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TRAINING PRIMARY TEACHERS THROUGH EXPERIENTIAL GEOGRAPHY

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Abstract:

Training primary school teachers is a teaching challenge in itself. Most have a low level of education in the subject of geography and are thus not keen on teaching this discipline since they feel insecure in their knowledge of it, partly related to the fact that most high school geography teachers are historians. French teacher teach geography and history. Consequently, in order to effectively train future primary school teachers, the authors have developed a course based on experiential geography (Kold, 1984). At the beginning of the course, students' cognitive representations regarding geography were analysed, and their teaching practices were also video recorded. Following this, the entire course is organized around a field trip or simulation games. This paper demonstrates how this experiential training approach is both highly efficient in improving students' knowledge and skills in geography, and a very good way to change their representations of geography.

Keywords: *Geogr*aphy teaching – teacher training- experiential learning

1. INTRODUCTION

Geography is taught in France from nursery school right to the end of compulsory schooling. While the first years are dedicated to learning spatial references and spatial relationships(above, below, in front, behind, etc.), the acquisition of geographical knowledge and skills really starts at the beginning of primary school wherein pupils explore their close space before discovering spaces which are more and more distant in a relatively Piagetian perspective. All primary and junior nursery school teachers should therefore be trained to teach geography and, more broadly, spatial knowledge and skills. Nevertheless, training teachers in geography is not an easy task.

Most primary school teachers did not complete courses in geography when studying for their Bachelor's degree at university. Indeed, geography is not a compulsive subject for them, since the test in this discipline in the teacher recruitment process is optional, therefore only a minority of teachers choose it. Moreover, future primary teachers are often marked by their own memories of uninteresting high school geography classes, and consequently have both an insufficient knowledge of, and a dislike for, the discipline. In France, teaching of geography is combined with history, and 85% of teachers have an academic background in history. So, with only minimal training in geography, teaching of this discipline in secondary schools is inevitably negatively impacted.

In this context, training future teachers in geography and its teaching principles is a real challenge. How do we train primary school teachers to truly appreciate geography, and to be able to teach it and develop spatial thinking? The focus of this article is to explore the hypothesis that a course based on an experiential method would change their approach to geography and develop their disciplinary skills, Further exploring the argument set out by Molin et al. (2015) that teachers' personal experiences influences their choices in teaching geography themselves.

This paper is organized as follows: first, the theoretical foundations of a course based on an experiential approach are presented, then the methodology of analysis of this experiment and finally the results obtained from participants.

2. EXPERIENTIAL GEOGRAPHY, A TOOL FOR TRAINING PRIMARY TEACHERS

2.1 From experiential learning to experiential geography

The experiential learning theory was formalised by Leon Kolb (1984) in-keeping with the theories of Dewey (1938), Lewin (1951) and Piaget (1971). Experiential learning is aligned with a holistic approach, which considers the person in every dimension: intellectual, ethical, psychological, cultural… It promotes active learning, which places the learner and their experience at the heart of the learning process. This theory is founded on the premise that individuals can learn from their experiences by critically analysing them, which leads them to conceptualise the experience. They can then assess the solidity and validity of their theoretical construction by testing it in experiments. The entire process can be mapped out as shown in Figure 1.

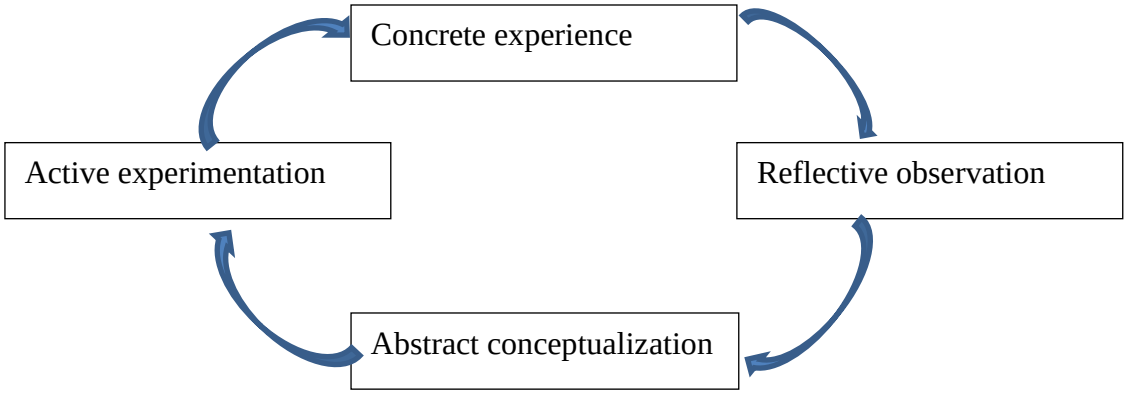

Figure 1. Experiential learning (based on Jenkins (1998, 43) and Healey & Jenkins (2000, 187)

Figure 1 demonstrates how the experiential learning process is circular. The different stages of the process are framed, with arrows indicating the direction of the process. The process begins with lived experiences, but the critical analysis and conceptualization which are developed are later reinvested in new experiences.

