% lower secondary-school students and only 11% primary-school students), while others focused on an element of nature they had encountered and observed (47% lower secondary-school students and 15% or 17% for the others grade levels), and others again highlighted the physical activity that took place during the fieldwork (35% primary-school students and only 12% upper secondary-school students; see Figure 3). These differences were significant (Pearson's chi^2 test, $q_{obs} = 14.52$, $p < 0.01$). Many primary-school students (31%) answered that they liked everything (overall category). Given their weaker writing skills, compared with older students, they may have chosen this shorter

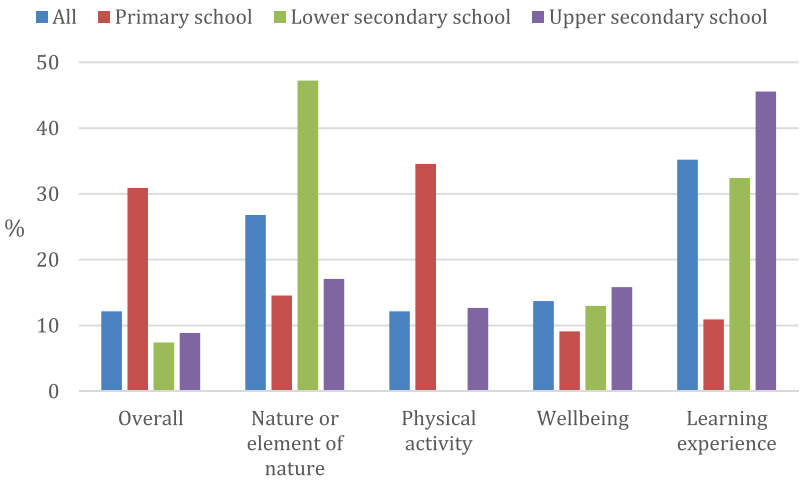

Figure 3. Categorization of what students said they liked during the fieldwork (in percentages) according to school level: All (n = 321), primary-school (n = 55), lower (n = 108) and upper (n = 158) secondary-school.

response (i.e. 'all') because it was the most economical. Nearly half the lower secondary-school students cited an element of nature that they really appreciated, particularly the cows, which they were able to approach and sometimes even stroke during their outing to a farm. Finally, for the three grade levels, an equivalent proportion of students (around 14%) cite wellbeing as a dimension appreciated during the outing.

When students specified what they liked, they cited many concrete actions associated with different knowledges of nature. Cognitive knowledge as learning (e.g. determining the age of a tree, recognizing a leaf, identifying different types of rock), embodied and sensory knowledge (e.g. stroking a cow, smelling a plant), affective knowledge and experience of nature (e.g. walking in the forest, peace and quiet, fresh air), and finally some also directly cited their concrete relationship with nature (contact with nature).

What did students learn during the fieldwork?

Concerning the new learning achieved during the fieldwork (Question 4; n = 240, only secondary students), the categorization of the results was similar regardless of grade (Pearson's chi2 test, q_{obs} = 4.99, p = 0.28). The majority of students (69%) indicated that they had learned scientific concepts; such as "nesting birds that leave the nest as soon as the eggs have hatched and those that remain in the nest" (fourth grade), 'cattle feed is made from corn and barley' (sixth grade), 'new varieties of plants' (10th grade), 'the composition of rocks' (11th grade), and 'the different forms of plant adaptation' (12th grade). A small proportion did not specify the content of this learning, giving either a positive overall response ('everything': 10%) or a negative one ('nothing'; 5%). Finally, a few highlighted a learned procedure (10%), such as 'how to measure a tree' (fourth grade) and 'starting a fire' (12th grade). Overall, we can say that the majority of students, whatever their grade, were able to identify the scientific learning that took place during the fieldwork.

When asked whether they had gained a better understanding of the concepts previously covered in class during the fieldwork, the highest proportion of students who answered in the affirmative were in 12th grade. More specifically, 40% of primary-school students, 43% of lower secondary-school students, 21% in 10th grade, 49% in 11th grade and 71% in 12th grade (out of 259 responses) said they did. This result is probably partly linked to the fact that for the 12th graders,

the geological processes were first seen in class and then illustrated in the field. This question probably made more sense to them than to those in other grade levels, who were more involved in a discovery process.

Interest in the fieldwork

The majority of students stated that they were interested by the fieldwork, whether they were in primary or secondary school (Question 5; see Figure 4). Overall, 26% were very interested by the fieldwork, 65% were interested, and only 9% were not very interested. No students indicated that they were not interested at all. More than half the students in primary school expressed maximum interest, compared with between only 14 and 25% in the higher grades (these differences were significant; Kruskal-Wallis test, $q_{obs} = 28.28$, $p < 0.001$).

