



## Environmental education in Moroccan primary schools: Promotion of representations, knowledge, and environmental activities

**Bouchta El-Batri**, *Sidi Mohammed Ben Abdellah University, Morocco*, [bouchta.elbatri@usmba.ac.ma](mailto:bouchta.elbatri@usmba.ac.ma)

ORCID: 0000-0001-6428-8478

**Anouar Alami**, *Sidi Mohammed Ben Abdellah University, Morocco*, [anouar.alami@usmba.ac.ma](mailto:anouar.alami@usmba.ac.ma)

ORCID: 0000-0002-3951-9382

**Moncef Zaki**, *Sidi Mohammed Ben Abdellah University, Morocco*, [zaki.moncef@yahoo.fr](mailto:zaki.moncef@yahoo.fr)

**Youssef Nafidi**, *Sidi Mohammed Ben Abdellah University, Morocco*, [youssef.nafidi@taalim.ma](mailto:youssef.nafidi@taalim.ma)

**Abstract:** The study aims to promote environmental education in Moroccan primary schools through three complementary entries; the expansion of students' representations about the environment, the qualitative improvement of knowledge and activities related to the environment. We conducted a descriptive correlational study involving four schools from different socio-economic backgrounds. The results obtained allowed us to identify the principal representations of students on the environment. Then, we founded a proposal to broaden the range of these representations. In addition, an environmental knowledge test revealed a significant positive correlation between student performance and socio-economic background. The study highlighted the positive educational impact of the contextualization of curriculum knowledge. We also made some recommendations that could improve students' activities and performance in environmental education. Consequently, reduce the negative educational impact of social inequalities.

**Keywords:** Environment, student, representations, environmental knowledge, environmental activities

Received: 04.03.2019

Accepted: 21.10.2019

Published: 15.01.2020

### INTRODUCTION

In Morocco, research that explores environmental education at the primary level is rare (Cherai, El Hnot, El Fellah-Idrissi & Akkaoui, 2017). However, between 6 and 13 years old is the golden age for children to learn about the external environment and form attitudes, values, and rules of conduct relating to it, some of which will remain engraved in memory and will influence their personality and future behavior. Environmental education (EE) is an essential component of basic education (Bonin, 2006; Orellana, 2002; Sauv , 1997b, 2002, 2012). It relates to the human relationship with the environment; one of the basics of personal and social development (Sauv , 1997b, 2002, 2012). It is an ongoing process, with goals that go beyond participating in the resolution of certain environmental problems. It also aims to prevent new ones emerging, and above all improve the quality of the environment (UNESCO-PNUE, 1978). This research explores EE in a school setting, considering three fundamental aspects; the representations, knowledge, and activities related to the environment.

#### *Students' Representations of "The Environment"*

Social representations are organized models of beliefs, attitudes, and actions that convey a certain position in a universe—that of common sense (Billig, 1991 & Moscovici, 2001). Thus, a social representation could be conceptualized as a structured mental model shared by individuals within a social group, allowing collective elaborations of social objects in their daily lives (Moscovici, 2001). Many researchers consider that representations are socially constructed during exchange processes and interactions with the reference social group (Doise, Cl mence & Lorenzi-Cioldi, 1992; Garniez & Sauv , 1999; Jodelet, 1989; Moscovici, 1989). Sauv  and Machab e (2000) considered the representation as a focal point for learning about an object.

Other researchers (Hadjichambis, Paraskeva-Hadjichambi, Ioannou, Georgiou & Manoli, 2015) have argued that the collective representations of young people play an important role in decision-making, and are related to the ways in which they may intend to act. Additionally, Shepardson, Wee, Priddy & Harbor (2007) support the idea of a correlation between representations and decision criteria. Lee (2010) found that adolescent knowledge was a significant predictor of behavioral intentions regarding green purchasing. The clarification of the concepts holds a very important place in the field of the environment where articulate and interact the individual and social factors (Bonaiuto, Carrus, Martorella & Bonnes, 2002) and where varies the scale of perception of the problems; global, regional or local (Lima & Castro, 2005, Uzzell, 2000). It is also the area of intervention of ecological considerations as well as anthropocentric concerns (Castro & Lima, 2001). Some authors believe that environmental education should begin with questioning about the subject of environmental representations (Chávez, 2008, p. 169); that is, clarification of the meaning of the environment. In this study, we revealed the representations of primary school students concerning the environment. This is based on Sauv e's typology of representations of the environment (Sauv e, 1996, 2002). Indeed, this author has apprehended the environment according to several facets: the environment as nature (to be appreciated, respected, and preserved); the environment as a resource (to be managed, and to be shared); the environment as a problem (to be solved); the environment as a place to live (to know and learn about, to plan for, and to take care of); the environment as a system (to be understood for better decision-making); the environment as a community project (in which to get involved); and the environment as the biosphere (in which we all live together and into the future).

### ***Knowledge about the Environment***

In addition to environmental representations, this study has revealed the degree of mastery and use of specific environmental knowledge related to the curriculum of the fourth and fifth year of primary school (subject: scientific activity). Some studies support the existence of a more or less direct and positive relationship between the environmental knowledge of an individual and a positive attitude towards the environment (Bradley, Waliczek & Zajicek, 1999; Lester, Ma, Lee & Lambert, 2006; Rodriguez, Boyes & Stanisstreet, 2010, Tuncer, Sungur, Tekkaya & Ertepinar, 2007) and a tendency to act in respect of the environment (Boyes, Skamp & Stanisstreet, 2009; Chhokar, Dua, Taylor, Boyes & Stanisstreet, 2011). Other researchers have proposed a less direct and non-linear link between knowledge and environmental behavior (Cialdini, Reno & Kallgren, 1990; Corraliza & Berenguer, 2000; Hines, Hungerford & Tomera, 1987; Kollmuss & Agyeman, 2002, p. 20; Malandrakis, Boyes & Stanisstreet, 2011; Pruneau et al., 2006; Skamp, Boyes & Stannistreet, 2009). Because human behavior is influenced, according to these same authors, by other factors in addition to knowledge. These include social pressures, beliefs, motivation, individual action competence, and other intrinsic and extrinsic factors in complex interaction with each other. However, in general, we can say that knowledge is part of a number of factors that influence the intention to act (Heimlich & Ardoin, 2008), and this is a prerequisite for informed environmental decision-making (Jensen, 2002; cited by Hadjichambis et al., 2015).

On the other hand, student performance and particularly their environmental curricular knowledge are strongly correlated with the socioeconomic status of their families. This correlation has been revealed in several research (Ali, Haider, Munir, Khan & Ahmed, 2013, Downey 1995, Filmer & Pritchett 2001; Hall, Davis, Bolen and Chia, 1999, Ince & G z tok, 2018, Jeynes, 2003, Liu & Lu, 2008, Marks, 2010, Nonoyama-Tarumi, 2008, Paquette et al., 2016, Sirin, 2005, Tomul & Savasci, 2012, Zhao Valcke, Desoete and Verhaeghe, 2012 and many others). However, we have found some studies that do not quite agree with this idea. For example, White (1982) in a meta-analysis found that socio-economic status is only weakly correlated with student outcomes. Also, Marks (2005) conducting a study of 30 countries explained variations in student performance across countries studied by modernity and school system characteristics (in each country) rather than socio-economic status. In the same vein, Werning, L ser and Urban (2008) linked student performance to the existence of specific support for students in difficulty.

In Morocco, the socio-economic status of families is relatively related to their educational level (CSEFRS, 2018). In this study, we also revealed the impact of families' socio-economic status on their children's performance. In addition, the importance of this study is that it seeks to reduce the negative impact of social inequalities (imposed on students) on their performance in environmental education. This by exploring in the areas of student representations, their environmental activities and especially the revelation of the importance of the local context and the contextualization of curriculum knowledge.

### ***Use of Environmental Knowledge***

The use of environmental knowledge in daily life is the criterion for contextual knowledge, in which the knowledge is relevant and significant for the individual. This leads to a better impregnation of knowledge, or what Perrenoud (1998) calls “Apprentissages durables” (sustainable learning), because knowledge and skills decline over time when they are not used.

The Global Monitoring Report on Education (Benavot et al., 2016) clarified that primary and secondary education should lead to “relevant and effective learning”. In environmental education “relevant and effective learning” is a type of learning that is transferable in other situations, and likely to produce responsible behavior towards the environment (Erdog n, 2009; Genc, 2015; Hungerford & Volk, 1990). Many studies have shown that formal education has not allowed students, in many cases, to achieve this goal effectively (Alp, 2005; Hallar, McCubbin & Wright, 2011; Ozdem, Dal,  zt rk, S nmez & Alper, 2014). For example, researchers (Alp, 2005; Hallar et al., 2011; Ozdem et al., 2014) found that students' environmental knowledge did not allow them to take responsibility in an efficient way for the environmental problems of everyday life.