Geographers, especially from English speaking nations, have adopted the experiential learning theory to develop experiential geography. This involves teaching geography based on students' experiences, and enables students to question their representations and spatial

practices and to rethink them in light of the knowledge and skills acquired in class (Leininger-Frézal, 2016).

The experiential learning approach is in-keeping with the epistemology of the discipline. Indeed, so-called hermeneutic geography (Retaillé, 2000; Thémines, 2006; Hertig, 2009) incorporates the spatial representations of actors and their spatial practices as objects for analysis, so as to understand the meanings of places, i.e. the space as it is perceived and/or experienced. This is not true for other geographical fields such as spatial analysis. Experiential learning is also coherent with the wider teaching practices in geography teaching such as analysis of students' initial representations or those developed during fieldwork (Krakowka, 2012; Elwood, 2007; Halocha, 2005; Healey & Jenkins, 2000 ; Ives-Dewey, 2009).

Experiential geography is not limited to fieldwork, it can be implemented in other learning approaches. "Other types of learning situations can also adopt experiential learning: role play, discovery learning, problem resolution, etc." (Pruneau & Lapointe, 2002, 4).

The present authors mobilized different experiential approaches throughout a 22-hour course designed to train future school teachers in geography.

2.2 A course based on experiential geography

Each session of the course involves analyzing a spatial experience. Sometimes, this experience is anchored in the students' surrounding living spaces. It is therefore necessary to analyse their practices and/or spatial representations prior to the course. Sometimes, the experience to be analysed is created for the course. This analysis is carried out in two stages. Firstly, the students formalize their experiences or their representations, and they are asked questions to support them in this process. This work is carried out using a bottom-up inductive framework. At the beginning of the course, students collaborate together to share the outcomes of their work and to confront their observations. They are then asked new questions in order to help them to conceptualize their experience. Thirdly, the reflections of each group are shared in the classroom, allowing the teacher to discuss, qualify and reinforce the learning outcome achieved by comparing student contributions with other cards, documents or facts.

The themes chosen to build this course were sourced from either:

- the subjects featured in the programme at the end of the primary school curriculum: questions relating to the local area and vicinity; Where does the food come from? How to get around in France? Where is the internet located?
- or from geography tools (map, landscape, fieldwork).

A session is also dedicated to the educational purposes of geography teaching and to the curriculum.

Themes are conceived as problem-based learning, and are formulated as questions. One of these themes is central: that of the local area and its vicinity. Indeed, the surrounding space is the starting point for each learning cycle in the French system. In nursery school, spatial learning requires the implementation of differentiated rites and space-time (Frouillou, 2011). Pupils learn that in the classroom, spaces have specific uses and rules that correspond to moments of the day, for example:

- the kitchen and small cars area for the morning reception time,
- the blackboard area for learning times, the shared area for common activities,
- the area with small tables for learning workshops

etc…

At the beginning of primary school, geography learning begins with the classroom space, followed by the school, the neighbourhood and the city. Through comparison, pupils are led to distinguish different types of spaces. At the end of primary school, the surrounding space is again the starting point, but the spaces explored at this stage are much larger. Curricular logic thus presides over that of training. This explains the predominance of this theme in teacher training, as shown in Figure 2.