Regarding the association between different levels of interest and students' reasons for liking fieldwork, we calculated the mean level of interest per argument category (Figure 1). We found a higher mean level of interest for students in the affinity category (3.46 ± 0.17) than for those in the other two categories, namely learning (3.25 ± 0.16) and wellbeing (3.09 ± 0.10). Only the difference between the affinity and wellbeing categories was significant (Student's t test, $q_{obs} = 3.88$, $p < 0.001$).

Conversely, when we explored the distribution of the students' reasons for liking fieldwork according to their level of interest, there was a difference between those who declared themselves to be very interested by the fieldwork and those, more numerous, who indicated that the fieldwork (only) interested them (Pearson's chi^2 test, $q_{obs} = 16.76$, $p < 0.0001$).

Figure 5 illustrates this distribution and confirms the previous result. Students who were very interested by the fieldwork were more likely to belong to the affinity category (41%) than those who were (only) interested (17%). Conversely, the majority (58%) of students who expressed interest in the fieldwork were in the wellbeing category. Comparable proportions of students in the learning category were very interested (30%) and interested (25%). Finally, students who declared the least interest in the fieldwork were in the minority (24 students in total but only 13 with full data for the two linked dimensions), and are therefore not represented in the graph. Nevertheless, they had a similar profile to those who declared themselves interested (31% learning, 54% wellbeing and 15% affinity).

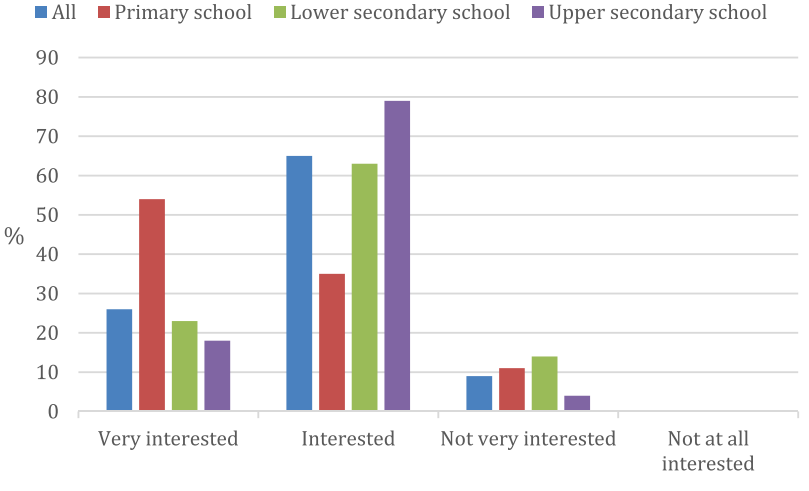

Figure 4. Students' level of interest in fieldwork expressed as a percentage: All ($n = 280$), primary-school ($n = 54$), lower ($n = 88$) and upper secondary-school ($n = 138$).

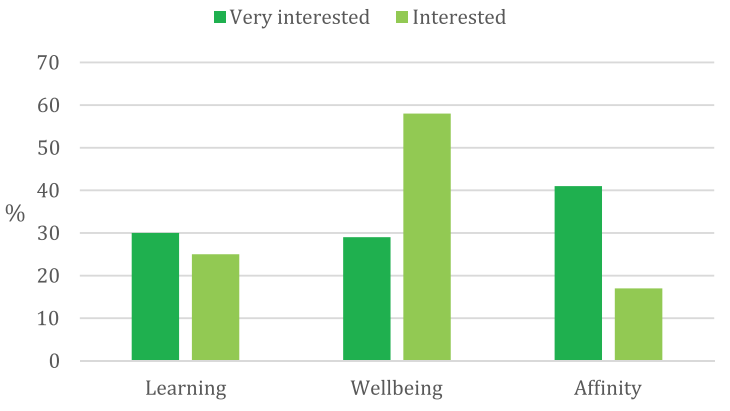

Figure 5. Distribution of reasons for liking fieldwork according to level of interest (in percentage).

Discussion

Wellbeing and affinity for nature: reasons why students like fieldwork

The vast majority of students expressed a liking for nature fieldtrips in general (90%, question 1.1.). The reasons given are divided between the well-being they feel in nature, the desire to learn about nature, and finally the fact that they love nature, which shows their affinity for nature (question 1.2., see Figure 1). The responses given by the students allow us to establish relationships between nature experiences (such as fieldwork), a priori interest in nature, and affinity for nature. This last category was represented at every grade level, and deserves to be explored further, especially through interviews (see Figures 1 and Figure 5 for the relationship between affinity and interest for nature). A 'love of nature,' which shows an affinity for nature, seems to contribute to the development of a strong interest in nature, as illustrated in Figure 5. At the end of the fieldwork, the majority of students, regardless of grade level, stated that they were either very interested or interested by the fieldwork (91%). As in Ballantyne and Packer (2002)'s study, primary-school students were more enthusiastic about the field trip than lower and upper -school students. Personal interest was reflected in the students' answers to the question about why they liked going on nature trips: 'I like nature' or 'nature has always interested me.' Situational interest (Hidi & Renninger, 2006) elicited responses categorized as *learning* or *wellbeing* (e.g. 'during the outing I was mainly interested in observing frogs').