In environmental education, among the types of useful environmental knowledge that may arouse the motivation of the student and his active involvement in learning, we can highlight local environmental knowledge. Several studies have highlighted the very positive impact of addressing local and tangible environmental issues on improving student learning and pro-environmental behavior (Anderson, 2012; Banerji, Bhattacharjea & Wadhwa, 2013; Chanse et al., 2017; El Batri, Alami, Zaki, Nafidi & Chenfour, 2019a; Higde, Oztekin & Sahin, 2017; Saribas, Kucuk & Ertepinar 2017; Sauv , 2014; Tugurian & Carrier, 2017; Villemagne, 2004). This can be done through the contextualisation of curriculum knowledge. Contextualization in education is a pedagogical action that involves linking science to society (Van Weelie & Wals, 2002) and to the local environment of the learner. It is a kind of operationalization and concretization of scientific concepts a little broad and ambiguous. Stevenson (2007) found that school curricula focus on abstract theoretical problems, while environmental education programs need to focus on real practical problems (Stevenson, 2007). In the life and earth sciences, teachers usually treat ecological concepts generally, regardless of the local context sometimes closely related to these concepts. Some authors have expressed this contextualization by speaking of the 'local approach'. According to Villemagne (2005), this is based on an anchoring of educational activities in the learners' living environment and, in the socio-ecological issues that characterize it (Villemagne, 2005). Thus, Saribas et al. (2017) stated that “environmental education courses should involve presentations, reflections, and discussions on authentic, local, and specific environmental issues.” Anderson (2012) pointed out that a closer examination of the local, tangible, and concrete aspects of climate change education leads to individual positive behaviors that support progress towards climate change mitigation (cited by Higde et al., 2017, p. 261). In addition, students involved in actions that have a tangible impact on the state of the environment will have greater self-confidence and awareness of their ability to transform their environment (Kerry et al., 2013). Tugurian and Carrier (2017) indicated that a child has an “environmental identity”, and that this identity can be exploited to improve his environmental behavior and strengthen his interest in the natural sciences.

To analyze the environmental education received by the students of the four schools under study, we used the typology of Lucas (1980), which was also used by Robottom and Hart (1993) and Sauv  (1997a, 1997b). In this categorization, there are three types of EE; “education about the environment”, centered on knowledge (the environment is a learning object);

“education for the environment”, focused on behavior and social practices in favor of the environment (the environment becomes a goal); and “education in the environment”, which is person-centered and considers an individual’s relationship to the environment—that is, “learning in contact with the environment” (Sauvé, 1997b, p. 18). This last type of EE emphasizes the importance of creating bonds between the person and his environment in order to develop feelings of belonging and empathy, as well as the desire to engage to solve certain environmental problems. However, it is important to note that this typology has been adopted to facilitate the analysis, despite it being practically difficult to draw clear and definitive boundaries between the three types of environmental education. As we can find these three types in the same project of environmental education.

This research aims to characterize the types of environmental education administered to Moroccan students who continue their studies at the elementary level. As well as improving their representations, knowledge and activities related to the environment. This is done by identifying ways to reduce the impact of social inequalities on their school performance. Thus, the study set three research questions:

1) What are the representations of primary school students regarding the concept of ‘the environment’, and what insights can we obtain from these representations towards to promoting relevant environmental education?

2) Are students' performance correlated with the socio-economic status of their families? In this case, can the teaching of useful and contextual environmental knowledge be a way of improving learning and reducing the impact of social inequalities?

3) What are the different types of environmental education actually offered to primary school students? And how can we make significant improvements?

## METHOD

### Research Design

The correlational descriptive design is the most appropriate for our study. In fact, descriptive research consists of the description of observations or data and then find the plausible explanation (Pelletier & Demers, 1994) and the interpretation of the relationships between the phenomena or variables studied. Moreover, the correlation between two variables does not imply causality (Shadish, Cook & Campbell, 2002). Certainly, correlations do not exclude alternative explanations for a relationship between two variables (Shadish et al., 2002). That’s what we tried to do in this study. In fact, after describing the essential of the variables studied. That is, representations, knowledge and activities related to the environment. The identification of some significant correlations helped us better explain the causal variables of the identified weaknesses. And to propose, later, some ways of improvement.

### Sample

We used the cluster sampling method because we have taken four schools that represent four different socioeconomic groups to which a Moroccan student can belong. Indeed, the study concerns four schools, two public belonging to precarious environments, one rural and the other urban. And two other schools belonging to one district of the middle and upper class, one private and the other public. Based on a population of 540 students from four different schools (grade 5), an exhaustive sample of 400 students (100 students per school) was taken. The sample studied included 214 boys and 186 girls. For the three public schools studied, there were about 40 students per class. For the private school that was studied, the number of pupils per class did not exceed 27. The fifth grade was chosen because the fourth and fifth year ‘Scientific Activity’ program contains the most important content related to environmental education. This program can be exploited to promote a contextualized and relevant environmental education. The details of the sample studied are shown in Table 1.

## Data Collection Tool

The data collection tool was a three-component questionnaire: the students' representations regarding the environment concept (six items), a test of environmental knowledge and their use (six items), and an exploration of the various environmental activities carried out inside and outside the school, along with their frequencies (nine items).

**Table 1.** *Details of the sample studied*

	School				Total	
	Rural Public	Urban Pub. precarious	Downtown Public	Private		
Gender	Boys	56	52	54	52	214
	Girls	44	48	46	48	186
Total	100	100	100	100	400	

The content of the questionnaire was developed in order to meet the objective of the study, which is the promotion of environmental education in the Moroccan primary school through the improvement of representations, knowledge and activities related to the environment. To characterize students' representations about "the environment", we went through the literature to select Sauvé's typology (1996, 2002). This typology is best suited to identify student representations. Indeed, the author distinguishes between several types of representations of the environment; environment as nature, environment as a resource, environment as a problem, environment as a place to live, environment as a system, and environment as the biosphere. Simple definitions for each type of representation were presented, and the student responded by ticking his degree of agreement or disagreement according to a 5-point Likert scale. Zero points represented "no answer", 1 to "disagree", 2 to "indifferent", 3 to "mostly agree", and 4 to "totally agree". We note that the student can express the same opinion (agree or disagree) for more than one type of representation.

Concerning the validity of the content of the questionnaire. For the first part relating to representations, we used Sauvé's typology (1996, 2002) which has been validated and widely used by several researchers (Bonin, 2006; Karwera, 2007; Naoufal, 2012; Orellana, 2002; Sauvé, 1996, 2002; Villemagne, 2003 and others). For the second part concerning the environmental knowledge test. The test questions were formulated from the formal program of "Scientific Activity" in the fourth and fifth year of primary education (Moroccan Curriculum Review Committee, 2002). The questions were precise and representative of all the units likely to be exploited in the context of environmental education. The themes are: human-induced risks to water resources and forests, food chains, and reproduction in animals. Direct and specific questions were asked about each of these program units (Table 2). Question 5 aims to reveal an indicator of the level of appropriation of local environmental knowledge. It has already been noted that many researchers have stressed the importance of integrating the local environment and its problems into environmental education courses.

**Table 2.** *Environmental knowledge test questions*

1)	Name two activities (in which man is involved) that jeopardize the water resources.
2)	Specify three risks that threaten the forest.
3)	Sexual reproduction is a function that allows the preservation of a species, and its multiplication. What is the phenomenon of fusion of a spermatozoon with an egg?
4)	Correctly write an example of a food chain composed of three species.
5)	Aquatic environments are part of environmental media. Name three wadis that cross the city of Fez and its regions.

The usefulness of environmental knowledge acquired in school was measured by the degree of their use in the student's daily life (not at all, rarely, occasionally, or often). Only those students who reported using their environmental knowledge in their daily lives either occasionally or often were counted, while those who reported using it rarely were not.

The third part of the questionnaire was an exploration of the different environmental activities carried out during two school years (2016–2017 and 2017–2018). To determine the different types of activities that can be implemented in schools, we have benefited, in addition to literature reviews, from our own experience in extracurricular clubs. The low percentages attributed by the students to the "Other Activities" section indicate that the main activities are actually the ones we have determined. These activities included waste collection, greening, beautification of the school space and surroundings, conducting research, environmental outings, and other activities (Figure 3). Only activities completed twice or more were counted. However, environmental activities carried out accidentally only once in two years were not taken into account.

In the questionnaire, we used only the lexicon that appears in the official 'Scientific Activity' program for grades 4 and 5. The items of the questionnaire have been reformulated several times, in collaboration with the research committee. This committee is made up of specialized professors in the didactics of sciences and educational engineering. This was done to ensure the reliability of the questionnaire, its clarity and accuracy. In addition, the questionnaire was tested with a group of 16 students (grade 5) before reaching the final version used in this work. Then we administered it, face-to-face, to the students of the four schools studied. The data collection was done during the month of May 2018, and the test to confirm the distinctive power of the instrument was carried out in June 2018. Indeed, one month after data collection, we tested the distinctive power of the instrument in two schools; the precarious public school (20 randomly selected students) and the private school (20 randomly selected students). This test confirmed the differences between the two institutions that were revealed during the first data collection. That is to say, we found the same three first representations of the environment and in the same order as that identified in the first data collection. Also, the test of environmental knowledge confirmed the significant superiority of the private school (15 students who have achieved an average grade or higher) in comparison with the public school of precarious environment (only 7 students who had an average grade or higher). Similarly, the environmental activities carried out by more than half of the students (twice or more) are the same, with a significant superiority of the private school regarding school trips and research activities. Which means that we found the same differences as those identified during the first data collection. This constitutes a strong element of the reliability of the instrument.

The questionnaire also benefited from external validity from the report of the Higher Council for Education, Training and Scientific Research (CSEFRS, 2018) entitled "A School of Social Justice". This report has highlighted the impact of social inequalities on school inequalities and their amplification.

The reliability index (Cronbach's alpha) applied to each component of the questionnaire gave the following values: 0.701 for the environmental knowledge test, 0.651 for the environmental activities performed and 0.543 for the students' representations about "the environment". This indicates that the internal consistency of the questionnaire is satisfactory.