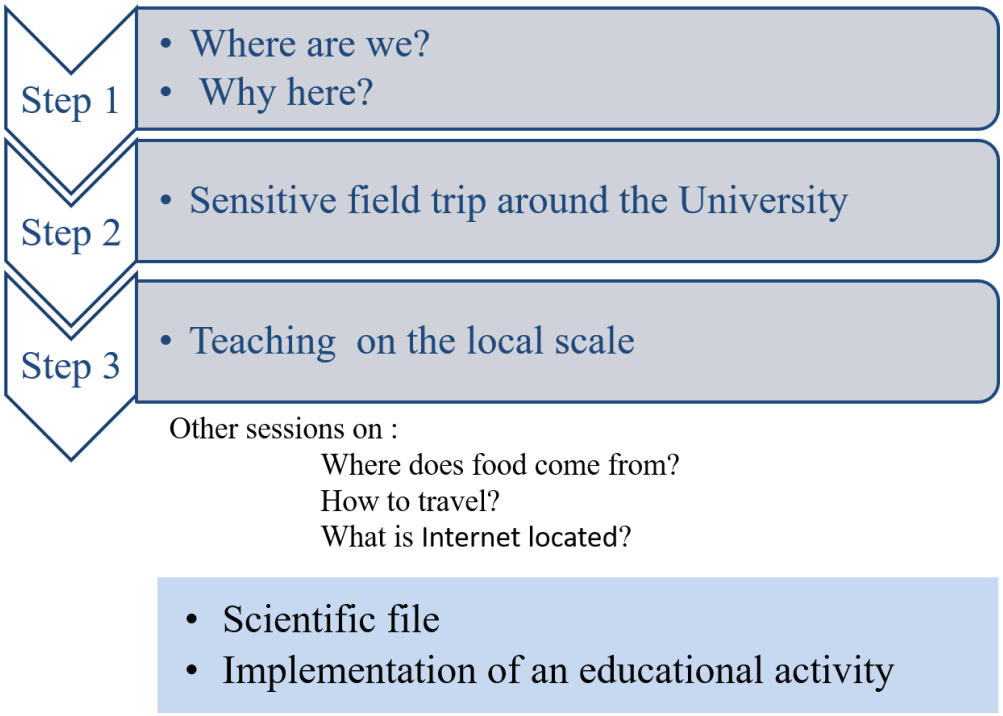

Figure 2. Organization of sessions dedicated to teaching about surrounding areas
The sequence is organized into three sessions represented by arrows. The right side of the figure shows the teaching approach.

The first session began with the questions: Where are we? Why here? Students first answered this question by drawing their mental maps of the neighbourhood, expressing their previous knowledge of the university and its neighbourhood and their daily observations of the neighbourhood. They then confronted their representations and perceptions of the neighbourhood, which provoked discussions and questions. They developed this questioning by relying on maps and texts recounting the history of the Bibliothèque François Mitterrand district in Paris.

Located in the south of Paris, this district on the banks of the River Seine was, in the 1980s and 1990s, industrial and very rundown. Indeed, part of the area was dedicated to the railway right-of-way serving Gare de Lyon and Gare d'Austerlitz stations. The presence of a river port and the Halles in Bercy stimulated the development of food industries over the 19th century which still mark the urban landscape today: large mills, the Halle aux Farines flour market, refrigerators, and industrial furnaces. The university has invested in and transformed the Grands Moulins de Paris factory and the Halle aux Farines in which students attend lessons every day. The opening of the *Bibliothèque Nationale de France* (National Library of France) in this district provided political incentive for regeneration.

The Paris Rive Gauche mixed development zone (ZAC) was established from the Gare d'Austerlitz station to the inner ring road, and from the River Seine to the Tolbiac district. The Paris semi-public construction company SEMAPA was created to manage the

regeneration of the district. Paris Diderot University, originally located in the Jussieu district, was looking for new premises in the 1990s, its own buildings being contaminated with asbestos, and the university opened its doors in this new district in the mid-2000s. Students who attend Paris Diderot University can observe the development of this work-in-progress every day, with new buildings still emerging. Part of the stonework which covers the railway, and on which these new buildings are erected, is still under construction.

This first session made it possible to introduce the field trip which would take place later: a sense-driven visit of the neighbourhood. In pairs, students had an hour and a half to survey the neighbourhood with instructions to understand the space from an alternative perspective. They had to experiment with new means of transport: bikes, running, trams, walking slowly, walking with their eyes closed guided by their partner, etc. They were encouraged to pay attention to the sounds and colours of the neighbourhood in various places, and to observe the people they saw and the ways in which they used the space. Some students even took the initiative to question passers-by. This sensorial visit was guided by the methodology developed by Sophie Gaujal (2016) in her doctoral thesis.

Following this visit, each pair joined another pair to compare their observations. The aim of this was to get them to differentiate the spaces around the university through comparison. The students produced a field report which aimed both to transcribe their experience but also to develop spatial thought about the neighbourhood. This visit was then anchored in the context of a course on the interests and limits of teaching about direct close and local space in primary school. Following this course, students were asked to submit a scientific file presenting the facilities available in the Bibliothèque François Mitterrand district and also to animate in class a teaching activity which would enable students to understand the space around the university.

The other themes of the course were approached in a similar way, as shown in Table 1.