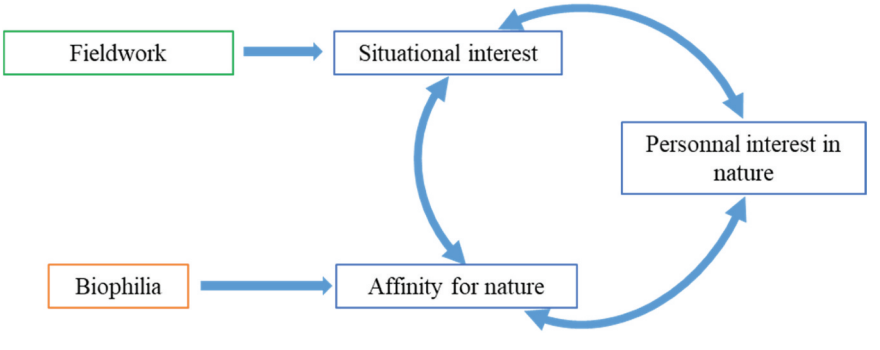

Figure 6. Modelling the influence of the fieldwork on interest in nature.

For Kals et al. (1999), although interest in nature can motivate the acquisition of knowledge to explain natural phenomena, affinity is a greater motivation for developing a sensory experience with nature. These authors referred to *biophilia*, a term coined by Edward O. Wilson as early as 1984 to describe what he believed to be humanity's innate affinity for the natural world. Multidisciplinary research (Kellert & Wilson, 1993) has examined the scope of this hypothesis and suggests that while humans have a biological attraction to nature, their wellbeing depends, to a large extent, on the relationships they form with the natural world around them.

Another reason why students expressed a liking for nature fieldwork is the desire to learn. However, we need to ascertain whether this desire to *learn new things about nature* is a potential contribution to or possible consequence of an interest in nature, or whether this relationship can work both ways. This last category, which was the most frequent one among primary- and lower secondary-school students when asked about their feelings on nature outings in general (see Figure 1), can be interpreted as referring to students in their *student role*, who have learned the rules of the game and give the responses they think are expected of them. In contrast, the fact that upper-school students emphasize wellness may be related to the fact that they have learned to learn in the classroom (more so than younger students) and are therefore likely to emphasize dimensions other than learning (e.g. wellbeing). However, we must qualify this statement since after the fieldwork (Figure 3), upper-school students are the ones who place learning in the dimension they appreciated the most.

During a fieldwork, the desire to learn new things, the pleasure, the physical activity, the wellbeing experienced in nature, and the affinity for nature can therefore help to develop students' personal interest, either directly or by reinforcing their situational interest. Nature experiences, of which fieldwork is a part, therefore potentially feed the system and strengthen first situational interest and then affinity for and personal interest in nature. Furthermore, if we accept the biophilia hypothesis (Kellert & Wilson, 1993), then biophilia could contribute directly to affinity for nature. Fieldwork and biophilia may therefore be factors that contribute to this system and reinforce pinterest in nature. We therefore modeled the contribution of fieldwork to these potential relationships between affinity for and interest in nature (see Figure 6).

Direct experiences via the senses seem to have a major impact on the development of affinity for and interest in nature (Kals et al., 1999). In our study, wellbeing and, more generally, the sensory dimension, was one of the reasons put forward for the affinity for nature, which was more pronounced among upper secondary-school students than among younger ones (Figure 1). However, the sensory dimension was less evident at the end of the outing (Figure 3).

The very small minority (10%) of students who stated that they did not like nature produced only a few justifications, and these referred to a fear of-or even phobia for-specific categories of animals (snakes, insects, spiders, etc.) that has already been documented in the literature (see Bixler et al., 1994). For these authors, these fears and phobias, described as misunderstandings, could be avoided by developing nature experiences in childhood. These would allow students to reconsider their beliefs. Even once they are well established, these fears can be modified by working directly with the animals in question, as shown in Ballouard, Provost, Barré, and Bonnet (2012)'s study with snakes. In all cases, time spent in nature seems to be a lever for developing a greater affinity for nature and, if necessary, a means of avoiding the development of fears linked to beliefs and fear of the unknown.