We respected ethical principles throughout the data collection process. First to access the schools and distribute the questionnaires, we took the authorization of our faculty, the regional academy of education (Fes-Meknes), two provincial delegations of education (Fez and Moulay Yacoub). Then we coordinated with the principals of the schools concerned and some teachers to choose the ideal time to distribute the questionnaires. In addition, before distributing the questionnaires, we explained to students the context and purpose of the research and the voluntary nature of their participation. We took their explicit voluntary agreement to participate in this study. We kept the confidentiality of the names of the participants as well as the schools studied.

### **Data Analysis**

The analysis of the data was based mainly on descriptive statistics, analysis of variance, and correlations between the different variables studied. This was completed using the IBM SPSS20 statistical software.

Regarding students' representations about the environment, a comparative analysis of the frequencies of the different degrees of agreement or disagreement reported for each type of representation in the four schools was undertaken. Given that the "strongly agree" opinions with certain types of representations were significantly higher than for other opinions (somewhat agree, indifferent or disagree), only the frequencies of opinion "strongly agree" were retained in the results.

For the environmental knowledge test, a comparison was made of the percentages of students who obtained the average (a score greater than or equal to 5/10) in all four institutions. Then, an analysis of variance (ANOVA) was completed to extract the significant differences and classify these institutions into separate categories. Afterwards, we looked for correlations between these results and the socio-economic level of the students.

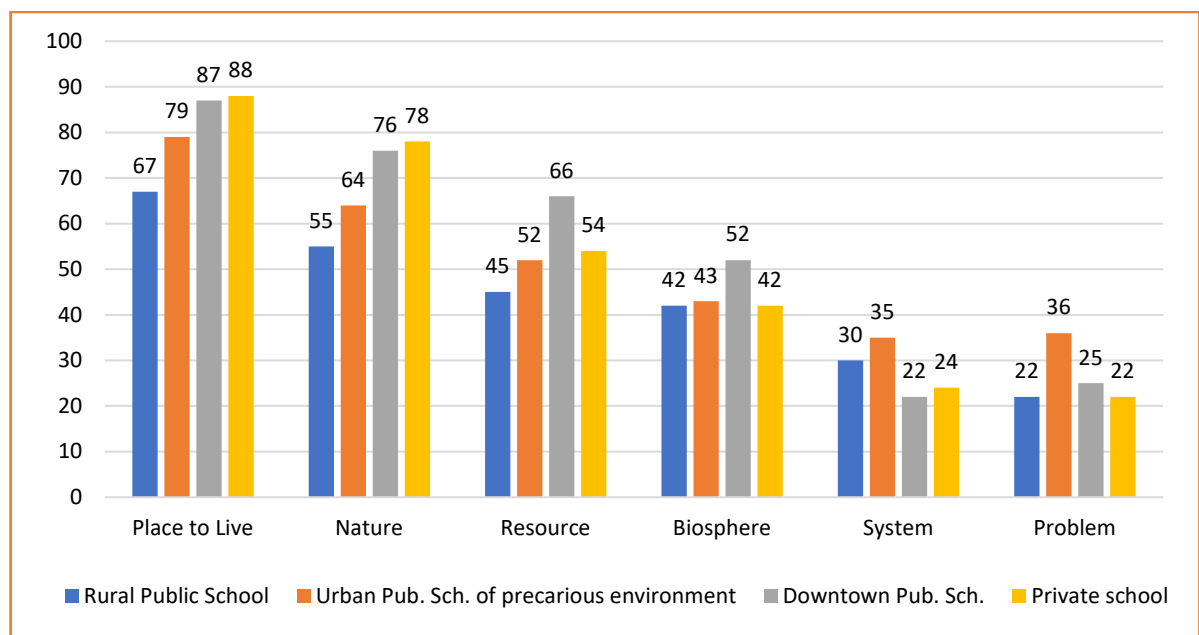
In this work, we explored the different correlations existing between the acquisition of certain types of environmental knowledge, the declared use of environmental knowledge, and the environmental activities carried out. We also looked for significant correlations between gender and certain environmental activities.

The assessment of the environmental knowledge acquired and the environmental activities carried out allowed us to identify the types of environmental education administered in each institution. The types of environmental education were classified according to the typology of Lucas (1980), which was also utilized by Robottom and Hart (1993) and Sauvé (1997a, 1997b). The following three categories were considered: education about the environment (environmental knowledge); education for the environment focused on behavior and social practices for the environment (environmental activities), and education in the environment (school outings).

## RESULTS

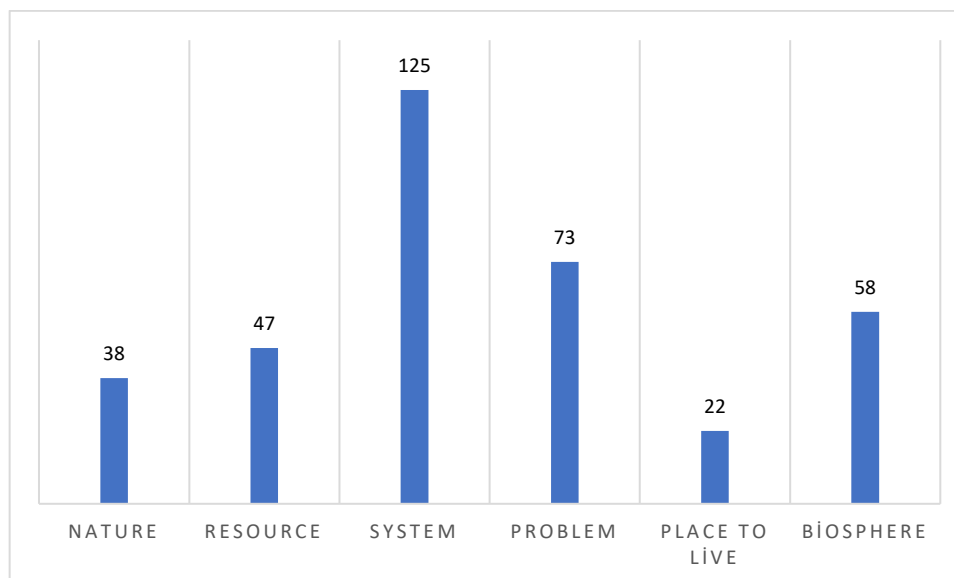
### The Concept of "the Environment"

By analyzing the opinions of the students who "strongly agree" for each of the six representations of the environment presented, we found a similar order of ranking of the first three most representative conceptions of the environment. In fact, for the four institutions under study, the representation of the environment as a "place to live" always came first, followed by the environment as "nature", and in third place was always the representation of the environment as a "resource" (Figure 1).



**FIGURE 1.** Frequency of the opinion "strongly agree" for each of the six representations of the environment

In analyzing the different opinions of students about "the environment", we noticed that among all the representations proposed, the conception of the environment as "system" made the most ambiguity for the students. Indeed, we found for all the institutions studied that the definition of the environment as a "system" systematically received the most "indifferent" opinion (Figure 2). That is, the students probably did not come to understand its meaning and make a clear decision (agree or disagree).



**FIGURE 2.** Number of "indifferent" students for each of the representations of the environment

### Environmental Knowledge Test

The test results showed striking differences between the four institutions studied. Indeed, we found a noticeable superiority in the private school and a very remarkable deficiency in the rural public school. This is illustrated by the percentage of students who were able to obtain the average (grade  $\geq 5/10$ ) in each institution; 77% in the private school, 46% in the urban public school of downtown Fez, 35% in the urban public school of the precarious environment, and only 18% of the students of the rural public school were able to achieve the average.

**Table 3.** Percentage of students who have scored the average and more in the environmental knowledge test

Schools	N students	n1 boys	n2 girls	% Students who obtained the average and more
Rural Public	100	56	44	18%
Urban Pub., precarious environment	100	52	48	35%
Downtown Public	100	54	46	46%
Private	100	52	48	77%

To test the hypothesis that there are significant differences between the schools studied in terms of student performance; specifically, their environmental knowledge of the curriculum, we conducted an analysis of variance (Anova) with multiple comparisons between students from all the schools studied (Table 4). This analysis allowed us to isolate three distinct groups whose scores differ very significantly. The first and best group consists of the private school which has marked very significant differences in comparison with other schools. The second group brings together the two urban public schools (downtown and precarious environment), there are no significant differences between the two. The third and last group is composed exclusively of the rural public school. So, these results confirm our hypothesis.



**Table 4.** Analysis of variance (ANOVA) applied to student scores with multiple comparisons between schools.

ANOVA	Multiple Comparisons (Post Hoc Tests)		
	Schools	Mean Difference	Sig.
Dependent Variable = Knowledge Test Notes	Urban Public, Precarious Env. // Public Rural	,39000*	,001
Criterion = Schools	Public, Downtown // Public Rural	,46000*	,000
N = 400	Public, Downtown // Urb. Pub., Precarious Env.	,07000	,530
F (3, 396) = 27,248	Private // Public Rural	1,00000*	,000
significance = ,000	Private // Urban Public, Precarious Environment	,61000*	,000
	Private // Public, Downtown	,54000*	,000

\*. The mean difference is significant at the 0.05 level.

There is a very significant positive correlation between student performance (test scores) and the socio-cultural level of parents, and particularly their social class and level of schooling (both are relatively related) (Spearman's correlation coefficient = 0.468 with significance level of 0.01). It has already been mentioned that the precarious urban public school and the rural public school contain a poor and precarious social class with average to very low parental schooling levels, the public school in downtown Fez represents mostly a middle social class, and finally the private school represents a middle to wealthy social class with a high level of parental education.