Table 1. Themes of the course and objectives

Situation-Problem studied	Inductive Experiments / Experimentation	Conceptualization Phase	Knowledge and Skills Objectives
Where does the food we eat come from?	Students chose two food products in their kitchen: one raw and one processed. They then researched who created these products, where they came from and what itinerary these products have gone through to get to them	Students compared their observations in groups. This led them to observe that food products were subject to globalization and were part of industrial food chains.	- Food production is integrated into industry and global trade.
How to get around in France?	Students participated in a virtual race in La Rochelle. In pairs, they planned a trip from different French cities. The starting time was the same for all, and the first pair to get to La Rochelle was the winner. In case of a tie, the cost of the trip was considered. The pairs did not have the same budget constraints or access to the same means of transport. The use of a car was forbidden.	The whole class compared their different routes. The groups of students then tried to understand the results of the race, which led them to see the inequalities of service in France and the centralized network of railways and motorways.	- Access inequalities in France - The various measures put in place to reduce these inequalities
Where is the internet located?	Students drew an approximation of the functioning of the internet. They then reflected on the geographical dimension of the topic. Finally, they compiled a document to explain to pupils at the end of primary school the physical infrastructures necessary for the functioning of the internet and their unequal distribution. This theme is included in the geography curriculum of the final class of primary school.	As a group, the students confronted their representations of the internet. They recognized their lack of knowledge of the material and spatial dimensions of the network.	- The distribution of the internet network worldwide - Internet access inequalities.
Why and how to use landscapes and maps to teach geography?	Students looked for a map which could be used to teach geography in primary school. They then considered possible uses in the classroom. Similar work was plannedabout landscapes, but due to lack of time it could not be carried out.	Students discussed their proposal as a group. They were led by the instructions given in class to analyse the sense and shape outlined by the maps, and to choose among the propositions those which seemed to be the most relevant for learning geography.	- Knowledge of how to sketch a landscape - Knowing how to write and explain a landscape - Reading and explaining a map - Knowing how to produce a map
What is taught in geography in the primary school curriculum? What are the objectives?	Students were encouraged to reflect on the content of geography at school and its usefulness.	Students debated the various opinions expressed and this allowed them to experience the Piaget approach of French geography programmes.	- What is taught in primary education in geography - The objectives of teaching geography at school - The major phases of spatial learning for children

The entire course was developed as part of a didactic engineering approach (Artigues, 1988) and was subjected to a data collection methodology to both scientifically substantiate its analysis and to test the initial hypothesis.

3. METHODOLOGY

The experimentation proposed in this article is exploratory in nature. Indeed, the method was tested on a single class of 18 students during the 2016-2017 academic year.

3.1 A class test

The student sample were in the third year of their Bachelor's degree and were preparing to enter their Master's degree in Teaching. The training they received is only taught at the Paris Diderot University. It is a multidisciplinary course in which students receive a refresher in all subjects taught in primary school (literature, mathematics, science, history, geography, theatre) except for sport and arts and crafts. The training also includes a teaching and education component for each of the disciplines. Class size is limited to 30 students but the year group used in the sample comprised only 18 students. They came from various disciplinary backgrounds, as shown in the figure below, with some having even attended technical training previously.

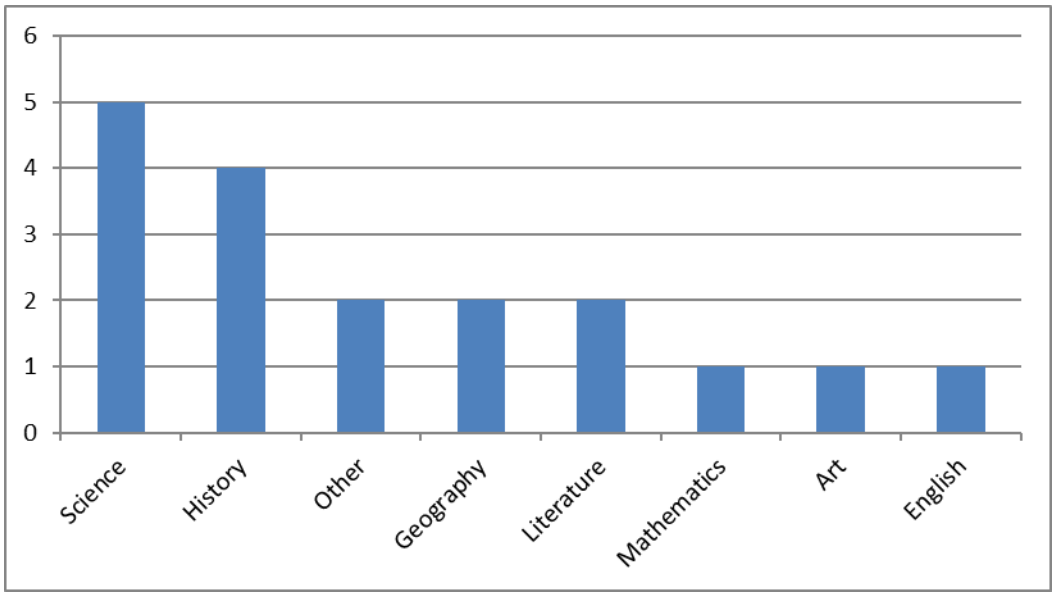

Figure 3. University curriculum for multidisciplinary students in 2016-2017

Figure 3 shows the training disciplines followed by students in their first two academic years. The ordinate axe indicates the number of students per discipline.