Fieldwork for more effective science learning

Whereas students' memories of previous school fieldwork were of activities rather than the notions or concepts they had worked on, following the fieldwork, the majority of them indicated that they had learned new things and that these were mostly scientific notions. Overall, from the point of view of learning, students were fully aware of having acquired scientific notions during the fieldwork, and this was consistent with what they said they enjoyed (Figure 3). These results confirm the value of learning in and about the natural environment. Several studies have demonstrated a positive impact

of fieldwork on scientific learning by comparing groups working in the classroom with others going on the field (Carrier-Martin, 2003; Klemmer, Waliczek, & Zajicek, 2005; Rios & Brewer, 2014). Cronin-Jones (2000) compared the learning of primary-school students with and without a fieldwork in the immediate environment (schoolyard) over the equivalent of 10 sessions. Actual observations of plants and animals in the schoolyard were contrasted with slide and film presentations for the groups who learned from a traditional classroom sequence. Results showed better scientific learning for the students who worked outdoors.

Our analysis of students' responses, especially those of upper secondary-school students concerning the compulsory (in France) geology fieldwork, indicated that it was probably the fact of going out into the field and direct observing geological phenomena that enhanced their understanding of previously abstract processes. Moreover, learning that involved concrete activities in the environment was what students remembered and part of what they enjoyed during the fieldwork. Regardless of learning, anything that brought students into direct contact with nature or with the living world, possibly with an emotional dimension (e.g. stroking the cows for lower secondary-school students), remained an outstanding memory or a favourite element during the outing.

Students place the learning science dimension in first place when asked what they appreciated most during the fieldwork (35% of students on average, see Figure 3). Although the scientific dimensions appear to be predominant in the students' statements immediately after the fieldwork, it is important to ensure that this learning will continue over time. To do this, it seems necessary to reorganize what was learned during the fieldwork into the classroom lessons. Indeed, the preparation and the exploitation of an outing are the factors that most influence the effectiveness of learning during a field trip (Orion, 1993). As with any teaching method, the learning achieved during a fieldwork is primarily dependent on the preparation with the pupils beforehand, as well as on the teacher's attitude during the trip (Dewitt & Storksdieck, 2008). Students' prior knowledge of the environment that is to be the subject of a fieldwork appears to be essential for effective learning (Bitgood, 1989). The recent study by Ayotte-Beaudet et al. (2019) showed that preparing a fieldwork with the students develops their interest and contributes to the success of the fieldwork. Morevoer, the work carried out must be problematized, structured and linked to theoretical input in the classroom (Fägerstam, 2012). In addition, on the fieldworks we observed, students were involved in group work activities most of the time. The students appreciate this teaching practice that allows them to socialize while learning. By working in small groups, students are engaged in the activity and learn effectively through interactions with each other and with the environment (Jeronen, Palmberg, & Yli-Panula, 2017).

Even if for teachers the scientific content corresponds to the essential objective of a field trip Julien & Chalmeau, (in revision), it seems to us central to maximize the educational value of the other dimensions of fieldwork, notably sensory exploration, taking into account the emotional sphere, and awareness of our relationship to the world and to living things.

Conclusion

The results of our study highlight students' enthusiasm for fieldwork. Most of the students we interviewed, from primary- to secondary- school, expressed a definite interest in fieldwork organized by their teachers. This interest was based partly on an affinity for nature and partly on the situation. Given that interest and affinity for nature appear to be strongly correlated and account in equal measure for pro-environmental behaviour (Kals et al., 1999), then it is clearly important to give students more opportunities to experience nature.

In our study, there are two main reasons for students' interest in nature, starting with the desire for a sensory experience linked to a lived relationship with the natural environment. In this context, the wellbeing experienced by the students during the fieldwork is an important contribution to the fact that they like nature outings. The development of sensitivity towards the environment should therefore be an objective of environmental education, so that students feel sufficiently concerned by

the environment to act to preserve it (Chawla, 1998; Pruneau & Lapointe, 2002). The second reason is that students want to learn something new about nature and how it functions. Learning scientific concepts and processes in and from nature is a primary motivation for students, which is both a consequence and a cause of their interest in nature. The direct relationship with the elements of the environment, the concrete dimension of what they observe, seems to facilitate their understanding.

In addition to their cognitive impact (scientific knowledge in particular), fieldwork can have an impact on emotional and social dimensions, and prompt individuals to become involved in environmental issues (Heras, Medir, & Salazar, 2019). If time spent in the natural world remains an important predictor of affinity for nature (Chawla, 2006), we think it is important to activate both cognitive and emotional dimensions, in order to develop an interest in nature and, by so doing, can contribute to the development of a reflective, concerned, and even pro-environmental attitude.

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