Regarding the indicator question of local environmental knowledge (wadis crossing the region of Fez), the results were worrying. Indeed, the majority of students from all institutions studied did not know the names of the wadis that cross their city (or have only known one wadi among the three requested). The number of students who gave correct answers was less than 10% at the level of the rural public school, 13% at the private school level, 26% in the precarious urban public school, and 34% at the downtown public school.

### Use of Environmental Knowledge in the Student's Daily Life

The use of environmental knowledge in the student's daily life is a good indicator of contextualized knowledge which is significant for him and transferable in other situations. The results show that the majority of students (62 to 73%) of the three public schools stated their use (occasional or often) of this type of knowledge. At the private school level, this percentage did not exceed 46%. Analysis of variance (ANOVA) revealed very significant differences (a very high level of significance) between the private school and the other public institutions regarding this point. However, the results of the environmental knowledge test showed a very apparent superiority of the private school in terms of students' grades.

### Environmental Education

#### *Environmental Activities*

The main reported environmental activity carried out in three institutions, by more than half of the students (55 to 72%), was waste collection and cleanliness. Environmental research activities were significantly reported only at the public downtown school and the private school (61% and 60%, respectively). This was a clear difference compared to the public school of precarious environment and that of the rural environment (31% and 29%, respectively). The beautification activities of the school space were mainly affirmed at the downtown public school (63%). In addition, school trips were made significantly only in the private school. The remaining environmental activities were poorly represented in all the institutions studied; namely greening, awareness raising, and artistic works related to the environment.

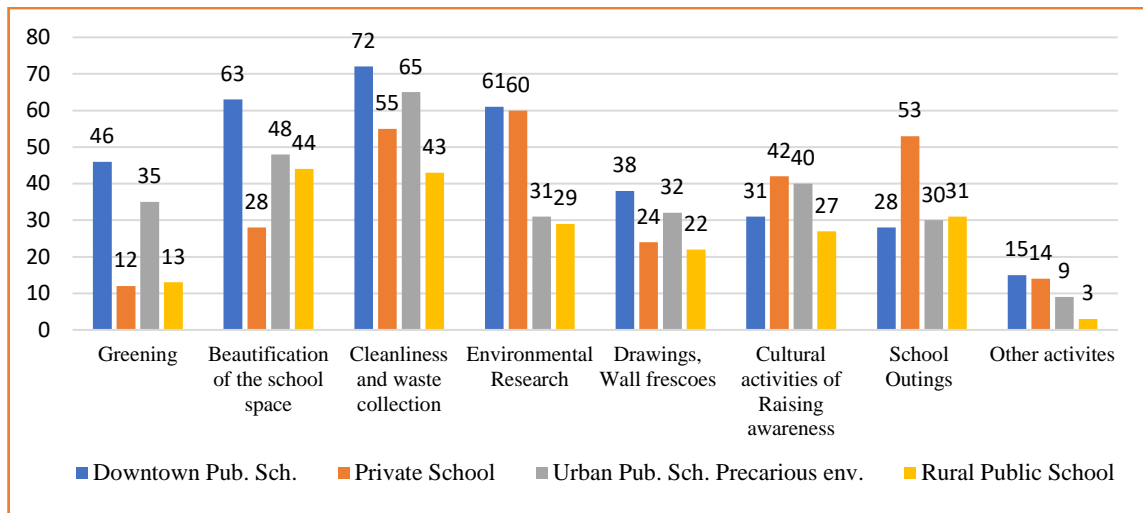


FIGURE 3. Environmental activities conducted twice or more during two school years (2016-2017 and 2017-2018)

### Environmental Education

The Lucas typology (1980) was applied to analyze the types of EE at the institutions under study. Thus, “education about the environment” was associated with environmental knowledge test results, in addition to environmental research activities. “Education for the environment” is attributed to the following activities: cleanliness and waste collection, awareness activities, greening, beautification of the space, and drawings and frescoes related to the environment. Finally, the last type of EE, “education in the environment”, is devoted to school outings. It is important to note that this categorization has been adopted to facilitate analysis, since it is virtually very difficult to draw definitive boundaries between these three types of EE; some activities may have both educational and environmental objectives, as these three categories can be found in a single environmental project.

Concerning education about the environment, we note a superiority of the private school with 68.5%, followed by the public school of the downtown (53.5%), whereas in the urban public school of precarious environment and rural public school, this type of environmental education is well below average (33% and 23.5%, respectively). Regarding education for the environment, this occurs predominantly at the public downtown school (50%), followed by the public school of precarious environment (44%); however, this type of EE is poorly represented in the private school (32.2%) and rural public school (29.8%). Moreover, education in the environment is weakly achieved at the three public schools studied (28% to 31%). On the other hand, this type of environmental education is fairly well represented at the private school level (53%). This is mainly due to the significant existence of school trips only at the private school.

Table 5. Average percentages for each category of environmental education

Schools	Education about the environment	Education for the environment	Education in the environment
Private school	68,5	32,20	53
Downtown Pub. Sch.	53,5	50	28
Urban Pub. Sch. Precarious env.	33	44	30
Rural Public School	23,5	29,8	31

### Correlations

We have already mentioned that, of all the institutions studied, the private school is the only one where more than half of the students who go on school trips regularly (at least once a year). However, in this school there was a significant correlation (Table 6) between gender and school trips; boys do more outings than girls. The identified correlation between gender and the

achievement of school trips can be explained mainly by cultural reasons. Families are generally more concerned about their girls than their boys while on a field trip. Therefore, they give more freedom to their boys rather than their daughters. Also, a significant positive correlation has been found between local environmental knowledge and knowledge of human activities that pose a risk to water resources (Table 6). This correlation has been identified at the level of the two urban public schools. Certainly, there is a logical link between the two types of knowledge. Local knowledge concerns the wadis that cross the city of Fez and its surroundings (Table 2, question 5). These wadis are polluted and overexploited, so, students who know these wadis are more likely to know about the human activities that pose a risk to water resources. Here, local environmental information is well linked to curricular knowledge and promotes its acquisition. Among the other significant correlations revealed in this study is that existing between conducting environmental research and student performance (test scores). This correlation is found only in the most active institutions in environmental research (the private school and the downtown public school) (see Figure 3 and Table 6). That is, students who do more environmental research will be more likely to perform well in the 'Scientific Activity' courses than those who do not. This type of activity is among the active learning methods recommended to be initiated from the primary level.

**Table 6.** *Different correlations identified at the level of the four schools*

Schools	Correlated Variables	Spearman Correlation	Level of Significance
All institutions (N=400)	The socio-economic status // Environmental knowledge test score	0.468**	0.01
Private School (N=100)	Gender // School Outings	-0.335**	0.01
	Environmental research // Test score	0.410**	0.01
Downtown Public School (N=100)	Local environmental knowledge // Risks threatening water	0.340**	0.01
	Environmental research // Test score	0.288**	0.01
Urban Pub. Precarious (N=100)	Local environmental knowledge // Risks threatening water	0.256*	0.05

## DISCUSSION

By and large, we can say that students in the four schools studied expressed almost the same types of representations about the environment. This is despite the fact that these are students from very different socioeconomic and sociocultural backgrounds. The private school (not accessible to everyone) represents a middle to affluent social class with a high level of education of the parents (often university level). The public school in downtown Fez represents mostly a middle social class. The urban public school of the precarious environment and the rural public school contain a poor and precarious social class, with a parental education level of average to very low. Therefore, we can say that the socio-cultural environment of the students had no significant influence on their conception of the environment.

However, the surprising thing is that these results are in perfect agreement with those found in other studies involving students of/about the same age range (10 to 12 years), from many distant and different countries from the point of view of language, culture, religion, state of development, and so forth. In this context, we can cite the study by Marquis (2001), in particular the section concerning young people from Niodior (Senegal); that of Djané, Konaté and Kouassi (2009) (Côte d'Ivoire); the study of El Kent, Bekhat, Madrane and Jules (2015) (Congo) and in particular the study of Côte and Picard (2003). The latter concerns the representations affirmed by elementary students of Iles-de-la Madeleine (Canada). In fact, even though this study was carried out in an insular island belonging to a continent far removed from our study population (Fez, Morocco) and carried out with a different qualitative method, they achieved exactly the same results as ours. That is to say, in both studies we found the representation of the

environment as a "place to live" came first, followed by the environment as "nature", and thirdly the conception of the environment as a "resource". This calls into question the theory of social representations, which considers that representations are socially constructed and that they depend on the exchanges and interactions that each person maintains with his or her social reference group and cultural background (Doise et al., 1992; Jodelet, 1989; Moscovici, 1989). Admittedly, these results support the possibility of the existence of similar representations in different societies. We must therefore admit that we have obtained a kind of unity of representation at the very moment when we are looking for differences. We found the common rather than the particular. It is thought that there are traits of unity in these representations which are independent of the socio-cultural context. That is, the conception of the environment touches a deep and common aspect in human beings. In other words, the conceptual schema that man constructs vis-à-vis "the environment" is more or less stable, whatever his origin and socio-cultural context.