Two students had followed a mixed curriculum (mathematics and geography or geography and history), and two others had completed a geography course in the previous two years. The remaining students had not had any training in geography since the end of secondary school, geography being a compulsory subject in the French Baccalaureate. To work with these students, didactic engineering was implemented (Artigue, 1988).

3.2 Collecting data

"Didactic engineering, seen as a research methodology, is characterized first and foremost by an experimental scheme based on "didactic realizations" in class, that is, on the design, realization, observation and analysis of teaching sequences." (Artigue, 1988, 285-286). This method was originally developed in teaching approaches to mathematics in the 1980s and then later extended to other disciplinary fields. Michèle Artigue formalized this methodology into three stages: the preliminary analysis, the a priori conception of a didactic system, and the experimentation and assessment of this system.

3.2.1 Preliminary analysis

Preliminary analyses may include epistemological aspects of the subject to be taught, teaching practices or student conceptions and difficulties. In the framework of this research, the preliminary analysis led the authors to establish an inventory of previous research on representations of geography held by primary school teachers or teachers in training in France, and on their class practices. Representations held by students from multidisciplinary degrees were identified. To do this, during the first session of the course, a questionnaire was conducted and students' mental maps on the neighbourhood surrounding their university were collected.

The questionnaire comprised three questions:
• Give three words that geography evokes for you
• Give your own definition of geography
• In your opinion, what is the use of geography?

Students were then instructed to represent the neighbourhood surrounding the university on plain paper distributed by the teacher. No additional information was given to students: the limits of the space to be represented were defined by students themselves, as well as the mode of representation chosen (drawing, plan, etc.). Permission was sought from students to use their productions for research purposes. The training was designed according to the principles of experiential teaching as presented hereabove. The training began with a presentation of the collection of students' initial representations and their mental maps. The following section discusses and assesses the training course provided.

3.2.2 Training assessment

Assessment of the approach was carried out continuously throughout the training. Students' individual reports of the sensorial visit were analyzed and given feedback a week later. This analysis was based on the following grid:

Table 2. Grid of analysis of field reports

Criteria of analysis	Factors
The report reflects the sensorial nature of the visit	• Mention of sounds, colours, odours • Expression of personal feelings
The student defines his / her itinerary and the places he / she passed through	• Mention of place names
The student operates spatial differentiations in the neighbourhood	• Distinction of the main roads and other streets in the neighbourhood • Distinction of different spaces in the neighbourhood • Identification of the different functions of the neighbourhood
The student differentiates the various uses of space	• Mention of different types of actors • Distinction of the various uses of space

The analysis of scientific files was based on a different analytical framework, with the exercise carried out later. The purpose of the scientific file was different to that of the field report: it aimed to support students in conceptualizing their lived experience rather than merely representing it. A reading list was distributed to students to guide them. The grid of analysis of the scientific file is therefore essentially conceptual.

Table 3. Grid of analysis of scientific work

Criteria of Analysis	Factors
Concepts in the folder	• Urbanization, densification • Social and functional mix • Development • Actors • Uses • Districts • Primary, secondary, tertiary, tertiary sector
Highlighting neighbourhood issues	• Recovering areas in crisis in Paris • Regeneration of the neighbourhood • Developing modes of transport • Neighbourhood economic development • Development of original architecture.
Highlighting actors and processes	• Identification of the different stakeholders in neighbourhood planning • Identification of the different users of the district

After completing the file, the students created an educational activity which they then presented orally to the whole class. This activity was also analysed in terms of:
- Its consistency and relevance to the curriculum
- The proposed geographical approach
- Defined learning objectives.

The analysis of students' reports was supplemented by two surveys. The first explored the questions submitted during the preliminary analysis and aimed to measure the evolution of the representations students held about geography and its teaching at the end of the lessons on surrounding and local spaces.
- Give three words which you associate with geography
- What did you learn about geography from the sensorial visit and the group work that followed?
- What did you learn about teaching geography?

All students responded to this survey, unlike the second one, which aimed to obtain students' reviews the course and only received 12 responses. This second survey comprised five questions:
- Were the course objectives clear to you?
- Were the assessment criteria presented in a clear and comprehensible manner?
- What did you find interesting in the course?
- From your experience, would you say that the approach of the course, working within a small tutorial group with work to prepare at home, seems effective for this teaching?
- What would you change about the course?
- Any further remarks

The analysis of the students' work and the surveys conducted show that the students had only a partial understanding of geography before the course and its teaching

3.3 Initial understandings of geography

3.3.1 Geography, an ambiguous subject

At the beginning of the course, students did not know what geography was. Seventy percent of them associated geography with a "discipline", "teaching", "study" or "knowledge" of something not very precisely defined. Only two students referred to geography as a science. The subject of geography was also ambiguous for students. Six students combined space and geography. The other terms mentioned in the first questionnaire showed that students consider geography to be an inventory of the world. The figure below shows the disparity of terms students associated with geography.