The meaning of the environment as a "System" is poorly understood by students. However, learning about the environment as a system and the systemic approach to environmental education is recommended by several researchers (Giordan, Martinand & Souchon, 1991; Gough, 1993; Goffin, 1998; Sauv , 1999 and Ragou & Souchon, 2000). Additionally, the final report of the Tbilisi Conference on EE (UNESCO-PNUE, 1978) proclaimed that "the fundamental goal of environmental education is to bring individuals and communities to understand the complexity of the environment..."—a complexity that takes into account (according to the same report) the interaction of biological, physical, social, economic and cultural aspects of the environment (p.28). Again, this brings us back to the concept of the environment as a "system". To broaden the range of students' representations on the environment, we propose to start teaching the environment as a "system" from the fifth year of primary school, through the systemic analysis of local environmental issues. This will help students to learn to take into account the complexity of the network of relationships between the components of the environment, and to understand the interdependence of living beings with each other and with their environment. Within this framework, the 'Scientific Activity' program of the fifth year, and particularly the unit devoted to chains and the food web, can be enriched by concrete and meaningful local examples. For example, the effect of the pollution of "Oued Sebou" on the extinction of certain species of fish (the shad), and its consequences in terms of deterioration of food chains, would be a relevant to the local area of this study.

In the literature, several studies carried out in various countries are in good agreement with our results, in particular the research concerning the impact of the socio-economic status of parents on the educational performance of their children. For example, Jeynes (2003) reported parents have an influence on students' academic performance. Filmer and Pritchett (2001) pointed out that students from affluent families have a greater opportunity to obtain education, especially in developing countries. Other studies in several parts of the world have confirmed the impact of parental socio-economic status on a child's academic performance. Examples include the works of Downey (1995); Hall et al. (1999) and Sirin (2005) in the United States; Liu and Lu (2008) and Zhao et al. (2012) in China; Marks (2010) in Australia; Tomul and Savasci (2012) and  nce and G z tok (2018) in Turkey and Nonoyama-Tarumi (2008), who conducted a study at the country level of the Organization for Economic Cooperation and Development (OECD). In the same vein, Chevalier and Lanot (2002) reported that students from poor families in the United Kingdom generally had worse grades than their better-off counterparts. In Canada, highly vulnerable students perform significantly less well on exams, and are six times more likely to repeat grades in primary school (Paquette et al., 2016). However, it should be noted that although the majority of the studies we examined support the impact of socio-economic status on student performance, a few other studies have found that this correlation is weak or absent (Marks, 2005; Werning et al., 2008; White, 1982). In Morocco, the latest report of the

Higher Council of Education, Training and Scientific Research (CSEFRS, 2018, pp. 6–20), entitled “Une École de Justice Sociale” (A School of Social Justice), focused on the impact of social inequalities on school inequalities and their amplification. We can say that in Morocco, the social (educational and economic) level of families plays a decisive role in the schooling of children. Indeed, students from educated and more economically stable families (average or better off) receive a better education in comparison with their counterparts from precarious and less educated families. This study seeks, among others, to reduce the educational impact of social inequalities, specifically in terms of environmental education.

The study found that students have a significant lack of knowledge about the local environment such as wadis that cross their area. This is despite the fact that several of the major ecological problems experienced in the city of Fez and its surroundings (and which still persist) are related to the pollution of its wadis. It seems that the environmental knowledge being taught is largely general and decontextualized from the local environment, and particularly the biophysical environment and its specific problems. The relative increase in the number of students who answered the question at the downtown public-school level can be explained by the proximity of this school to one of these wadis (Oued El Mahraz). Local environmental knowledge, lacking in the schools studied, is for many authors a very important basis that can be exploited to motivate students, facilitate learning (by concretizing certain concepts), and improve students’ pro-environmental behavior (Anderson, 2012; El Batri et al., 2019a, 2019b; Higde et al., 2017; Tugurian & Carrier, 2017). In a very recent study conducted in the same region (El Batri et al., 2019a), the use of ecological knowledge related to the local environment has significantly improved the performance of students in science programs. So, to improve the appropriation of environmental knowledge, it is necessary to integrate significant examples for the pupil. Local environmental knowledge falls within this framework. It is very important, from a pedagogical point of view, to reveal to students the links between the environment “object of the science course” and “the environment close to the student”. This is essential for the student to make sense of the learning (Roegiers, 2006). The example already mentioned (concerning the effect of the pollution of Oued Sebou) falls within this framework.

The educational importance of knowledge about the local environment has been revealed by their significant correlation with some specific curricular knowledge (Table 6); especially, when it is the same theme (risks threatening water). In this case, contextualization of curricular knowledge is preferable and recommended to facilitate and inculcate more sustainable learning. Some authors have emphasized the positive impact of local and specific environmental knowledge on the improvement of learning and pro-environmental behavior (Anderson, 2012; Banerji et al., 2013; Chanse et al., 2017; El Batri et al., 2019a; Higde et al., 2017; Saribas et al., 2017; Sauvé, 2014; Tugurian & Carrier, 2017; Villemagne, 2004). Tugurian and Carrier (2017) indicated that children have an “environmental identity”, and that this identity can be exploited to “improve their environmental behavior and strengthen their interest in the natural sciences.” Therefore, when teaching the units of the program “Scientific Activity, 4th Year Primary”, which deal with risks to water resources, it is strongly recommended to integrate local examples. These examples make scientific knowledge more meaningful and motivating for the student. The positive effect of the individual’s interaction with his biophysical environment on his mastery of environmental knowledge has been discussed by Thorndyke and Hayes-Roth (1982). Additionally, Lacroix, Martin-Storey, Déry, Lemelin and Temcheff (2018) focused on the influence of the local environment (residential neighborhood) on the academic performance of adolescents. On the other hand, the practical utility of knowledge of the local context has been demonstrated by several researchers (Brokensha, Warren & Werner, 1980; Fischer, 2000; Gladwin, 1989; McCorkle, 1989). This utility has been confirmed in several areas; in particular environmental protection (Fischer, 2000; Kollmuss & Agyeman, 2002; Liebenberg, 1993). Therefore, the local environment (at the city and regional scale) must be integrated into ‘Scientific Activity’ programs. This facilitates the learning of certain environmental concepts, especially when this local environment is subject to significant risks, as is the case in the Fez

region (degradation of the wadis). This makes it possible to contextualize certain abstract concepts such as pollution, so they become meaningful for the student. This contextualization of environmental concepts is strongly recommended for units of the 'Scientific Activity' program for 4th and 5th year primary students, concerning the risks threatening the forest and water resources. This makes it possible to develop in the learner, in addition to academic performance, other types of skills such as willingness to act, pro-environmental behavior and a practical awareness.

Among the environmental activities that marked very significant differences between the studied institutions, we note the environmental research activities as well as the school trips. Indeed, research activities are well represented only at the level of the private school and the downtown public school. At these two institutions, research activities are correlated with student performance. We can say that the high number of research activities testifies to a type of active learning that puts the student at the center of the educational action. This type of active learning is conducive to student performance development (Chickering & Gamson, 1987; El Batri et al., 2019a; Felder, Woods, Stice & Rugarcia, 2000; Genc, 2015; VanWinkle, Davis & Larwood 2002). School trips are regularly carried out significantly only at the private school level. The absence or poor existence of school trips in all public schools has also been confirmed in other studies conducted in Morocco (El Batri et al., 2019a, 2019b). It seems that school outings are devalued in Moroccan public education. However, we found many articles in the literature supporting the importance of administering field trips at least to serve the ecological and environmental themes of the program. In fact, this type of activity provides several educational and social benefits in the short, medium and long term (Pace & Tesi, 2004). In particular, school outings have been shown to promote better cognitive learning (Behrendt & Franklin, 2014; DeWitt & Storksdieck, 2008; Pace & Tesi, 2004; Prokop, Tuncer & Kvasničák, 2007; Stern, Powell & Ardoin, 2008). Additionally, some researchers have shown that field trips have significantly improved motivation and willingness to act in favour of the environment (Behrendt & Franklin, 2014; Chawla & Cushing, 2007; Palmberg & Kuru, 2000; Sivek, 2002; Wells & Lekies, 2006). We can therefore say that the exploitation of school outings in learning can help to reduce the educational effect of social inequalities.

The few students who have mastered the environmental knowledge curriculum (private school) said that most of this knowledge is useless or rarely used in everyday life. In other words, much of the curriculum knowledge about the environment is unusable or unrelated to the student's immediate environment. Besides, by analyzing student responses to test questions, we found that question 2 (citation of three threats to the forest) received the highest percentage of correct answers in all schools (62.8%), with a very significant difference in comparison with the correct answers from the rest of the test questions (between 10.3% and 24.8%). It seems that concrete environmental knowledge that can be used in everyday life is best acquired by the majority of students. In fact, the little environmental knowledge acquired by the students in the three public schools generally concerns the most concrete and useful information, while most of the other "academic" knowledge acquired by students in the private school is useless in their daily lives. As a result, students will soon forget them, because knowledge and skills decline over time when not being used. If this is the case, we will surely not succeed in what Perrenoud (1998) calls "Apprentissages durables" (sustainable learning)". In the same vein, the Global Monitoring Report on Education (Benavot et al., 2016, p. 216) states that primary and secondary education should lead to genuinely useful learning. It seems that was not the case for the students in our study.

If we compare the four institutions under study, we can deduce that the private school and the downtown public school are the two most active establishments in terms of the number of environmental activities carried out (by more than 50% of students). Indeed, there are three environmental activities carried out at a significant level in each of these two schools. In third position is the urban public school of precarious environment, with a single activity (cleanliness and waste collection). Finally, in last position is the rural public school, in which no environmental activity is registered by the majority (more than 50%). Table 5 shows that the downtown public school and the private school are represented by a majority ( $\geq 50\%$ ) for two

types of EE among the three mentioned. For the precarious urban school and the rural school, both of which represent a poor and less educated social class, no type of EE has been recorded at their level that reaches the 50% threshold. In another study (El Batri et al., 2019a) concerning four similar schools belonging to the same socio-environmental contexts as those of this study, they found significant differences between the schools studied in terms of learning methods, teaching aids used, and the number of students per class. These factors may partially explain some of our results. In addition, this study provides further evidence which reinforces the content of the latest report of the Higher Council of Education, Training and Scientific Research, entitled “Une École de Justice Sociale” (A School of Social Justice) (CSEFRS, 2018, pp. 6–20). Indeed, this report focused on a reciprocal amplification between social inequalities and educational inequalities.

To reduce the negative educational impact of social inequalities, this study has made some relevant recommendations. These will have to be taken into account in the new curriculum reforms that are being implemented in Morocco. Among these recommendations, we mention the contextualization of curriculum knowledge, the adoption of active learning methods (research activities) in addition to the valorization and implementation of school trips in public schools.

## CONCLUSION

This research work aimed at promoting environmental education in Moroccan primary schools through targeted educational actions on three interrelated components; representations, knowledge and activities related to the environment.

The representations of students from the four schools we studied regarding the concept of ‘the environment’ are similar, regardless of their socio-cultural and socio-economic context. Indeed, the environment mainly means to most people a “place to live”, “nature”, and “resources”. These same representations have been found following the same order in other studies (Côte and Picard, 2003). This conceptual stability allows us to suggest that students’ representations of “the environment” are not mere individual impressions about external objects, but rather expressions reflecting a deeper and more common image of the environment. On the other hand, to grasp the complexity of interactions within the environment, we have proposed expanding the range of representations. This may be achieved by starting teaching of the environment as a “system”, as recommended by many researchers (Giordan et al., 1991; Gough, 1993; Goffin, 1998; Sauvé, 1999 and Ragou & Souchon 2000), from the fifth primary year (unit: chains and food webs) through local examples which are concrete and meaningful for the students.

There is a significant positive correlation between student performance and the socio-economic and sociocultural status of families. In fact, a student from a middle-class or affluent family, with a higher level of parental education, is more likely to obtain better results than his or her counterpart from a poor and poorly educated family.

The study revealed a notable lack of some important local environmental knowledge in all the institutions studied. This indicates that the student's local environment is far from being a learning object within Moroccan primary schools. However, knowledge of the local environment is very useful, and can be linked to other knowledge in the school curriculum (scientific activity), thus facilitating the acquisition of such knowledge. In addition, the study found a significant positive correlation between some knowledge of the local environment and curricular environmental knowledge (threats to water resources). Admittedly, the environmental problems of the Fez region require the contextualization of certain environmental curricular concepts, such as pollution and the overexploitation of resources. This contextualization of the concepts makes them meaningful and motivating for the student. This will undoubtedly improve and facilitate the learning of these concepts.

Based on the results and significant correlations identified, we can say that the improvement of environmental learning and environmental education can be achieved through an action oriented towards the negative indicators revealed in this study. Particularly the

contextualization of curricular knowledge and the integration of the local environment in the learning related to the course of "Scientific Activity", the valorization and the implementation of school trips within public education and finally the adoption of active learning methods (research activities). In this way we can reduce the impact of social inequalities imposed on students.

The minority of students who have a good command of environmental curriculum knowledge (private school) reported that this knowledge is useless, or rarely used in their daily lives. This means that the student is "laden" with knowledge that is largely decontextualized, insignificant for him, and not transferable in other situations outside of school. This reality must be taken into account in the new school reforms that are being implemented at the level of the Moroccan School Curriculum. Reforms should aim to lead to truly useful learning, as recommended by UNESCO (Benavot et al., 2016) and as proclaimed by the Strategic Vision (2015–2030) of the Higher Council of Education, Training and Scientific Research (CSEFRS, 2015).

## REFERENCES

- Ali, S., Haider, Z., Munir, F., Khan, H., & Ahmed, A. (2013). Factors contributing to the students academic performance: A case study of Islamia University Sub-Campus. *American journal of educational research*, 1(8), 283-289.
- Alp, E. (2005) *An analysis of Turkish students' environmental knowledge and attitude* (Unpublished Master's Thesis). Middle East Technical University, Ankara.
- Anderson, A. (2012). Climate change education for mitigation and adaptation. *Journal of Education for Sustainable Development*, 6(2), 191-206.
- Bonin, P. (2006). *Enjeux et stratégies d'éducation relative à l'environnement en milieu collégial : le cas du Cégep Sorel-Tracy au regard de la problématique des contaminants dans la région du Lac Saint-Pierre* [Issues and strategies for environmental education in a college environment: the case of Cégep Sorel-Tracy regarding the issue of contaminants in the Lac Saint-Pierre region] (Master's thesis). Retrieved from <https://archipel.uqam.ca/2997/1/M9425.pdf>
- Bradley, J. C., Waliczek, T. M., & Zajicek, J. M. (1999). Relationship between environmental knowledge and environmental attitude of high school students. *The Journal of Environmental Education*, 30(3), 17-21.
- Brokensha, D. W., Warren, D. M., & Werner, O. (1980). *Indigenous knowledge systems and development*. University Press of America.
- Banerji, R., Bhattacharjea, S., & Wadhwa, W. (2013). The annual status of education report (ASER). *Research in Comparative and International Education*, 8(3), 387-396.
- Behrendt, M., & Franklin, T. (2014). A review of research on school field trips and their value in education. *International Journal of Environmental and Science Education*, 9(3), 235-245.
- Benavot, A., Antoninis, M., Barry, M., Bella, N., Blanchy, N. K., Delprato, M., & Zubairi, A. (2016). Education for people and planet: Creating sustainable futures for all. *Global Education Monitoring Report*.
- Billig, M. (1991). *Ideology and opinions: Studies in rhetorical psychology*. Sage.
- Bonaiuto, M., Carrus, G., Martorella, H., & Bonnes, M. (2002). Local identity processes and environmental attitudes in land use changes: The case of natural protected areas. *Journal of economic psychology*, 23(5), 631-653.
- Boyes, E., Skamp, K., & Stanisstreet, M. (2009). Australian secondary students' views about global warming: Beliefs about actions, and willingness to act. *Research in Science Education*, 39(5), 661-680.
- Castro, P., & Lima, M. L. (2001). Old and new ideas about the environment and science: An exploratory study. *Environment and behavior*, 33(3), 400-423.
- Chanse, V., Mohamed, A., Wilson, S., Dalemarré, L., Leisnham, P. T., Rockler, A., ... & Montas, H. (2017). New approaches to facilitate learning from youth: Exploring the use of Photovoice in identifying local watershed issues. *The Journal of Environmental Education*, 48(2), 109-120.
- Chavez, M. (2008). Une démarche critique et réflexive dans le développement d'une thèse doctorale en lien avec l'éducation relative à l'environnement [A critical and reflexive approach in the development of a doctoral thesis related to environmental education]. *Éducation relative à l'environnement*.