Figure 4. The terms students associated with geography in the first course.

Figure 4 is made up of the words given by the students before the course. The more the term is quoted, the bigger its size on the image.

For the students, geography is about location and places: countries, continents, regions, capitals, the world, the earth. They also reduced the discipline to objects including culture, climate, flows etc. These results reflect the geography programme in the secondary education curriculum, inherited from the Vidalian tradition. Until 2008 in primary school, and 2010 in high school, geography was represented around a relatively stable organizational chart where pupils would study the different regions of France and the world having previously studied the general principles of geography (the foundations of physical and human geography).

These results are representative of the difficulties expressed by primary teachers. A 2005 study carried out on behalf of the Ministry of National Education (Larivain, 2006) shows that 16% of school teachers acknowledge that they have difficulty teaching geography. These difficulties were also observed by Thierry Philippot (2012) in an empirical study conducted on a sample of 9 teachers. School teachers observed in the classroom mainly teach facts in a masterful and unproblematic way. "This teaching, which can be termed factual, takes place in ways that leave little room for the student, considered a passive subject here, to actively learn. Indeed, a dominant mode of classroom work emerges, that of an essentially oral method of teaching in the form of questions / answers, which Philippot (2012, 30 – personal translation) called a dialogue course.

The representations students hold of geography influence the aims they attribute to its teaching. Indeed, they report associating geography with content to be transmitted rather than skills to be acquired. Teaching geography is first and foremost "discovering" the world, "knowing" it, and facilitating students' "comprehension". On a marginal level, one student associated geography education with citizenship training and another with the transmission of eco-citizenship principles. Only four students mentioned the location in the space as a dimension of this teaching.

Although students reported a generally homogeneous view of geography and its teaching, they demonstrated very disparate spatial skills.

3.3.2 Heterogeneous spatial skills

As the geography course was taught in the second semester, at the time the students designed their mental map of the neighbourhood, they had all been in the university district for at least six months. Thirteen of them had moreover even completed their first two academic years on the Paris Diderot campus. However, the mental maps produced show very disparate representations of the neighbourhood. Three types of profiles emerged.

First, there were those students whose mental maps were landscapes which rather reflected an ideal vision of the neighbourhood, an atmosphere, without any reference to specific places, like the map below.

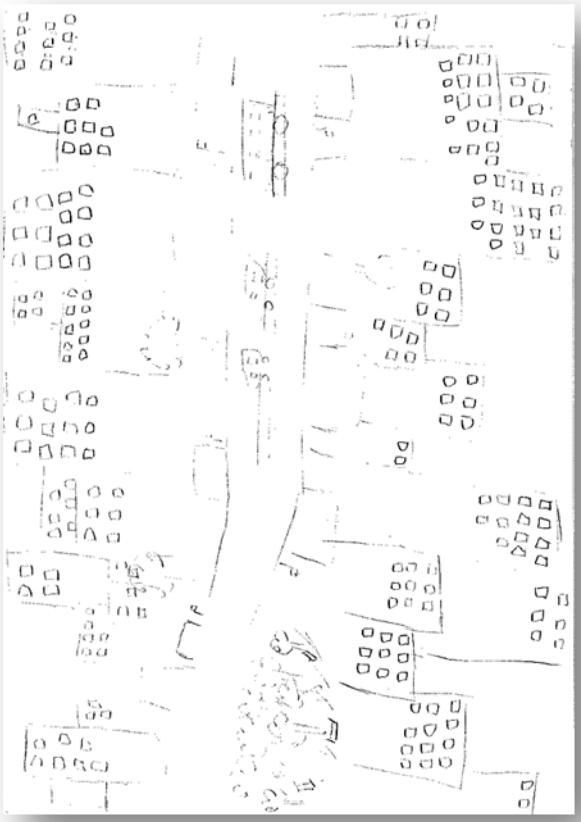

Figure 5. Mental map n° 1 of the Paris Diderot University district

This mental map shows a neighbourhood of buildings distributed along a main axis, along which cars and buses circulate. This axis corresponds to the Avenue de France, which is the backbone of the neighbourhood. Other modes of transport (metro, RER, tramway, river transport) are omitted. Vegetation is limited to a few trees scattered along the track and a green space. No place names are mentioned, there is no square on the map, and the neighbourhood represented is dehumanized: it is the image of a central business district.