- Regards-Recherches-Réflexions, (Volume 7)*. Retrived from [http://www. revue-ere. uqam. ca/vol7/vol7\\_pdf/MChavez. Pdf](http://www.revue-ere.uqam.ca/vol7/vol7_pdf/MChavez.Pdf)
- Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental Education Research, 13*(4), 437-452.
- Cherai, B., El Hnot, H., El Fellah-Idrissi, B., & Akkaoui, E. (2017). Les Clubs D'environnement Dans Les Établissements Scolaires Au Maroc : Une Voie Prometteuse Pour L'ancrage De L'éducation À L'environnement [Environmental Clubs In Schools In Morocco : A Promising Way To Embed Environmental Education]. *European Scientific Journal, 13*(13), 337-357.
- Chevalier, A., & Lanot, G. (2002). The relative effect of family characteristics and financial situation on educational achievement. *Education Economics, 10*(2), 165-181.
- Chhokar, K., Dua, S., Taylor, N., Boyes, E., & Stanisstreet, M. (2011). Indian Secondary Students' Views about Global Warming: Beliefs about the Usefulness of Actions and Willingness to Act. *International Journal of Science and Mathematics Education, 9*(5), 1167-1188.
- Chickering, A. W., & Gamson, Z. F. (1987). Seven principles for good practice in undergraduate education. *AAHE bulletin, 3*, 1-6
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of personality and social psychology, 58*(6), 1015.
- Comités d'Examen du Curriculum Marocain. (2002). *Livre blanc, partie 2 : Curriculum éducatif pour les deux cycles de l'enseignement primaire* [White Paper, Part 2 : Curriculum for the two cycles of primary education]. Rabat, Morocco, 2002, pp. 47-53. Retrieved from: [http://www.foka3at.sitew.com/fs/\\_/71349-kitab\\_abiad.pdf/](http://www.foka3at.sitew.com/fs/_/71349-kitab_abiad.pdf/)
- CSEFRS. (2015). *For a school of equity, quality and promotion. A strategic vision of reform 2015-2030* (Report 2015). Morocco: Higher Council for Education, Training and Scientific Research. Retrieved from <https://www.csefrs.ma/wp-content/uploads/2015/05/Re%CC%81sume%CC%81-vision-Anglais.pdf>
- CSEFRS. (2018). *Une École de Justice Sociale : Contribution à la réflexion sur le modèle de développement* [A School of Social Justice : Contribution to the reflection on the development model] (Report 2018). Morocco: Higher Council for Education, Training and Scientific Research. Retrived from: <http://www.csefrs.ma/wp-content/uploads/2018/05/Une-e--ducation-de-justice-sociale-FR.pdf/>
- Corraliza, J. A., & Berenguer, J. (2000). Environmental values, beliefs, and actions: A situational approach. *Environment and behavior, 32*(6), 832-848.
- Côté, P., & Picard, M. (2003). Représentations de l'environnement et de l'agir dans l'environnement chez des élèves du primaire des Îles-de-la-Madeleine [Representations of Environment and Environmental Action in Elementary School Students in the Magdalen Islands], Quebec, Canada]. *Vertigo-la revue électronique en sciences de l'environnement, 4*(2). Retrieved from <https://journals.openedition.org/vertigo/4513>
- DeWitt, J., & Storksdieck, M. (2008). A short review of school field trips: Key findings from the past and implications for the future. *Visitor studies, 11*(2), 181-197.
- Djané, K., Konaté, A., & Kouassi, F. (2009). *Éducation environnementale à l'école primaire et adoption du comportement environnemental par l'élève* [Environmental education in primary school and adoption of environmental behavior by the student] (research report). Bamako, Mali : ROCARE. 02 August 2018. Retrieved from [http://www.espace-ressources.uqam.ca/images/Documents/Recherche/Rapports\\_recherche/K.DJANE\(2009\).pdf](http://www.espace-ressources.uqam.ca/images/Documents/Recherche/Rapports_recherche/K.DJANE(2009).pdf)
- Doise, W., Clémence, A., & Lorenzi-Cioldi, F. (1992). *Représentations sociales et analyses de données* [Social representations and data analysis]. Grenoble: Presses Universitaires de Grenoble.
- Downey, D. B. (1995). When bigger is not better: Family size, parental resources, and children's educational performance. *American sociological review, 746-761*.
- El Batri, B., Alami, A., Zaki, M., Nafidi, Y., & Chenfour, D. (2019a). Promotion of the Environmental Knowledge and Behavior through the Moroccan Syllabus of Sciences in the Middle School. *International Electronic Journal of Elementary Education, 11*(4), 371-381.
- El-Batri, B., Alami, A., Zaki, M., & Nafidi, Y. (2019b). Extracurricular Environmental Activities in Moroccan Middle Schools: Opportunities and Challenges to Promoting Effective Environmental Education. *European Journal of Educational Research, 8*(4), 1013-1028. doi:10.12973/eu-er.8.4.1013
- El Kent, A. M., Bekhat, B., Madrane, M., & Jules, B. M. (2015). Regard sur l'éducation relative à l'environnement des jeunes scolarisés : cas de la Commune de Kadutu en RDC [A look at the environmental education of schoolchildren: the case of the Kadutu Commune in the DRC].

- Erdoğan, M. (2009). *Fifth grade students' environmental literacy and the factors affecting students' environmentally responsible behaviors* (Unpublished doctoral dissertation). Middle East Technical University, Turkey.
- Felder, R. M., Woods, D. R., Stice, J. E., & Rugarcia, A. (2000). The future of engineering education II. Teaching methods that work. *Chemical Engineering Education*, 34(1), 26-39
- Filmer, D., & Pritchett, L. H. (2001). Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. *Demography*, 38(1), 115-132.
- Fischer, F. (2000). *Citizens, experts, and the environment: The politics of local knowledge*. Duke University Press.
- Garniez, C., & Sauvé, L. (1999). Apport de la théorie des représentations sociales à l'éducation relative à l'environnement—Conditions pour un design de recherche [Contribution of the theory of social representations to environmental education—Conditions for a research design]. *Éducation relative à l'environnement: Regards-Recherches-Réflexions*, 1, 65-77.
- Genc, M. (2015). The project-based learning approach in environmental education. *International Research in Geographical and Environmental Education*, 24(2), 105-117.
- Giordan, A., Martinand, J. L., Souchon, C., Eds. (1991). Communications. In *Ecole et médias face aux défis de l'environnement* [School and media face the challenges of the environment]. Association DIRES, Didactique innovation recherche en éducation scientifique ; Paris, France, 1991 ; pp. 221-228. 25 February 2019 Retrieved from: <http://artheque.ens-cachan.fr/archive/files/9d1e70aa2788d64295ccf5d1a732d99d.pdf/>
- Gladwin, C. H. (1989). Indigenous knowledge systems, the cognitive revolution, and agricultural decision making. *Agriculture and Human Values*, 6(3), 32-41.
- Goffin, L. (1998). L'environnement comme éco-socio-système. *Populations Et Développements : Une Approche Globale Et Systémique* [Populations and Developments: A Global and Systemic Approach]. Louvain-La-Neuve Et Paris. *Academia Bruylant Et l'Harmattan*. P199, 230.
- Greenall Gough, A. (1993). Founders in environmental education. *Geelong: Deakin University*.
- Hadjichambis, A. C., Paraskeva-Hadjichambi, D., Ioannou, H., Georgiou, Y., & Manoli, C. C. (2015). Integrating Sustainable Consumption into Environmental Education: A Case Study on Environmental Representations, Decision Making and Intention to Act. *International Journal of Environmental and Science Education*, 10(1), 67-86.
- Hallar, A. G., McCubbin, I. B., & Wright, J. M. (2011). CHANGE: A place-based curriculum for understanding climate change at Storm Peak Laboratory, Colorado. *Bulletin of the American Meteorological Society*, 92(7), 909-918.
- Hall, C. W., Davis, N. B., Bolen, L. M., & Chia, R. (1999). Gender and racial differences in mathematical performance. *The Journal of Social Psychology*, 139(6), 677-689.
- Heimlich, J. E., & Ardoin, N. M. (2008). Understanding behavior to understand behavior change: A literature review. *Environmental education research*, 14(3), 215-237.
- Higde, E., Oztekin, C., & Sahin, E. (2017). Turkish pre-service science teachers' awareness, beliefs, values, and behaviours pertinent to climate change. *International Research in Geographical and Environmental Education*, 1-11.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of environmental education*, 18(2), 1-8.
- Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *The journal of environmental education*, 21(3), 8-21.
- İnce, M., & Gözütok, F. D. (2018). Effect of Parental Education and Home Educational Resources to Students' Results of PISA Reading Skills Test. *İlköğretim Online*, 17(2).
- Jensen, B. B. (2002). Knowledge, action and pro-environmental behaviour. *Environmental education research*, 8(3), 325-334.
- Jeynes, W. H. (2003). A meta-analysis: The effects of parental involvement on minority children's academic achievement. *Education and urban society*, 35(2), 202-218.
- Jodelet, D. (1989). Les représentations sociales [Social representations]. *Paris: Presses Universitaires de France*. pp. 31-61.
- Kerry, J., Pruneau, D., Cousineau, M., Mallet, M. A., Laliberté, B., & Langis, J. (2013). Faire naître l'espoir et l'auto-efficacité chez les jeunes par l'action environnementale communautaire. *Canadian Journal of Education/Revue canadienne de l'éducation*, 36(4), 3-32.
- Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior?. *Environmental education research*, 8(3), 239-260.

- Lacroix, K., Martin-Storey, A., Déry, M., Lemelin, J. P., & Temcheff, C. (2018). Influence du quartier résidentiel et des problèmes de comportement extériorisés sur le rendement scolaire des adolescents. *Canadian Journal of Education/Revue canadienne de l'éducation*, 41(4), 991-1022.
- Lee, K. (2010). The green purchase behavior of Hong Kong young consumers: The role of peer influence, local environmental involvement, and concrete environmental knowledge. *Journal of international consumer marketing*, 23(1), 21-44.
- Lester, B. T., Ma, L., Lee, O., & Lambert, J. (2006). Social activism in elementary science education: A science, technology, and society approach to teach global warming. *International Journal of Science Education*, 28(4), 315-339.
- Liebenberg, L. (1993). Give Trackers Jobs: conservation can ensure the survival of traditional skills. *New Ground, Spring*, 93, 24-26.
- Lima, M. L., & Castro, P. (2005). Cultural theory meets the community: Worldviews and local issues. *Journal of Environmental Psychology*, 25(1), 23-35.
- Liu, X., & Lu, K. (2008). Student performance and family socioeconomic status: Results from a survey of compulsory education in Western China. *Chinese Education & Society*, 41(5), 70-83.
- Lucas, A. M. (1980). The role of science education in education for the environment. *The Journal of Environmental Education*, 12(2), 33-37.
- Malandrakis, G., Boyes, E., & Stanisstreet, M. (2011). Global warming: Greek students' belief in the usefulness of pro-environmental actions and their intention to take action. *International journal of environmental studies*, 68(6), 947-963.
- Marks, G. N. (2005). Cross-national differences and accounting for social class inequalities in education. *International sociology*, 20(4), 483-505.
- Marks, G. N. (2010). What aspects of schooling are important? School effects on tertiary entrance performance. *School effectiveness and school improvement*, 21(3), 267-287.
- Marquis, G. (2001). Les représentations sociales de l'environnement : une comparaison des jeunes du Québec et du Sénégal. *Canadian Journal of Environmental Education (CJEE)*, 6(1), 158-177.
- McCorkle, M. (1989). *The social sciences in international agricultural research: Lessons from the CRSPs*. Lynne Rienner Pub, USA.
- Moscovici, S. (1989). Des représentations collectives aux représentations sociales. In D. Jodelet (dir.), *Les représentations sociales* [Social representations]. Paris : Presses Universitaires de France. p. 62-86.
- Moscovici, S. (2001). Why a theory of social representations? In K. Deaux, & G. Philogene (Eds.), *Representations of the social* (pp. 8-35). Oxford, UK: Blackwell.
- Nonoyama-Tarumi, Y. (2008). Cross-national estimates of the effects of family background on student achievement: A sensitivity analysis. *International Review of Education*, 54(1), 57-82.
- Orellana, I. (2002). *La communauté d'apprentissage en éducation relative à l'environnement: signification, dynamique, enjeux* [Environmental Education Learning Community: Meaning, Dynamics, Issues] (Doctoral Dissertation). University of Quebec in Montreal. Retrieved from <https://archipel.uqam.ca/7213/1/I.ORELLANA%282002%29.pdf>
- Özdem, Y., Dal, B., Öztürk, N., Sönmez, D., & Alper, U. (2014). What is that thing called climate change? An investigation into the understanding of climate change by seventh-grade students. *International Research in Geographical and Environmental Education*, 23(4), 294-313.
- Pace, S., & Tesi, R. (2004). Adult's perception of field trips taken within grades K-12: Eight case studies in the New York metropolitan area. *Education*, 125(1), 30-40.
- Palmberg, I. E., & Kuru, J. (2000). Outdoor activities as a basis for environmental responsibility. *The Journal of Environmental Education*, 31(4), 32-36.
- Paquette, K., Japel, C., & Paradis, H. (2016). L'association entre l'état de vulnérabilité psychosociale pendant l'enfance et le rendement scolaire au primaire. *Canadian Journal of Education/Revue canadienne de l'éducation*, 39(2), 1-25.
- Perrenoud, P. (1998). La transposition didactique à partir de pratiques: des savoirs aux compétences [Didactic transposition from practices: from knowledge to skills]. *Revue des sciences de l'éducation*, 24(3), 487-514.
- Prokop, P., Tuncer, G., & Kvasnicak, R. (2007). Short-term effects of field programme on students' knowledge and attitude toward biology: a Slovak experience. *Journal of Science Education and Technology*, 16(3), 247-255.
- Pruneau, D., Doyon, A., Langis, J., Vasseur, L., Ouellet, E., McLaughlin, E., ... & Martin, G. (2006). When teachers adopt environmental behaviors in the aim of protecting the climate. *The Journal of Environmental Education*, 37(3), 3-12.