Two other maps submitted by students in the study are similar. These maps represent a checkerboard juxtaposing blocks with few place names. Nevertheless, this shows a low capacity for observation and analysis of everyday space.

The second group of students comprises those seven who represented an area limited to the main buildings of the university, which were the only references cited on the map. One of these maps represented a landscape with three-dimensional buildings. The others show vertical views. The students of this group presented landmarks in space but show limited knowledge of the neighbourhood. Six of these students had completed the first two years of

their degree on this campus and one of the students had furthermore attended a geography course. This demonstrates limited spatial competence.

The third group of students (nine) drew more or less precise maps of the district, showing sound knowledge of places, like the map below.

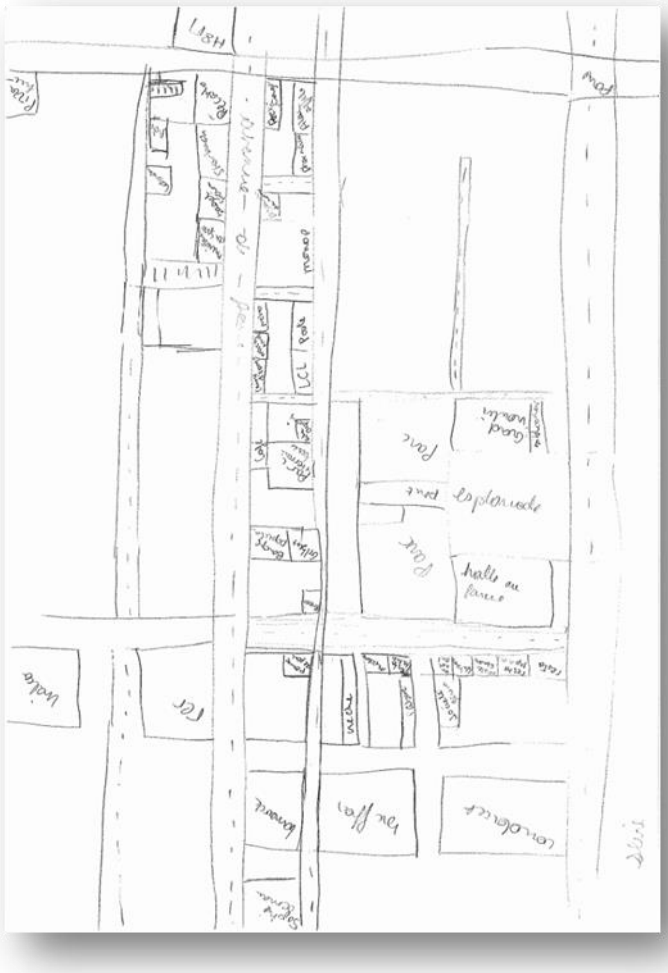

Figure 6. Mental map n° 2 of the Paris Diderot University district

The student took care to represent the main axes (avenue de France, Quai de Seine) as well as the River Seine which delineates their map. The layout of the streets is relatively accurate, as is the general appearance of the neighbourhood. Some blocks are empty, indicating spaces less frequented by this student.

This mental map shows a good ability to observe and represent their surrounding space. The maps in this category are not all as richly detailed as the map featured above, but all show a capacity to visualize and observe space.

This analysis of mental maps shows that the students participating in this teacher training course have highly disparate abilities to observe and think about space. Half of them (profiles 1 and 2) nevertheless seem to have difficulty in spatial thinking. The challenge of this training is to see whether the course has enabled them to progress.

3.4 Improving teachers' skills in geography?

The analysis of students' various works and the two surveys shows that students enriched their representations of geography and better identified the learning objectives of the discipline as a result of the course. They also improved their geographical culture. The scientific files also highlight the emergence of spatial thinking.

3.4.1 Encouraging a new approach to geography and its teaching

At the end of the course, students no longer assimilated geography to different parts of the world, as shown by the cloud of words below.

Figure 7. The terms students associated with geography at the end of the course

This cloud of words was created using the same methodology as Figure 4. The more frequently the term was quoted, the bigger its size in the image.

More than half of the students (13/18) related geography to either space or territory, or to tools which allow us to locate things (map, sketch). These students understood that geography is the science of space. One student responded "geography also concerns actors and space" to the question "What did you learn about geography from the sensorial visit and the group work which followed?". Students were aware that their understanding of the discipline had changed. One student explicitly stated: "I was able to learn that geography was not just what we were able to study in high school. I have discovered new aspects such as: learning to observe our environment and the people living in it, and to identify its uses. Geography is therefore not only a study of the populations and resources of other countries. "

The representations the students held of teaching geography also evolved. They reported in their survey that geography could be taught differently than in a traditional lecture, that its teaching could be "fun" and "user friendly". The students adopted a socio-constructivist vision of learning in geography. "I was able to learn that there are alternative methods to teach geography. Group work is possible in geography, sharing ideas over a short time

period. This inspired ideas to emerge which then enriched the written trace that we will keep". Students are thus more active than in geography courses used by the authors in previous studies. The learning activities students created for pupils at the end of primary school are all based on an active learning approach (learning by doing) with a workshop, during which students question their experiences. These activities showed that students acquired the capacity to prepare and implement courses which comply with the curriculum.