- Ragou, P., & Souchon, C. (2000). L'approche systémique : une méthode d'apprentissage et un outil d'évaluation pédagogique en éducation relative à l'environnement. *Éducation relative à l'environnement : Regards-Recherches-Réflexions*, 2, 195-200.
- Robottom, I. M., & Hart, E. P. (1993). *Research in environmental education: Engaging the debate*. Deakin University.
- Rodríguez, M., Boyes, E., & Stanisstreet, M. (2010). Spanish secondary students' willingness to undertake specific actions to combat global warming: Can environmental education help?. *Psychology*, 1(1), 73-89.
- Roegiers, X. (2006). La pédagogie de l'intégration en bref (The pedagogy of integration in a nutshell). *Mars*.
- Saribas, D., Kucuk, Z. D., & Ertepinar, H. (2017). Implementation of an environmental education course to improve pre-service elementary teachers' environmental literacy and self-efficacy beliefs. *International Research in Geographical and Environmental Education*, 26(4), 311-326.
- Sauvé, L. (1996). Environmental education and sustainable development: A further appraisal. *Canadian Journal of Environmental Education*, 1, 7-34.
- Sauvé, L. (1997a). L'ERE Une Diversité de Conceptions. In Guérin (2nd Ed), *Pour une éducation relative à l'environnement : éléments de design pédagogique : guide de développement professionnel à l'intention des éducateurs* [For Environmental Education: Elements of Instructional Design: A Professional Development Guide for Educators] (pp. 9-30). Montréal, Canada: Guérin.
- Sauvé, L. (1997b). L'approche critique en éducation relative à l'environnement: origines théoriques et applications à la formation des enseignants [The Critical Approach to Environmental Education: Theoretical Origins and Applications of Teacher Education]. *Revue des sciences de l'éducation*, 23(1), 169-187.
- Sauvé, L. (1999). Un «patrimoine» de recherche en construction [A "heritage" of research in construction]. *Éducation relative à l'environnement: Regards-Recherches-Réflexions*, 1, 13-40.
- Sauvé, L., & Machabée, L. (2000). La représentation: point focal de l'apprentissage [Representation: focal point of learning]. *Éducation relative à l'environnement: Regards-Recherches-Réflexions*, 2, 183-194.
- Sauvé, L. (2002). L'éducation relative à l'environnement: possibilités et contraintes [Environmental Education: Opportunities and Constraints]. *Connexion, La revue d'éducation scientifique, technologique et environnementale de l'UNESCO*, 27(1/2), 1-4.
- Sauvé, L. (2012). Éducation, environnement écocitoyenneté, mieux s'inscrire dans un monde en double tension [Education, environment eco-citizenship, better fit into a world in dual tension]. Conférence de Lucie Sauvé, colloque *Éduqué au développement durable : nouveaux défis, nouvelles pratiques dans les territoires ?* SupAgro Florac, July 2012. Retrieved from: [http://www.espace-ressources.uqam.ca/images/Documents/Recherche/Actes\\_colloque/SupAgro\\_Florac\(2012\).pdf](http://www.espace-ressources.uqam.ca/images/Documents/Recherche/Actes_colloque/SupAgro_Florac(2012).pdf)
- Sauvé, L. (2014). Au cœur des questions socio-écologiques: des savoirs à construire, des compétences à développer [At the heart of socio-ecological issues: knowledge to build, skills to develop]. *Éducation relative à l'environnement. Regards-Recherches-Réflexions*, 11(2013-2014).
- Shepardson, D. P., Wee, B., Priddy, M., & Harbor, J. (2007). Students' mental models of the environment. *Journal of Research in science teaching*, 44(2), 327-348.
- Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. *Review of educational research*, 75(3), 417-453.
- Sivek, D. J. (2002). Environmental sensitivity among Wisconsin high school students. *Environmental Education Research*, 8(2), 155-170.
- Skamp, K., Boyes, E., & Stannistreet, M. (2009). Global warming responses at the primary secondary interface 1. students' beliefs and willingness to act. *Australian Journal of Environmental Education*, 25, 15-30.
- Stern, M. J., Powell, R. B., & Ardoin, N. M. (2008). What difference does it make? Assessing outcomes from participation in a residential environmental education program. *The Journal of Environmental Education*, 39(4), 31-43.
- Stevenson, R. B. (2007). Schooling and environmental education: Contradictions in purpose and practice. *Environmental education research*, 13(2), 139-153.
- Thorndyke, P. W., & Hayes-Roth, B. (1982). Differences in spatial knowledge acquired from maps and navigation. *Cognitive psychology*, 14(4), 560-589.
- Tomul, E., & Savasci, H. S. (2012). Socioeconomic determinants of academic achievement. *Educational Assessment, Evaluation and Accountability*, 24(3), 175-187.
- Tugurian, L. P., & Carrier, S. J. (2017). Children's environmental identity and the elementary science classroom. *The Journal of Environmental Education*, 48(3), 143-153.

- Tuncer, G., Sungur, S., Tekkaya, C., & Ertepinar, H. (2007). A comparative study on pre-service teachers' and elementary students' attitudes towards the environment. *International Research in Geographical & Environmental Education*, 16(2), 188-198.
- UNESCO-PNUE (1978). *Rapport final de la conférence intergouvernementale sur l'éducation relative à l'environnement* [Final Report of the Intergovernmental Conference on Environmental Education]. Tbilissi, URSS. October 14-26, 1977, Paris: UNESCO. Retrieved from: <http://unesdoc.unesco.org/images/0003/000327/032763fo.pdf>
- Uzzell, D. L. (2000). The psycho-spatial dimension of global environmental problems. *Journal of environmental psychology*, 20(4), 307-318.
- Van Weelie, D., & Wals, A. (2002). Making biodiversity meaningful through environmental education. *International Journal of science education*, 24(11), 1143-1156.
- Van Winkle, R., Davis, W., & Larwood, L. (2002). Active teaching-active learning teaching techniques and tools.
- Villemagne, C. (2004). Le milieu de vie comme point d'ancrage pour l'éducation relative à l'environnement : réalité ou chimère? [The living environment as an anchor point for environmental education: reality or chimera?]. *Education relative à l'environnement : regards-recherches-réflexions*, 5, 89-95.
- Villemagne, C. (2005). *L'éducation relative à l'environnement en milieu communautaire urbain : un modèle théorique en émergence enrichi de l'exploration collaborative de pratiques éducatives* [Environmental education in urban community: an emerging theoretical model enriched by collaborative exploration of educational practices] (Unpublished doctoral dissertation), Rennes 2, France.
- Wells, N. M., & Lekies, K. S. (2006). Nature and the life course: Pathways from childhood nature experiences to adult environmentalism. *Children Youth and Environments*, 16(1), 1-24.
- Werning, R., Löser, J. M., & Urban, M. (2008). Cultural and social diversity: An analysis of minority groups in German schools. *The Journal of Special Education*, 42(1), 47-54.
- White, K. R. (1982). The relation between socioeconomic status and academic achievement. *Psychological bulletin*, 91(3), 461-481.
- Zhao, N., Valcke, M., Desoete, A., & Verhaeghe, J. (2012). The quadratic relationship between socioeconomic status and learning performance in China by multilevel analysis: Implications for policies to foster education equity. *International Journal of Educational Development*, 32(3), 412-422.