This training helped to change students' relationship to geography and its teaching. It inspired students to learn and teach this discipline of which they did not have a sound grasp initially, which demonstrates that the course achieved one of its objectives: to improve students' knowledge of geography.

3.4.2 Development of spatial thinking

Students reinforced their disciplinary skills. They enriched their conceptual network as shown by both the previous word cloud and their responses to the survey. The analysis of the scientific files corroborates their statements. The students could identify in their files the actor-driven logics at stake in the Bibliothèque François Mitterrand district and remobilize the concepts seen in progress, even if this is not always explicitly expressed. Two of the files are very descriptive, wherein the idea is present but lacking the words to describe it.

Students also reported learning to observe, understand and analyse different types of spaces. Field reports show that they have begun to differentiate spatially in the surrounding neighbourhood of the university by distinguishing the large commercial avenues lined with offices and large commercial and restaurant chains, small streets inside the university neighbourhood, narrower and calm, rather residential with some shops nearby. The sensorial approach certainly helped the students, since half of them initially had relatively poor representations of the university neighbourhood (category 1 and 2 mental maps). One of the groups of students even attempted a cartographic sketch of the neighbourhood (below).

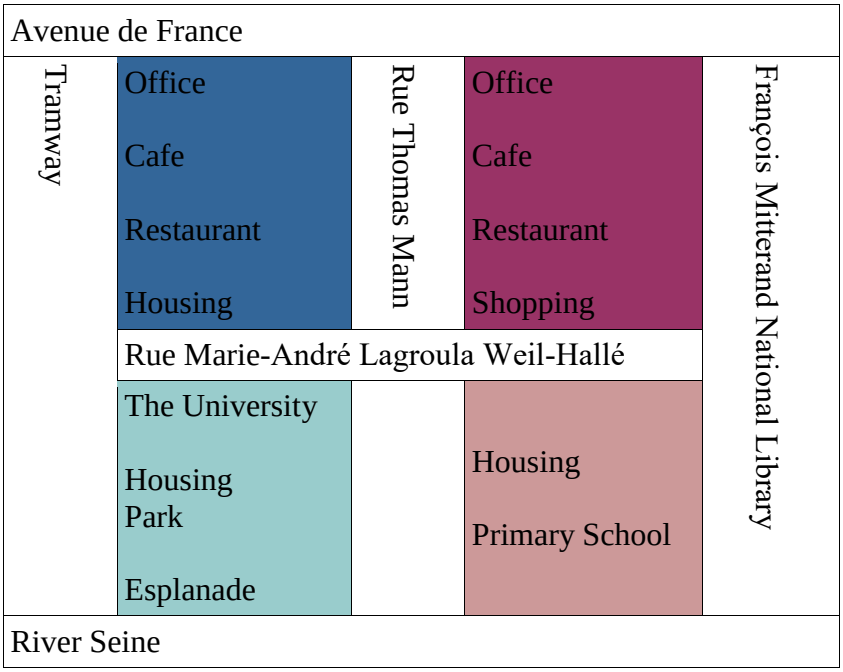

Figure 8. Sketch of the Bibliothèque François Mitterrand district by one of the student groups

This sketch represents the distribution of economic activities in the university district. The blocks are represented in colour and the roads in white.
It would be presumptuous to conclude that students have solidly acquired spatial thinking, and more accurate to say that training has contributed to the initiation of spatial thinking among students. Analysis of their work has shown their ability to identify spatial structures.

4. CONCLUSIONS

To conclude, experiential geography is a promising training lever for future primary school teachers. A training course based on an experiential approach enables future primary school teachers to master geographical concepts and develop geography-anchored reasoning skills. It also enables them to create a new relationship with the discipline. At the end of the training, the future teachers had fun participating in geography exercises and wanted to teach it and this is undoubtedly the most important outcome: training is an empowerment process.
Nevertheless, the present study is exploratory. Michèle Artigue speaks of micro-didactic questioning for didactic engineering focused on a class-based intervention. The scope of this research is inherently limited. To better measure the impact of experiential training on primary teachers in training, it is necessary to, on the one hand broaden the experiments by replicating them over several years and, on the other hand, to replicate them at a Master's degree training level somewhere else. This dissemination requires formalizing the approach within a training framework: future research should continue in this direction.

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